NINETEENTH CENTURY STONEWARE MANUFACTURING AT POTTERSVILLE, SOUTH CAROLINA: THE DISCOVERY OF A DRAGON KILN AND THE REINTERPRETATION OF A SOUTHERN POTTERY TRADITION

BY

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DISSERTATION

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Abstract

The focus of this research project was the Pottersville kiln site (38ED011) located in Edgefield, South Carolina (circa 1810-1850 C.E.). That production center was founded by Abner Landrum and is renowned as a first place of the manufacture of alkaline-glazed stoneware vessels in the Americas. The founding ceramic entrepreneurs of the Pottersville kiln attempted to produce porcelain and other products during a period of limited trade interaction with China. The Pottersville proprietors drew upon ceramic knowledge rooted in generations of pottery production, the proceeds of earlier European industrial espionage in China, and failed European attempts to create products to mimic Chinese porcelain. Elemental analysis of the molecular composition of clays and ceramic product samples was conducted as a portion of this project. That elemental study indicates that Edgefield kilns were constructed in locations to take advantage of high-quality kaolin resources. The clay deposits discovered in South Carolina were similar in quality to those located adjacent to Chinese manufacturing centers and the Cornwall mines of England that were exploited by Staffordshire potters. The availability of such high quality clay was a factor influencing the difference between success and failure in the production of porcelain and related ceramic products.

Clay quality was not the only factor that held a key to the successful production of porcelain. To transform clay into porcelain, molded objects were fired in a kiln to temperatures that exceeded 1,400 degrees Celsius. The Pottersville ceramic entrepreneurs constructed a kiln capable of being fired to high temperatures and based their design upon centuries of technological expertise. Based on earlier archaeological and documentary

research, the typical kiln for production of alkaline-glazed stoneware in the American South during the late 1800s was known as a "groundhog" kiln. Such groundhog kilns were of modest size and were derived from earlier European kiln designs. In 2010-2012, I conducted archaeological investigations to study a number of Edgefield pottery centers and in particular to investigate the Pottersville kiln's architectural features in attempt to understand 19th century kiln technology. Upon conclusion of a 2011 archaeological field school focused on the Pottersville kiln site, I found that the kiln displayed similar widths to a groundhog kiln. Astoundingly, though, the excavations revealed that the Pottersville kiln was 105 feet in length -- five times longer than a typical groundhog kiln. Field work at two related kilns in the area of the nineteenth-century, Edgefield pottery district, revealed that two members of Abner Landrum's extended family also built and operated such larger-scale kilns in the antebellum period. To understand the unexpected scale of these production structures, the project focus was expanded to include potential architectural influences based upon non-European kiln designs, including the Chinese "dragon" kiln.

The increased dimension of the Pottersville kiln, coupled with the results of regional, elemental analysis, led to a careful consideration of the ways in which enslaved laborers were deployed as a part of this rural, industrial enterprise. In China, porcelain production activities were of such an industrial scale as to support entire cities. Due to the immense scale of Chinese production centers employing multiple dragon kilns, entire communities participated in a full array of production process from mining clay through producing porcelain objects. At the Pottersville kiln, to ensure a dedicated, long-term work force, enslaved laborers were forced to participate in all facets of production. Those manufacturing steps included the chopping of fire wood, quarrying and preparation of clay, turning the vessels, and loading and unloading of the kiln. The deployment of enslaved labor for industrial means runs counter to the perceived notions slavery and industry in South Carolina.

Entrepreneurs of the Pottersville kiln were ultimately unsuccessful in their attempts to create porcelain; however, the site was the first full-scale ceramic operation in North America where a porcelain-like, alkaline glaze was developed and applied to stoneware vessels. Those stoneware vessels were made of high-quality kaolin clay and fired in these South Carolina kilns at temperatures of 1,200 degrees Celsius. Within the Edgefield district, ceramic history, technology, invention, and industrial slavery coalesced to produce a utilitarian vessel identifiable to this day throughout the American South. Due to these factors, the Pottersville kiln has been recognized as nationally significant based on historical and documentary evidence and is listed on the National Register of Historic Places.

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Chapter 1: Introduction

This research project examines a combination of European-American innovations in glaze, forms, and kiln construction with the accomplishments of skilled African-American craftspeople in a new stoneware industry in Edgefield, South Carolina in the early 1800s. I explore the ways in which individuals or groups carved out innovations in established traditions of practice. The alterations of these social and technological traditions were experienced as hands molded pots, as laborers stacked bricks to build the kilns, and as entrepreneurs peered into burning crucibles of clay afire.

The research questions that I seek to answer were driven by my archaeological investigations of the Pottersville kiln site in Edgefield, South Carolina. The Edgefield pottery district was at the epicenter of a ground-breaking florescence of innovations in early 1800s. A Scots-Irish entrepreneur somehow combined the first instances in the Americas of alkaline glaze recipes for stoneware with an industrial-scale, “Dragon” kiln. These innovations were operationalized by enslaved African Americans working all aspects of skilled and unskilled tasks in that rural, industrial enterprise.

Figure 1.1 Mills 1826 Map, Edgefield District

On an 1825 Edgefield District map, multiple pottery kilns are shown to have existed in the area (Figure 1.1 and 1.2). Pottery from the Edgefield district was acclaimed to be "stronger, better, and cheaper than any European or American ware of the same kind" (Mills 1826). Stoneware storage vessels finished with alkaline glaze filled a demand previously addressed by lead glazed earthenware or salt glazed stoneware. These stoneware vessels provided a more durable storage alternative that avoided rising health concerns with lead glazed pots and a less expensive option than salt glaze. The Edgefield pottery district possessed an abundance of the required elements needed for producing an alkaline glaze mixture and high-quality stoneware: 1) silica (most notably sand), 2) slaked wood ash and or lime, and 3) a rich deposit of kaolin clay (Zug 1986).

Figure 1.2 Mills 1826 Map, Pottersville (Landrumsville) and the town of Edgefield.

The remains of the Pottersville kiln lie just beneath the topsoil and remain largely intact due to lack of agricultural activities in the space directly related to the kiln. Excavations that I directed at the Pottersville kiln site in 2011 presented us with a reevaluation that only archaeology would provide. Historians had predicted a folk pottery facility of modest dimensions buried beneath the soil. Our archaeology project revealed an industrial-scale, Dragon kiln of 105 feet in length. The remarkable scale of the Pottersville kiln opened new research questions which had was not been considered previously. That kiln technology must be viewed as an integral facet of how ceramic technologies were altered in Edgefield. The Pottersville kiln was first assumed by historians to be 20 to 30 feet in length. However, after archaeological investigation showed that the kiln was in fact 105 feet in length, I broadened documentary research to include kiln designs outside of Europe. Through this investigation, I determined that the kiln design was most likely inspired by Chinese industrial enterprises, rather than more modest forms of European pottery kilns.

The historical development of alkaline glaze technology was a primary research topic. Scholars have long postulated how Pottersville's proprietor discovered the techniques to create a glaze which had previously not been utilized in the Americas. Past scholarly discussions regarding the discovery of alkaline glaze technology range from independent innovation to alteration of known technologies. I explore the historical events and literary resources available in the nineteenth century to provide my own interpretations on this topic.

The Pottersville kiln site provides an excellent opportunity to examine the dynamics of industry in an agrarian setting in the American south. The social ideology which persisted in South Carolina in the early 1800s has not been considered as a context facilitating industrial production, or even the desire to promote industry. This project demonstrates that Pottersville should be recognized as an industrial site providing significant insights for the study of southern industry. Embedded within southern industry was the labor put forth by enslaved Africans and African Americans within that rural, industrial setting.

Chapter 2 discusses the theoretical approach of this dissertation. To explain daily operations and decisions that occurred at the Pottersville kiln site, I engage with practice theory and a related framework of *chaîne opératoire* analysis. The first portion of this chapter outlines the theoretical description of practice theory as defined by Pierre Bourdieu and Anthony Giddens. The chapter then explains how I intend to utilize practice theory at the Pottersville kiln site. By considering practice theory in the Pottersville kiln context I am able to define my research questions. I plan to answer these research questions with the assistance of practice theory, the archaeological record, and historical documentary evidence. I conclude chapter 1 with an examination of how a framework *chaîne opératoire* analysis allows me to examine the daily actions within a larger-scale application of practice theory.

Chapter 3 introduces a principal archaeological site that I excavated as a part of this study. The Pottersville kiln site is located in Edgefield County, South Carolina and represents the remains of America's first alkaline glaze stoneware manufacturing facility. Research focused on the Pottersville kiln site included a review of the geologic history, geographic setting, and historical underpinnings of Edgefield and the state of South Carolina. The principal commodities produced at the Pottersville kiln site were an array of stoneware utilitarian vessels. Throughout this dissertation I examine ceramic technologies and the manner in which persons of interest have been able to innovate and change manufacturing techniques over the course of several centuries of international competition in ceramic production.

In Chapter 4, I examine the history of stoneware ceramics. Pottersville was not the first location to produce stoneware, and the ceramic products created at Pottersville were influenced by previous manufacturing facilities. In this chapter, I explore potential stoneware production modes that influenced Pottersville designs and production. Kiln owners and potters must be conversant with kiln architecture and vessel production technologies in order to create a viable manufacturing facility. This chapter also provides an overview of studies of other possible kiln designs that may have provided conceptual models or otherwise influenced the design of the Pottersville facility. This chapter concludes with information regarding the daily working environment which likely supported stoneware production at Pottersville.

Pottersville was the first kiln site to mass produce alkaline glazed ceramics in the Americas. Chapter 4 also focuses on the development of such glaze technologies and how an alkaline glaze utilizing wood ash became the material of choice at Pottersville. Glaze technology was linked to the exchange of ceramic production techniques between Asia and Europe. In an effort to become less reliant upon Chinese suppliers and trade, European potters and scientists attempted to discover techniques for the production of high-quality porcelain. Such porcelain products were made with higher-quality clays fired at higher temperatures than pottery referred to as earthenware and stoneware. Chapter 4 discusses several historical figures who participated in the development of pertinent elements of ceramic commodities over the course of several centuries. The chapter concludes with a discussion of Pottersville's founder, Dr. Abner Landrum.

Chapter 5 provides a detailed report of archaeological investigations undertaken at the Pottersville kiln site in 2011. This chapter provides information regarding archaeological excavations and features uncovered during the course of these investigations. The chapter concludes with a summary of two additional kiln sites in the Edgefield district. These two kilns were contemporary with Pottersville and were operated by Landrum family members. They too incorporated industrial-scale, Dragon kilns in their operations during the antebellum period.

Chapter 6 expands upon and interprets the archaeological information in Chapter 5. I apply insights from a study of other kiln construction approaches, as addressed in Chapter 4, to examine the architecture at Pottersville. Chapter 6 also examines the artifacts recovered during excavation of the Pottersville site. These artifacts provide data indicative of the chronology in which production activities began and terminated at Pottersville.

Chapter 7 concludes with information regarding enslaved laborers forced to work at the Pottersville manufacturing facility. Building from the information regarding enslaved laborers working at the Pottersville stoneware facility, Chapter 7 explores the scantly discussed topic of industrial slavery. The research begins with a discussion about southern ideology and the perceptions of master-slave relationships. I review two theoretical viewpoints, focused on paternalism and economics, and explain that when these perspectives are combined a more holistic understanding of key facets of slavery in the United States can be presented. This chapter explains the division of labor which existed on many plantations and the role that trusted, enslaved laborers held on the plantation. Industrial slavery entailed different characteristics than slavery in agricultural plantations. In such industrial settings, enslaved laborers often earned a wage or were provided liberties to which agricultural field hands would have been less accustomed. Enslaved labor was an approach utilized in the daily operations of the Edgefield stoneware facilities, including skilled potters and others engaged in tasks such as quarrying clay and preparing other resources.

The purpose of Chapter 8 is to detail additional elemental analytical research which I have conducted regarding the production of Edgefield stoneware. Stoneware kilns in the Edgefield district were not centrally located, but rather built in potentially strategic locations throughout the region. This chapter focuses upon the elemental constitution of waster fragments located at Edgefield production facilities in order to determine the locations of clay resources available to kiln owners. This research aims to determine whether raw materials originated at one extraction site and were transported to the stoneware facilities throughout Edgefield or if production sites were built adjacent to high quality stoneware clay resources.

Lastly, Chapter 9 presents my concluding observations from this dissertation study of the alteration and development of ceramic technologies in antebellum South Carolina. I reconsider evidence discussed throughout the dissertation in order to interpret the archaeological record, analyze the influences drawn upon by ceramic entrepreneurs, and the subsequent developments in ceramic manufacturing methods and strategies. This project presents a moment in history where a shift in previous knowledge merged with an innovative implementation of technologies and created a new episode of ceramic history and technology.

Chapter 2:
Theoretical Framework for Examining Ceramic Technologies Research into Ceramic Material Culture

Ceramic objects, kilns, and glazes have been under continual development since social groups obtained knowledge for the production of these materials. The production technologies initially utilized at the Pottersville kiln site altered and inspired southern ceramics to such a degree that alkaline glaze stoneware is still produced to this day. The southern alkaline glaze and the regional kiln technology which supported production of stoneware vessels in Edgefield were rooted in thousands of years of ceramic history. In order to comprehend production techniques utilized at Pottersville it is important to understand those preceding, historical developments. Such technological innovations and developments were initiated by particular social groups in different terms and locations and integrated into their daily activities. By understanding such historical advances in ceramic technologies it is possible to examine the innovations and established practices with which southern American potters engaged in daily production techniques.

I recognize that both stoneware and alkaline glaze were not developed in a vacuum, but rather were rooted in previous successful techniques and methods of ceramic manufacture. The manufacture of different types of ceramic materials and vessel forms can be studied for changes over time and location in relation to development and adoption of different techniques and technologies. Regardless of when in time or where in the world, ceramic technologies consisted of learned processes that particular social groups accepted and operationalized during a portion of their histories. The technology and techniques of particular traditions of ceramic production were thus based upon a series of choices and knowledge borrowing and not solely on environmental and resource constraints.

The Pottersville kiln site provided an ideal location to examine ceramic production and technologies. Entrepreneurs who operated the Pottersville kiln utilized an innovative glaze technique that was incorporated as a key facet of their production practices. To explain the creation and maintenance of ceramic technology, techniques, knowledge, and operations, insights from practice theory and the related refinements of the analytical framework of *chaîne opératoire* are useful for investigating the development and acceptance of this innovative glaze technique.

Ceramic production entails more than the creation of a vessel. Production includes the acquisition of raw clay, processing of the clay, production of glaze, forming the vessel, and loading, firing, and unloading of the kiln. Each of these processes involves a particular series of operations and technical knowledge in which the social actor engages to create the intended finished stoneware vessels. These series of operations can be described through the detailed analytical steps of the *chaîne opératoire* approach refined by an agency focus within the framework of practice theory. These individual actions were conducted by various members working at the production facility. By examining the techniques of production it is possible to infer the day-to-day activities which occurred at this particular pottery site.

The following discussion provides an overview of the theoretical and interpretative framework I employ in this study. The facets of this framework will be applied and discussed in greater detail in the individual sections and chapters of this dissertation.

I. Practice Theory

Technology provides an intermediary between people and materials. The construction of material objects can be explained through the informative framework of "practice theory." Practice theory developed by Pierre Bourdieu in an attempt to address the relationship between people's actions and social structure (1977). Bourdieu's practice theory was a reaction against both French Structuralism and Althusserian Marxism (Swartz 1997: 98). Anthony Giddens (1979) provided a similar social theory construct with his discussion of "structuration theory" which addressed concerns about Durkheim's dichotomy of subject and object, and mind and body (Cohen 1987; Last 1995). Neither Bourdieu nor Giddens' work was directly developed for the explanation of archaeological questions. However, both have been accepted within the field in an effort to more thoroughly discuss the dialectics between individuals and social groups and between agency and structure (Cobb and King 2005; Dobres and Robb 2000; Fennell 2003, 2007; Moore et al. 1983; Ortner 1984; Pauketat 2000; Renfrew 1994; van der Leeuw 1993).

Practice theory aids in the explanation of social context and historical processes by accentuating the people-centered nature of social settings (Dobres and Hoffman 1994; Dobres 2000; Fennell 2003; Hodder 1991; Ortner 1984; Pauketat 2000). In addition, practice theory is not focused upon general principles of behavior or laws. By removing the focus from laws and behavior, practice theory is non-deterministic in terms of seeing social or personal responses as historically contingent actions operating in the context of available resources and constraints as both conscious choices and routinized, structured actions (Dietler and Herbich 1998; Lightfoot et al. 1998; Meskell 1998; Ortner 2001;

Pauketat 2000; Wilkie 2000). Thus practice theory focuses on people, their actions, and their activities.

A. Doxa, Heterodoxy, and Orthodoxy

Bourdieu (1990) was guided by interest in the maintenance of class distinction. His theories address the relationship that exists between culture, social structure, action, and power. Bourdieu (1990) explained that practices, symbols, gestures, and manners are a portion of social distinction, established, and maintained by society. Individual actors are regulated by "doxa" and "habitus." Internalized gestures make up quotidian practices which communicate basic assumptions about social categories such as gender, age, and social hierarchy. Quotidian practices are often not a result of conscious thought, and the actor is not aware of the generative schemes of their isochrestic practice, "thereby founding immediate adherence, in the doxic mode, to the world of tradition experienced as a 'natural world' and taken for granted" (Bourdieu 1977: 164). Thus, actors are often conducting themselves in a routinized, unconscious manner and often are not aware that their actions are reproducing their settings and related social rules. Routine unconscious actions are made possible since "the stabler the objective structures and the more fully they reproduce themselves in agents' dispositions, the greater the extent of the field of doxa, of that which is taken for granted" (Bourdieu, 1977: 165–66).

Bourdieu explained that doxa is the unquestioned, shared, and often unacknowledged backdrop of givens in discourse and social interactions (Bourdieu 1977: 159-71; Silliman 2001). Doxic practices can be either intentional or unintentional actions. Intentional actions are based upon shared motives or histories and are related to habitus as a set of durable dispositions (Bourdieu 1977). Intentional actions do not diverge from but rather reproduce identical events (Silliman 2001). At the other end of the spectrum, unintentional actions are viewed as mundane, routinized, and everyday practices that go unquestioned and are considered to exist outside of the sphere of intentionality.

Conflict within a social system can provide a context in which doxa can be questioned. When questioned by members of a dominant class, doxa can be revised and refined and create an "orthodoxy" (Bourdieu 1977, 1994). Orthodoxy can be seen as representing continuity within a given social group with regard to social rules and norms. It is a discourse which tends towards conservatism and towards preserving the existing structure on a given subject. Dominant patterns of social relations are not always maintained by an exercise of repressive power but also acquire power through the accumulation of consensus. Such consensus can constitute a belief system which Bourdieu calls habitus or the accepted aspect of social relations which structure the disposition of agents. Thus, orthodoxy attempts to conserve this state of habitus and maintain a status quo in relation to social practice (Bourdieu 1994; Holton 1997; Silliman 2001).

Orthodoxy is often based on a more traditional habitus that imposes a more customary set of norms and practices in an authoritarian manner, succeeding in suppressing traditional elements rather than fundamentally changing them (Pauketat 2000; Pauketat and Emerson 1999). In turn, "heterodoxy" represents the moment in which the once unquestioned orders of doxa are no longer believed to be true by all members of the social group (Bourdieu 1977, 1994). Agents within the social group inject opinion into daily occurrences. These agents who are intent upon change view the once concrete concepts as if these were fallacies. Such agents of change at times attempt to expose the problems associated with preexisting doxa and suggest how to renew a previous doxa or introduce innovations to correct for deficiencies in the current structure. The taken-for-granted doxa is exposed when the agent poses the new way forward to those in the social system. Thus, heterodoxy allows for invention and alteration of an action and can be viewed as an action that shifts from one technique, style, or design to another.

B. Habitus

Habitus is defined as the internalized, cognitive, and bodily system of principles that generate and organize practices. Habitus provides the agent's "basic tools of thought, the basic values and oppositions which shape our thinking, the terms of identity and personhood which make us who we are and the emotional currencies we live through" (Robb 2010: 500). Furthermore, habitus establishes limits for action and generates practices (expectations) that were informed by the agent's earlier socialization (Bourdieu 1977: 72; Swartz 1997: 103). People direct their actions based upon possible outcomes allowed for by their particular habitus. This does not mean, however, that actors have specific intent or the capacity to affect an outcome. Strategies, or actions, do not imply conscious or rational choice but a sense of practice that is an internalized and formative disposition of socialization (Bourdieu 1977: 88).

Habitus resembles structuralist codes that consist not of rigid grammars played out deterministically but of flexible dispositions full of ambiguities, potential contradictions and slippages (Bourdieu 1977). Habitus is a way of moving though and making sense of the world through observations and interaction with people and objects in daily practice (Bourdieu 1977: 88-90). The socialization process permeates habitus with a sequential quality that allows for the integration of previous experiences, perceptions, and attitudes that all inform and often transform social structures. During the formation of habitus, an agent's socialization and previous experiences are all situational and must be interpreted and understood within the particular historical and social context.

C. Agency and Structuration

The relationship between structure and agent is complementary where an actor's recursive practices form and inform themselves as well as particular forms of social structures (Giddens 1979: 5; 1995: 341). Recursive acts are "human social activities, like some self-reproducing items in nature brought into being by social actors but continually recreated by them" (Giddens 1984: 2). The duality present between structure and agency constitutes social life through social practice and is the means and result of an individual's practices. This approach thus recognizes and analyzes individuals' capacities to participate in the creation, recreation, and change of their social settings (Dobres and Hoffman 1994; Fennell 2003; Hodder 1991; Ortner 1984; Pauketat 2000). Giddens observed that "social structures are not brought into being by social actors but continually recreated by them through the very means whereby they express themselves as actors."As a portion of daily activities, agents reproduce the conditions that make these activities possible"(Giddens 1984: 2).

Structuration is concerned with agency of the social actor, where agency is defined as the intent to act, the ability to act, and the action itself. Furthermore, "agency concerns events of which an individual is the perpetrator, in a sense that the individual could have acted differently" (Giddens 1984: 9). In this view of structure, resources and rules motivate social actions that are repeated in a familiar manner by the agent. These rules are precise and more rigid than the underlying social structure. Resources are both tangible (material) and intangible (knowledge and beliefs) and both can be transformed into power through use. Rules and resources allow for "techniques or generalizable procedures applied in the enactment/reproduction of social practices" (Giddens 1984: 21). Rules are closely related to habitus since both are utilized to generate social actions without being completely regulated.

Rules relate to tangible actions carried out by social agents through the concept of "knowledgeability." Practical consciousness is the knowledgeability that an agent brings to the tasks required by everyday life, which is so integrated as to be hardly noticed. Reflexive monitoring occurs at the level of practical consciousness (Giddens 1984, 1986). Knowledgeability is what the actors believe about the factors of their situation which they draw upon to take action. Factors, such as cognitive ability, can limit or enable an actor are known as capability constraints. That is to say that an agent will be unable to acquire a new set of knowledge if they are not at the knowledge level as the new information (Leroi-Gourhan 1993). Additionally, knowledgeability is viewed as practical knowledge that an agent has learned during the course of their daily interactions and experiences. The learned information regarding social life allows the agent to properly participate within their social setting (Giddens 1984, 1986).

Integral to structuration and the relationship between structure and agent is reflexivity. Reflexivity is not just self-consciousness, it is the "monitored character of the ongoing flow of social life" or "duree" of life and is a "continuous flow of conduct" (Giddens 1984: 3). The world occurs around the agent, the agent is constantly aware of their surroundings and what is occurring. Since the agent is accustomed to their surroundings these world actions are evaluated and monitored continually and understood for both context and location of the given action. Due to awareness, monitoring, and evaluation, actions are historical since these events become a portion of the flow of life. Historical actions within the life flow are monitored by everyone in the setting. These monitored occurrences guide the next set of situational actions and re-inform the agent's knowledgability.

Bourdieu and Giddens are both concerned with hypothesizing the dialectic relationship between agent and structure. Also, they propose the means by which this dialectic is reproduced through practice. For both, practices in which people engage are expressions of knowledge. Bourdieu claimed that habitus is the expression of knowledge as it is reproduced through practice. Giddens suggested that knowledge is nuanced and embodied as a part of the following three concepts: unconscious, practical, and discursive. Practical consciousness is similar to habitus; however unlike habitus, practical consciousness is the actor's subconscious knowledge rather than conscious knowledge (Giddens 1984). Discursive consciousness is the explicit and conscious mind and is akin to "articulateness" (Giddens 1979: 5; 1984: 44-45). While Giddens provided a distinction between practical and discursive knowledge, he suggested that both are flexible and influenced by learning, socialization, and experience with the difference being "what can be said and what is characteristically simply done" (Giddens 1984: 7).

Giddens (1984) and Bourdieu (1990) have argued that human knowledge should be seen as a significant activity grounded in everyday practice. Knowledge that a particular agent possesses can encompass the understanding of the techniques of production. In addition, the capability to acquire knowledge is intrinsic to being able to continue the daily routines of social life. These insights have led to an understanding that such knowledge in practice is continually enacted through actions. Such an understanding rejects the traditional dualism set up between knowledge that exists "out there" (encoded in external objects, routines, or systems) and knowledge that exists "in here" (embedded in human minds, bodies, or communities) (Giddens 1984; Bourdieu 1990). Rather, "knowing is an ongoing social accomplishment, constituted and reconstituted in everyday practice" (Orlikowski 2002: 252). Knowledge of production techniques is not a static entity or stable disposition, but rather an ongoing and dynamic production that is repeatedly enacted as actors engage the world in practice.

Since knowledge is a dynamic process during the course of activities, agents are afforded the opportunity to affect change based upon awareness of their social situation and socialization. Change involves a profound disruption of a technique which reshapes an existing institution (Giddens 1994). The affordance of change allows the agent to become responsible for innovations of a particular doxa. Innovations can occur through the slight alteration of an agent's task or as a learned process through the observation of another actor. Innovation can be considered as a technique that could improve upon a given action which subsequently increases productivity. Slight alterations or innovations within a particular doxa do not come into conflict with the social situations since the output aided by the modification is equivalent to the preceding output without the variation. As a portion of history creation, innovation of a doxa continues to develop to such a degree that the new action has shifted from the old to a new doxa.

II. Application of Practice Theory for Stoneware Production

The focus of this project is to investigate the development of ceramic technologies in antebellum South Carolina. At the heart of this research project are the people that altered ceramic technologies and southern history. This innovative ceramic technique was initially utilized at the Pottersville kiln site by entrepreneur Dr. Abner Landrum. I suggest that through the lens of practice theory it is possible to identify Landrum's activities and actions to discover the moments of alteration in regards to ceramic production. Landrum's engagement with ceramic tradition grounded in doxa with respect to ceramic technologies; kiln design, glaze, and vessel form. While production of stoneware was widely known in the 19th century, the actions taken by Landrum were a departure from other previous forms which were available as either inspiration or acquisition of knowledge.

Dr. Landrum and his family were of Scots heritage and had moved to South Carolina by way of Virginia and North Carolina. It is postulated that, during his family's years in North Carolina, Landrum possibly obtained knowledge regarding ceramic production. While living in North Carolina, the Landrums were associated with the Craven pottery clan (Vlach 1990a; Zug 1986). This North Carolina interaction could have provided Landrum with a social knowledge and insight into ceramic production techniques and traditions.

Many of the pottery producing families residing in North America were socialized through their participation in ceramic manufacturing in their ancestral homes of Germany, England, and Scotland. These pottery families brought with them doxa related to ceramic production as they emigrated to North America. As a portion of this doxa, immigrant pottery families built kilns, created vessel forms, and utilized glazes in relation to and in departure from those that they had previously employed.

Through the processes of socialization, Landrum could have been immersed in various lines of ceramic production knowledge. The knowledge likely available to Landrum would have included all facets of production from the acquisition of raw resources, kiln building and firing techniques, to the workshops that were integral to production. These considerations provide detailed contexts with respect to the larger research question: to examine the creation and maintenance of ceramic technologies, techniques, knowledge, and operations in a particular place and time period. I contend that this research question can be subdivided into a series of subsidiary inquiries.

First, 19th century North American kiln technologies were based primarily upon centuries of functionally viable kilns in Germany and England. What type of kiln did Dr. Abner Landrum utilize to fire his innovative alkaline glaze technology? With historical connections to England and Scotland it is possible that Landrum's kiln design was developed from either a bottle kiln or a Newcastle kiln. Both kiln designs were utilized throughout the British Isles and other North American potters are known to have utilized a derivative of these kiln designs. To answer this question archaeological research targeted the area suspected to contain the buried remains of the Pottersville kiln (Figure 2.1).


Figure 2.1. Potterville Kiln Site photographed 13 May 2009 west to east

Second, what were the social relations employed at the Potterville kiln site? Questions one and two both relate to the scale of production and thus suggest the number of persons involved in the production process. Was Pottersville a family operation much like those seen in New England where each family member possessed a particular task associated with production? Tasks such as chopping of fire wood were often accomplished in combination with general household activities such as acquiring fuel for the hearth (Figure 2.2). Was the Pottersville kiln site a larger operation that required an increased labor force? A larger kiln would have expended greater quantities of fire wood and clay; larger quantities likely meant a particular person or group of people would have been dedicated full-time to the acquisition of clay and fuel. In 19th century North America and Europe, both small and large-scale ceramic operation existed and would have been prevalent enough for Landrum to acquire knowledge about the socially acceptable manner to in which conduct his day-to-day operations.

Figure 2.2. Family of potters with each conducting a given task. Courtesy John Vlach

Third, what were the natural resources utilized for production at the Pottersville kiln site? Excavations address the first question in regards to kiln design and provide insight for the second research question. Data on the kiln design in turn provide valuable information regarding the likely holding capacity, firing duration, amount of fuel, and number of firing events for any given period of time. The kiln’s holding capacity can suggest the amount of raw resources utilized during one firing event. The scale of the operation could suggest whether these raw resources were acquired locally or purchased from an extraction facility. Small kiln operations in North America both acquired clay locally and from regional extraction sites. I suggest that proprietors of large production operations, such as the Pottersville kiln site, likely established facilities close to raw resources to make use of available labor.

Finally, Dr. Abner Landrum was known to have successfully utilized alkaline glaze (Figure 2.3). What is not known, however, is what spurred this innovation or where he learned the techniques of production. Do the above questions and answers provide insights regarding glaze technology? Information regarding this discovery might very well be connected to kiln design. Alkaline glaze is applied to ceramic vessels through the process of dipping; is the design of the Pottersville kiln constructed similar to those utilized by potters working with lead, salt, or Bennington glazes? Could day-to-day knowledge about a similar glaze technology been accessible in another location affording Landrum the ability to blend such techniques with his own traditional ceramic knowledge?

Figure 2.3. Alkaline glazed storage jug Isaac Lefever potter, Courtesy Linda Carnes-McNaughton.

These questions relate to day-to-day stoneware production activities, involving a series of actions which constitute the completion of a manufacturing task. That is to say that stoneware production involves more than a potter pulling clay to form the vessel.

Production includes the acquisition of raw clay, processing of the clay, production of glaze, forming the vessel, glazing the vessels, loading the kiln, firing the kiln, and unloading the kiln. All of these events are a portion of the entire ceramic production process and the sequence must be completed in a manner and order to successfully create stoneware vessels. By viewing ceramic production as a sequence of events it is plausible to infer social situations based upon artifacts recovered during archaeological investigations. Analysis regarding such a sequence of events can be discussed through the use of an analytical framework referred to as *chaîne opératoire*.

III. Chaîne Opératoire

To provide insight regarding the day-to-day social actions embedded within the questions above, I engage with the analytical framework of *chaîne opératoire* or chain of operational task (CO). CO provides a means to understand production techniques and choices made by an individual conducting those actions. CO enables the identification of steps which occurred while turning a raw material into a refined, finished product (Bleed 2001; Boëda 1995; Gosselain 2000, 1992a, 1992b; Lemonnier 1986; Schlanger 1994; Wayessa 2011). Techniques employed by the actor are structured by traditions and both facilitated and constrained by the physical properties of the raw resources (Hassan 1988; Schiffer 1976, 1992, 1997; Wayessa 2011). However, these techniques are not rigid which provides the actor room to manipulate, or choose, a method of production without altering the entire system. By utilizing CO, it is possible to infer specific knowledge regarding materials, tools, and production techniques (Sheets 1975). I engage with CO as a means to explain the acquisition and replication of ceramic knowledge.

Lemonnier's "Anthropology of Technical Systems" and the school of "cultural technology" were rooted in the work of French functionalism, Marcel Mauss, and Emile Durkheim's organic social systems approaches (van der Leeuw 1984, 1993; Leroi-Gourhan 1993). Cultural technology posits that technologies are inextricable from social structures and should be understood as a system of interactions in which a producer engages with material. Technological knowledge provides a framework of choices and is shaped by society. The social agent possesses the understanding to engage with this traditional knowledge, social organization, and human cognition (Gosselain 2000; Lemonnier 1993; Lemonnier and Latour 1994; Pfaffenberger 1992). Lemonnier suggests that technologies can be analyzed with Leroi-Gourhan's definition of CO.

The concept of CO has been heavily utilized by researchers focused on lithic artifact assemblages. These projects are often conducted in conjunction with refitting and use-wear studies which provide valuable inferences regarding the operational sequence of production and use (Andrefsky 2009; Bar-Yosef and Peer 2009; Sellet 1993). By utilizing the same theoretical understanding, operational sequence analysis can be applied to techniques of ceramic production (Gosselain 1995, 1998, 2000; van der Leeuw et al. 1993). Additive and reductive processes of production both involve activities that can conceal previous actions. For lithic studies, for example, flakes are removed from the core in a manner that often obliterates previously produced points of percussion on the surface. Similarly, for example in ceramic production, the smoothing of the exterior of vessels hides signs of coil stacking used to construct the vessel walls. I argue that additive technologies are aptly suited for CO analysis, because steps of production are still visible, transformed or not. Additionally, CO is useful for examining subsidiary activities associated with ceramic production, such as firing, glaze mixing, and material preparation.

Within my research question is a focus on what knowledge particular agents may have at their disposal for understanding the techniques of production. Giddens (1984) and Bourdieu (1990) have argued that human knowledge should be seen as a significant activity grounded in everyday practice. Giddens (1984:4) defines knowledge ability as "inherent within the ability to 'go on' within the routines of social life," and Bourdieu (1990:52) identifies knowledge as "constructed within practice rather than passively recorded." These insights have led to an understanding that such knowledge in practice is continually enacted. Such an understanding rejects the traditional dualism set up between knowledge that exists "out there" (encoded in external objects, routines, or systems) and knowledge that exists "in here" (embedded in human minds, bodies, or communities). Rather, "knowing is an ongoing social accomplishment, constituted and reconstituted in everyday practice" (Orlikowski 2002:252). Knowledge of production techniques is not a static entity or stable disposition, but rather an ongoing and dynamic production that is recurrently enacted as actors engage the world in practice.

The technical actions taken by the actor are in part determined or are a part of the greater social group. These technological actions are numerous and are a portion of a complete system of production. These technological actions are a choice of the participants and are either accepted or rejected as a portion of production. The group chooses a given technique based upon many factors, such as environment, tradition, or social contacts and information acquisition and borrowing. Choices are actions which an agent participates in during the creation of social actions. For example, a group chooses to produce a ceramic object and production of this object form leads to a new manner in which to serve food (the choice of food could also inform the creation of new vessel forms). Thus, choice can be linked to the acceptance of a new production technique (Basalla 1988; Leroi-Gourhan 1993; Lemonnier 1993, 1986; Parayil 2002).

The preference to produce a new form of object leads to questions of whether the choice was based upon invention or borrowing. Invention can be viewed as the discovery of a new technique or technology which is accepted as a means of production. Invention suggests that the new technique was previously unknown to the group. Additionally, if an invention is accepted, the group breaks from facets of a previous tradition in the process of adopting the invention.

Borrowing occurs during communication between groups. Groups that share techniques and technologies do so by the reorganization of routine behaviors (Audouze 2002; Leroi-Gourhan 1993). For instance, ceramic glaze techniques spread from an initial locus of production to other locations in part due to exchange systems between social groups (see chapter 2). For the technique to be accepted by those who had not previously utilized the method it must be favorable to the new group (Audouze 2002; Leroi-Gourhan 1993). Leroi-Gourhan explained that the new technique and the existing tradition must be at the technical level to gain acceptance. Creswell (1983) and Lemonnier (1994) each discussed social groups that reject useful technologies based upon incompatibilities (Audouze 2002). The acceptance or rejection of the new technique is based upon technical saturation. Saturation occurs when the technique is well known and is utilized and accepted by members of the group. However, when techniques are not saturated all members of the group are not using the same method due to flaws and difficulties. Thus, new techniques are often accepted when a current technique is not saturated and is in need of improvement (Leroi-Gourhan 1993).

The major outcome of invention or borrowing is the understanding that technology and knowledge coexist. Ideas, information, and techniques provide the information structure within which a technology is constructed. The sharing of information can be discovered within family practices, craft traditions, apprentice systems, or exchange through trade networks. These traditions are learned or inherited by participating in daily social activities. The ability to teach or learn pottery production goes beyond being able to verbally explain techniques. For example, an apprentice potter must be able to understand how to form the vessels while being able to physically conduct the techniques of production.

Techniques utilized for production are developed and enacted through a combination of matter, energy, object created, gestures, and knowledge (Lemonnier 1983). Every object produced by a member of a social group can be identified by the end result of production techniques. Techniques are a series of activities that exist within a technology and can be identified within the operational sequence. Gosselain (2000) suggests that techniques utilized during the manufacturing process can be subdivided and described by three distinct categories: salience, technical malleability, and social context (Arnold 1991; Rice 1996).

Salience involves the description of those techniques that leave behind evidence on the end product, such as knowingly utilizing a glaze variation (Gosselain 2000). The physical evidence of such glaze was applied to the vessel through the potter's performance (Courty and Roux 1995; Rye 1981). These visible attributes provide information regarding processes taken by the potter during manufacture. At points during manufacture an agent may divert from a well-worn technique and subsequently invent a new technique, method, or design. Innovative attributes are allowed to be borrowed and replicated after the social group accepts the new concept. A social environment of acceptance encourages participants to become agents of change since their efforts can be acknowledged rather than eliminated (David and Hennig 1972; Gosselain 1992; Hodder 1979; Longacre 1991). As a portion of this project I identify salient moments in history where interactions between social groups lead to borrowing and attempted replication of ceramic production techniques.

According to Gosselain (2000), the second category is technical malleability. This category is the information utilized by the actor that goes unseen and is hidden after the manufacturing process is completed. Clay is extracted from the landscape to create the vessel; however, the manner in which the raw material was acquired cannot be determined (Peuramaki-Brown 2012). Potters quarry clay from a particular location for reasons known to them and likely due to a material characteristic that has been learned over the course of production. Inexperienced or transient potters acquire knowledge about raw resources from more experienced potters in the region since it is advantageous to emulate successful participants (Gosselian 2000; Peuramaki-Brown 2012). Postlearning is acquired through interactions at a local scale and often reflects networks of interactions (Dietler and Herbich 1989, 1998; Gosselain 1995, 1998). For this project I viewed alkaline glaze and kiln technology as acquired and shared knowledge that became accepted through the Edgefield district and allowed those innovations to be replicated by fellow stoneware entrepreneurs.

The final category is social context of learned techniques. This step is known as the finishing phase when the potter is forming or roughing out the vessel (Courty and Roux 1995; Rye 1981). Gosselain (2000) suggests that this phase of operation does not leave any "appearance traces on the finished product and usually is conducted on an individual basis." The finishing stage is predicated upon the gesture utilized by the actor rather than tools utilized to create the vessel. These gestures are "motor habits" that the craft specialist performs as a manner of unconscious action rather than conscious thought. Such skills are likely taught from one individual to another in close social interactions of teacher and apprentice. Gestures are a portion of a technological system that exists within traditional knowledge. Scholars have studied the operational sequences in modern day groups to better interpret similar past actions (Dietler and Herbich 1998, 1999; Gosselain 1998; Hosler 1996). Since motor habits are often conducted at the unconscious level, these actions are resilient to change (Arnold 1981; Gosselain 1995, 1998; Hill 1977; Nicklin 1971). These resilient actions are thought to be the way that an object is created and acceptable to the casual observer since the end product is properly made (Gosselain 2000).

Resilient acts persist throughout the life span of the potter and are rooted in kinship and social identity (Arnold 1981; Gosselain 1995, 1998; Herbich 1987; Hosler 1996; Miller 1985; Wayessa 2011). This is to say that is a potter creates an object in one fashion they will continue to do so throughout their personal history. While this is most apparent in the actual formation of ceramic object I take this a step beyond to the construction of a kiln type. Alkaline glaze stoneware manufacturing in the Edgefield district was linked to the Landrum family and information was shared within that group.

The knowledge of how to "properly" build a kiln for alkaline glazed stoneware may have been shared but not every kiln within the district should be assumed to have been identical. Thus, by maintaining technical aspects of kiln firing dynamics slight variations may have existed between kiln sites within the Landrum kinship.

Through the analysis of ceramic sequence of operations I plan to provide insights into the structure and innovations employed at the Pottersville kiln site. The chapters that follow will apply these facets of a theoretical framework in examining and explicating the archaeological and historical information discovered during this research project. These chapters will explore the historical, personal, and material correlates that allow for a discussion of this theoretical framework. Chapter 3 that follows outlines the geologic history that allows for the creation and maintenance of alkaline glaze. This chapter also investigates the economic system in South Carolina, one that provided a marketplace for the large volume of stoneware created at Pottersville. Finally, Chapter 3 introduces the Pottersville kiln site and provides a historical overview for the location in which this theoretical framework will be applied.

Chapter 3:
Background History of South Carolina and Stoneware

The focus of this research project is set in the landscape surrounding the modern town of Edgefield, South Carolina. To understand the importance of the development of stoneware in this region in the antebellum south, one can examine the geological and historical context in South Carolina that facilitated those industrial innovations. This chapter will first discuss the geological and geographic resources that made the stoneware industry possible. I next provide an overview of the colonial formation of the territory through the antebellum period and the economic structures which dominated the social landscape of that time period. The production of stoneware, or any ceramic technology, is predicated upon the raw resources available to potters. Thus, I begin with an overview of the landscape resources available in Edgefield.

I. Geology and Geography of Edgefield South Carolina

The Edgefield district was situated on geological zones called the Piedmont and Coastal Plain Unit and is divided along an east-west axis by a "Fall Line." The Fall Line is a geologic boundary that divides the Piedmont area from the Coastal Plain and coincides with an area that is often referred to as the Sand Hills (Figure 3.1) (Baldwin 1993; Murphy 1995; Sacks 1990; Dennis and Wright 1997). The Fall Line is a boundary of bedrock between the Piedmont's metamorphic formations, consisting of materials transformed over time, and the Coastal Plain's largely unconsolidated sediments, made up of materials transported and accumulated from other geologic regions. The Sand Hills were once ancient beach dunes which now generally divide the Piedmont from the Coastal Plain. The Fall Line is also identifiable by the presence of larger and faster streams (Drayton 1802; Sloan 1904; SCDNR 2012). At the Fall Line contour lines display falls or rapids, while below the Fall Line streams develop much broader flood plains (DOI 2008).

Clays situated within the Piedmont consist of residual materials created by the decomposition of parent geologic materials. In contrast, Coastal Plain clays primarily consist of sedimentary clay deposited into the region due to receding ocean waters and flows from local rivers and streams (Sloan 1904; Buie and Schrader 1982). Over the course of millions of years hydrolytic processes have created rich clay resources throughout the Edgefield district.

Figure 3.1. South Carolina geologic zones. Map Courtesy South Carolina DNR 2013

The Piedmont region constitutes one third of South Carolina’s area. This region is in general hilly with elevations ranging from 300 to 600 feet above mean sea level (amsl) near its border with the Coastal Plain to 1,500 feet amsl at the base of the Blue Ridge.

The Piedmont is underlain by metamorphic and igneous rocks of various origins that were folded during the Paleozoic as the North American and African plates converged within the “megacontinent” called Pangaea (DOI 2008; SCDNR 2012).

The Coastal Plain represents the largest geographic region within South Carolina, covering approximately two thirds of the state, and contains vast flood plains, marshland, and swamps. The Coastal Plain can be divided into three subsections: the lower, middle, and upper plains. The Upper Coastal Plain joins to the Fall Line and is known for its hilly terrain and unconnected bands of sand from ocean dunes created during the Miocene Epoch (DOI 2008; SCDNR 2012). The Fall Line above these sand deposits, where the rocky riverbeds of the Piedmont meet the sediment covered river bottoms of the Coastal Plain.

Multiple geologic events occurred within the landscape underlying the Edgefield district over the course of the region’s geologic history. The geological developments that shaped the Edgefield region are labeled as follows: the Carolina terrane, Upper Cretaceous, Paleocene/Eocene, Savannah River Terrane, Modoc Shear Zone, and Charlotte terrane. The soils and clays within the region are primarily formed from metaigneous (igneous materials) and metasedimentary (sedimentary materials) rocks produced through sub-aqueous pyroclastics, which consisted of volcanic processes operating when the region was submerged in shallow waters (Whitney et al. 1978; Dennis and Wright 1997; Dennis and Shervais 1991; Hibbard et al. 2002; Hibbard et al. 1998; Hibbard 2000). This volcanic activity led to the production of felsic, mafic, and quartzite parent materials which are silica-rich and abundant throughout the region.

The Pottersville site is located north of the Fall Line and is situated on the Modoc Shear Zone and Carolina terrane geologic formations (Figure 3.2). The Carolina terrane was formed during the Neoproterozoic period by a collision with the Charlotte terrane and has a Uranium-Lead (U-Pb) age of approximately 579-535 million years ago (Ma) (Dennis and Wright 1997, Barker et al. 1998). The Modoc Shear Zone is a 5-km thick oblique ductile shear zone and contains high metamorphic grade structures (Kish and Black 1982).

These tectonic dynamics stacked the South Carolina Piedmont low to medium grade metavolcanic (metamorphic rock produced by volcanic activity) and metasedimentary rocks of the Carolina and Augusta terranes with medium to high grade gneisses of the Savannah River and Piedmont terranes (Hibbard 2000). Along the southeastern edge of the Appalachian Mountains, from southern Virginia to Georgia, sequences of Late Proterozoic and Cambrian metavolcanic rocks are associated with igneous and magmatic rocks near the ground surface and are widely identifiable throughout the Carolina terrane (Hibbard et al. 2002; Butler and Secor 1991; Maher et al. 1991). Situated within the Carolina terrane, Potterville is dominated by clay which is referred to as the Richtex Formation. The Richtex Formation is exposed at the ground surface across approximately 20% of the area of modern-day Edgefield County (USGS 2012). The Richtex Formation is approximately 3 km thick and consists of fined grained sedimentary rock, commonly associated with clay-stone and mudstone, and sandstone intermixed with mafic (iron and magnesium rich) metavolcanic rocks (Maher et al. 1991). Metavolcanic rocks comprise about 10% of the Richtex Formation, most of which are mafic volcanic greenstones. Outcrops of greenstone were quarried for buttress materials which supported the Pottersville kiln's exterior walls (Calfas 2012).

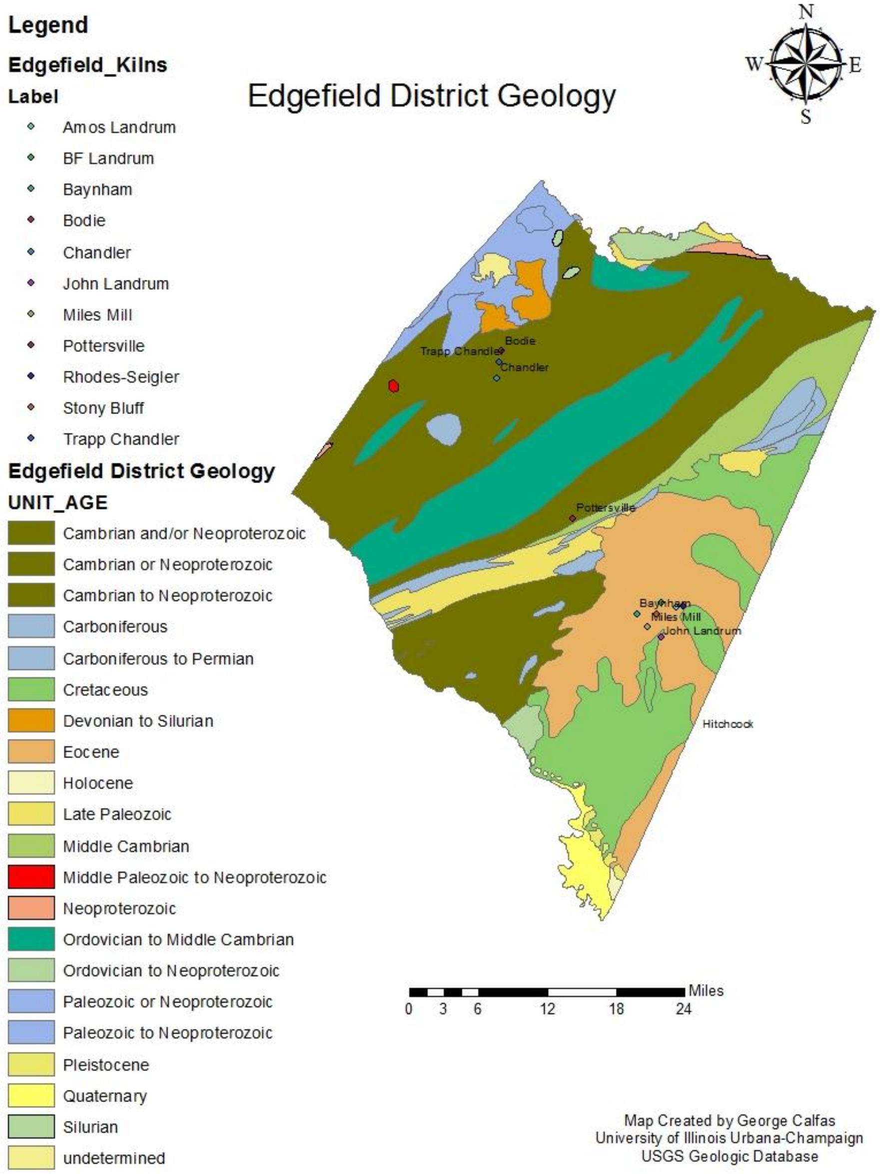


Figure 3.2. Geologic periods for Edgefield district, South Carolina

Other nineteenth-century kilns in the Edgefield area besides Pottersville are situated south of the Fall Line in the Coastal Plain Unit. That area is comprised of three different parent materials: Cretaceous, Paleocene/Eocene, and Savannah River terrane (Herren 1981). This band of geologic parent material stretches from the Coastal Plain of eastern North Carolina to Mississippi and has a Potassium-Argon (K/Ar) age of 91.3 Ma for the Upper Cretaceous and 56-34 Ma for the Paleocene/Eocene (Sundeen and Cook 1977). The Savannah River Terrane is a portion of the Carolina Slate Belt, which has a K/Ar date of 640-620 Ma (Steltenpohl et al. 2008). Inclusions of oceanic organics in the younger geologic materials on top of the Savannah River terrane were caused by elevated sea levels between the Cretaceous and Paleocene/Eocene epochs (Buie and Schrader 1982; Nystrom 1982, 1986, 1991, 1992). Receding ocean water, rivers, and streams cut through this soft geologic material and created steep embankments which exposed clay veins in these low-lying areas over time. Exposed white bands of kaolin clay are visible along the Fall Line where moving waters created drastic elevation difference between the Piedmont and Coastal Plain Unit (Tuomey 1848; Sloan 1904).

A. Hydrology of the Edgefield Region

Of equal importance to pottery production is access to flowing water. The Edgefield district is situated within the 2,252 square-mile area of the Savannah River Basin. The Savannah River Basin is constituted by 16 contiguous watersheds. Of these 16 watersheds, the Horse Creek and Turkey Creek watersheds represent the primary water resources of the Edgefield district (SCDHEC 2012).

The Turkey Creek watershed occupies 182,665 acres of the Piedmont and Upper Coastal regions of South Carolina and is located in the northern region of the Edgefield district. Land use and land cover maps for this area display that the watershed consists of 72.3% forested land, 19.8% agricultural land, 4.4% urban land, 2.0% forested wetland (swamp), 1.1% barren land, and 0.4% water. Turkey Creek originates near the town of Johnston and traverses toward the Savannah River; along this course Log Creek enters into the flow. Log Creek flows to the north of Pottersville and a small intermediate stream spurs from the main waterway. The Log Creek intermediate stream supplies water to the area around an apparent borrow pit depression near the Pottersville site. This intermediate stream terminates approximately 100m south of the Pottersville kiln at a location that likely contained support facilities for manufacturing stoneware vessels (USGS 2012). The 626 miles of the Turkey Creek watershed drains into Stevens Creek prior to entering the Savannah River Basin. The majority of the Turkey Creek watershed is located within the Sumter National Forest (SCDHEC 2012).

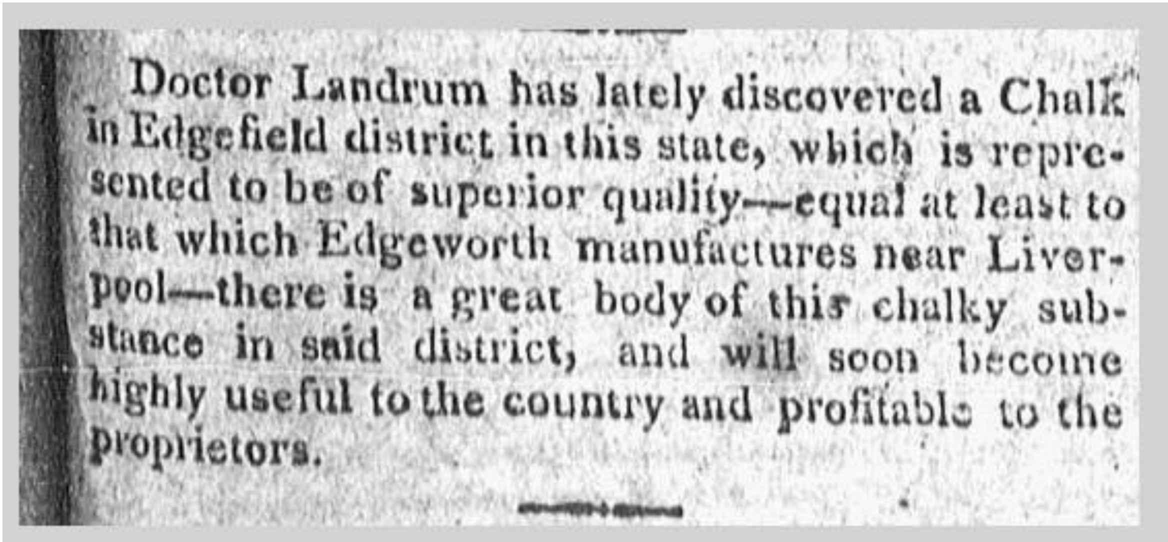
The Horse Creek watershed occupies 103,402 acres of the Sand Hills and Upper Coastal Plain regions of South Carolina (Figure 2.3). Land use and land cover maps indicate that the watershed includes 44.7% forested land, 31.0% agricultural land, 17.5% urban land, 4.6% forested wetland (swamp), 1.2% water, 0.7% barren land, and 0.3% non-forested wetland (marsh). The 297 miles of Horse Creek streams drain directly into the Savannah River (SCDHEC 2012). The tributary streams which comprise the Horse Creek watershed provide hydrological resources utilized by stoneware manufacturing centers established later in time than the Potterville kiln. Closer proximity to the Fall Line allows for the streams of the Horse Creek watershed to become faster flowing than the counterparts of Turkey Creek. The more swift moving waters accelerate the weathering process which erodes rock into clay. The weathering process has produced a larger volume of higher quality raw clay resources in the Paleocene, Eocene, and Miocene regions of the southern Edgefield district when compared to those of the Charlotte terrane in the northern section of the district.

B. Geologic Knowledge and Resource Affordance for Edgefield Ceramic Entrepreneurs

Successful pottery production in America was not without challenges. American potteries of the late 18th and into the 19th century encountered difficulties in retaining skilled craftspeople and gaining access to high quality clay. High quality clay resources are not available everywhere throughout the United States. Such limitations meant that many regional potters interested in the production of ceramics were forced to incur additional costs of purchasing their raw resources from other areas. However, this was not the case in the Edgefield region where a successful stoneware production industry arose in the backcountry. The Landrum family acquired parcels of land along Turkey Creek in the upcountry region of Edgefield (Baldwin 1993; Castille et al. 1988). Those Landrum properties were purchased in 1792 and the availability of high quality clay situated on those tracts would become the foundation for their stoneware enterprises.

To manufacture a large volume of stoneware storage vessels to meet the potential demand for such wares by the regional population, Edgefield kiln operators would have sought to understand the natural resources available within the district--clay, water, and wood. For example, to create the greatest return on investment, stoneware manufacturers would have attempted to transport raw resources the shortest possible distance. Even though enslaved labor could have been utilized to transport raw clays long distances, that approach would have added additional time and logistics to the manufacturing process. Thus, to create an economically viable stoneware industry in 19th century South Carolina, manufacturing facilities were likely positioned as near to the relevant natural resource deposits as possible, including wood, sand, water, and silica clays. South Carolina offers a wide variety of geologic diversity caused by long-term formation and transformation processes extending back more than 400 Ma (Shervais et al., 1996; Hibbard 2000). As discussed earlier, the geologic structure of South Carolina can be divided into three basic physiographic units: the Blue Ridge, Piedmont, and the Coastal Plain Unit (DOI 2008).

On July 15, 1809, the *Augusta Chronicle* printed an article in which Dr. Abner Landrum claimed to have discovered high quality clay in the Edgefield district which possessed the compositional characteristics that would enable reliable ceramic manufacturing (Figure 3.3) (*Augusta Chronicle* July 15, 1809; *Charleston Gazette* July 25, 1809). It was shortly after this news release that Dr. Landrum established his stoneware manufacturing facility one mile north of the town of Edgefield (Baldwin 1993; Castille et al. 1988). Some evidence indicates that he initially aspired to create porcelain products. However, Dr. Landrum was ultimately successful in the mass manufacture of utilitarian stoneware vessels (SCGR 1812). What he had discovered was that the Edgefield district possessed an abundance of raw resources that supported the production of stoneware.



Doctor Landrum has lately discovered a Chalk in Edgefield district in this state, which is represented to be of superior quality—equal at least to that which Edgeworth manufactures near Liverpool—there is a great body of this chalky substance in said district, and will soon become highly useful to the country and profitable to the proprietors.

Figure 3.3. Chalk discoveries by Dr. Abner Landrum, Charleston Gazette July 25, 1809

These resources importantly included locally available clay deposits possessing high silica content which could withstand high firing temperatures within a kiln to produce near-vitrified, stoneware vessels (Greer 1981; Sweezy 1994; Zug 1986). Feldspar is also widely available in this region. This mineral can aid the molecular bonding of clay particles when fired. When a raw clay resource is not self-sufficient to withstand extreme kiln temperatures, materials such as feldspar are added during the mixing process before vessels are shaped and fired. Feldspar and other silica agents are used as a "flux", an element or compound used in clay bodies or glazes which lowers the melting temperature of that clay body or glaze. Such fluxes help to maintain the vessel's shape and allow for the clay's crystalline structure to bond during the process of near vitrification within the kiln. Thus a potter works to understand the "pyrometric" properties and alterations of clay that occur during the firing process (Sloan 1904; Greer 1981; Rhodes 1981).

The 1809 *Augusta Chronicle* news article suggests that Dr. Landrum, or someone associated with his entrepreneurial enterprise, possessed knowledge about pottery production and clay (*Augusta Chronicle* July 15, 1809). These individuals would have understood principles of clay prospecting and been able to discern the qualities of the local raw material. Thus Dr. Landrum and others would have known that high quality clay consist of a fine grained material which exhibits plasticity when wet. Plasticity permits clay to be molded into a desired shape and then allows for permanent deformation, through the process of hardening after firing, without breaking (McColm and O'Bannon 1994; O'Bannon 1984; Rice 1987). Clays with low levels of plasticity are referred to as "lean," while "fat" clays possess high plasticity and these levels can be altered by adding or removing materials to the clay body. For example, potters often include temper to fat clays, providing strength for a vessel form to hold up under its own weight (Sloan 1904; Searle 1912, 1915). Temper is a non-plastic additive to clay (e.g., sand, shell, crushed pottery, or charcoal) to improve workability and assist uniform drying by preventing excessive shrinking. The difference in plasticity is based upon the particle sizes in the clay body and the presence of inclusions such as minerals or organic materials. Pure clays are often selected for the manufacture of refined wares and possess little to no inclusions, while impure clays, or "common clays," contain impediments and can only be utilized after the clay body has been milled (Searle 1912, 1915; Robinson et al. 1961). Thus, higher levels of impurities discovered in a clay body will decrease the level of plasticity.

The clay needed to produce stoneware must be of high quality and free of excessive inclusions (Sloan 1904; Geer 1981). Due to the processes of geologic weathering, naturally occurring clays often require a greater degree of preparation to remove naturally occurring sediments. Stoneware manufacturers often utilized a "pug mill" to eliminate and reduce sedimentary inclusions. Such pug mills often consisted of a circular enclosure in to which raw clay was deposited. Wooden stirring paddles were rotated through the clay to levigate inclusions from the more plastic matrix of the clay. Common clays with excessive inclusions require a high level of preparation and were often deemed to be cost prohibitive as a result.

To produce stoneware, a clay body must be heated to temperatures which exceed 1200 degrees Celsius (Lovejoy 1935; Greer 1981; Rhodes 1981). To withstand high firing temperatures, stoneware clay would need to possess a high elemental percentage of both silica and alumina. Kaolin veins within the western region of South Carolina possess an elemental composition ideal for stoneware manufacturing: Silica 46.5%, Alumina 39.5%, and water 14% (Sloan 1904). The elemental signatures provided by Sloan (1904) suggest that many South Carolina clay resources would be very well-suited for the production of refined whiteware and porcelain ceramics. Clay beds that I sampled during a 2009 survey of kiln sites in the Edgefield district area displayed similar elemental compositions as those described by Sloan (1904). Those Edgefield samples ranged from 44.9 to 57.44% Silica and 29.27 to 44.39% Alumina. The quality of the 2009 samples also indicates that little or no additional materials, such as feldspar, would need to be added to the clay to achieve stable firings and a near-vitrification process for vessel forms.

Clay prospectors and pottery entrepreneurs no doubt understood the physical properties of kaolin clay and the variation which exists within any particular vein they could mine. South Carolina kaolin and potter's clay, plastic and moldable, are both high-quality clays which exhibit high levels of plasticity and strength. Kaolin is thought to have first been named in China; given the name "kauling," this matrix enriched by quartzite and feldspar was the basis for porcelain production throughout southeast China for centuries (Vlach 1990a). Due to the varying amounts of residual water, the specific gravity of kaolin ranges from 2 to 3.2 (Sloan 1904). Specific gravity is the density of a substance divided by the density of water (1 gram/cubic cm). The geologic formation of kaolin parent materials allows for the inclusion of various double silicates. Double silicates are often defined as the combination of raw materials such as potash and alumina or soda and lime (Sloan 1904; Robinson et al. 1961). The inclusions of these double silicates results in the additional benefit that naturally occurring kaolin consists of materials that can be readily used for the production of an alkaline glaze to be applied to ceramic vessels. Additionally, these double silicates are soluble materials. Soluble materials leach into geological parent materials and create a chemical reaction which assists in the transformation (weathering) of geologic material into more clay deposits (Sloan 1904; Robinson et al. 1961; Rapp and Hill 2006: 26).

The Edgefield district exhibits both residual and sedimentary types of kaolin clay (Buie and Schrader 1982; SCDNR 2012; USGS 2012). The northern section of the Edgefield district contains residual clay deposits that were deposited during the Paleozoic formation while sedimentary clays from the Cretaceous formation are located in the southern portion of the region (SCDNR 2012; USGS 2012). Residual clays are made possible through weathering of alumina rich materials. These residual clays contain insoluble materials. These insoluble materials provide the flux agents of quartz, mica, and feldspar that can be employed in stoneware ceramic production (Langenbeck 1895; Sloan 1904; Searle 1912, 1915). Sedimentary deposits are a result of the transportation of sediments by flowing water traversing northwest to southeast across the Fall Line. Particle size and pace of flowing water determines the deposition location of these sediments (De Segonzac 1970, Rapp and Hill 2006: 27). This sorting of suspended materials has created clay veins that each homogeneous in nature and often require little to no additional milling of materials.

While much of the preceding geologic information for this project is reported based on the studies of contemporary scholars, 19th century South Carolinians also had access to the same information on available resources. During the first years of the 19th century, John Drayton (1802) compiled a compendium regarding the general status of resources in South Carolina. Drayton's discussion included information on the natural resources around the region of the state known as the Fall Line. The waterways that flow through the Fall Line have exposed rich kaolin clay deposits that were utilized in the production of stoneware (Baldwin 1990). Just north and west from the Fall Line the Piedmont region of South Carolina were better suited for agricultural output (Kovacik and Winberry 1987). South Carolinians who desired to acquire new parcels of land relied upon the works of Drayton and others to inform their decisions. While such geologic and geographic information assisted land acquisition decisions in the 19th century, the history of European-American entrepreneurs in South Carolina was also shaped by the developments occurring decades earlier during the Colonial Period.

II. South Carolina Boundaries

The formation of South Carolina and its boundaries can be traced to a territorial dispute between the English colony of Virginia and Spain (Edgar 1998; Johnson and

Sloan 1971; Kovacik and Winberry 1987; Lander and Ackerman 1973; Weir 1983). In 1565, Spain had laid claim to coastal lands in the southeastern region of North America with the establishment of St. Augustine, Florida. The Spanish claim included lands northward along the Atlantic coast towards Virginia. In 1629, King Charles I granted Sir Robert Health lands situated between 31 degrees north latitude and 36 degrees north latitude in an effort to counteract the Spanish coastal land claims. South Carolina received its name from this original charter, which referred to these lands as "Carolana." While the English crown "claimed" Carolana in 1629, the region was then devoid of European settlers (Lander and Ackerman 1973; Merrens 1977; Weir 1983:46-7).

Efforts to populate Carolana intensified in 1663 when Charles II granted eight nobles, the Lords Proprietors, "all that territory or tract of ground within six and thirty degrees of the northern latitude and to the west as far as the South Seas" (i.e. the Pacific Ocean) (Carroll 1836; Sirmans 1966: 6). As a result of the 1663 charter and the later clarified 1665 charter, Charles Town (modern day Charleston, South Carolina) was founded in 1670. Regulation of the territory was extremely difficult due to the vast expanse of lands decreed in the 1663 charter. In an effort to regulate and populate colonial lands Carolana was subdivided into the northern and southern territories in 1729 and into the colony of Georgia in 1732. The subdivision of land allowed for more English lords to acquire colonial lands. The boundary between North Carolina and South Carolina was under dispute until 1735 when the two territories agreed that 30 miles south of the Cape Fear River would be the dividing line (Edgar 1998; Johnson and Sloan 1971; Kovacik and Winberry 1987; Lander and Ackerman 1973; Weir 1983).

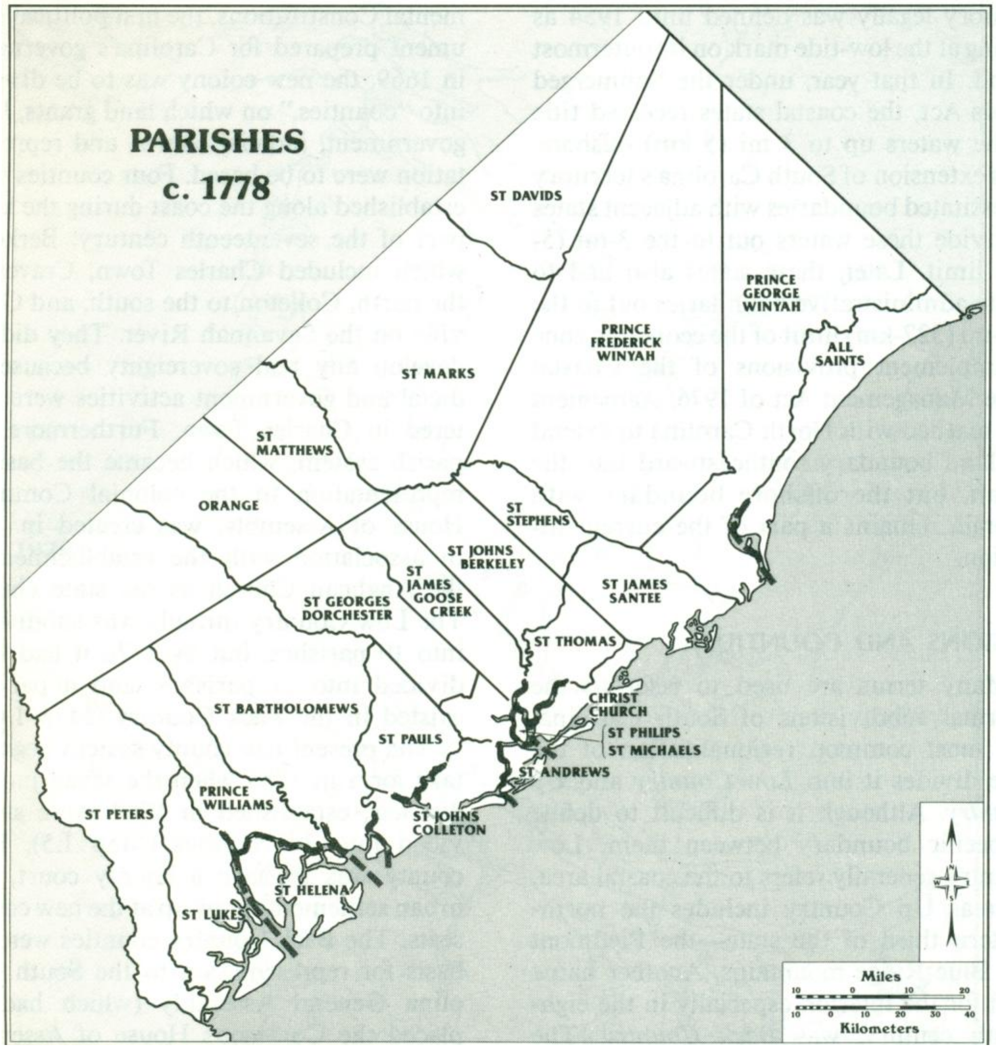


Figure 3.4. 1778 South Carolina Parish boundaries, Map Kovacik and Winberry 1987: 8.

More structured governance of South Carolina began in 1669 when the colony was subdivided into counties. These counties were the foundation for land grants, local government, and courts. During this early period of colonization, coastal lands were separated into four counties: Berkeley (which included Charles Town), Craven, Colleton, and Granville (Weir 1983:64-5; Sirmans 1966). These four counties accounted for the populated areas along the coast while the non-coastal lands were without governance due to lack of population. In 1706, to effectively govern the colony, the four counties were further subdivided into 10 parishes (Figure 3.4). The parish structure became the system utilized for representation to the Commons House or Assembly (Edgar 1998; Weir 1983:64-5; McCardy 1901; Sirmans 1966). As the population of South Carolina grew, the counties were further divided into 21 parishes along the coast. In comparison, the non-coastal lands were divided into four parishes.

A. Antebellum Period Boundaries

In 1769, South Carolina transitioned away from the initial county/parish system and adopted a judicial district system. Unlike the parish system, the newly formulated county system accounted for all lands within South Carolina by creating seven judicial districts: Beaufort, Camden, Charleston, Cheraws, Georgetown, Ninety-Six, and Orangeburg (Edgar 1998; Weir 1983: 64-5; McCardy 1902; Sirmans 1966). The area of Edgefield was included in the Ninety-Six judicial district. To govern these judicial districts effectively each was divided into a number of smaller counties, 34 counties across the seven judicial districts. Judicial districts aided in the legislation of the sparsely populated upcountry lands while it allowed for the maintenance of the coastal parish system. As the population of the upcountry grew, the governing boundaries were once again redrawn. In 1785, the 34 counties of the seven judicial districts became responsible for the direct representation for the entire populous (Figure 3.5) (Easterby and Polk 1975; Edgar 1998; Johnson and Sloan 1971; Weir 1983). The 1785 mandate stated that every county must possess a county court in order to attend the daily needs of the citizens. For each of the 34 counties the court was established in the town with the highest urban population within the county (Edgar 1998; Snowden 1920; Weir 1983).

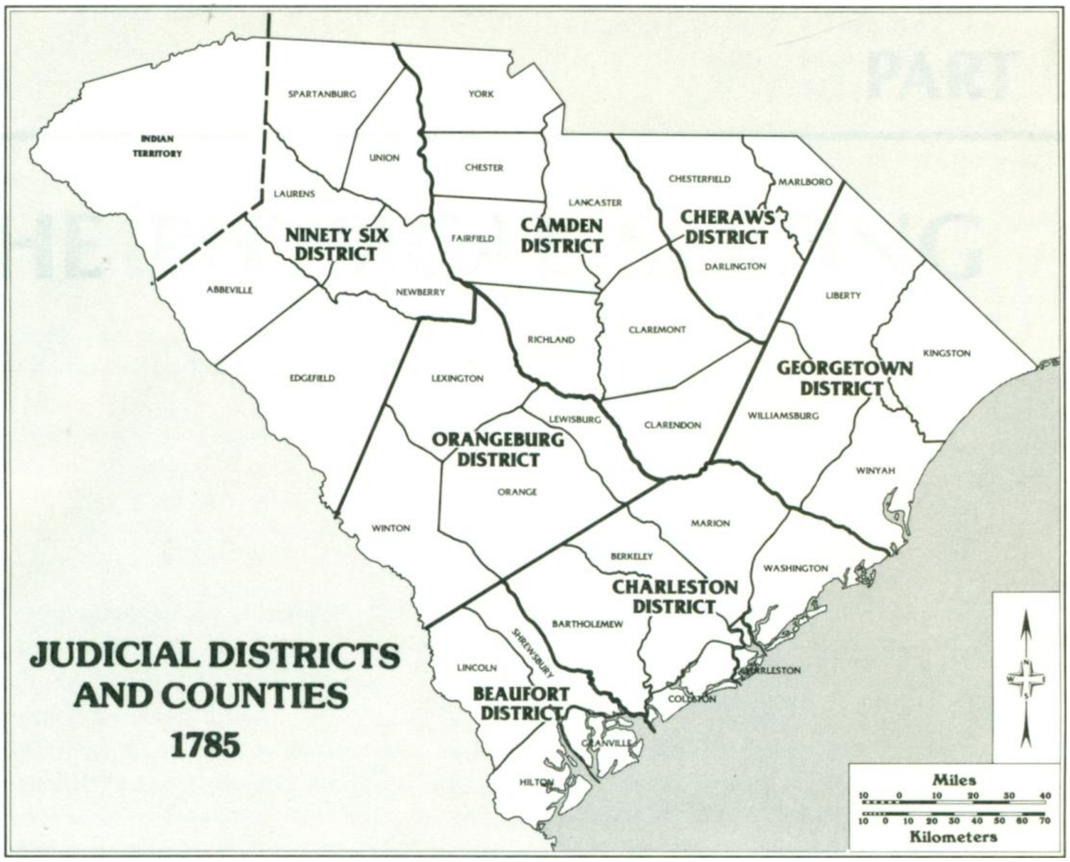


Figure 3.5. 1785 South Carolina Judicial Districts and County boundaries, Map Kovacik and Winberry 1987: 9.

By 1800 the population of South Carolina had grown to such a degree that each of the 34 counties could govern independently from the seven judicial districts. At this time the seven judicial districts were abolished and the 34 counties were redefined as districts. The town of Edgefield was the county seat of the Edgefield District which had formally been a portion of the Ninety-Six District. The later district system remained in place until the state constitution was ratified in 1868 (Edgar 1998; Johnson and Sloan 1971; Weir 1983).

South Carolina's population movement and subsequent reorganization of interior boundaries have ties to agriculture and associated economic opportunities. In the antebellum period of 1785-1865, which is relevant to the sites in this study, South

Carolina and its population were involved in numerous economic, political, and social transformations. These transformations would rebuild the state from the devastation following the Revolutionary War into a state that would help pave the way toward secession on April 12, 1861 (Chaplin 1996; Edgar 1998; Lander and Ackerman 1973; Weir 1983).

1. Agricultural Enterprises

In the years that immediately followed the Revolutionary War, South Carolina was beleaguered by the enduring effects of that conflict (Edgar 1998; Lander and Ackerman 1973; Weir 1983). Battles fought throughout the region destroyed land, property, and lives. Not only had the agricultural system been decimated but so too was the export market. South Carolina, like many of the territories within the newly formed Republic of the United States, needed to rebuild from the devastation. South Carolina did so through people who were "busy in their respective vocations, covering as fast as they can the marks of British cruelty, by new Buildings, Inclosures, and other Improvements, and recovering their former State of happiness and Prosperity" (Laurens 1784; see Chaplin 1996).

Before the Revolution, South Carolina primarily exported goods to England. That market was disrupted by the Revolutionary War and was slow to recover after the war. In the late 1700s, South Carolina finally regained an export volume which provided 100,000 barrels of rice and 800,000 pounds of indigo to European markets in the years 1790 to 1800 (Chaplin 1996; Ruffin 1843, 1992). The indigo trade declined again and by the mid-1790s was dropped from agricultural activity due to the lack of economic viability (Winberry 1979: 248-250). Tobacco markets also waxed and waned through these years.

As America developed its own trade partners, South Carolina saw a sharp increase in tobacco exports. In 1793 exporters sold 643 hogsheads of tobacco and in 1799 exported 9,646 hogsheads (Figure 3.6) (Edgar 1998; Johnson and Sloan 1971; Weir 1983). Increased access to markets encouraged South Carolinians to purchase land and enslaved laborers in order to gain their own portion of this economic success.

During the antebellum period (1790 to 1865) cotton became the principle focus of the commercial enterprise and took center stage as South Carolina's key economic agricultural export. Cotton agriculture gained traction and became a viable export commodity after Eli Whitney invented the cotton gin in 1792 (Gray 1973). Early success of black seed cotton in the 1790s helped to displace indigo production as a coastal agricultural venture. Black seed cotton, also known as *Gossypium barbadense,* possesses fibers that measure 1.5 to 2.5 inches in length, which are 1 to 2 inches longer than other cotton species. The longer fiber meant that more yields could be obtained with the same number of cotton plants. In comparison with the shorter fiber cottons, these longer cotton fibers were more valuable due to ease of use by the end user (Lunan 1814: 233).

In order for black seed cotton to grow and to produce the fullest yields, the crop needed long-growing periods and frequent light rain. Coastal Carolina was properly suited with these weather conditions while the upcountry was less desirable due to a shorter growing season and fluctuating rain totals. To tap into an emergent cotton market, backcountry cotton agriculturalists planted green seed species of this cash crop. Green seed cotton, also known as *Gossypium hirsutum*, yielded shorter fibers (Lunan 1814: 233, Miller 1835: 584). While these shorter fibers were worth less in the export market, a larger number of upcountry plantations could successfully, with the assistance of the cotton gin, cultivate the crop and make making it a viable enterprise (Olmstead 1861).

Figure 3.6. Hogshead of tobacco, Smithsonian National Museum of American History.

By 1801, South Carolina produced approximately 20 million pounds of cotton and by 1830 the output had tripled to 60 million pounds (Coclanis 1990, 1985, 1982; Ford 1988: 8-12; Smith 1958; Edgar 1998). The four upcountry districts of Abbeville, Edgefield, Fairfield, and Laurens accounted for approximately one half of the 1830 cotton agricultural output (Edgar 1998; Johnson and Sloan 1971; Weir 1983). The upcountry, which had been sparsely populated at the start of the 19th century, had become a center for wealth and prosperity. The success of the upcountry agriculturalists was due to several factors: 1) the industrial revolution, 2) the cotton gin, 3) improved transportation routes, and 4) the development of merchant exchanges at the Port of Charleston (Kovacik and Winberry 1987).

Upcountry agriculturalists utilized these four economic factors to increase their wealth. Landowners were often directly involved in the exchange of cotton on the Charleston docks. In his work, *Statistics of South Carolina*, Robert Mills (1826) stated that upcountry cotton was the primary crop under cultivation in virtually every non-coastal district. At the time in which Mills was collecting his research data the state of South Carolina was cultivating approximately 170,000 bales of cotton (a bale equals 500 pounds) (Figure 3.7) (Yafa 2006). By 1820 South Carolina was producing 50% of America's cotton output. In 1850, South Carolina's cotton production had grown to 320,000 bales, accounting for 10% of the nation's total output. The increased yields and decreased total percent speak to the national importance of cotton and the desire of landowners in other states to capture a portion of the market (Edgar 1998; Weir 1983).

In order to tap into the cotton market people looked to the west and deep south for new lands. To cultivate large quantities of cotton landowners also increased their demand for slave labor. Labor, not land, became the largest capital investment for an agriculturalist (Coclanis 1982; Edgar 1998; Johnson and Sloan 1971; Weir 1983). To mitigate labor expenditures slave holders often diversified the workforce by employing enslaved laborers in activities on neighboring farms or in settings away from the plantation. Slaves who worked away from plantations often did so in industrial settings, a practice which will be discussed later in further detail (Dew 1994; Lewis 1979; Starbon 1970a, 1970b).

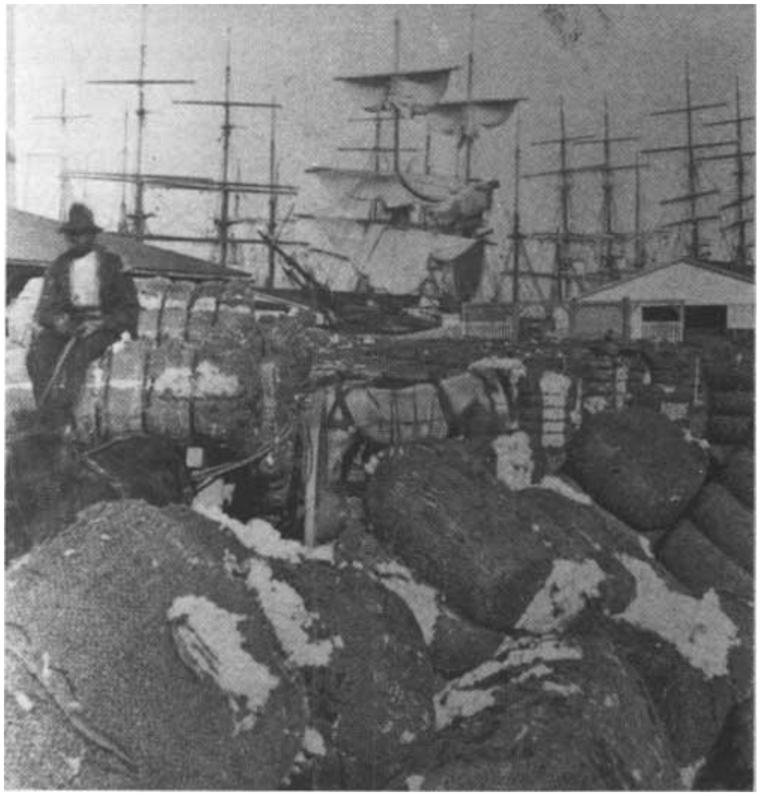


Figure 3.7. Cotton bales at Charleston Harbor during the Civil War, Courtesy National Park Service

Not all southern landowners utilized enslaved laborers or focused on the cultivation of cotton. While some accounts painted a picture that most southern whites owned large numbers of slaves, in fact the inverse was true. The majority of the slaveholding southerners operated small farms and owned fewer than five slaves (Oakes 1983: 38). These small farmers were much more akin to subsistence agriculturists, holding people in bondage only during the active portions of the growing season (Ford 1988). However, these landowners were often plugged into local economic systems and they provided food products to local plantations (McCurry 1997). Since cotton provided the largest return on capital investment, larger-scale plantation owners primarily focused on cultivating that commodity crop rather than food crops (Chaplin 1996: 277-278). This singular focus meant that there were little resources invested by large-scale plantations for the cultivation of food products for their own labor forces. Small farms thus profited by providing plantations with food supplies from crops such as corn, wheat, sweet potatoes, and cowpeas (Chaplin 1996).

2. Transportation Systems

During this period in American history merchants in South Carolina saw their region as lagging behind all of the other states in economic advancement (Collins 1977; Kovacik and Winberry 1987; Ford 1986). South Carolina was deeply rooted in enslaved labor agriculture while other states, especially in the North, began to incorporate industry and wage labor as engines of economic expansion. Accompanying efforts to develop regional transportation systems provided profits and expanded infrastructure. For example, New York saw increased economic growth in part due to the construction of the Erie Canal and multiple railroad lines. These transportation routes made it possible to move materials and people far more quickly than in previous decades. In contrast, Charleston's port trade in 1821 was 25% that of the Port of New York and a decade later that total had dropped to 10% due to lack of import diversity (Kovacik and Winberry 1987). Through this one example it is clear that the northern ports were becoming more active and profitable when compared to their southern counterparts. This economic disparity was linked to the multiplicity of goods flowing through northern ports while the south was focused on agricultural commodities. During the antebellum period, cotton became South Carolina's primary agricultural commodity over rice and indigo. For plantation owners to get cotton to market the large bulky bales needed to be transported from the state's interior to the coast. Thus, demand grew for the creation of roads, canals, and railroad lines so that plantation owners could more readily realize the value and profits of their annual crops (Dodd and Dodd 1976; Ford 1988; Kovacik and Winberry 1987). To put these expenditures in context, $1 in 1828 provided the purchasing power of $20 to $25 in 2012 (EH.net 2013; Friedman 2013).

The creation and improvement of transportation routes would help to increase the economic success of South Carolina plantation owners during the antebellum period. Enslaved laborers and free white workers were utilized in the construction of roads, waterways, and railroads throughout the state. In 1790, Charleston merchants funded the construction of the 22 mile Santee Canal which connected the Santee and Cooper Rivers. Later in 1818, the South Carolina General Assembly provided $1 million dollars of funding over four years for the construction of roads (Ford 1988; Hollis 1968; Mills 1826; Liscombe 1994; Wallace 1934). Both of these building projects aimed to speed the transportation of cotton from the upcountry to the port facilities in Charleston. By 1819, South Carolina had created the Board of Public Works, which was charged to manage the state's transportation routes. South Carolina commercial interests wanted to utilize the natural water ways that traversed the state from northwest to southeast. By 1828, the Board of Public Works had provided $1.8 million dollars towards building projects, the largest of which was the State Road that connected Charleston and Columbia. In total, more than 110 miles of roads, 25 miles of canals, and improvements to 2,000 miles of waterways assisted in the transportation of approximately 80% of South Carolina's cotton output (Figure 3.8) (Ford 1988; Hollis 1968; Liscombe 1994). To put these expenditures in context, $1 in 1828 provided the purchasing power of $20 to $25 in 2012 (EH.net 2013; Friedman 2013).

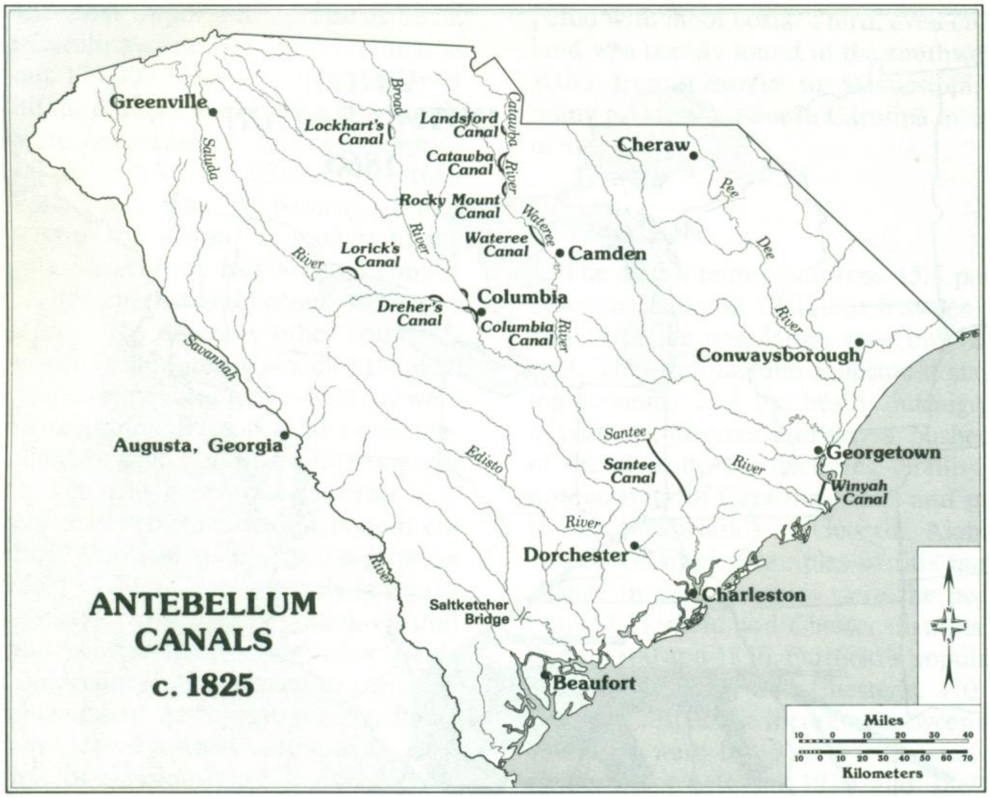


Figure 3.8. South Carolina Canals 1825, Map Kovacik and Winberry 1987: 94

In addition to improved road and waterways, South Carolina assisted in the construction of railroads (Figure 3.9). Initially plans had been conceived to build rail lines connecting the Ohio Valley and Charleston. Access to this growing region of the United States would expand Charleston markets and create competition with New York City and other coastal port cities (Collins 1977; Kovacik and Winberry 1987; Ford 1986). The construction of rail lines into the Ohio Valley was abandoned about 1840 in favor of expansion westward through neighboring southern states. The decision to focus on westward construction was based on economic and political factors. John C. Calhoun (1782-1850), a South Carolina political theorist, claimed that a transportation system focused in the south would provide economic and political unity for the southern states (Collins 1977; Ford 1986). Railroad construction made sluggish progress and Charleston never reaped the benefits of an expansive transportation system in its region due in part to the successful competition by new regional markets which sprung around coastal hubs in Mobile, Alabama and New Orleans, Louisiana. In 1820, South Carolina was the leading producer of cotton and by 1850 the cultivated weight of raw cotton had tripled. However by 1850 westward expansion had taken its toll and South Carolina ranked 4th in cotton cultivation (Dodd and Dodd 1976: 4-60).

Nonetheless, the railroad did provide lasting benefits for those within the state of South Carolina. Backed by businessmen in Columbia, the state capital became a transportation hub for the local railroads. By 1850, there were nearly 1,000 miles of track spanning South Carolina which connected small, upcountry farms and plantations to coastal markets through Charleston (Collins 1977; Kovacik and Winberry 1987; Ford 1986). Until 1854, when rail lines were built to the port in Wilmington, North Carolina, Charleston was the primary Atlantic coast port for the exportation of South Carolina cotton. To counteract the port at Wilmington, Charleston financiers funded additional rail construction by funding projects to connect previously underserved areas. The success of the two ports meant that South Carolina growers had a choice of markets after cultivation. These planters were free to choose the best location for their sales in order to obtain the highest return on investment for the annual crop (Edeleson 2006).

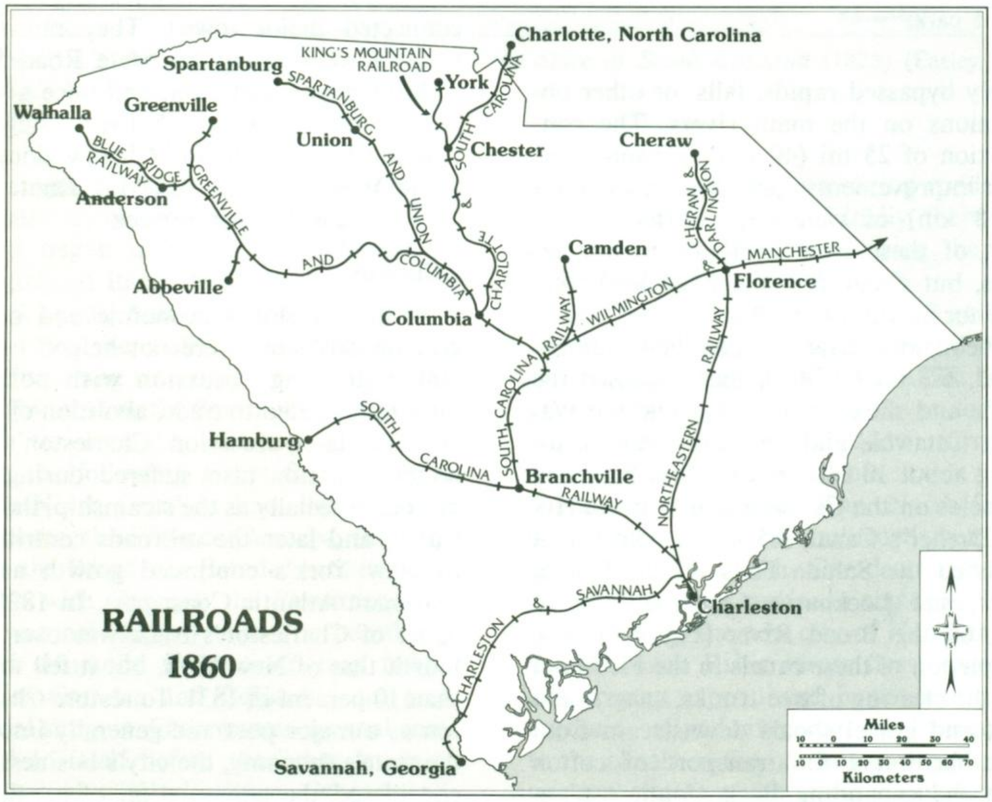


Figure 3.9. South Carolina Railroads 1825, Map Kovacik and Winberry 1987: 94

While the rail lines were intended to transport cotton to the Carolina ports they also provided a wider market for other upcountry business ventures. In the 1830s, the South Carolina Railroad operated a line that connected Hamburg (now the area of North Augusta on the Savannah River) and Charleston (Derrick 1975 [1930]; Ford 1988). Viewing the construction of this rail line, businessmen from the Edgefield district funded the construction of a plank road which connected the town of Edgefield to Hamburg. This road allowed for refined goods, such as stoneware pottery, to be sold at Hamburg and transported by river barge or railroad in a network that facilitated wider distribution of those products. An archaeological record of such shipments was recovered in the *Mepkin Abbey* shipwreck located on the Cooper River, South Carolina. The excavations of this rice barge contained 11 complete stoneware vessels, included one alkaline glazed jug from an Edgefield district pottery (Vezeau 2004: 30). The distribution traces of these alkaline glaze stoneware vessels reflect the development in which these utilitarian objects were not only made for local use but found their way into a larger marketplace.

Railroads were viewed as a means to tap into economic markets outside of the local. Businessmen and landowners in Edgefield considered the northern states to be a potential market for raw clay or for manufactured alkaline glazed stoneware. The following excerpt from the *Edgefield Hive* discussed the linkage between the expanding railroad infrastructure and potential opportunities to reach larger markets.

> There has been left with us a Porcelain Milk Pot, manufactured in Philadelphia, from a specimen of white clay, from the Chalk Hills, as they called, in Edgefield District in this state. We understand that the supply of this clay is inexhaustible. As the Rail Road is expected to pass immediately through these lands, this clay may one day become an article of inconsiderable value to the proprietors of the soil, as well as profit to the Rail Road Company
> -*Edgefield Hive* March 1830

B. Edgefield District

The Edgefield district was located along South Carolina's western border. The westernmost portion of the district was situated along the Savannah River (Figure 3.10) (SCDNR 2012). The Savannah River is a navigable waterway stretching from the Appalachian Mountains to the Atlantic Ocean. As South Carolinians migrated westward the Savannah River became an important means of transportation for people and commerce. Edgefield district towns of Hamburg, South Carolina and Augusta, Georgia sprung up along the river at geologically depressed elevations which allowed for river crossings. Since people were funneled into these naturally low lying areas, Hamburg and Augusta became important economic locations during the antebellum (Chapman 1897).

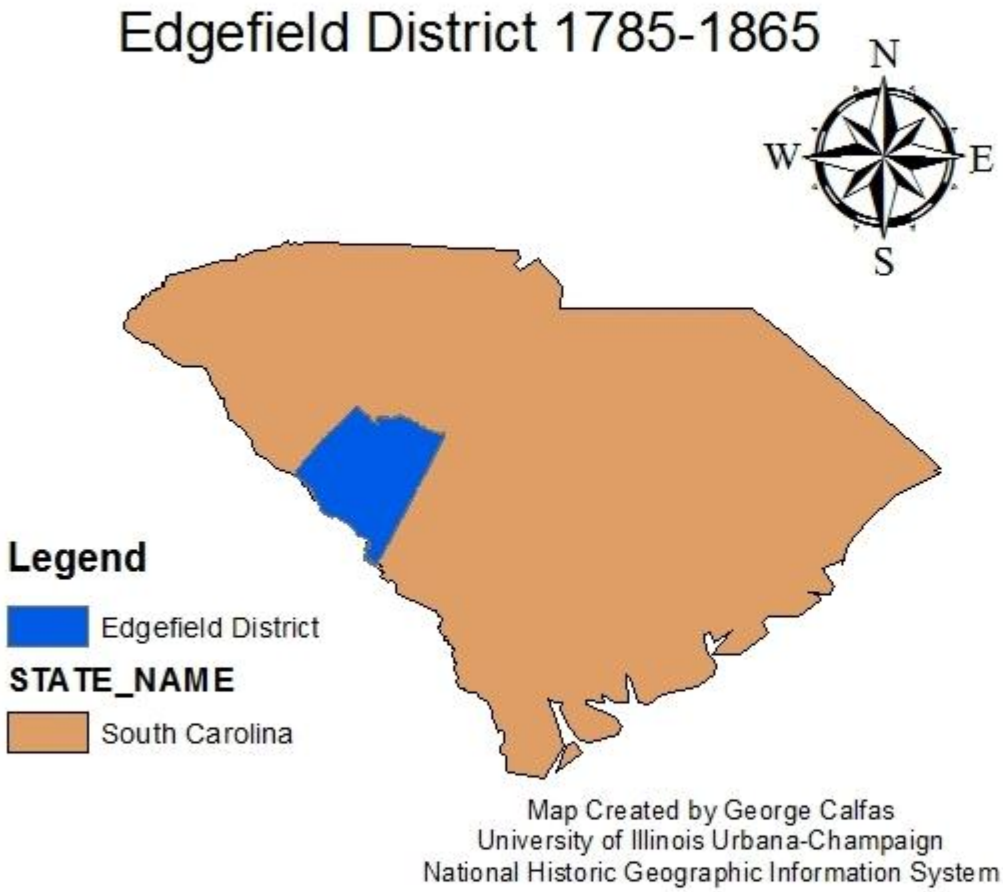


Figure 3.10. Edgefield District 1785-1865

Landowners within the Edgefield district relied upon the soil and the blood and sweat of their slaves to create their wealth and fortune. The first Europeans in the area hunted and trapped wild game to forge their existence. These woodsmen helped to establish the first permanent European settlements in the region (Chapman 1897; Wallace 1934). These first settlements were supported by adjacent small farms some of which would later grow into large-scale, antebellum plantations (Edgar 1998).

Just as house styles differed, so too did agricultural activities. Lowcountry planters centered their attention on cotton and rice while their Edgefield upcountry counterparts took different agricultural paths focused on crop diversity. Edgefield farmers and plantation owners cultivated corn, oat, wheat, rye, and barley in addition to cotton (Burton 1985; Chapman 1897; Edgar 1998). Populated later in time than the lowcountry, landowners in the upcountry could also harvest timber as a means of economic diversity. By harvesting timber, landowners were able to recoup monetary expenditures from purchasing a parcel of property while clearing the land for agricultural activities. By 1850, the Edgefield district was South Carolina’s leading producer of dairy by-products and either the leader or runner-up in the production of cotton, orchard fruit, oats, potatoes, and corn (Burton1985; Edgar 1998). In Edgefield, agriculture was so successful that 65% of the white population was actively engaged in it, whether as owner, farmer, overseer, or field hand. The remainder of the district’s population was thus engaged in activities in support of agriculture which created an employment space where few if any residents were in search of work (Wallace 1934).

The level of population in the Edgefield district led to a low unemployment rate of free whites in the region. Europeans and enslaved Africans arrived in the Edgefield district in the 1730s. Enslaved Africans were brought to this frontier portion of the colony to assist with the clearing of forest areas to make way for farmsteads (Burton1985; Edgar 1998; Lander and Ackerman 1973; Weir 1983). During the mid-18th century indentured servants toiled alongside slaves in remittance of their Atlantic voyage. By the first decade of the 19th century the Edgefield district population would come to be dominated by free whites. In 1800 there were 13,063 free whites and 5,006 enslaved African Americans living in the district. The success of cotton in western South Carolina and acquisition of lands to the west of the state would soon shift these statistics. By 1820 the white population had slightly decreased to 12,864 while the enslaved population had grown fourfold to 19,198 (Burton 1985; Dodd and Dodd 1976).

The expanded population of enslaved laborers had a multitude of causes and effects. In an effort to cultivate more cotton, plantation owners needed a large labor force to work their parcels of land. Unlike other regions in South Carolina, plantation owners in the Edgefield district tended to own larger enslaved labor forces in order to efficiently cultivate the larger upcountry plantations (Burton1985; Dodd and Dodd 1976). By 1850, 21% of the plantations owned 20 or more enslaved laborers and by 1860 that number had risen to 23.6%. During the same periods, small scale agricultural operations tended to hold 5 or fewer slaves. The amount of landowners holding enslaved laborers was 58% and 55% respectively (Burton 1985; Dodd and Dodd 1976). The high percentage of landowners that held enslaved Africans supports the accounts that a high portion of the population was involved in various agricultural pursuits. This expanding population needed to be supported with daily subsistence supplies. For the purpose of this project it is important to consider the topic of food storage. Small-scale farms typically filled the niche market of supplying food products to the larger-scale plantations that focused on cash commodities like cotton (Hilliard 1969). Whether on the plantation or a small farmstead, the enslaved laborers were often provided with food rations for subsistence and these rations could be stockpiled in utilitarian, stoneware storage vessels (Burton 1985; Vlach 1990a). In an effort to supply the local community with utilitarian vessels, Dr. Abner Landrum established the Pottersville stoneware facility.

1. Pottersville Manufacturing Facility

Pottersville is considered to be the birth place of American, alkaline-glazed stoneware. The Edgefield district was situated within a geologically rich zone of high quality kaolin clay ideal for the manufacture of stoneware. The first stoneware manufacturing facility in the Edgefield district was referred to as “Pottersville” or “Landrumsville,” the latter name derived from the facility’s proprietor. Pottersville was established by Dr. Landrum sometime after 1809 (Figure 3.11). Pottersville was known to have been a fully functioning stoneware manufacturing facility in 1817 when surveyors marked the site on their survey map. Pottersville was a moderate-sized village which housed workers, and may have included a wheelwright, a blacksmith, wagon maker, wagon driver, and a miller (Baldwin 1993; Chapman 1897; Mills 1826). Pottersville was not the only stoneware operation within the district during the antebellum. Among them were Dr. Landrum’s brothers Amos and John, John's son Benjamin Franklin, John’s son-in-law Lewis Miles, Colin Rhodes, and Thomas Chandler, who also operated stoneware production centers to capitalize upon the district’s high volume of agricultural output and storage needs.

The site of the Pottersville kiln is recognized as a nationally significant site based on historical, documentary evidence, and is listed on the National Register of Historic Places (NPS 2009 [1975]). The *Camden Gazette* first wrote about the Pottersville vessels in 1819, describing them as “the first of the kind” and “superior in quality” (*Camden Gazette* June 3, 1819 4-5). The quality of these vessels was later echoed by Robert Mills in his 1826 *Statistics of South Carolina* in which he observed that the stoneware was “stronger, better, and cheaper than any European or American ware of the same kind.”

Figure 3.11. Mills 1826 Map, Pottersville (Landrumsville) and the town of Edgefield.

Today, the Pottersville kiln site is situated in an open pasture within 30 meters of a modern road. A small stream is located 200m to the east and a small pond approximately 1 km to the northeast. An archaeological survey conducted in 1987 identified architectural building materials related to the kiln structure; however, due to the scope of the survey, researchers were unable to determine the kiln's dimensions (Castille et al. 1988). The kiln remains sit along a sloping hill on the highest elevated point of a pasture, surrounded by a surface scatter of ceramic sherds in all directions. To the southeast, the downhill side of the kiln has the highest density of surface debitage. This scatter of downhill deposits is at the mid-point between the kiln and the location downhill where the turning shop was likely built in the early days of the production site's operations (Castille et al. 1988; Monday 1995). Clay in this region varies in color from 10R 4/8 Red to 10YR 4/3 Brown and 10YR 8/4 Pale Yellow. The operators of the Pottersville production center were able to utilize the wealth of clay color variations at the site to produce a wide array of products for market.

2. Development of Pottersville

One of the first newspaper accounts regarding Potterville was an advertisement in the *Camden Gazette* which pitchers, jars, and churns were among “370 pieces of Edgefield made Stoneware” described as “the first of their kind ever offered for sale” (*Camden Gazette* June 3, 1819:4-5). Camden was approximately 100 miles away from Edgefield, which suggests that access and distribution of these stoneware vessels extended beyond the local and into the regional. However, the facility was known to have been in operation prior to this 1819 printing. Robert Mills’ research regarding Pottersville was provided by a map maker traveling through South Carolina. The cartographer recorded details with respect to the stoneware facility in 1817. In December 1812, Dr. Landrum petitioned the state of South Carolina for a loan to fund the construction of a Queensware or Porcelain manufacturing facility (Appendix A) (Landrum 1812). Queensware was a term used in the early 19th century for refined earthenware products. Porcelain was a term typically used in the same time period for higher-quality, vitrified pottery. An even earlier newspaper report provided one possible moment in which Dr. Landrum considered the initiation of a ceramic industry. In 1809, Abner was quoted in the *Augusta Chronicle* regarding his discovery of pottery clay in the Edgefield district (*Augusta Chronicle* 1809).

From these lines of evidence, Pottersville’s construction date falls at some point between 1809 and 1817. The December 1812 document provides notable evidence; however, not enough data exists to unequivocally determine if the funds went towards original construction of the facility or post-construction developments. The 1812 document suggests that the manufacture of stoneware was not Dr. Landrum’s initial intent. He instead used phrases for other types of ceramic products. The 1812 document stated:

> The Committee on the Governors Message No.1 to whom was referred the Petition of Abner Landrum Praying for Legislation assistance in the Establishment of a Queensware or Porcelain manufactory. Report that they have only concurred the same and are of opinion that is will be worthy of the Legislature to hold out a fostering hand to its infant manufactories they therefore recommend that the sum of two thousand dollars be loaned the Petitioner for the term of three years on his giving satisfactory security for the faithful payment of this said sum of two thousand dollars and the annual sum of one hundred and fifty dollars as Interest therefore.
> Signed John Johnson Jr. Chairman Dec. 14 1812

The request did not mention the manufacture of stoneware, but proposed the creation of a facility similar to those found in England. The terms used in the 1812 request for a loan appear to indicate that Dr. Landrum had early aspirations to produce refined tableware for local markets. To provide some context to the sums involved in this grant, $1 in 1812 provided the same purchasing powers as $13 to $17 in 2012. Thus, a $2,000 grant in 1812 provided the equivalent of at least $26,000 in today's currency (EH.net 2013; Friedman 2013).

At some point after Dr. Landrum was awarded the $2,000 he had requested in December 1812, but before the surveyors recorded Pottersville as a stoneware manufacturing facility, the intended object of manufacture changed. Information regarding this shift in production was provided in Landrum's report upon final repayment of the Governor's loan (Appendix A). Landrum's 1816 report to the state of South Carolina was submitted three years after funds were received and read as follows:

> The Honorable the President Members of the Senate
>
> Your Petitioner begs leave to represent to your honorable body that he has for the last three years been prosecuting at a considerable expense of time, labor, & money an exhaustive course of experiments on the chemical properties of the different earths; by which he has been enabled

> to produce specimens of the most elegant Porcelains or Chinaware; various kinds of Glass from the black green to the best double flint; a good quality of Delft or Queensware; a quality of Stoneware superior in texture and glazing to the best European, with the additional advantage also over that of enduring, uninjur'd quick transitions from heat to cold; a composition of mortars superior to those of Wedgwood; Crucibles, preferred by the artists to the best Hessian; also artificial flints which promise to supersede those imported from Europe. The most of these experiments have been reduc'd to practical purposes; but the limited finances of your Petitioner has hitherto prevented him from making it of a general and of extensive utility to the country, as the processing of good workmen in earthen ware and glass must be attended with considerable expense; your Petitioner therefore humbly prays such legislative aid as your honorable body may think proper to grant and your Petitioner as in duty bound will ever pray
> Signed Abner Landrum (emphasis original)
> SC Gov Report 1816

In Dr. Landrum's own words, he explains that the manufacture of porcelain and earthenwares (often called Queensware and Delft) were only modestly accomplished and the production of stoneware vessels proved much more successful. The crucibles mentioned by Landrum consisted of modest-sized vessels used by metallurgists to hold molten solutions. Of note, gold mines operated in the Edgefield district and a grand-nephew of Dr. Landrum later owned a claim to one such enterprise (Baldwin 1993). Thus, the first successful manufacture of alkaline glazed stoneware by Dr. Landrum's enterprise at Pottersville appears to have occurred at some point between 1812 and 1816.

An 1820 United States census enumerator listed Pottersville as being an "industrial" facility. Listed in the 1820 Industrial Census, the Pottersville stoneware manufactory was recorded to have four pottery wheels in operation and $8,000 in capital investment. In a footnote, the enumerator claimed that the "proprietors about to enlarge this operation" (U.S. Industrial Census 1820). No further documentation has been discovered to support this claim or postulate what the "proprietors" expansion entailed, however deed records indicate that parcels of land were developed around the kiln site from 1827 to 1846 (Monday 1995). Of additional note from the 1820 Industrial Census, the facility employed five men and two children. In the early years of production, the center employed men and children of European heritage, though worker demographics subsequently shifted to mainly enslaved African Americans (Holcombe and Holcombe 1986: 49-51). The enslaved laborers working at the facility included the now famous enslaved master potter named Dave Drake, who very likely learned the pottery trade at Pottersville.

The Pottersville manufacturing facility changed hands several times during its operation. The stoneware operation was first sold in 1828 when Abner Landrum transferred control of Pottersville to Harvey and Reuben Drake (Castille et al. 1988:16; Edgefield Deeds 45: 373-374). Under direction of the Drakes, Pottersville became an operation in which several partnerships were established. These partnerships spread both the financial burden and success of the facility. Some partners owned as little as one-sixth of the facility (Castille et al. 1988). Available documentary evidence is unclear as to whether the partial owners shared in Pottersville activities throughout each year or if partial shares allowed each investor to create and fire wares during limited timeframes for their individual enterprise (Castille et al. 1988; Edgefield County Conveyances 1840-1869; County Court Conveyances: 71). Pottersville was known to have been operated until at least 1842 when six people were listed as partial owners of the facility. Even though ownership changed, the pottery remained an integral site for stoneware manufacturing until its closing in approximately 1843 when the principal owner at that time, Jasper Gibbs, departed for Mississippi (*Edgefield Advertiser* April 12, 1843; Baldwin 1993; Castille et al. 1988).

Stoneware produced at Pottersville was made available throughout the Edgefield district. One particular marketplace for Pottersville stoneware consisted of plantation operators who employed enslaved laborers. Pickled pork was the primary food product provided in rations to enslaved workers. Food products such as pork, potatoes, cornbread, greens, and corn were included in weekly ration allotments. James Henry Hammond, an Edgefield planter, wrote that a field hand should be provided three pounds of pork per week (Faust 1985; Vlach 1990a). The pork pickling process took approximately four weeks and a five-gallon vessel held approximately 20 pounds of pork. Vernon Burton's research indicates that half of the Edgefield plantations maintained groups of 25 or more slaves with a total enslaved population of nearly 13,000 in 1820 (Burton 1985). If a plantation owner were to provide 3 pounds of pork per week to 25 field hands, the plantation would empty 4 to 5 of the 5-gallon vessels a week. Thus a plantation owner would very likely prefer to own a minimum of 20 stoneware vessels just to pickle pork. To provide enough pickled pork for the entire population of 13,000 enslaved people in the Edgefield district, plantation owners, for example, could have utilized more than 11,000 of the 5-gallon stoneware vessels. Plantation owners very likely presented a market demand for such affordable food storage vessels and Edgefield stoneware manufacturers were eager to take advantage of that market (Burton 1998: 41; Vlach 1990b, 1991).

In addition to providing storage for distributing food rations to the agricultural work force, stoneware was also very likely desirable for other storage uses for the high volume of perishable goods produced in the district. The agricultural diversity of the area thus facilitated a market demand for the manufacture of stoneware storage vessels. This is not to say that all perishable goods were initially stored in stonewares. For example, colonists in earlier periods tried to use wooden barrels and casks that they sealed to the best of their ability. Such wooden storage containers were notably inferior to glazed stoneware vessels in characteristics such as nonporousness. It is very likely that any amount of materials pickled or preserved for an extended period of time would have been stored in stoneware vessels once that option was available. Before the first decade of the 19th century, stoneware utilized in the Edgefield district was primarily produced outside of the state. With local population growth, local stoneware manufacturers were able to produce and sell utilitarian vessels throughout the region without the additional price increases associated with long-distance transportation of heavy ceramic goods.

Alkaline glazed stoneware has a rich history in Edgefield, South Carolina, one that is persistent to this day. Pottersville potters wielded a wealth of knowledge about ceramic technology. These potters are a part of a larger ceramic history which spans millennia. In the chapter to follow I will explore an array of ceramic technologies, how practices in Edgefield fit within those broader histories of technology, and the details of the techniques most likely developed at Pottersville.

Chapter 4:
Ceramic Technologies: Practices and Innovations Leading to an Edgefield Industry

An integral facet of this research project is to better understand ceramic technologies employed in the antebellum American south and how Edgefield industry fit into that broader context. In turn, to understand broader trends in American pottery production, one can look at European and Asian technologies that influenced American enterprises. An understanding of ceramic technologies similarly informs interpretations of the archaeological record. During the 2011 archaeological field season, research was focused on the kiln structure at the Pottersville site in Edgefield, South Carolina. This chapter provides a discussion focusing on the history of stoneware ceramics, kiln technologies, and ceramic variations which potters throughout the world have employed over centuries.

Edgefield was the epicenter for the development of alkaline-glazed stoneware in the Americas. However, the district's pottery production centers were not the locations at which artisans first developed the technical methods to create stoneware. The Edgefield potters created vessel forms similar to those created earlier in Europe. Stoneware production in Europe dates to the medieval period and the historical development from this point to the 19th century provided foundations for the development of Edgefield ceramics. Technological developments over several centuries in southeastern China pottery industries provide comparable precedents that later impacted options pursued at Edgefield.

Chapter 4 is written to provide a brief historical, technical, and innovation overview regarding ceramic production with respect to the Pottersville kiln site. The first section begins with the focus of this research project, stoneware. Part I discussions the history of European stonewares and the movement of production knowledge America during the colonial period. Part II provides a discussion of for the nomenclature and dynamics of kiln firing and relocated technologies. Once kiln firing processes are established, Part III provides focus upon kiln designs. This discussion is written to include a subset of all possible kiln designs built in regions throughout the world which could have held some association with the history of the Pottersville kiln site. Chapter 4 concludes with a discussion of ceramic technologies and the people and nations that are responsible for ceramic development. Integral to this project are the people and nations that strive to create porcelain and information that is learned through networks of exchange.

I. European Stoneware Developments

European stoneware was developed as an advancement of medieval Pingsdorf and Schinveld earthenwares (Baldwin 1993; Bookmann 1986; Heege 1995). These earthenwares created in the 12th century were "hard burned," a firing technique that hardened the ceramic object beyond normal earthenware temperatures (Corder 1959; Hampe and Winter 1962; Heege 1995). The 12th century potters learned that increased heating temperatures altered the ceramic structure.

Through these medieval developments potters experimented with kiln technologies in efforts to increase furnace firing temperatures. In the Rhine River region of Germany and Northern France, 12th and 13th century potters made strides in improving kiln technologies to advance the production of stoneware (Corder 1959; Hampe and Winter 1962; Rhodes 1981). By the 14th century kilns in Seiburg, Germany and Beauvais, France were capable of transforming raw clay into semi-vitrified stoneware. Porcelain products are made with high-quality, silica-rich clay that is fired to a high temperature that vitrifies the clay into a glass-like translucence (Barber 1893; Hamer and Hamer 1991; Kenny 1949; Rice 1987). Stonewares are made with high-quality clay and fired at temperatures that do not produce vitrification, but result in near-vitrified, "stone-like" solidity of clay paste (Baldwin 1993; Rhodes 1981; Sweezy 1984; Zug 1986). Stoneware facilities in Germany produced hard-paste, non-porous vessels, with flame treatment rather than utilizing an applied glaze to achieve non-porous finishes. During this period, when potters utilized glazes they were applied as a thin layer to the ceramic object. While the application of liquid glaze was a known technique in Europe, potters tended to use a salt glaze created by vaporization of salt crystals within the kiln (Corder 1959; Hampe and Winter 1962).

Salt glazing began in Europe at some point during the 15th century. German potters of the Rhine River, Seigburg, Cologne, and Raeren were major production centers for salt-glazed stoneware (Corder 1957; Hampe and Winter 1962; Rhodes 1981). During the 15th century potters became extremely conversant in stoneware production and began to further develop the industry. With the assistance of the pottery wheel, Rhenish potters expanded the type of forms being produced. As manufacture grew in Germany, so too did the artistic elements of production. Stoneware potters during this period began to apply treatment to the exterior of their vessels which included sprigged and incised designs (Figure 4.1). Sprigged designs consist of molded clay forms applied to the exterior of an unfired ceramic object, while incised designs were created by etching or carving into the unfired clay body. By the 16th century potters also began to experiment with colors.

These Germany potters discovered materials with which to create cobalt blue ornamentation of their pottery, for which the region would later be renowned (Corder 1957; Hampe and Winter 1962).

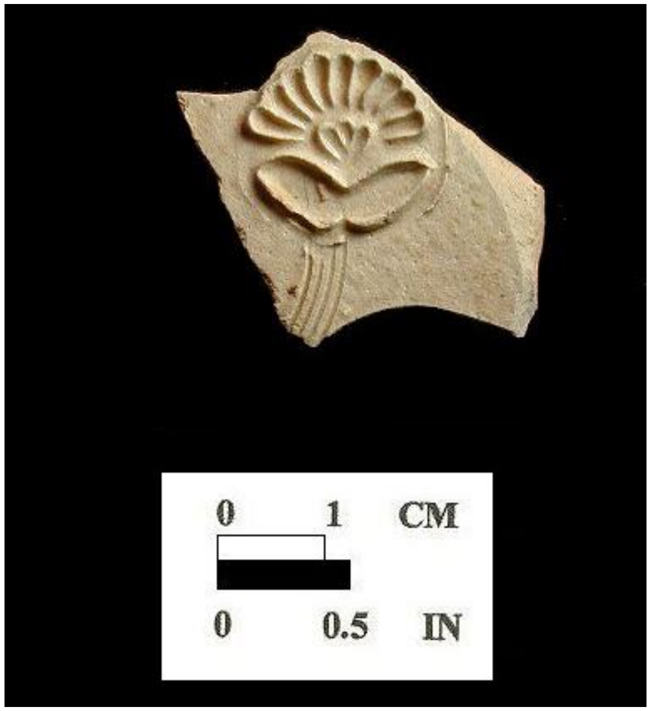


Figure 4.1. 16th Century Rhenish “sprigged” stoneware fragment with incised lines, Courtesy Maryland Archaeological Conservation Laboratory.

A. Production of English Stoneware

For centuries, England had been a major importer of Germany stonewares. However, during the 17th century English entrepreneurs initiated attempts to manufacture locally-produced stoneware (Figure 4.2). John Dwight, an English master potter, worked to recreate Rhenish stoneware (Green 1971 1991, 1999; Green at al. 1976; Rhodes 1981). In 1671, Dwight obtained a patent to create salt-glazed stoneware at his Fulham manufacturing facility. A century later, English stoneware had fully developed so that the majority of stoneware products utilized by the populations in Great Britain were made locally.

English potters mastered the skills to produce utilitarian stoneware, and also focused their skills on creating decorative tablewares, such as platters, plates, and bowls. During the 18th century, Josiah Wedgwood developed cream-color earthenware products by utilizing kiln technologies designed for the production of stoneware (Burton 1922; Dolan 2004; Pickman 1936; Reilly 1992; Wills 1969). Potters who worked in German and English stoneware potteries immigrated to American bringing with them the knowledge of various stoneware manufacturing methods. The basis of American stoneware manufacturing can be traced to beginnings in the early colonial period.

Figure 4.2. 18th Century Ale mug, Fulham, England, Courtesy Victoria and Albert Museum

B. American Enterprise

Immigrant potters, primarily from Germany and England, brought with them cultural preferences regarding form, function, and decoration for their stoneware products. German potters engaged in new production ventures in America by recreating large mugs, long neck jugs, and bulbous jugs. Along with these deigns, German potters continued to apply blue glazes to the vessel exteriors (Corder 1957; Hampe and Winter 1962; Rhodes 1981). Along with techniques of decoration came methods to construct and operate salt glaze kilns. The influence and distribution of salt-glazed stoneware products could be seen throughout the Mid-Atlantic States.

When English potters emigrated to America they brought with them similar pottery production methods. English potters were well versed in both salt and slip glazing to decorate their ceramic creations. Slip glazing consists of the application of a liquid glaze to the exterior of a ceramic object prior to final firing. English potters continued to create short, cylindrical vessel forms typically produced in their local production centers. These potters tended to utilize more exterior decorations than their German counterparts. English inspired stoneware can be identified by bands created by glaze dipping, sprigs, and incised lines (Greer 1981).

Ceramic technologies in North America shifted and developed as the population expanded to locations previously unpopulated by European settlers. While clay was naturally occurring throughout various regions of the colonies, clay suitable for the production of stoneware was not always accessible (Greer 1981; Ketchum 1991a; Watkins 1968). Regional potters learned the physical properties of local clays and the types of vessels that could be readily manufactured. Through this process of discovery potters learned that some clays were suitable for the creation of low-fired earthenware, while other clays were suitable for the production of high-fired stoneware.

1. New England Colonial Potteries

The colonies of New England were situated in a geologic region where only glacial clays were accessible. Glacial clay, or glacial till, consists of a variety of unsorted glacial sediments. Glacial clays are embedded with sediments transported by ice and water flows associated with retreating glaciers. Sediments in glacial clays range from small sand-sized inclusions to larger sized rubble. Due to the large mixture of sediment sizes glacial clay was not suitable for stoneware production due to the impurities in the clay body (Greer 1981; Ketchum 1991a; Watkins 1968). Since stoneware is heated to 1,200 degrees Celsius and beyond, the clay body must be nearly homogeneous so that the ceramic fabric of the clay body expands at a constant rate. Inclusions will expand at a different rate than the clay body which will cause the ceramic object to crack or explode at high temperatures. However, thermal expansion is less of a concern at lower firing temperatures. While glacial clay was not appropriate for the production of stoneware it could be utilized in the production of earthenware. During the colonial period, New England potters focused on creating low-fired redwares (red clay earthenwares) for daily consumption (Lasansky 1979; Ketchum 1991a).

Redware production facilities in colonial New England were often operated by a small number of individuals in a particular town. These people often were from the same family and often possessed pottery manufacturing knowledge gained in England or Europe. The manufacture of redware was often a part-time undertaking to which family members contributed. All members were typically assigned tasks, such as digging clay, preparing clay or glaze, turning the vessels, chopping fire wood, and firing the kiln (Ketchum 1991a, 1991b; Lasansky 1979a, 1979b; Watkins 1968). The materials to create redware were naturally occurring and inexpensive to obtain, which kept market prices affordable to the local populations. Redware potters filled a market for the local population; however their products were limited in number and quality and thus seldom were distributed beyond the local vicinity (Figure 4.3).

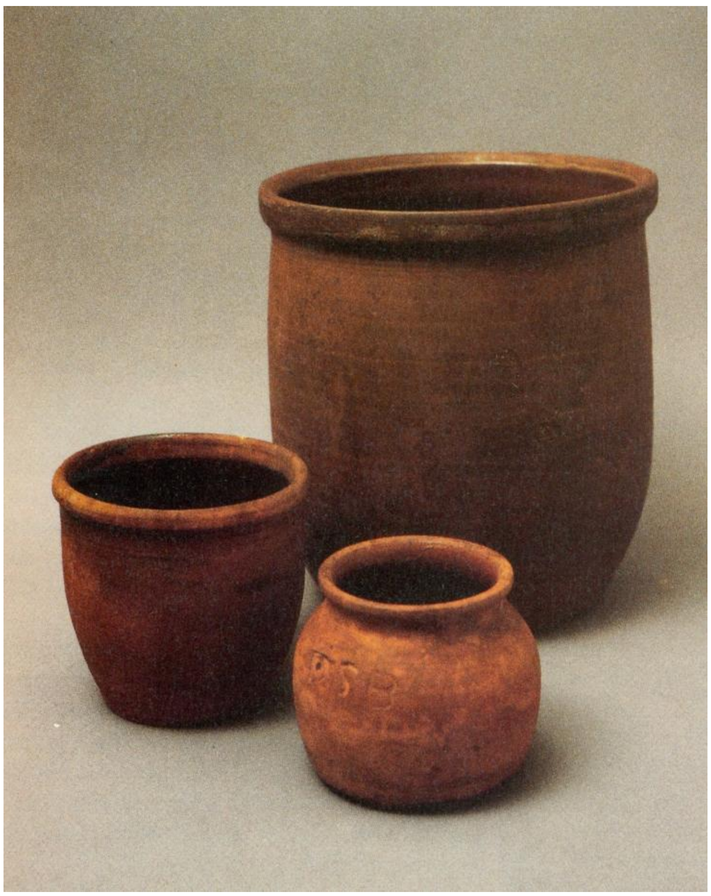


Figure 4.3. New England Redware vessels, Ketchum 1991a: 7.

2. Stoneware Production Methods in America

The market for utilitarian vessels transitioned from local to regional after the discovery of high quality stoneware clay in the Mid-Atlantic states. Potters from New

York to South Carolina and west through the Ohio Valley found themselves creating vessels in an industrial context rather than through smaller-scale, episodic production (Gates and Ormerod 1982; Greer 1981; Ketchum 1991b). This shift in manufacturing output meant that potters often partnered with local business interests to fund the costly construction of facilities. These late 18th and early 19th century stoneware manufacturing facilities were either located near high quality clay resources or transportation routes that aided in the movement of raw goods to the facility and refined wares to the marketplace (Figure 4.4).

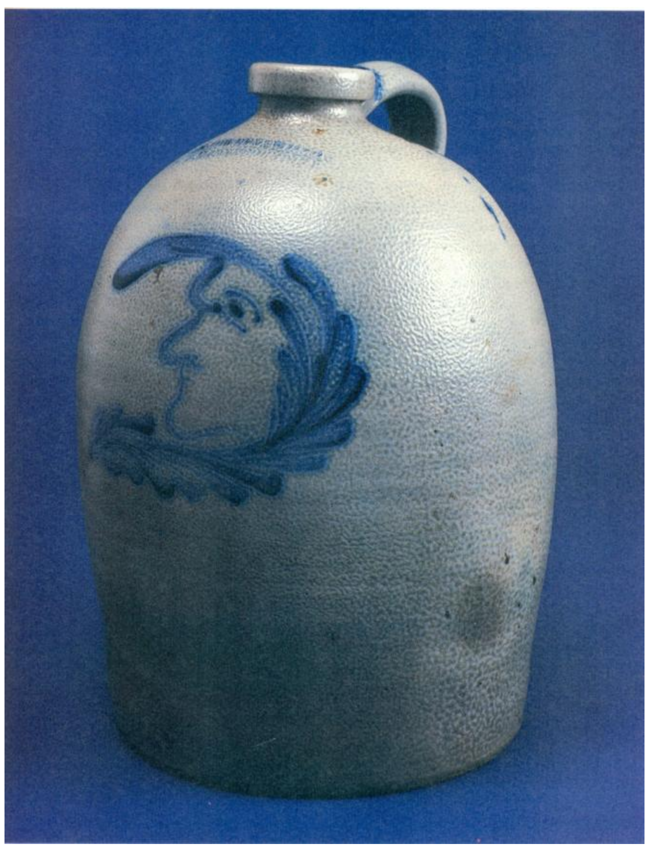


Figure 4.4. Pennsylvania salt-glazed vessel, Ketchum 1991b: 89

During the 19th century stoneware manufacturing enterprises became large scale businesses. Many of the largest stoneware manufacturers were located adjacent to high quality clay sources in New York and Pennsylvania (Greer 1981; Ketchum 1991b; Lasansky 1979a, 1979b). One such production facility was the Caire Pottery in Poughkeepsie, New York. In 1880, Caire expanded to such an extent that the facility covered an entire city block. Additionally, Caire employed 36 employees who labored to produce a volume of stoneware worth approximately $120,000 in 1880 (Ketchum 1991b).

Operating a stoneware manufacturing facility was not the only means to earn an income through this growing industry. The Morgan family, of Cheesequake, New Jersey, owned a highly sought-after clay resource (Ketchum 1991b). The Morgan family was able to mine raw clay and export the materials to potteries where high quality clay was not available. For more than 100 years, clay from Cheesequake, New Jersey was sold throughout the Eastern Seaboard (Ketchum 1991b). While costly, transportation of clay from one location to another was not unusual. For example, clay from Vermont was in high demand by potters from New York and New Jersey to use in producing Bennington glazed pottery. Bennington pottery was designed as an imitation of a famous English, brown earthenware glaze (Ketchum 1991a; Pitkin 1918). Potters in Bennington, Vermont utilized local clays to create an imitation of Rockingham wares. Jabez Vodrey and his family were notable for having made Rockingham-style wares in their potteries during the 19th century in East Liverpool, Ohio (Gates and Ormerod 1982; Ketchum 1991b).

During the 19th century, potters in America continued to create regional variations of old stoneware designs. The discovery of alkaline glaze was one of these regional variations (Figure 4.5). Local production of salt-glazed stoneware was much more expensive in the upcountry region of South Carolina because the raw materials for salt glaze had to be transported from neighboring regions. The discovery of alkaline glaze provided a locally available and effective means to glaze stoneware. The Edgefield pottery district possessed an abundance of the required elements needed for producing an alkaline glaze mixture for use on stoneware; 1) silica (most notably sand), 2) slaked wood ash and lime, and 3) kaolin clay (Zug 1986). Local potters engaged with these local materials to create yet another variation on utilitarian stoneware.

Figure 4.5. Alkaline glazed stoneware vessel, signed Dave, Courtesy Dr. Arthur Goldberg

The creation of these stoneware ceramics was inherently linked to the principles of kiln firing dynamics. Potters that master the skills of ceramic production were often masters of such firing principles. The following discussion explains these firing dynamics. Through an understanding of ceramic firing approaches researchers can better engage in analysis of ceramics typologies and kiln technologies employed by past potters.

II. Kiln Firing Dynamics and Nomenclature

The word kiln comes from the Latin *culina*, meaning kitchen or having association with culinary activities (Hamer and Hamer 1991; Leach et al. 1976; Rhodes 1981; Seale 1915). Depending on locations and dialects the word kiln was pronounced with or without the "n." A kiln is a structure built to retain heat in order to transform moldable clay into a hardened object which provides uses not possible with unfired clay, as embodied in objects such as bowls, plates, and cups. Kilns have been built with a multitude of materials, however. In the historic period most were constructed with bricks. Kilns have several construction features, each with a particular form and function. These features include, but are not limited to, the following: a firebox, bagwall, flue, ware chamber, and chimney (Figure 4.6).

The firebox, fire mouth, or burners are terms for the architectural feature that allows for the kiln space to be heated to alter clay vessels into the desired, hardened form. The firebox is loaded with a fuel source such as wood, coal, or oil (Hamer and Hamer 1991; Leach et al. 1976; O'Bannon 1984; Rhodes 1981; Seale 1915). To obtain the desired firing temperature, both the air flow and burning of fuel must be continually regulated. Air flow into the firebox is either primary or secondary air. Primary air is the air within the space prior to the fuel becoming ignited and secondary air is the heated air being drawn throughout the kiln space. Primary air is allowed to enter into the kiln space through openings in the firebox or ports along the kiln walls. Primary air is transformed into secondary air as it is heated and circulates throughout the kiln space (Hamer and Hamer 1991). Moving air transports heat and flames throughout the kiln allowing for desired temperatures to be obtained. By controlling air flow from the firebox the potter can alter the amount of “oxidation” or “reduction” within the kiln (Mellor 1914; Rice 1987, 1997).

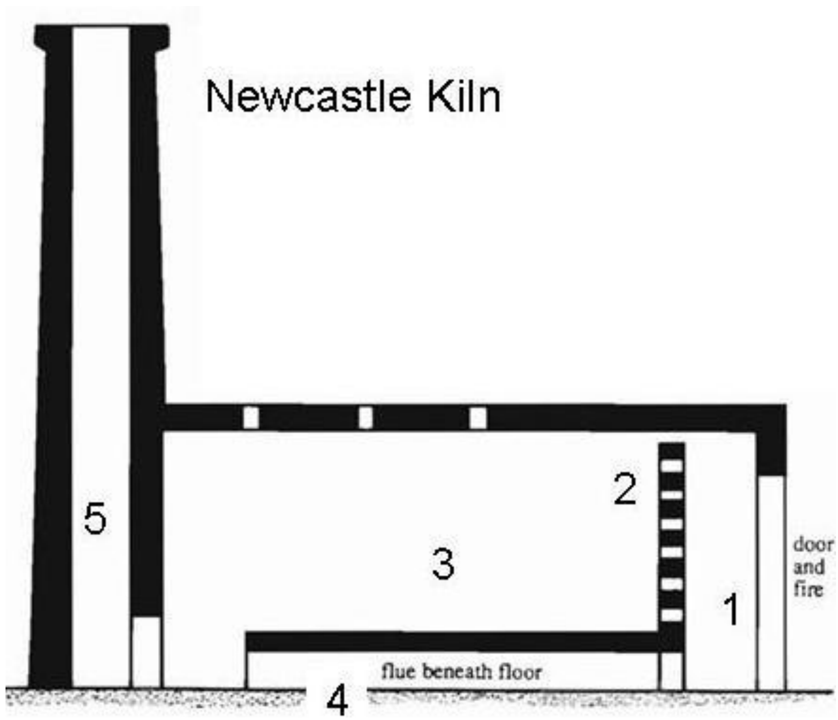


Figure 4.6. Sample sketch of typical kiln with architectural features: 1. firebox, 2. bag wall, 3. ware chamber, 4. Flue, 5. Chimney; Baldwin 1993: 20; label overlay by G. Calfas.

The firing chamber, also called the ware chamber, is the section of the kiln in which potters stacked the objects to be fired (Rhodes 1981; Whitaker 1942, 1947; Zug 1986). Potters are concerned with firing temperatures depending on the type of firing being conducted. The temperature is measured within the ware chamber since this is the space where clay is transformed into the desired, finished product. Objects to be fired can be loaded into and stacked within the ware chamber by access portals from the firebox, the chimney end, or loading doors along the kiln exterior. The ware chamber is often loaded through a fire door, chimney, or firebox which is determined by the type of kiln and its dimensions. The floor of the ware chamber can either be flat or slanted (Moeran 1997; Rhodes 1981; Robeson 1954; Seale 1915). These floors are often treated with sand-like materials to prevent ceramic objects from fusing to the floor. Ceramic objects can be placed directly upon flat floors while a leveling device or "shim" must be utilized in slanted floors in order for the object to stand upright. Slanted floors are associated with climbing kilns typically utilized in regions of southeastern Asia. Potters in southeastern China discovered that uphill sloping kilns with correspondingly slanted floors facilitated heat convection and often obtained higher firing temperatures and relatively uniform heating throughout the ware chamber. A kiln's ware chamber can be of any dimension as long as the space can be effectively heated (Hamer and Hamer 1991; Leach et al. 1976; O'Bannon 1984; Rhodes 1981; Seale 1915).

The flue is the architectural feature constructed into a kiln which allows primary or secondary air to circulate through the space of the kiln (Hamer and Hamer 1991; Leach et al. 1976; O'Bannon 1984; Rhodes 1975, 1981; Seale 1915). Flues built into the exterior of the kiln are built in conjunction with the firebox. Flues at the firebox can be left completely open or partially closed in order to regulate the amount of primary air allowed into the kiln. Flues within the kiln space assist the transportation of secondary air throughout the kiln space. These interior flues circulate heated air allowing for increased firing temperatures. Secondary air travels through flues built into the floor prior to exiting the kiln through the chimney. Updraft kilns often omit flues and instead include fire mouth openings between the firebox and the ware chamber. Secondary air flows through the main space of the ware chamber in such an updraft kiln design.

The chimney is the final kiln architectural feature associated with the transfer of heated air (Hamer and Hamer 1991; Leach et al. 1976; O'Bannon 1984; Rhodes 1981; Seale 1915). To accomplish efficient, even heating within the kiln, a balanced ratio of "air in" and "air out" is preferable. Thus, the chimney opening should not be larger than the flue or fire mouth openings at the firebox. The chimney draws secondary air from the front of the kiln and through the ware chamber before that heated air exits the kiln through the chimney. This heat convection current of secondary air, often called the "draw" to the chimney, assists air flow to create uniform heating throughout the ware chamber.

The bag wall is the architectural feature constructed into up-draft and cross-draft kilns (Hamer and Hamer 1991; Leach et al. 1976; O'Bannon 1984; Rhodes 1981; Seale 1915). The bagwall is situated at the point where the firebox and ware chamber join. The purpose of this feature is to direct heat and flames throughout the ware chamber. Additionally, the bagwall protects the first row of objects from direct flames, and thus lessens hotspots in the ware chamber nearest to the firebox. Bagwalls are constructed as either solid, in down-draft and up-draft kilns, or perforated, in cross-draft kilns, depending on the type of fuel being utilized, desired heating temperatures, and glaze being employed.

Stoking ports are openings along the kiln exterior which allow for the introduction of primary air into the kiln space (Hamer and Hamer 1991; Moeran 1997; Rhodes 1981). To bring primary air into the kiln space equally, stoking ports typically are built in pairs and inserted one directly across from the other. Stoking ports can also be utilized to introduce additional fuel, fire, and heat into the ware chamber space. Fires initiated at the stoking ports are thus devised to eliminate perceived cool spots within the ware chamber.

Air flow within the kiln space allows for clays and glaze to obtain luster and color. Luster and color are achieved through oxidation and reduction (Green 1979; Mellor 1914; Rice 1987). Oxidation is the interaction between oxygen in the air and the object being fired. Oxidation is allowed to affect the fired object when the kiln has reached sufficient temperatures which allow clay to change into a hardened state. To oxidize the fired object, potters open airways in the kiln space. The opening of airways introduces additional oxygen into the space, causing the fuel and air to “burn out.” Burning out, or super cooling, creates the necessary fusion to adhere a glaze application to the ceramic body of an object.

Reduction, the opposite of oxidation, is the removal of oxygen from the kiln space (Green 1979; Mellor 1914; Rice 1987). Reduction allows for the potter to control elemental properties of the clay and glaze. By reducing the air within the kiln, natural pigments within the clay and glaze and can forced to the surface. Thus, ceramic objects are allowed to cool with only secondary air which provides a different surface appearance when compared to oxidation. Potters who create porcelain utilize reduction in order to create a unified smooth surface with the natural, cream color of kaolin clay (Hamilton 1982). For stoneware, reduction allows for iron oxides within the clay paste to become a natural flux agent. A flux agent consists of materials added to the clay paste which lowers the overall melting temperature. As the iron oxides are reduced the clay body fuse with the glaze to produce a green color referred to as “celadon.”

To obtain oxidation or reduction, heated air must move throughout the kiln space. Heated air is drawn through a kiln by the draft. Three of the main kiln draft techniques are: down-draft, cross-draft, and up-draft (Mills 1933).

Down-draft kilns are designed so that heat and flames from the firebox are directed downward throughout the firing chamber (Cardew 1969; Hamer and Hamer 1991; Olsen 1983; Rhodes 1981). Down-draft kilns allow for the heat to be evenly distributed before the flames are allowed sufficient time to cool and escape through either a flue of chimney. Heat and flames enter into the kiln from opposite of the chimney. The heat and flames encounter a baffle or bag wall and are directed upward. After the change of direction, the heat and flames enter into the ware chamber. Objects being fired are spaced in the ware chamber such that heat and flames can move in a downward direction. This open space between vessels is what allows for the even heating and glazing of the ceramic object. The heat and flames move downward and pass throughout the ware chamber before exiting the flue or chimney.

Down-draft kilns are often constructed with a damper in the chimney. Dampers in down-draft kilns allow potters to control the oxidation or reduction during firing (Cardew 1969; Hamer and Hamer 1991; Olsen 1983; Rhodes 1981). Down-draft kilns are more efficient when compared to up-draft kilns. This efficiency is based upon the distance in which the heat and flames travel. Since the firebox and chimney are on opposing ends of the furnace, and flames travel a greater distance while making best use of its energy potential. The burning of wood creates long flames and is an ideal fuel source for down-draft kilns. By maximizing the fuel’s heating potential one firebox is often sufficient to heat a large down-draft kiln. Down-draft kilns are also often supplemented with secondary air ports, or stoking ports. These ports allow for heat and flames to be pushed or drawn throughout the kiln space to facilitate an even heat distribution.

Cross-draft kilns are nearly identical when compared to down-draft kilns (Cardew 1969; Hamer and Hamer 1991; Olsen 1983; Rhodes 1981). The variation in a cross-draft kiln is located in the bagwall. Cross-draft kilns are constructed with a perforated bagwall while down-draft kilns are constructed with a solid bagwall. The perforated bagwall does not direct the heat and flames upward but rather is allowed to enter the ware chamber through the holes in the bagwall. The perforated bagwall allows for heat and flames to travel perpendicular to the objects being fired within the ware chamber before exiting the chimney.

Up-draft kilns are designed so that heat and flames pass in an upward direction through the ware chamber (Cardew 1969; Hamer and Hamer 1991; Olsen 1983; Rhodes 1981). A popular form of up-draft kiln consisted are tall structure resembling a bottle, and thus called a "bottle kiln." The firebox is often built directly underneath or below and to the side of the ware chamber. In the case where the heat source is underneath and to the side of the chamber, the up-draft kiln is often built with multiple fireboxes. Heat in an up-draft kiln can be increased by a shorter flame fuel source such as coal. The floor of a bottle kiln is often checkered or grated while the upper limits of the kiln are built with a baffled ceiling rather than a chimney. Objects fired within an up-draft kiln are often stacked one on top of another and tightly packed. Such up-draft kilns in a "bottle" design are often less heat efficient than down-draft kilns. Those forms of up-draft kilns only make use of 5% of the heating potential from the fuel source. The inefficiency means that the up-draft bottle kiln is more difficult to heat and to maintain even firing temperatures.

The tight packing of the ware chamber mitigates heating efficiency flaws by retaining the heat and flames prior to their exhaust exit through the baffled ceiling.

Historic period kilns often utilized either fire brick or common house brick for construction. Common house bricks are best for firing temperatures less than 1,000 degrees Celsius while fire bricks are suitable for all kiln firing temperatures (McCollam 1976; Peacock 1977, 1982; Robeson 1954). Common house bricks are less efficient and required an additional type of insulation. Fire bricks are manufactured in multiple grade types based upon porosity. Fire bricks are formed by combining refractory clay, which can withstand high temperatures without deformation, and sand to create a dense block that does not require additional insulation. Fire brick is durable and can be utilized for an extended period of time without repairs.

Since the time in which clay was first fired to create ceramics, potters utilized such materials and design elements to construct ceramic kilns. During the history of ceramic kilns those structures have not been one shape and size, but rather have been redesigned and reconfigured over millennia. The developments of kiln technologies have varied by regions of use. The following discussion examines developments and variations in kiln technologies relevant to the current research project. The regional histories are relevant to an analysis of Edgefield pottery as potential design inspirations and as the background context of technology innovations that preceded Edgefield.

III. Kiln Technologies and Design Variations

Pottery production is a process of combining raw earthen materials and firing them with a fuel source. The process of turning raw earthen materials into those known as ceramics has been utilized by societies for the past 20,000 years (Rice 1987; Rhodes 1981). The creation and development of ceramics have provided social groups with hard, durable materials which facilitated the advancement of food preparation, storage, and consumption methods. Similar to other human made objects, pottery or ceramics have multiple loci of development and traditions. The form in which a ceramic vessel is created is often directly related to a specific function.

A. Surface Firing and Pit Kilns

The first method utilized for turning raw earthen materials into more durable ceramic objects was to place the objects in fires placed directly upon the ground surface or in shallow pits (Cardew 1969; Olsen 1983; Rhodes 1981). Surface firing, which is still practiced today in many parts of the world, is the process of stacking unfired vessels, called "green" objects, on the ground surface. Ceramic objects are stacked directly on the ground surface and a fuel source is placed around the objects. As the fuel burns the center space where the objects are situated, the vessels become heated which allows the raw clay to be altered into a hardened ceramic. A pit firing is identical to a surface firing except the objects are placed in a shallow pit dug into the ground surface. The shallow pit allows for greater retention of heat than surface firing. By retaining heat, less fuel is required and higher temperatures can be reached during the process. Higher temperatures achieved during firing will typically result in a ceramic object that possesses a superior level of durability for the end product.

As pit firing developed over time it was realized that the shallow earthen walls indeed provided a useful heat barrier. Thus, the creation of the first kilns was directly connected to pit firings (Cardew 1969; Rice 1987). These early kilns were not a separation from pit firing but rather entailed improvements on the shaping of walls within the pits. Walls made of mud brick were later extended above the pit surface. These mud brick walls increased the interior kiln space which provided additional room of ceramics and fuel. Ceramics produced in these mud brick kilns were not fired at notably higher temperatures when compared to simpler pit kilns. However, the walls prevented extraneous air from outside of the kiln to reach the objects. Heat retention and lessening contact to air allows for vessels to cool more slowly which prevents cracking.

Ground and pit kilns have been an effective method in the production of ceramics and are still utilized by potters today (Cardew 1969; Olsen 1983; Rice 1987; Rhodes 1981). However, while these methods are still feasible for the manufacture of wares, over the wide breadth of ceramic history the vast majority of kiln technologies have developed away from these ground-based methods. Ceramic technologies across the globe have advanced at different rates and have created different ceramic technologies based upon these individual regional alterations. Kiln designs and construction provided increased temperatures and heating efficiency which allowed for ceramics to be created in larger forms. In an attempt to further understand the advancement of kiln technologies across Europe, Asia, and the Americas, a next important subject focuses on how potters further improved updraft pit kilns. In China, potters expanded upon the principles of updraft pit kilns which allowed for the creation of a number of Chinese ceramic traditions. Archaeological investigations have traced such kiln technologies to the Neolithic Period in China.

B. Neolithic Period Chinese Kilns

Ceramic development in China started with early stages similar to those seen in other regions throughout most of the world. Potters developed surface and pit kilns to fire and create early ceramics objects. During the Neolithic Period in China (10,000 BCE to 1,000 BCE) ceramic technologies shifted with the development of up-draft kilns. Potters in China utilized in-ground, up-draft kilns from approximately 6,000 BCE to 1,000 BCE (Li Jiazhi et al. 1995; Feng Hsien-Ming et al. 1982; Needham 2004).

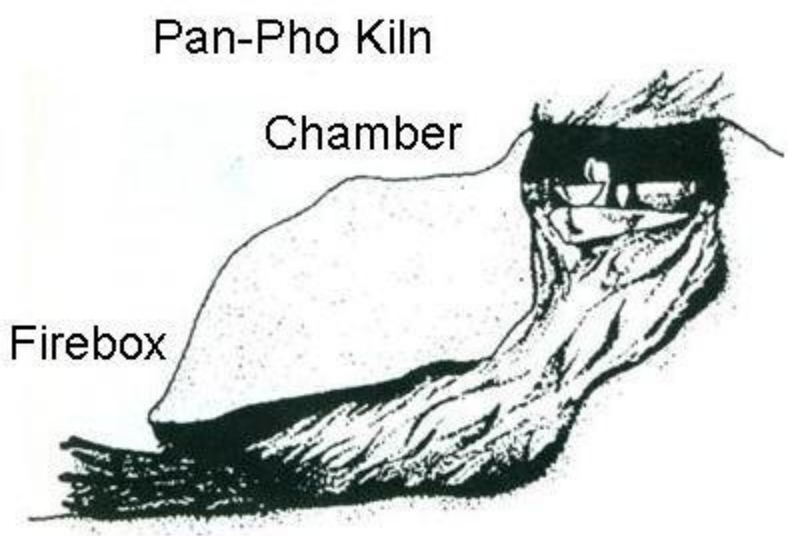


Figure 4.7. Profile view of Pan-Pho kiln, Needham 2004: 291; label overlay by G. Calfas.

Chinese potters improved upon the pit kiln through the separation of different chambers within kilns that they excavated into the ground (Needham 2004). One chamber served as the location of the fire and the other chamber the location in which ceramic objects were stacked to be transformed by the flow of hot air. The firing area was situated outside of and beneath the ware chamber. To connect the two spaces potters dug a channel between the firebox and ware chamber. The channel funneled fire and heated air from the firebox area into the bottom of the ware chamber (Feng-Hsien-Ming 1982:8; Needham 2004).

Archaeological evidence from Pan-pho, China, displays large-scale production in which kilns were operated for an extended period of time with multiple firing events (Chao Wen-I and Sung Pheng 1994). The Pan-pho kilns were dug into the side of a hill with slanted heat channels which connected the firebox and ware chamber (Figure 4.7). The slanted heat channels of early Pan-pho kilns tended to be 2 meters in length (Chao Wen-I and Sung Pheng 1994). The length and slant of the channel made full use of the long flames produced by wood fuel. The Pan-pho updraft kilns had an estimated firing temperature range of 800 to 1,000 degrees Celsius.

Temperatures were achieved through two construction methods. The first altered holes in the ware chamber floor which ranged from fewer in number toward the center and more toward the exterior. Fire and flames in the firebox tend to travel directly to the chimney. In an effort to force fire and flames to all portions of the ware chamber fewer holes were located in the center of the floor when compared to the outer section of the ware chamber. The additional holes toward the ware chamber exterior forced fire and flames throughout the entire ware chamber space which allowed heat to be more evenly distributed. Second, the ware chamber was kept small in diameter. The small ware chamber allowed for the retention of heat. These up-draft kilns likely employed a domed roof made of mud bricks in a manner similar to the pit kiln. The combination of these two design features also slowed flame speed which meant that less fuel was required to obtain firing temperatures (Needham 2004).

The development of the up-draft kiln created a means by which heat could be controlled and efficiently managed in the kiln space. The first updraft kilns were built with multiple chambers. The fuel source was placed in the first chamber and set lower in space relative to the ware chamber. These bottle shaped updraft kilns were the first to utilize a number of the features which are considered to be the hallmarks of modern kiln design technology: firebox, ware chamber, and flue. The independent firebox meant that fuel could be added to the fire continually to control the kiln temperature. To add fuel to the previous kilns care would have been taken when sliding additional fuel in and around the materials being fired. The separate firebox lessened the level of care needed when stoking the fire and lessened the likelihood of bumping or breaking objects.

These Chinese up-draft kilns remained mostly unchanged up into the Bronze Age (2,000 BCE to 771 BCE) (Needham 2004). Key modifications were the location of the firebox and the overall size. As later kilns were expanded in size the firebox was positioned in closer proximity to the ware chamber. This shift in design techniques limited the potential of channel collapse and made possible the subsequent discovery of the cross-draft kiln (Chang 1986).

C. Bronze Age Chinese Kilns

In about the 9th century BCE, Chinese kiln construction shifted from being built with rounded walls to having square walls (Hsu et al. 1982; Wang 1982). Rectangular kilns were first thought to have been utilized in Lo-yang, in the Honan province of northern China. Unlike kilns built in Pan-pho, Lo-yang kilns were built directly upon the ground surface. Potters piled earth and stone around the exterior walls of these above-ground, square kilns to provide insulation. These kilns were typically 1.3m long, 1.3m wide, and 1.3m tall (Hsu et al. 1982; Needham 2004). During this period kilns were built with adjoining architectural features. The firebox was connected to the ware chamber and a square chimney or flue was in the back wall of the ware chamber. Due to these design alterations, air flow was shifted from up-draft to cross-draft. Heat and fire now traveled horizontally throughout the kiln space which once again improved heating efficiency and lowered fuel consumption (Needham 2004; Wang 1982).

Cross-draft kilns become popular throughout northern China towards the end of the Bronze Age (circa 800 BCE). Ceramic technologies improved many facets of the built environment. Rich clay resources could be turned into numerous material types, including but not limited to, bricks, tiles, pipes, and pottery. One of the most prolific regions was that of the Wu-chi in the Hopei province of northern China. Archaeological investigations have unearthed kilns from the Warring States, Western Han, and Eastern Han periods (221 BC to 220 BC) (Needham 2004: 303; Chhen 1954; Anon 2001 [People's Daily]).

The Wu-chi kilns were built on a larger scale than other Bronze Age kilns. These kilns at Wu-chi resemble later period "egg-shaped" and sloping or "stepped" kilns (Needham 2004). The egg-shaped and stepped kilns were most often associated with the production of Chinese porcelain. The Wu-chi kilns were typically 2 meters in length and 1.8 meters in height. While the firebox was adjacent to the ware chamber it was situated approximately 0.5 meters below the ware chamber. Similar to Lo-yang kilns, Wu-chi kilns had square holes inserted into the back wall to assist with air flow (Anon 1978; Needham 2004: 305). However, the Lo-yang kilns added a chimney to further assist in drawing secondary air through the ware chamber.

D. High Temperature Kilns

In the mid-6th century CE potters worked to further increase heating temperatures. The increase in heating temperature allowed potters to make a shift from low-fired earthenware to high-fired stoneware and porcelain. Kung-hsein district, of Honan province in northern China, was one of the first locations associated with the development of such high-fire production (Figure 4.8) (Green 1999; Wenxian and Xiangsheng 1986; Needham 2004; Kingery and Vandiver 1986). Kung-hsein produced glazed stoneware during the Northern Chhi period (479-502 CE). During this period in time metallurgy was also being refined and kilns often served as both the ceramic and metal industries. Due to this combined work output, coal, an abundant material in northern China, became a primary fuel source in this region (Green 1999; Wenxian and Xiangsheng 1986; Needham 2004; Kingery and Vandiver 1986).

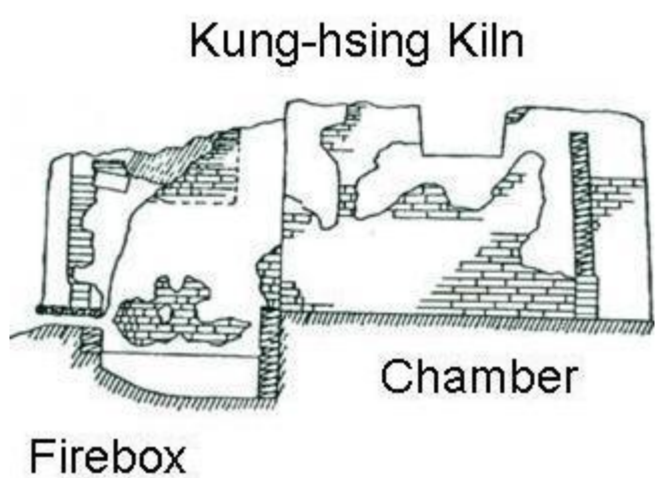


Figure 4.8. Profile Kung-hsing kiln, Needham 2004: 305; label overlay by G. Calfas.

Kung-hsein kilns were Mantou (natural-draft) (Figure 4.9), and utilized with pillared platforms on which vessels were stacked, in a design that was near prototype for later, hot-bottom, down-draft kiln plans (Bourry 1911; Sui 1986, 1989; Needham 2004; Hsueh 1992; Chen 1989). Kiln temperatures varied between the floor and the upper regions of the ware chamber. The difference in heat distribution caused the vessels on the floor to be left underfired. In an effort to increase air flow under the lowest objects, pillar-like platforms were constructed from fired-clay.

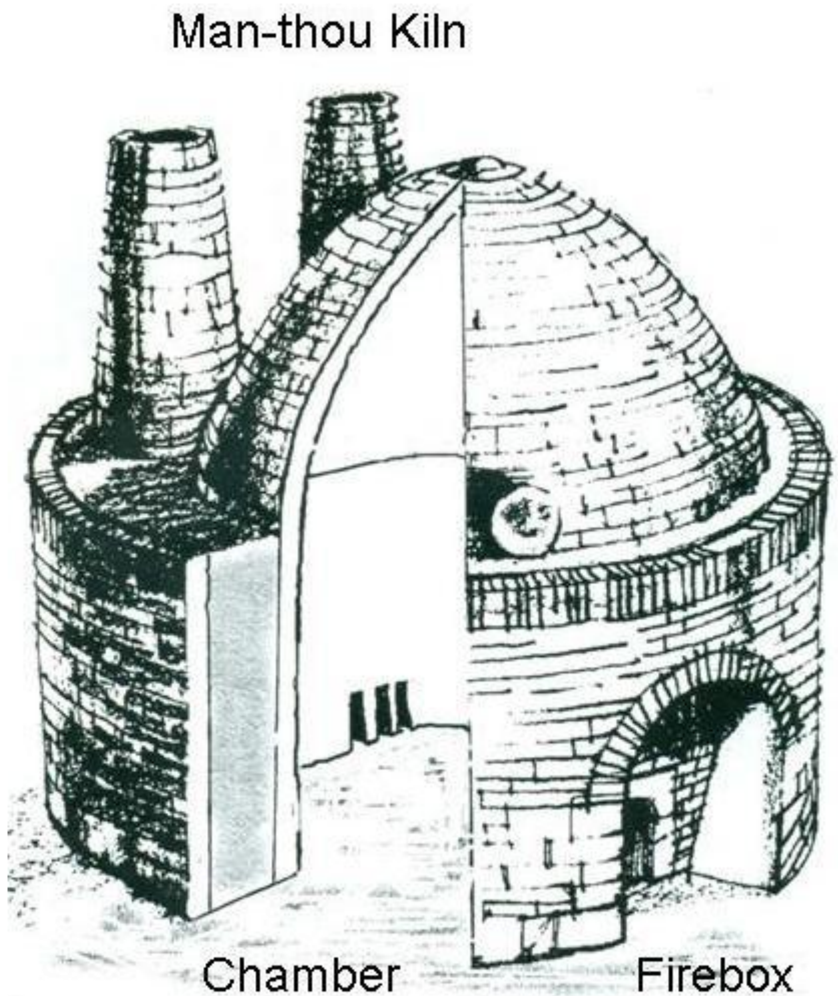


Figure 4.9. Sketch of a Man-thou kiln, Needham 2004: 320; label overlay by G. Calfas.

Ceramic vessels were placed upon the pillars which allowed heated air to flow underneath the lowest level. In this near prototype of a down-draft kiln approach, the firebox was moved into the ware chamber with vessels stacked around the exterior (Hua

1991; Sui 1986; Naihai and Zhizhong 1989). This Kung-hsein kiln type was not a true down-draft kiln, since flames still travelled in a horizontal direction to the chimney. Potters in China would not perfect a down-draft kiln until the 19th century CE (Green 1999; Needham 2004).

1. Dragon Kilns

While the Man-thou kiln was preferred in Northern China, potters in southern China most often utilized the Dragon or Lung kiln (Figure 4.10) (Meng 1997; Hsiung 1995; Needham 2004; Chiang 1998; Yuba 2001; Li 1989). A Dragon kiln is a long, narrow barrel vault built on the incline leading to a top of a hill with a slope of 2 to 20 degrees. For some observers, the term “dragon kiln” seems appropriate due to the structure’s resemblance to a dragon with its smoky head at the base of a slope and its tail uphill. However, the term more likely was derived from the use of the dragon as a symbol for Chinese ruling dynasties that subsidized the pottery production centers in which these designs developed (Needham 2004). The firebox was constructed at the low end of the kiln to maximize the tendency of heated air to rise. Since heat rises, the slope of the hillside acts as a natural chimney drawing heat towards the terminal end. While not necessary since heated air rises, Dragon kiln were also built with an external chimney which often ranged from 3 to 4 meters in height (Needham 2004: 356). The length of the kiln along the hillside was ideal for long flame fuels; thus wood and not coal was the primary fuel source. The ware chamber was either stepped or sloped and lined with a bed of quartz sand so that the vessels would not adhere to the floor. Dragon kilns in operation today are often built with stoke holes along the arch roof in the area of the ware chamber.

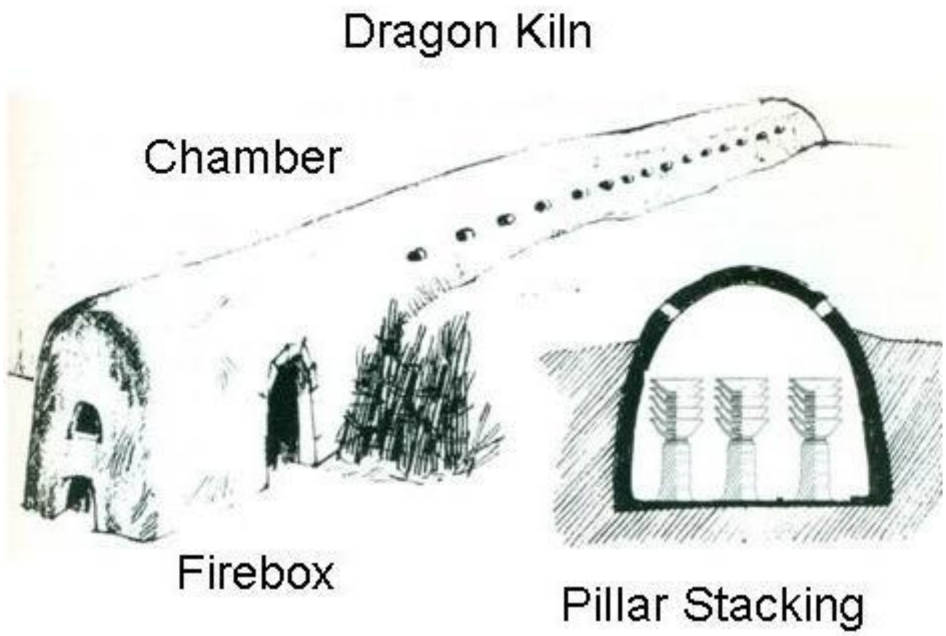


Figure 4.10. Profile and ware chamber view of a Dragon Kiln, Needham 2004: 353; label overlay by G. Calfas.

The only similarity between Man-thou and Dragon kilns are that both utilized cross-draft air flow. Dragon kilns were far larger than their northern counterparts. Man-thou kilns averaged 6 meters in diameter, while Dragon kilns have been recorded to have been as long as 135.6 meters (Chin et al. 1983; Chen 1989; Chhang-Hung et al. 1992; Meng 1997:30-1). The increased length meant that a Dragon kiln could fire thousands of ceramic vessels while the Man-thou kiln could only fire a few hundred. The firing cycle for a 30 meter Dragon kiln would typically take 24 hours to achieve 1,200 degrees Celsius (Chen 1989; Needham 2004).

An even distribution of heat was of upmost concern to potters who utilized the early Dragon kilns (Meng 1997; Hsiung 1995; Needham 2004; Chiang 1998; Yuba 2001; Li 1989). Since Dragon kilns were far longer than previous kiln types ceramic objects situated in the upslope portion of the kiln were fired at cooler temperature as opposed to those near the firebox (Yeh et al. 1986; Rosenthal 1954; McMeekin 1984; Needham

2004). To mitigate this design characteristic side-stoking became a solution. Side-stoking allowed the potters to insert fuel into the ware chamber, where it would catch fire and increase the temperature of the secondary air in that particular portion of the interior. Later kiln designs would increase the number of side-stoking ports along the kiln exterior. It was determined that temperatures in a kiln's upper regions would further increase if primary air was allowed to enter into a lower region of the ware chamber (Meng 1997; Hsiung 1995; Yuba 2001; Li 1989). Thus, primary air from downhill was pulled uphill which increased heat through combustion.

2. Jingdezhen Kilns

Jingdezhen, also referred to as Ching-te-Chen, became China's most important porcelain production center (Figure 4.11) (Hsu 1989; Hsu and Khun 1980; Tichane 1983; Mudge 1981; Scheurleer 1974). The high quality of the craftsmanship was prized by the Imperial Palace and required annual delivery of pottery and ceramic objects. Due to the high volume of ceramic objects produced in Jingdezhen, potters experimented with numerous kiln types in order to discover the most efficient for industrial operations. Potters in Jingdezhen built their own versions of the following kiln types: Dragon, Man-thou, gourd-shaped, and egg-shaped kilns (Hsu 1989; Hsu and Khun 1980; Tichane 1983; Mudge 1981; Needham 2004; Scheurleer 1974). The egg-shaped kiln would be the primary kiln utilized in later years while the other three were constructed during the center's earlier periods (1004 CE to 1521 CE) (Needham 2004; Tichane 1983).

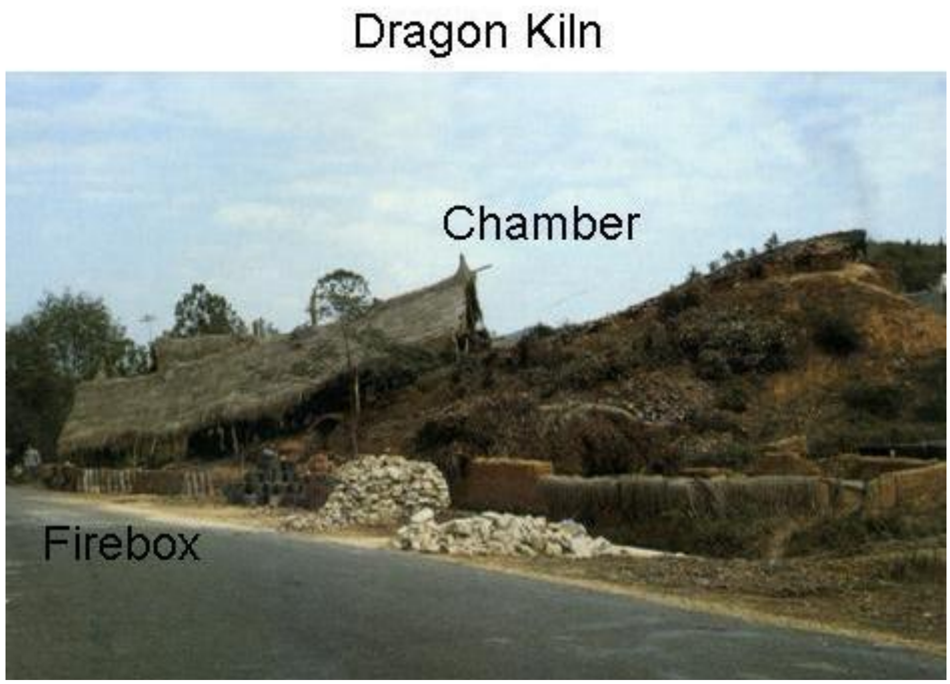


Figure 4.11. Dragon kiln (1984) in operation in Jingdezhen, China, Needham 2004: 356; label overlay by G. Calfas.

Archaeological investigations have focused on Jingdezhen's porcelain production and kiln technologies. These research projects have unearthed numerous kiln sizes. Black ware fired at Wu-ni-ling of the Southern Sung and Yuan periods (1127 CE to 1368 CE) were fired in a kiln 2.9 meters wide, 13 meters long, and situated along a 14.5 degrees slope. At Jingdezhen a gourd-shaped kiln 19.8 meters long was situated along a 12 degrees slope. This kiln included additional buttress materials along the exterior wall (Khun and Yuan 1980). The gourd-shaped kiln (Figure 4.12) was unique to Jingdezhen and is thought to have been the basis for the later egg-shaped kiln. Excavated gourd-shaped kilns dating to 1,000 CE measure 8 to 10 meters in length and are often situated along a 4 to 10 degrees slope (Hsu 1989; Needham 2004; Youzhi 1995). Archaeological studies suggest that gourd-shaped kilns were a hybrid design which borrowed elements from the Man-thou and Dragon kilns. The archaeological researchers observed that since gourd-shaped kilns were shorter and the slope was less steep, when compared to Man-thou or Dragon kiln, that chimney would have been necessary (Hsu and Khun 1980; Youzhi 1995; Hsu 1989).

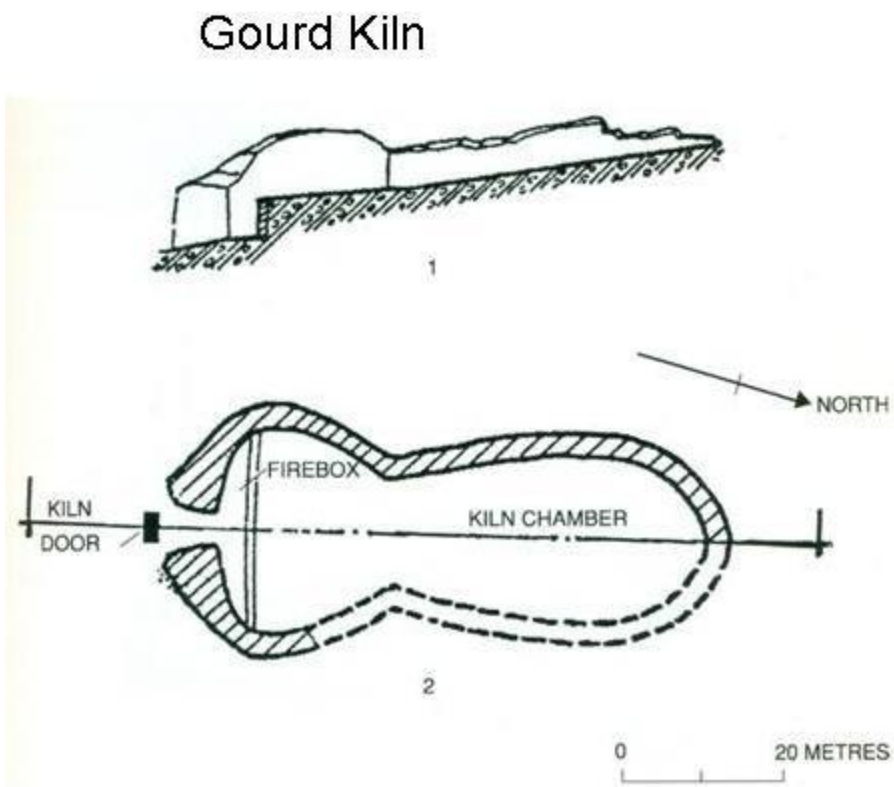


Figure 4.12. Profile and plan view of a Chinese “gourd” kiln, Needham 2004: 367; label overlay by G. Calfas.

During the Ming dynasty (1368 CE to 1644 CE) it appears that potters in Jingdezhen decided to utilize the egg-shaped plan as their primary kiln design (Figure 4.13) (Terpstra and Gui Hong 2001; Vogt 1906; Youzhi 1995). Jingdezhen was the Emperor’s primary ceramic facility and a high level of national investment was placed upon the development of China’s ceramic technology (Needham 2004). The egg-shaped kilns were easily constructed from brick and were extremely durable. Egg-shaped kilns were as long as 18 meters, 4.6 meters wide, and 6 meters high and had a 6 meter chimney in the rear. Firing times for the egg-shaped kiln still ranged from 24-36 hours (Terpstra and Gui Hong 2001; Needham 2004; Youzhi 1995). Additionally, the front portion of the ware chamber would reach the desired 1,300 degrees Celsius while the rear of the kiln would reach 1,000 degrees Celsius. The variation in heating temperatures was a benefit to Jingdezhen potters. Jingdezhen produced various ceramic types and each could be fired in a particular location within the kiln during a single firing. The complexity of kiln management was not only passed down through generations of potters but recorded by Chiangsi Sheng Ta Chih (1597), Thien Kung Khai Wu (1637), Thao Shuo (1774), and Ching-te-Chen Thao Lu (1815).

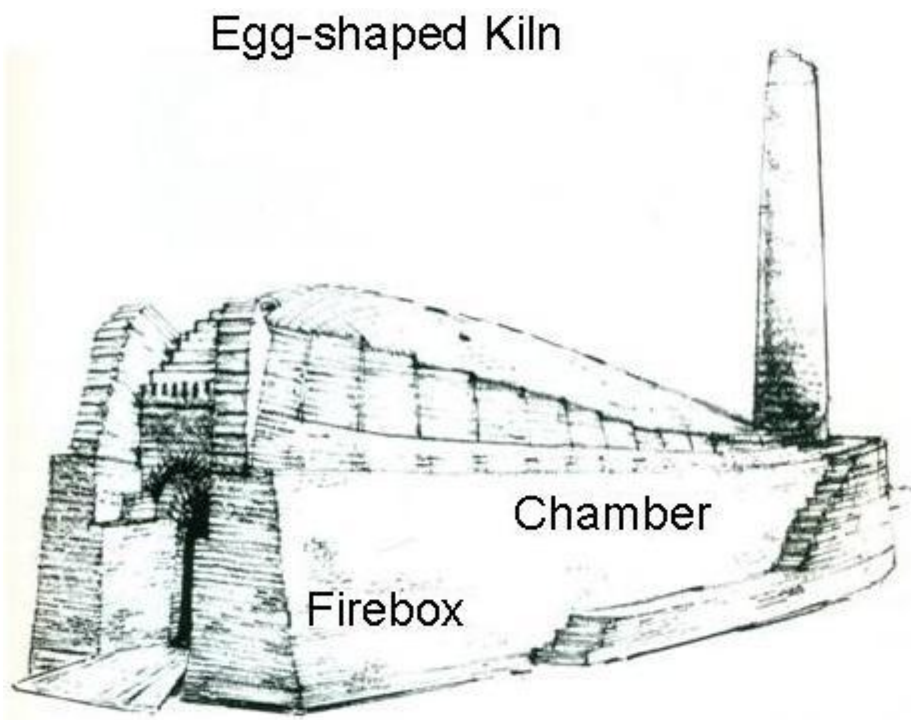


Figure 4.13. Sketch of a Chinese "Egg-shaped" kiln, Needham 2004: 367; label overlay by G. Calfas.

The quality of Chinese porcelain and other ceramics were revered throughout the world, so much so that commercial enterprises in other nations attempted to recreate similar objects for their own markets. One of the remarkable characteristics of the development of Chinese kiln technologies was that for more than five centuries regional potters have not settled on any particular kiln design, but have chosen to utilize the structures that best suited their technical and aesthetics goals. While Jingdezhen potters preferred the egg-shaped kiln to produce porcelain and other trade wares other portions of China and Southeast Asia utilized Dragon kilns due to the ease of use and efficiency. The Dragon and egg-shaped kiln designs have both flourished since their formative construction and are so integral to Chinese ceramics that these designs are still employed in pottery communities today (Figure 4.14) (Tichane 1983; Mudge 1981). Over millennia, Chinese potters elongated the pit kilns into regional kiln designs which are still in use today. In the Middle East and Mediterranean, by contrast, potters built structures upward to create their own regional variation in kiln designs.

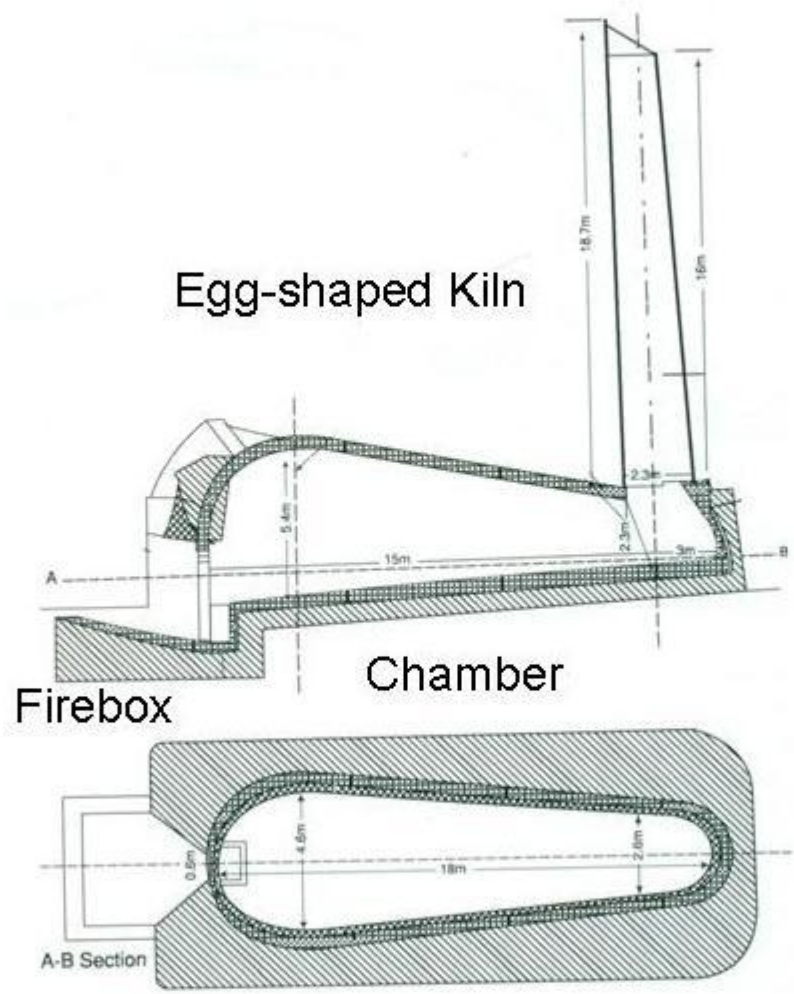


Figure 4.14. Profile and plan-view of a 20th century Chinese “Egg-shaped” kiln, Needham 2004: 368; label overlay by G. Calfas.

E. Kiln Technologies in the Middle East and Mediterranean

In the Mediterranean and Middle East, the next alteration in kiln technology after surface and pit kilns was to create a kiln in which the fire could be fueled from underneath of the ceramic objects (Cardew 1969; Leach et al. 1976; Rhodes 1981). The fuel being fired from underneath the ceramics allows for the heat to rise throughout the firing space, continually heating the object. Additional fuel can be added during the course of the firing process which increases firing duration and helps to harden the object. Additionally, holes were created in the walls which allowed for controlled air induction (Cardew 1969; Hamer and Hamer 1991; McGovern 1989; Rhodes 1981). Air flow coupled with additional fuel meant that ceramic objects could be heated by continual manipulations of the convection and not only heat transfer.

Roof construction was the next innovative step in the development of ceramic kilns in the Middle East and Mediterranean regions. In earlier approaches, heat had been allowed to escape through the highest point of a kiln. The addition of a roof meant that heat could be retained in the kiln space which increased heating efficiency. The first kiln roof coverings were constructed by the application of a clay straw mixture placed directly on top of the ceramic objects. These roof coverings were light weight and could be easily removed after the kiln space had cooled (Hampe and Winter 1962; Rhodes 1981).

Ongoing developments to improve roof and wall structures and regulate heat flow led to up-draft kiln plans in the region of the Mediterranean Sea and the Middle East (Hampe and Winter 1962). These kilns were highly efficient in the production of unglazed storage vessels which tended to be of larger size than objects intended for individual use. These bottle-shaped kilns allowed for gases from the fire to heat the objects rather than the objects being exposed to direct contact with the fire. These Mediterranean up-draft kilns were constructed of fired brick or limestone with at least one wall being placed against or cut into a hillside. Due to the materials of construction these kilns could be utilized multiple times and repaired as necessary. Such developments were examined at archaeology sites in locations such as Greece, Lebanon, Pakistan, and Turkey (Anderson 1989; Hasaki 2011; Helwing 2010; Miller 2007; Papadopoulos 1989; Poblome et al. 2012; Shoval 1994; Whitbred and Dawson 2013)

The creation of a dome over the kiln's open mouth was a next major development in the region (Anderson 1989; Helwing 2010; Poblome et al. 2012; Shoval 1994). The ware chamber was now a single, enclosed space which increased heating efficiency by decreasing secondary air loses from overhead open spaces. Thus, the domed feature above the kiln's firing chamber increased heating temperatures. This increase in kiln firing temperatures allowed potters to create even large ceramic vessels, much like the ceramic amphora. An opening was created within the domed roof to act as a damper. A damper acts as a means to alter the amount of air allowed into the kiln which can either build up or eliminate heat as desired. The techniques utilized by potters in the Middle East and Mediterranean regions provide a divergence point between Chinese and the European kiln technologies (Hasaki 2011; Papadopoulos 1989; Whitbred and Dawson 2013).

F. European Kiln Technologies

European kiln technologies were rooted in the semi-subterranean domed furnaces developed in the Mediterranean and Middle East regions (Heege 1995, 2007; Rhodes 1981). Islamic potters from Persia to Spain constructed low domed, round and rectangular, kilns for hundreds of years (Wulff 1966). Much like earlier kilns, the firebox was built toward the lower end of the kiln in an up-draft design. During the 16th century CE European potters were able to obtain kiln firing temperatures of approximately 1,000 degrees Celsius.

Medieval Period kilns (500 CE to 1500 CE) continued with the up-draft design and included multiple ware chambers that allowed for different types of vessels to be fired at one time (Heege 2007; Rhodes 1981). The multiple chambers were likely created to address the problem of uneven heating that would result within a single, larger ware chamber. By creating multiple chambers, potters achieved better control over the up-draft radiant heat that passed through the kiln spaces. This level of control allowed European potters to experiment with various glazes (Piccolpasso 1934). Italian and Spanish potters were many of the first European to effectively manipulate glazes (Caiger-Smith 1985; Pradell et al. 2008; Pradell et al. 2008b)

1. Luster, Bottle, and Round Kilns

Luster kilns were designed in Spain and Italy sometime between the 4th and 8th century CE (Caiger-Smith 1985; Randall 1957). Luster kilns were small in size and intended to retain heat in an effort to elevate heating temperatures. The kiln was built with the firebox nearest to the ground and a square or rectangular chamber constructed above. By elevating the temperature beyond 1,000 degrees Celsius, potters could apply metallic, mineral-based glazes to ceramics which yielded a “luster” finish. Flues and mufflers were constructed of brick at the top of the chamber. A muffler consisted of architectural material utilized to slow the exit of heat and flame. Above the flue was the kiln chimney which could be opened or closed to control air flow (Pradell et al. 2008; Pradell et al. 2008a).

Potters improved upon the Luster kiln and created one of the most widely utilized kilns in all of Europe, the bottle kiln (Figure 4.15). The English bottle kiln was popularized in England during the 18th century CE. Bottle kilns often vary in diameter based upon available resources and the amount and type of firing desired. While the diameter varies, the other hallmarks to the design were curved, bottle-like walls which led to a thin tapered chimney at the roof. Heat within flues was allowed to travel throughout the kiln space before exiting the chimney. To best utilize escaping heat, the upper regions of the bottle kiln were often loaded with ware intended for bisque firing. Bisque firing consists of an initial firing phase to harden the vessel prior to the application of glaze and a final firing. Additionally, later bottle kilns were constructed with tall, narrow chimneys. A tall narrow chimney limited the escaping air while retaining heat within the kiln space. Bottle kilns are constructed with multiple fireboxes along the base exterior walls. Bottle kilns can be considered to have incorporated an up-draft design due to the position of the fireboxes and the curved design of the kiln space (Caiger-Smith 1985; Randall 1957).

Figure 4.15. 19th century Bottle kiln, Stoke on Trent, England, Courtesy Leeds Archaeological Fieldwork Society

Colonial American potters were known to have utilized a round-domed kiln configuration. The round-domed kiln was a shorter variant to the English bottle kiln and could be constructed with less resources. These smaller, round-domed kilns allowed immigrant potters from England to create ceramics for local use in North America. Round domed kilns were most prevalent in the Midwest and into the South of the United States (Mansberger 2001). Round-domed kilns were extremely versatile; a kiln firing could be completed in 36 to 48 hours utilizing wood, oil, coal, and other available sources as fuel (Rhodes 1981; Ries and Leighton 1909; Scarlett 1999; Sweezy 1984; Zug 1986).

2. Newcastle and Cassel Kilns

During the industrial revolutions of the 18th century, Germany and England altered earlier European kiln technologies with the development of the Newcastle kiln design in England (Figure 4.16) and Cassel kiln plan in Germany (Baldwin 1993; Rhodes 1981; Ries and Leighton 1909; Sweezy 1984; Zug 1986). English and German potters utilized these kilns to create a wide range of manufactured products. Both kilns designs moved away from a reliance on an up-draft. These down-draft kilns were rectangular in shape and ranged from 11 to 35 feet in length and 8 to 12 feet in height. These kilns were constructed with similar design elements, including an arched roof, firebox in the front of the structure, and a chimney in the rear. The entrance into a Newcastle kiln was located in the firebox end of the structure while the entrance into the Cassel kiln was located in the chimney end. To protect the first row of ceramics from the fire’s flames both kilns were constructed with a flash wall, also called a bag wall. The flash wall was positioned at the point where the firebox and ware chamber join and extended nearly to the ceiling of the kiln. Apertures are constructed into the flash wall to assist in the movement of heat and air from the firebox to the ware chamber (Baldwin 1993; Rhodes 1981; Sweezy 1984; Zug 1986).

Figure 4.16. View of kiln front of a 19th century Newcastle kiln, Tarrasfoot Tileworks, Courtesy John R Hume.

Newcastle and Cassel kilns were primarily built of fire brick. The earliest versions were utilized in the production of tin-glazed earthenware (Dawson 2010; Rhodes 1981). Earthenware potters in London and Bristol utilized the Newcastle kiln due to the ease of firing for temperatures below 1,200 degrees Celsius. Potters increased efficiency in both designs by the addition of flues. Flues built into the ware chamber altered the kilns from cross-draft to down-draft air flow which increased the maximum heating temperature. This advance allowed potters throughout Europe to create larger volumes of stoneware during the 19th century (Baldwin 1993; Rhodes 1981; Sweezy 1984; Zug 1986).

Newcastle and Cassel kilns both provided highly efficient means of ceramic production and were utilized into the 20th century CE.

G. American Kiln Technologies

Potters in the United States tended to rely upon technical ceramic knowledge learned in Europeans locations from which they immigrated (Ketchum 1991a, 1991b; Watkins 1968). During the colonial period and into the antebellum (1400 CE to 1856 CE), potters often were members of a pottery clan with family ties and firsthand experience to ceramic production activities in Europe. These connections to European ceramic technologies allowed for the continuation of known manufacturing techniques. In the American South, European kilns were transformed into a regionally specific design. The design of the Southern "groundhog kiln" was so embedded in the region's pottery traditions that potters, in the American South still employ such kiln design today (Baldwin 1993; Rhodes 1981; Sweezy 1984; Zug 1986).

1. Groundhog Kilns

The groundhog kiln was the workhorse of potters in the American South and was very likely an adaptation from 15th century German and English rectangular kilns (Baldwin 1993; Koverman 2005; Rhodes 1981; Sweezy 1984; Zug 1986). Groundhog kilns tend to be 16 to 20 feet (5 to 7 meters) in length, 6 to 8 feet (2 to 3 meters) in width, and 2 to 4 feet (.8 to 1.4 meters) in height, with a 10 foot (3 meter) chimney at the rear (Figure 4.17) (Baldwin 1993; Burrison 2008; Clark 1926; Malone et al. 1979; Rhodes 1981; Sweezy 1984; Vlach 1990a; Zug 1986). Similar to the European predecessors, early groundhog kilns utilized a flue system to circulate air and fly ash through the ware chamber. Fly ash consists of burning organic particles trapped in flames traversing the ware chamber. The groundhog kiln design was simplified by eliminating the in-floor flue system utilized in Europe. Flue systems aid in the movement of primary and secondary air throughout the kiln. Since groundhog kilns tend to be smaller in dimension the air flow from front to back was less of a functional concern.

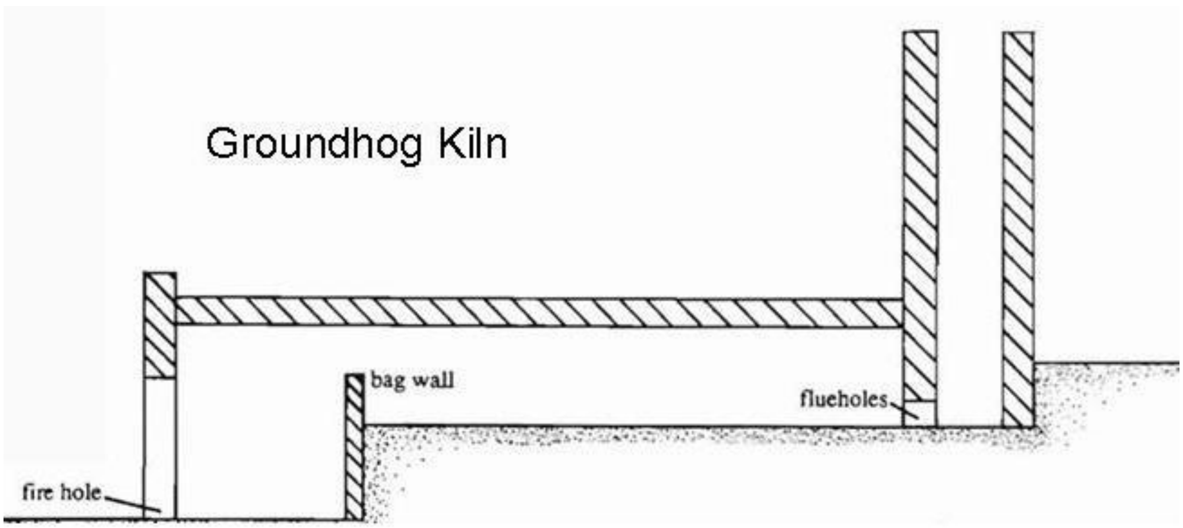


Figure 4.17. Profile view of a Groundhog kiln, Vlach 1990a; label overlay by G. Calfas.

Construction variations extended beyond interior kiln space and were visible along the exterior construction design. Potters were concerned with heat management and the exterior of the kiln space could be insulated for the retention of heat and to regulate the pace of the kiln's cool-down after firing. Unlike rectangular kilns, groundhog kilns were dug into the earth and exterior walls are constructed in the excavated space (Baldwin 1993; Burrison 2008; Clark 1926; Rhodes 1981; Sweezy 1984; Zug 1986). By excavating earth to construct a kiln, potters were able to utilize soils for insulation and buttress materials. When constructing the groundhog kiln, potters often excavated the space for the groundhog kiln into the side of a hill. Since heat rises, the slope construction creates a natural draw through the kiln which led to the elimination of the flue system.

Naturally occurring air movement up a hillside also incrementally aided the draw of air through the kiln and out the chimney end, which was typically placed in an up-slope position (Sweezy 1984; Zug 1986).

Air flow throughout a groundhog kiln is aided by the relatively low height of the barrel vault that covered the ware chamber (Baldwin 1993; Burrison 2008; Rhodes 1981; Sweezy 1984; Zug 1986). The barrel vault is a simple design, utilizing the fire bricks for the arched, interior walls. The arched vault and the top of the exterior walls were joined by the skew block. The skew block provided the angle for the arch and allowed outward pressure to press downward. Unlike European kiln arches, the groundhog kiln arch blocks were not cut to create the curve. Voids created where square bricks joined were filled with mortar created from fireclay (Rhodes 1981). Fireclay consists of silica-rich clay which can be heated and cool over a kiln's operation period. During the first kiln firing the fireclay mortar would fuse the blocks in the arch together, which increased overall strength in the structure. Since the design did not utilize cut block or a keystone, the arch was initially formed by use of a curved wooden mold. After the fireclay mortar air dried the mold was either removed from underneath the arch or burned in place during the first firing (Sweezy 1984; Zug 1986).

Groundhog kilns were constructed with many of the same features as other kilns. However, the design of the firebox was unlike European designs and more closely related to Asian designs. Much like the Chinese dragon kiln, the floor of the groundhog kiln firebox was positioned lower in space than the floor of the ware chamber. Often the firebox floor was dug an additional 2 to 3 feet in depth to accept large amounts of fire wood (Greer 1981; Rhodes 1981; Sweezy 1984; Zug 1986). The firebox typically was built with one main access door and multiple flues or “fire mouths” beneath the door. Fire mouths consisted of the exterior openings at the front of the kiln which allowed for the manipulation of heat and air flow. The multiple openings allowed for the potter to manage combustion through fuel and air intake. As the interior temperature of a groundhog kiln rose to 1,200 degrees Celsius, the openings were gradually closed up with bricks (Baldwin 1993; Rhodes 1981; Sweezy 1984; Zug 1986). Closing the kiln with bricks to seal such openings retained heat within the kiln forcing air to circulate through the ware chamber before exiting through the chimney. Current research has not yet determined the location of the first groundhog kiln constructed in North America. The design was known to have been in use during the 19th century CE throughout North Carolina, South Carolina, Georgia, and Texas (Figure 4.18) (Castille et al. 1988; Baldwin 1993; Espenshade 2002; Greer 1970, 1971; Malone 1979; Rhodes 1981; Sweezy 1984; Zug 1986).

The technologies of kiln design, construction of ceramic vessels, and approaches to finishing pottery with glazes have been interlinked over time. Potters utilize the knowledge gained regarding firing dynamics in the kiln to develop ceramic objects for personal and commercial purposes. One form of these technologies thus impacts others, allowing for potters to create new kiln designs for production or new ceramic forms. The next section of this chapter discusses developments in ceramic vessel technologies that are relevant to the subject of this research project and the development of alkaline-glazed stoneware in South Carolina.

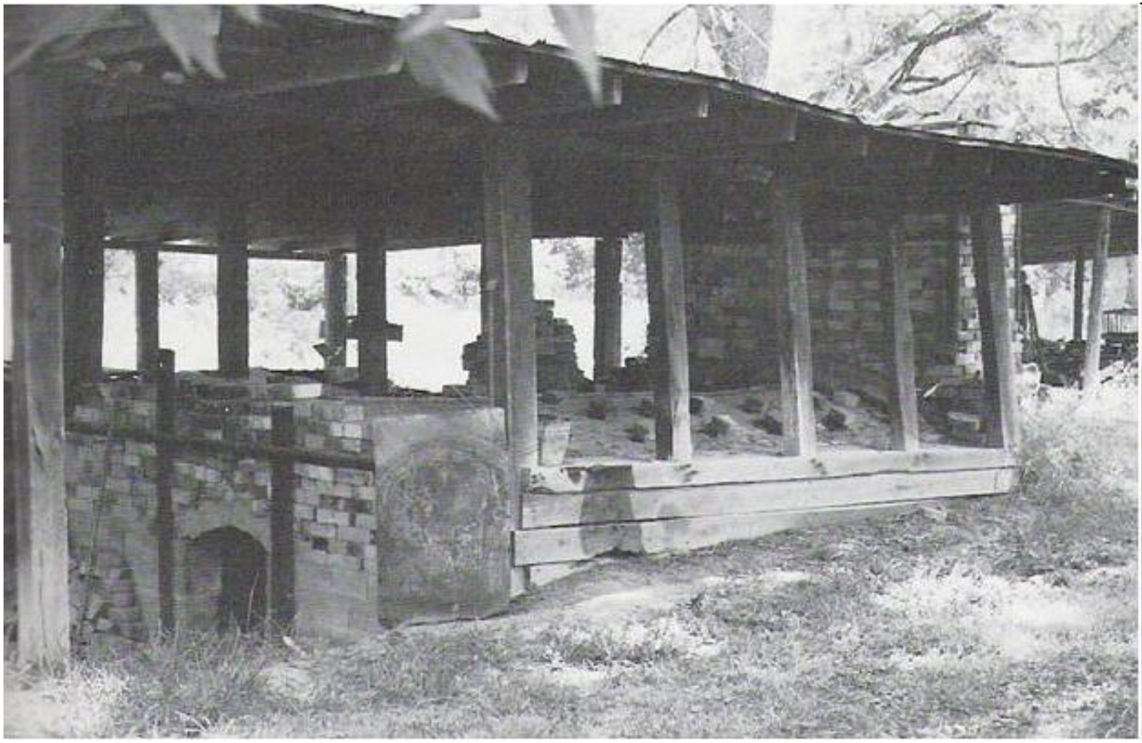


Figure 4.18. Early 20th century North Carolina Groundhog kiln, Courtesy Lucien Koonce

IV. Ceramic Technologies

Ceramists identify two primary types of utilitarian vessels: those made of earthenware and stoneware. Earthenware is porous to liquids and fired at low temperatures, whereas stoneware is non-porous due to near-vitrification that occurs at high firing temperatures. The clays needed to produce stonewares must withstand these high temperatures, and silica-rich, clastic materials are well-suited for that purpose. The typical firing temperature for stoneware ranges from 1,200 to 1,400 degrees Celsius (2,200 to 2,550 degrees Fahrenheit) which expels water from the parent material and allows the clay to harden significantly (Barber 1909; Ramsey 1939; Greer 1981). At this lower temperature range, below that of the vitrification that occurs in porcelain, the vessel becomes “stone like” and impervious to penetration by moisture. At higher temperature ranges of vitrification, refined clays are transformed into a translucent, glass-like material, typically referred to as porcelain. Due to the non-porous nature of stoneware, these vessels become valuable storage containers for perishable items kept in local storage or exchanged in regional trade.

A. Earthenware

Earthenware vessels are often produced from lower-quality clay (Ketchum 1991a, 1991b; Lasansky 1979a, 1979b; Watkins 1968). Earthenware clays tend to include iron and other sedimentary impurities. To utilize these clays for production of ceramics, an additional process, such as milling, was often employed to remove sediment from the clay. Even after the milling process sediments often still remained in the clay (Ketchum 1991a, 1991b; Lasansky 1979a, 1979b; Watkins 1968). The inclusion of these sediments makes the production of high quality vessels difficult since the surface quality is often less than desirable for market consumption. Heavy glazes are often utilized to smooth the surface of vessels created with lower-quality clay (Rice 1987). Heavy liquid glazes can create a uniform surface across the vessel after the glaze adheres to the clay body.

When produced without sealing glazes, these earthenware vessels are porous in nature. Porosity in ceramic vessels allows for particles of liquid or other materials contained within the vessel to seep into or through the clay body. Additionally, materials from the interior surface of the vessel can become detached and contaminate the material being stored within the pottery. To eliminate porosity, potters long ago sought ways to address these deficiencies and thus sealing glazes were developed and improved over time.

B. Stoneware

Stoneware is a ceramic material which derives from the hard, stone-like physical appearance of clay after a high temperature firing (Barber 1909; Ramsey 1939; Greer 1981; Zug 1986). Clays suitable for the production of stoneware are less course than those utilized for earthenware but more course than porcelain clays. Stoneware clays are capable of having their elemental bonds broken and reorganized when fired beyond 1,200 degrees Celsius without compromising the integrity of the vessel form. Historic period kilns utilized in the creation of stoneware often generated variable firing temperatures throughout the length of the ware chamber. Kiln firings could produce a range of under-fired and over-fired vessels. Due to uncontrolled firing temperatures many stoneware vessels were not hardened to fully stone-like consistency. Through the application of glazes, stoneware vessels could be utilized even when relatively under-fired (Barber 1909; Greer 1981; Ramsey 1939; Rhodes 1981; Zug 1986).

During the historical progression of ceramics, potters developed techniques to apply treatment to the surface of stoneware and other ceramic objects. Techniques employed in the production of ceramic glazes provided methods to enhance the finished product. The discussion to follow will explore glaze technologies, historical developments of ceramic glazes, and a number of innovators associated with advances in glaze technologies.

C. Glaze Technology

Glaze is a thin, glass-like coating, adhered to the surface of a ceramic object by application and firing (Chappell 1977; Pamelee 1921, 1973). Before firing the ceramic object, liquid glazes are applied to the surface and become solid after firing. The glaze process can either occur in one or multiple firing phases. Single-phase firing occurs when an unfired vessel has liquid glaze applied, the liquid glaze is left to air dry, and then the object is fired in one single event which fully forms the object in its intended end state (Cardew 1969; Hamer and Hamer 1991; Kenny 1949; Leach et al. 1976; Mansfield 1992; Maynard 1980; Nelson 1971; Rhodes 1981; Rice 1987; Singer 1960; Taylor and Bull 1986).

A multi-phase firing typically consists of two firings and occurs when the unglazed vessel is fired at a low temperature or short duration, after which the object is deemed to have been "biscuit" fired (Cardew 1969; Hamer and Hamer 1991; Kenny 1949; Rhodes 1981; Rice 1987). The biscuit fired vessels are removed from the kiln and liquid glaze is then applied to them. After the liquid has been allowed to air dry the objects are returned to the kiln for a second firing which creates the intended end state of the vessels. Biscuit firing permits the clay paste of a vessel to harden more than would be accomplished by air drying of the clay. Biscuit firing allows for ease in handling the vessels when dipping them into a liquid glaze. All clay bodies undergo some amount of shrinkage during the firing process and biscuit firing also allows the clay body to go through an initial stage of this shrinkage. By allowing the ceramic object to shrink, the applied glaze will be more uniform across the surface. Due to clay shrinkage, single-phase fired ceramics run the risk of glaze not adhering to all surfaces of the vessel creating unglazed portions of the surface which could lead to contamination, seepage, or lower aesthetic attractiveness of the object for end users (Hamer and Hamer 1991; Nelson 1971; Rhodes 1981; Rice 1987; Taylor and Bull 1986).

During the kiln firing process glazes are super-heated which forces the crystalline structure of the elements within the glaze to separate (Hamer and Hamer 1991; Kenny 1949; Rhodes 1981; Rice 1987). Once the kiln firing has been terminated, the objects within the kiln typically cool at a rapid rate proportional to how quickly they were fired. This relative “super-cooling” of the object does not allow for the reorganization of crystalline structures within the glaze mixture. Without this reorganizing the glaze retains the appearance of a liquid, creating a smooth, glassy surface with a hardened, protective coating (Nelson 1971; Rhodes 1973; Rice 1987).

Glazes are often defined by the temperature in which they were fired (Cardew 1969; Hamer and Hamer 1991; Kenny 1949; Rhodes 1981; Rice 1987). To understand which type of glaze will work well for a particular application potters consider the available firing temperature of the kiln. A notable dividing line for such decisions consists of a kiln’s ability to generate heat of 1,200 degrees Celsius or more. High-fired glazes are referred to as “hard” glaze and are fired at or above 1,200 degrees Celsius. Low-fired glazes are referred to as “soft” glaze and are fired below that threshold. High-fired clays and glazes contain feldspar minerals or other alkali based materials. Low-fired clays and glazes typically utilize flux materials with a lower melting rate, such as lead or tin. A flux ingredient reduces the temperature necessary for the liquid glaze to melt and fuse to the clay body (Nelson 1971; Rhodes 1981; Rice 1987).

The confluence of high-fired ceramic and glaze technologies is evident in the development of porcelain. Porcelain is a hard paste ceramic fired at temperatures above 1,200 degrees Celsius. Porcelain, also referred to as “porcellana” by Marco Polo, is a delicate, thin and translucent pottery originally produced in China. The development of porcelain is attributed to the Han Dynasty (206 BCE to 220 CE) but was later refined and perfected by potters of the T'ang Dynasty (618 CE to 906 CE). Early porcelain objects are often referred to as stoneware or protoporcelain due a lack of the typical, translucent clay body (Laufer 1917; Li Jiazhi 1995). Due to the quality of the workmanship, porcelain is often associated with the Imperial district and related kiln sites in Jingdezhen, in the northeastern region of China (Tichane 1983).

Jingdezhen (or Ching-te-chen) operated historically as the center for porcelain production in China (Mudge 1981; Pitman 1974; Thiel 1953; Tichane 1983; Wood 1999). The potteries are located in close proximity to large quantities of high quality kaolin and feldspar necessary of the production of porcelain. Raw and refined materials were transported along the neighboring river that flows from the mountains to the coast. During its long and important history, Jingdezhen was not characterized as a city, although it was a populated area encompassed by a large-scale, surrounding wall (Needham 2004; Tichane 1983). This lack of status as a city likely resulted because of its industrial economy and focus, and lack of other forms of urban employment opportunities. Jingdezhen appears to have served primarily as an industrial location, creating porcelain over two millennia. In 1712, Jesuit Priest Francois d'Entrecolles was sent on a mission trip to Jingdezhen to observe ceramic production and the approximately 300 kilns in operation (d'Entrecolles 1517).

During his 18th century observations of the pottery production center, d'Entrecolles claims that the population was similar to that of London or Paris (d'Entrecolles 1517, 1522). The reports compiled by Father Francois provided important insights into manufacturing techniques and maintenance of the workforce. Factories and kilns were operated with a division of labor in order to efficiently utilize the workforce and facilitate the mass production of porcelain. “They have built vast pent-houses [sheds], wherein appears abundance of earthen vessels, in rows one above another. Within this enclosure an infinite number of workmen live and work, each having a particular task” (d’Entrecolles 1517, 1522; Tichane 1983). Much like a modern factory assembly line, each worker was especially skilled at a given task and largely unskilled in other portions of the manufacturing process (Corbeiller 1971; Lee 1980; Phillips 1956). Later in the 18th century, Josiah Wedgwood would create similar villages that enabled his employees to live adjacent to ceramic workshops.

To increase work efficiency, Jingdezhen pottery manufacturers often utilized molds.

> To hasten a work that is bespoken, a great number of molds are made, for employing several companies of workman at the same time. If care be taken of these molds, they will last a long while; and a merchant, who has them ready for those sorts of works which Europeans require, can deliver his goods much sooner and cheaper, and yet gain considerably more by them, than another who has to make them (d’Entrecolles 1517).

D’Entrecolles’ observations provided powerful insights into the Chinese porcelain manufactory which could later be translated into practice within the European ceramic industries.

The first porcelain vessels from Jingdezhen are thought to have been produced during the Han Dynasty (206 CE-220 CE) (Mudge 1981; Pitman 1974; Thiel 1953; Tichane 1983; Wood 1999). During the Sung Dynasty (960 CE-1280 CE) the center was renamed in honor of Ching-te, the reigning monarch (1004 CE-1007 CE). During the Ming Dynasty (1368 CE-1644 CE), the Imperial production activities were permanently relocated to Jingdezhen (Tichane 1983).

During this period vessels were annually sent to the emperor in Peking. In 1675, during the Ming Dynasty (1644 CE-1912 CE), Jingdezhen was destroyed by a fire but was later rebuilt with support from emperor K'ang-hsi (1662 CE-1722 CE) (Tichane 1983). Porcelain production increased during the Ming Dynasty due to an increase in international trade.

Within Asia, neighboring nations either traded for or received celadon (green) colored porcelain as tribute. By the middle of the 16th century porcelain and celadon wares were being produced by multiple Asian societies. At the same point in history Europe entered into trade with these Asian enterprises and porcelain was one of the most highly sought-after items. The quality and workmanship of Chinese porcelain inspired numerous pottery manufacturers in England and Europe to attempt to emulate those production methods and results (Mudge 1981; Pitman 1974; Thiel 1953; Tichane 1983; Wood 1999).

European interest in Chinese ceramics drove potters to recreate porcelain. Initially, the information of porcelain technologies was unknown to European potters. In an effort to create porcelain, potters experimented with glaze techniques. Through these efforts potters developed European glaze technologies which began with a first attempt toward porcelain production. Other glazes were applied over time to more utilitarian forms of pottery and vessels produced with less refined clays.

1. Lead Glaze

Lead glazes were utilized for low fired earthenware vessels and were first utilized by Han Dynasty potters (206 BCE to 200 CE). Lead glaze was often produced by utilizing powdered lead oxide or galena (Barber 1907; Hamer and Hamer 1991; Kenny

1949; Rice 1987). Lead in glazes acts as a fluxing agent that reduces the temperature necessary for the liquid glaze to melt and fuse to the clay body. Lead glazes often harden with a transparent character, allowing for an underlying pigment or design to be seen through the glaze. Lead glaze can also be yellow to red in color in the instances where copper makes up a portion of the glaze. Since lead glazes were used in conjunction with low-fired wares, the shrinkage rate of such vessels was less than in high-fired stoneware. With a lower shrinkage rate the glaze could be applied more thickly, allowing for imperfections in the clay body to be covered or smoothed over by the glaze as the object was fired (Figure 4.19) (Hamer and Hamer 1991; Rice 1987).

Figure 4.19. 18th century Lead glaze bowl, Courtesy Gary Dexter

During the 19th century CE it was discovered that lead was caustic to both the potter and the end user (Hernberg 2000; Rhodes 1981; Vlach 1990a). Modern potters still utilize lead for glaze, but in controlled and limited contexts. To make lead safe for use, the glaze materials are made into a "frit." Frit glazes are produced by premelting the materials and combining them with silica and a fluxing agent. Toxicity from lead glaze is reduced by utilizing such "fritted" materials. However, acidic materials, such as citric juices, brine, or vinegars should not be served or stored in these ceramic vessels, as they can dissolve lead from the glaze resulting in contamination of the vessel contents (Hamer and Hamer 1991; Rice 1987).

2. Tin Glaze

Ceramicists also utilized one of two opacifiers in the production of glaze: tin oxide and zirconium oxide (Hamer and Hamer 1991; Kenny 1949; Koenig and Earhart 1937, 1942; Rice 1987; Tite et al. 2008). Opacifiers provide a white base to an otherwise clear glaze. By infusing a white color into a glaze solution and applying it to a ceramic object, the vessel can be painted or decorated with additional colors (Figure 4.20). Tin oxide, or stannic, is mixed with lead to create a thick glaze often utilized to cover the imperfect surface of an earthenware vessel. The amount of tin added to a glaze mixture alters the appearance of the fired glaze. When a potter adds 5% of tin to a glaze the result is an opaque appearance and upwards of 10% will render the glaze semi-opaque (Kenny 1949; Koenig and Earhart 1937, 1942). Semi-opaque glazes are achieved due to the higher percentage of tin causing the glaze to turn "cloudy." Tin glaze materials were often associated with earthenware pottery called majolica, produced in Italy, and delftware, produced in the Netherlands.

Tin glazes were utilized on low-fired earthenware vessels and were first developed by Assyrians sometime after 900 BCE (Caiger-Smith 1985; Fehervari 1973;

Mason 1997; Mignot 2004; Wilson 1988). During the time of the Assyrians, tin glazes were only applied to brick panels and tiles. As those materials were not trade commodities the technology did not spread to other social groups. Later in time Islamic potters rediscovered and utilized this ceramic production technology around 900 CE (Caiger-Smith 1985; Mason 1997; Mignot 2004).

Figure 4.20. Tin glazed majolica vase Trustees of the British Museum, Gaimster 1999: 141.

By the 14th century CE, tin glaze, or enameling as it was known then, had taken root in southern Italy (Caiger-Smith 1973, 1985; Whitehouse 1980). By the 16th century CE, after European traders began to acquire Chinese porcelains, other competitors had also taken interest in the processes of enameling. Europeans believed that the secret to recreating a porcelain glaze existed within the recipe for tin glaze. By the 17th century CE, when tin glaze was utilized in England, potteries throughout Europe had their own styles of tin glazed pottery. Majolica was produced on the Italian island of Maiorca, faience was made in Faenza, Italy and imported to France, and Delft was manufactured in the Netherlands (Caiger-Smith 1973, 1980; Wykes-Joyce 1958).

Figure 4.21. Delftware plate, manufactured 1736 at Wapping, London, England, Dawson 2010: 266.

Delftware was produced in Delft, Netherlands by potters who migrated from Italy sometime in the mid-16th century CE (Dawson 2010; Earle 1978; Knowles 1904; Moore 1908). Delftware from the Netherlands was produced in attempts to recreate Chinese porcelain. However, the delft potters were unable to directly replicate Chinese porcelain, and chose to apply decoration and motifs that often resembled Gothic or Renaissance iconography of the period. Hallmarks of delftware from the Netherlands were thin walled vessels and blue designs, both similar in style to Chinese porcelain (Burton 1904; Oswald et al. 1982). In England, delftware manufacture began sometime around 1630 CE, but these ceramic vessels created in Lambeth, Bristol, and Liverpool did not achieve the thin body associated with those from the Netherlands. English delftware potters utilized the glaze technology to create artistic designs which provided a different appearance when compared to their counterparts in the Netherlands (Figure 4.21). In England, delftware was an important ceramic material utilized by consumers of modest economic means and was not displaced until a pottery form called creamware was produced in the middle of the 18th century CE.

3. Salt glaze

Salt glazes have been utilized in the production of stoneware since at least the 16th century CE (Barber 1907; Burton 1904; Green 1979; Oswald et al. 1982). Salt glaze is a saline glaze applied in a vaporized form to the exterior of stoneware vessels. After a stoneware vessel has been fired the salt glaze exterior appears granular or "orange peel" in nature. Salt glaze is a one-step process and is applied to vessels during an initial firing. A semi-smooth surface is created on the vessel when granular salt is deposited into the kiln when sufficiently high temperatures have been reached. The salt vaporizes due to the heat and the vapor spreads throughout the kiln. The vaporized salt adheres to all of the stoneware vessel surfaces. After firing, salt-glazed stoneware vessels become nonporous and will not contaminate the contents stored within the vessel (Cochrane 2002; Green 1978; Oswald et al. 1982).

Salt-glazed stoneware was a primary export commodity for Germany during the 16th and 17th centuries CE (Burton 1904; Green 1978; Oswald et al. 1982). Stoneware vessels of the period were most often associated with potteries situated along the Rhine River. A river location provided both the natural resource necessary for production and a transportation system to export the final manufactured products. Ceramic vessels from this region of Germany were highly popular and are often referred to as Cologne ware.

German stoneware is traditionally grouped by the color of the clay utilized in a particular region: whitewares from Siegburg, red brown ware from Raeren, brown ware from Frechen, rusty and enameled from Kreussen, grey with blue and purple enamel from Grenzhausen, brown and grey from Bouffioux, ferruginous from Bunzlau, and dark red from Dreyhausen (Barber 1907).

The manufacture of salt-glazed vessels in Germany began sometime during the 17th century when John Dwight (1635 CE-1703 CE) was issued a patent for his designs of Cologne ware. Dwight, a scholar and amateur scientist, patented his discovery of the salt-glazing technique in 1672 CE (Green 1971, 1999; Green et al. 1976; Oswald 1982). The same year he founded his pottery in Fulham, with the intention of making porcelain, where he developed a number of new paste bodies, including highly refined white stoneware that could be molded (Green 1971, 1976, 1999; Green et al. 1976; Haselgrove and Murray 1979). The salt-glazed stoneware made in the Fulham Pottery was created with similar techniques utilized in Rhineland, Germany (Gaimster 1999, 2006). Dwight's second patent of 1684 included the making of "marbled porcelain," an experimental agate ware, which was unique in Europe. He also experimented with decorative techniques; his wares became known for their sophisticated use of sprigged decoration. Sprigged decoration is achieved by filling stamps, or molds, with soft clay, usually in a contrasting color to the body of the object, and then applying that separate clay ornament directly to the vessel body (Green 1971, 1999; Green et al. 1976; Oswald 1982).

The properties of salt glaze were accidentally discovered while salt was being refined in an earthenware pan. The liquid within the pan had boiled over and the result of this fortunate accident was that the exterior of the pan had become partially glazed. In England, historians credit the Elers brothers with discovering the benefits of salt glazing in 1690, prior to the arrival of Dutch potters to Staffordshire. Similar to the separation of pottery types in Germany, English salt-glazed stoneware can be described by region: early brown ware from Fulham and Nottingham, white salt glazed wares from Staffordshire, and modern brown ware from Lambeth (Green 1971, 1999; Green et al. 1976).

Production of salt-glazed vessels in American potteries had roots in the voyages of German and English immigrants to North America. Since potteries were not prevalent in the early years of the American colonies the import of European-made vessels for personal consumption and trade with native peoples was useful (Barber 1909). American colonial stoneware potteries came into existence near the beginning of the 18th century CE. Initially, these vessels were constructed in the forms most suited for everyday life, such as utilitarian storage crocks and jars. About 1735, John Remmey, of German descent, established a stoneware pottery in New York in close proximity to the old City Hall (Remmey 1809; Barber 1909; Ketchum 1987, 1991; Lukacs 2001; Marter 2011). Storage vessels produced in this manufacturing center were brown storage jugs approximately one foot in height with two looped handles (Figure 4.22). The Remmey production center, also known as Remmey and Crolius pottery, remained in operation until 1820 CE (Barber 1904, 1907; Kingsbury 1932; Lukacs 2001; Myers 1984). The Remmey pottery was able to produce utilitarian vessels needed within the local economy, eliminating the need for imported stoneware (Baldwin 1993; Ketchum 1987, 1991; Lukacs 2001; Marter 2011).

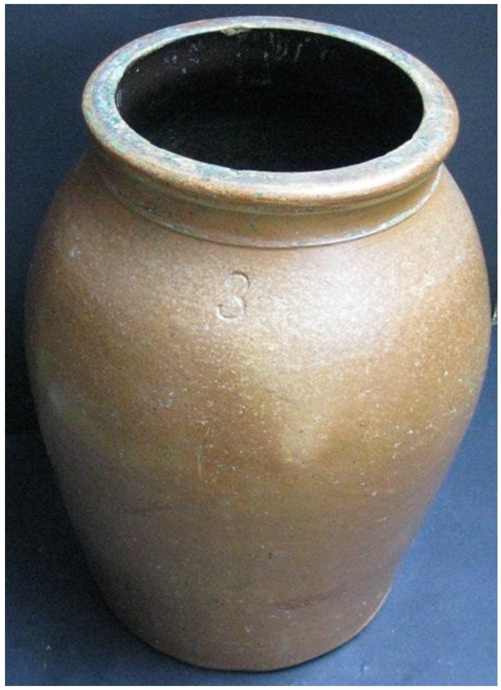


Figure 4.22. Salt glazed storage jar, Courtesy Michael Hargrave Collection

Many of these domestic production facilities in America were established around 1780 and continued into the 19th century CE. In the late 19th century CE, glass canning jars became readily available to American consumers and began to displace demand for ceramic storage vessels (Burrison 1983; Cabek et al. 1999; Greer 1981). In conjunction with multiple stoneware production technologies, potters experimented with forms and decorations to provide distinction in their wares. For example, potteries in Connecticut produced plain salt-glazed stoneware while blue and white decorations were applied to vessels produced in Pennsylvania and West Virginia. However, potters continued to produce stoneware similar to forms and designs created in Germany, such as grey paste stoneware with blue and purple decorations (Barber 1909; Greer 1981; Ketchum 1991; Watkins 1968).

While salt glaze was the preferred exterior surface treatment, potters also developed an interior treatment which would be used throughout America. Albany slip glaze was a decoration technique applied to salt-glazed stoneware (Greer 1981; Hamer and Hamer 1991; Ketchum 1991; Rhodes 1981). Slip produced from blue clay was utilized to line the inner walls of a storage vessel or bowl. Once fired the slip vitrifies and turns dark brown or black in color. The alteration in color is attributed to the high percentages of iron present in the raw clay. The clay utilized in the production of Albany slip was initially discovered in the river beds near Albany, New York. Albany slips, and the materials for its production, were easy to obtain and apply and numerous potteries throughout America adopted this manufacturing technique (Barber 1909; Greer 1981; Ketchum 1991; Watkins 1968).

5. Alkaline glazes

Alkaline glazes are a mixture of wood ash, feldspar, silica, and alumina (Baldwin 1993; McKeekin 1984; Rhodes 1981; Sweezy 1984; Zug 1986). The refinement of alkaline glaze was in part due to the advancements in kiln technologies. In China, around 500 BCE, down-draft kilns were designed which allowed kiln temperatures to rise above 1,200 degrees Celsius. The down-draft properties allow for heat to be recycled within the kiln ware chamber, which reduced the loss of heat through the chimney. These Chinese kilns were fueled by burning trees and grasses which contain high levels of alkalis (Needham 2004). Alkalis are water soluble earth metals commonly discovered in clay or other organic materials. Alkali glazes are created by clays which contain lithium, sodium, potassium, rubidium, cesium, and francium. Alkali compounds can create shiny, glassy surfaces. As the fuel is consumed by the kiln, very fine particles of ash are produced and transported by air flow throughout the kiln space. As wood ash is circulated throughout the kiln ware chamber these materials come into contact with the exposed surfaces of the ceramic vessels. Once the wood ash comes into contact with the vessel surface it adheres and starts to form a natural glaze. Wood ash can also be dissolved in a glaze solution which allows for application similar to other liquid glazes. The ingredients for an alkaline glaze were often easily obtainable since those raw materials were often the same as the natural resources utilized in the firing of a kiln and the production of stoneware vessels (Figure 4.23) (Baldwin 1993; Sweezy 1984; Zug 1986).

Figure 4.23. Alkaline Glaze stoneware storage vessels, signed "Dave/January 25, 1856"

Alkaline glazes are thin, fast moving liquids which can be difficult to control (Hamer and Hamer 1991; Kenny 1949; Rice 1987). Thin glazes often cause defects or imperfection in the surface quality of the ceramic object. One such defect is called crawling or creeping, yet results in a desirable decorative effect utilized in some forms of ceramic production. Crawling occurs when a defect in the glaze causes a separation of the mixture as it is heated in the kiln during the firing process (Hamer and Hamer 1991; Rice

1987). Portions of the glaze mixture congeal in regions along the clay body. When the glaze recombines it creates voids along the surface where little or no glaze remains, creating an imperfection in the final fired product. In the Southern pottery folk tradition in the Unites States, crawling is also referred to as a “tobacco spit” glaze because the vessel appears as if a tobacco chewer’s expectorant is rolling down the side of the vessel wall (Burrison 2008). Glazes prone to crawling are associated with ceramic vessels in which high levels of shrinking occur during the firing process. Celadon glazes, which are thick, green-colored, liquid glazes, are high in silica which makes them susceptible to shrinkage and thus prone to crawling (Burrison 2008; Sweezy 1984; Zug 1986).

Celadon is associated with alkaline glazed vessels that range from light green to dark olive green and is often described as ceramic jade or false jade (Grey 1984; Medley 1989; Rice 1987; Thiel 1953 Wood 1999). While celadon glaze had been utilized by numerous pottery centers the most famous derives from the Longquan District of the Southern Song Dynasty (1127 CE to 1179 CE). In China, similar to jade, the green color of the glaze was at times associated with the possession of magical and medicinal powers (Laufer and Nichols 1917).

A celadon glaze color is considered to be one of the visual attributes of Pottersville stoneware (Figure 4.24) (Burrison 2008; Koverman 2009; Sweezy 1994). The Pottersville kiln in Edgefield, South Carolina became the location for initial development of a ceramic tradition which has continued into the 21st century. The Pottersville kiln is considered to be the location where 19th century American potters first rediscovered the techniques to utilize alkaline glazes. To understand how Edgefield potters engaged with alkaline glaze an archaeological investigation was initiated at the Pottersville kiln site.

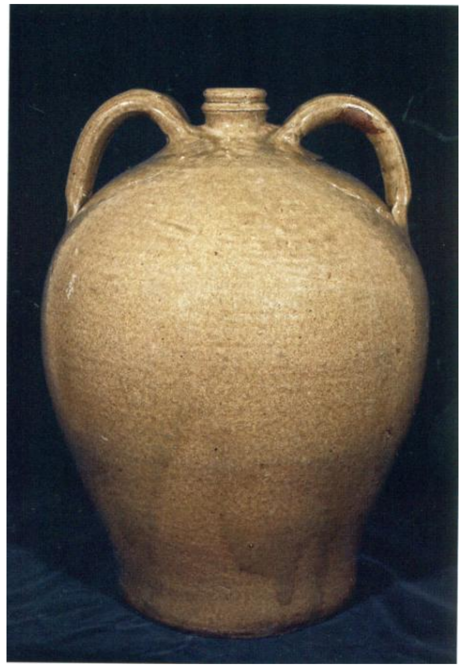


Figure 4.24. Four-gallon jug, celadon in color, circa 1830 Pottersville Stoneware Manufactory, Edgefield District, South Carolina, Burrison 2010: 22

The preceding discussion of glaze technologies ends with the subject of alkaline glaze, which is associated with Edgefield stoneware. The development of each of the other glaze technologies did not occur in isolation; in numerous instances a potter or entrepreneur was instrumental in a discovery that developed or improved a ceramic technology. The following discussion follows several historical figures whose innovations impacted existing ceramic technologies and from whom Dr. Abner Landrum drew inspiration as he shaped part of ceramic history in the Edgefield district.

D. A Historical Perspective on Ceramic Trades and Notable Innovators

Those who contributed to ceramic history did not act alone. Their daily lives were embedded in an infrastructure of regional economies, trade networks, and shifting impacts of international relations. To understand how ceramicists participated in significant innovations, the discussion should address the historic events and social trajectories which impacted these industries.

The history of trade between China and Europe stretches back as far as the Roman Empire (753 BCE-1461 CE). During this initial period of trade, China sent silk and spices to Europe which created fertile grounds for merchants to make fortunes. However, trade between east and west would come to a halt after both China and Rome were overtaken by groups of invaders. From the fall of these sovereigns to the beginning of the 16th century CE, trade between Europe and China would be extremely limited primarily based upon access to trade routes. As political power throughout Europe and Asia shifted so did the economic interest in Europe with regard to China. Stories remerged regarding China's goods which fueled the desire by European merchants to once again begin the acquisition of rare materials (Mudge 1981; Porter 2001).

During the 16th century CE various segments of European societies developed a fascination with Chinese trade goods based primarily upon the infrequent accessibility to materials which were deemed of the highest quality. In 1514 CE, Portugal was the first European nation to engage in sea trade with China and by 1557 CE a permanent trade center has been established in Macao, China (Jörg 1982; Litchfield 1900; Mudge 1981; Porter 2001). Macao would become a strategic location for European commercial interests to establish a settlement in order to gain access to the Canton province on mainland China. Canton would be the primary location where all trade activities occurred between European interests and their Chinese business counterparts. The Chinese people grew contemptuous of European traders due to multiple events of massacres inflicted upon Chinese commercial agents by Spanish shipping companies. In addition to these hostilities, China disapproved of the constant conflicts between European sovereigns, which eventually impacted Chinese trade interests (Jörg 1982; Mudge 1981).

As a result of shipping times and limited access to trade goods, Portugal was also unable to satisfy the European demands for Chinese trade goods. Due to the length of the voyage, Portuguese shippers could do little more than supply goods to annual European fairs. Since Chinese trade goods were available in limited quantities, ceramicists and scholars attempted to recreate porcelain technologies in order to respond to those market interests. The first reproduction of a material that resembled Chinese porcelain was accomplished in Florence, Italy. The factory, housed at the Casino of San Marco produced enameled wares from 1575 CE to 1587 CE. However, goods produced in this facility were manufactured primarily for diplomatic exchange rather than economic interest (Stiles 1940).

It was not until 1595 CE when another European commercial center, Holland, completed a voyage around the Cape of Good Hope and entered into trade with China (Jörg 1982; Litchfield 1900; Mudge 1981; Philips 1956; Scheurleer 1974). Before entering into trade with China, Holland had relied upon Spanish traders, based in Lisbon, to supply exotic trade goods. However, in 1594 a disagreement between Spain and Holland led to the termination of trading between the two. The exchange of Chinese commodities that once flowed through Lisbon to Dutch merchants was halted, which motivated Holland to establish the East India Company in 1602. In the years of 1602 through 1604 Holland also acquired Chinese wares by capturing Portuguese cargo ships. The captured Portuguese ships were loaded with Chinese porcelain, silk, and other exotic trade goods (Markley 2003; Monkhouse 1901). These captured Chinese wares were sold for high profits, and the perceived fortunes to be made were a partial impetus for the establishment of the Dutch East India Company. However, naval conflict between

Portugal and Holland prevented the East India Company from securing a port facility in China. Due to these hostilities Holland established a port in Formosa, later called Taiwan (Jörg 1982; Mudge 1981; Philips 1956; Scheurleer 1974). From Formosa, the East India Company was able to acquire teas, silks, and porcelain in order to supply the market in Holland. In Holland, porcelain was so popular that local manufacturers attempted to recreate these Chinese wares (Jörg 1982; Mudge 1981; Philips 1956; Scheurleer 1974). As a result, ceramic manufacturers in Holland created the blue and white ceramic form known as delftware (Dawson 2010; Wilcoxen 1987).

During the same period, England chartered the British East India Company in 1600 CE. However, it was not until 1662, when Charles II married Catherine of Braganza, that the pace of trade with Asia quickened (Litchfield 1900; Mudge 1981; Philips 1956; Scheurleer 1974). Access to Bombay, India was conveyed as a part of a wedding dowry and this newly acquired British access to this Indian port quickly accelerated the Asian trade market. Before 1662 CE, English ships were unwelcome along the China coast due to previous hostilities with the governing interest centered in Canton (Mudge 1981; Philips 1956). The British East India Company perceived other European operators' economic successes in China and continued efforts to establish communication with Canton. In 1699, a successful voyage to Canton returned a ship's hold full of teas and porcelain to England. Encouraged by this success, English merchants continued dialog with their counterparts in China and by these efforts a trade station was established in 1715 with a regular schedule of exports leaving the port annually (Litchfield 1900; Mudge 1981; Philips 1956). Successful acquisition of porcelain facilitated a market demand for high quality serving wares. In an attempt to fill this economic niche, entrepreneurs in the ceramic industry, such as Josiah Wedgwood, worked to create English-made porcelain in order to stake a claim to the market share.

Until 1784 CE, the colonies in British North America relied upon European shipping companies to supply the region's marketplace with rare Chinese trade goods. After gaining independence from England, governmental and commercial interests in America set out to establish their own trade networks in order to lessen the effects of increased prices as commodities changed hands through English intermediaries. Fortunately, during the years of the 18th century European interests in China decreased due to other colonial initiatives. Unlike European shipping companies, which were often owned or charted by a monarchy, American trade interests operated voyages through independent shipping vessels and captains. Autonomy often meant that these captains were willing to take on greater risks in order to increase profit margins (Gordon 1928; Mudge 1981; Philips 1956).

American trade interests in China can be discussed in three time periods: a beginning phase (1784 CE to 1790 CE), growth and conflict (1791 CE to 1814 CE) and expansion (1815-1839) (Gordon 1928; Mudge 1981; Philips 1956). Prior to 1784, American shipping had been decimated, losing more than 1,000 ships during the Revolutionary War. Based upon social interest of the American population to display high status material goods after the Revolution, entrepreneurs saw a need to obtain fine wares and rare goods. These entrepreneurs gathered funds to build ships and provide a captain with a seafaring crew in order to acquire these goods from China. The *Empress*, outfitted by Robert Morris and Daniel Parker, set sail for China on February 22, 1784 and returned to New York harbor on May 11, 1785 with a hold full of teas and other Chinese trade goods (Mudge 1981; Philips 1956). Due to the amount of start-up capital required, the profits from the first voyage were minimal. However, indentifying potential economic advantages of trade with China, ships from other major American seaports set sail for Asia in the years 1787 to 1790. In total, 28 ships completed the round-trip journey to supply American cities with trade goods from China during that period.

At this point, America entered into a growth and conflict stage of trade with China. During this period, shipping was facilitated by the American government through the ratified Constitution, the Tariff Act, and the Navigation Act of 1789 (Bourguignon 1994; Engdahl 1989; Noonan 1989; Warren 1923). The Navigation Act of 1789 levied taxes on imported goods based upon tonnage transported by foreign shipping companies into America. Second, the Tariff Act placed a 12.5% protection fee upon international shippers transporting goods from East India. Third, while tea taxes were excluded from the Acts, regulations were implemented to channel the importation of this widely desired trade good to only American shippers (Bourguignon 1994; Engdahl 1989; Noonan 1989; Warren 1923).

Even though taxation supported American shipping companies, war in Europe created great hazards at sea. During the French Revolution and Napoleonic Wars, French and British governments often established naval blockades which decreased American naval traffic. Additionally, the British utilized the practice of “impressment” (Clark 1931; Ennis 2002; Rogers 1994; Steel 1952; Usher 1951). Impressment was a tactic in which British forces stopped and boarded ships and captured the crew members into the British Navy. To prevent British and French intervention with American shipping, President Jefferson and Congress enacted the Embargo Act of 1807. Before the 1807 legislation, an average of 15 to 20 American trade ships sailed to Canton on an annual basis; however, due to fear of lost cargo or crew, only 8 ships braved the voyage from 1808 to 1809. It was not until the end of the War of 1812 that America reestablished full scale trade with Canton (Gordon 1928; Mudge 1981; Philips 1956).

In the first year into the expansion era 30 American ships sailed to Canton and in the 1818-1819 period of trade season 47 ships journeyed to China (Gordon 1928; Martin 1832; Mudge 1981; Philips 1956). This period in American commerce with China was principally characterized by American buyers' acquisition of Chinese trade goods. China's commercial sectors had been self reliant and American business operators had little to offer in exchange for porcelain, teas, and other goods. Otter skins and silver bullion were the objects most desired by Chinese merchants of the period. Both of these trade goods involved notable difficulties, though. Furs had become difficult to acquire due to strained relations with Native American populations and the near extinction of the otter (Gordon 1928; Philips 1956). Additionally, the American government was concerned that the amount of bullion being traded to India and China would erode the value of the United States currency. Therefore, to acquire materials for trade, American shipping companies focused primarily on acquisition skins and furs. Shipping agents were able to support their Chinese trade partners once hunting territories were expanded to the tip of South America, Northern Canada, and the Pacific Island chains (Gordon 1928; Mudge 1981). American trade interests with China waned during the decades leading up to the American Civil War, and that conflict significantly curtailed the large-scale exchange of goods between the two nations. However, the vast quantities of

Chinese trade goods in America did fuel the interest of some entrepreneurs who attempted to replicate wares for local markets (Gordon 1928; Philips 1956).

This discussion has outlined a period of trade with China in which a wide range of goods were acquired. In addition, that period of exchange had broader impacts on consumer preferences and production initiatives in Europe and America (Campbell 2005; Carson 1994; Frank 2011; Porter 2012). The wealthy of the period viewed owning and utilizing rare trade goods as a marker of high society. Drinking teas with the aid of porcelain cups was associated with the trappings of higher social and economic status. With a growing social elite, merchants were not able to fill market demands through imports alone, and local manufacturers worked to generate their own profits by replicating some Chinese wares. To create a vessel worthy of the social elite in American, British, and European markets the object would need to be as similar to the Chinese version as possible. For example, in an effort to recreate porcelain numerous entrepreneurs attempted to learn the secret of Chinese glaze technology.

1. Bernard Palissy

One of the first people associated with an effort to discover the secret to porcelain glaze was Bernard Palissy (1509 CE-1589 CE). Palissy was born in France where he learned the art of glass painting, also known as "Virrerie." Virrerie was a skill passed down within families through generations and was often practiced by nobles as a means of generating income. Palissy, born a peasant, very likely learned the trade through conversations and interactions that his father, a glass painter, had with nobles at a glass manufacturer where he worked (Kirsop 1961; La Rocque 1957; Morley 1855; Thompson 1954). Much like his ability to learn glass painting, Palissy possessed the capacity to gain knowledge about wide ranges of materials. He learned to read and write and gained an in-depth knowledge about chemistry and the natural environment (Kirsop 1961; Palissy 1957; Thompson 1954).

As a young man Palissy traveled the French countryside while he served in the military, worked as a logger, and sought educational opportunities. During his travels, Palissy subsisted by means of his glass painting, and developed an interest in philosophy and alchemy (Kirsop 1961; La Rocque 1957; Thompson 1954). His study of philosophy created a desire to do and know more than just the skilled to earn a daily wage (Palissy 1957). It was at some point after 1540 when Palissy was shown an earthenware "enameled cup" (La Rocque 1957; Palissy 1957; Thompson 1954). While Palissy did not possess a working knowledge of pottery production his intellectual interest drove him to recreate the enameled cup as an extension of the noble craft of glass painting.

During the middle of the 16th century European manufacturers did not possess the knowledge to create hard paste objects in which refined clays are fired to the point of vitrifying (Honey 1933; Rhodes 1968). Hard paste vessels were only available in limited quantities via trade with China. Pottery produced in France in 1540 was soft paste with the exception of thick utilitarian stoneware vessels created in Beauvais (Frantz 1906; Chaffers 1893; Marryat 1857). Unable to produce hard paste porcelain, German and Italian pottery manufacturers created enamel decorated earthenware vessels. Palissy had seen both porcelain and the enameled cup and set upon a life's work to replicate the paste and glaze chemistry associated with these rare objects (Honey 1933; La Rocque 1957; Palissy 1957; Thompson 1954). Palissy had only the porcelain and enameled vessels as representations of his end goals, because neither written nor oral information existed about how to produce these objects.

With an understanding of geology and chemistry, Palissy formulated experiments to learn which resources went into manufacture of the glaze. Since these ceramic objects were a two-part process, forming the vessel and mixing the glaze, Palissy first attempted to discover the elemental composition of the enamel glaze (Kirsop 1961; La Rocque 1957; Palissy 1957; Thompson 1954). To discover the techniques to produce glaze or enamel, Palissy could create ceramic vessels with methods similar to that of a glass painter. Equipped with a scientific method, Palissy broke earthenware vessels, applied glazes produced through chemical mixtures, and refired the sherds in a kiln in an attempt to discover the white glaze elemental composition. The white glaze was thought to be the base glaze color and all other colors could be developed by introducing color pigment to the glaze recipe (Honey 1933; Johnson 1983; La Rocque 1957; Palissy 1957). Throughout this process, Palissy remarked that his lack of knowledge into kiln heating principles was one of his major deficiencies. Without understanding kiln temperatures or firing times, Palissy often over- or under-fired his test samples by either time or temperature or both (Palissy 1957).

After 16 years of experimentation, Palissy discovered the materials and requisite proportions of each (La Rocque 1957; Palissy 1957). He listed the elements that comprised his enamel recipes: tin, lead, iron, steel, antimony, saphre, copper, arene, salicort, cendre gravelee, litharge, and Perigord stone (Palissy 1957: 201). While Palissy described the materials which he attributed to his enamel discovery, he did not provide the proportions. He wrote about his scholarship as if he were teaching another scholar, and when a hypothetical trainee rhetorically inquires about the percentages in his narrative, Palissy (1957: 201) observed:

> I judge that you should work to find this does, just as I have done; otherwise you would esteem the knowledge too lightly, and perhaps that would cause you to despise it: for I am certain that no one in the world takes lightly the secrets and the arts save those who get them cheaply: but those who have learned them at great cost and labor do not give them away so lightly.

By this quote it is clear that while Palissy was willing to describe the materials he utilized, the labor of his love was retained as his own. He similarly chose not to publish specific details on how he manufactured his vessels. A similar spirit of discovery was very likely significant to Dr. Abner Landrum's desire to manufacture ceramics centuries later.

2. Francois d'Entrecolles

Father Francois Xavier d'Entrecolles (1664 CE-1741 CE) was a Jesuit priest fluent in the Chinese language and conversant with scientific technologies Tichane 1983; Needham 2004; Wood 1999). D'Entrecolles was sent by the Society of Jesus on a missionary trip to China to spread religion and Jesuit ideals. While sharing the church's beliefs, he also engaged in the equivalent of 18th century industrial espionage (Tichane 1983; Vlach 1990a). European countries were engaged in large-scale economic trade with China and porcelain was one of the principal trade goods (Tichane 1983; Wood 1999). However, during this period the nature of porcelain manufacture and glaze technology was unknown to western manufacturers. Acquisition of these trade secrets would allow for local production of porcelain instead of continued reliance upon Chinese trade partners.

D'Entrecolles wrote two letters to the Society of Jesus in France from Jingdezhen, China's porcelain capitol, in 1712 and 1722 (d'Entrecolles 1712, 1722). Contained within these two letters was valuable information which allowed for European ceramic manufacturers to crack the code of porcelain manufacturing. D'Entrecolles keen eye allowed him to understand which types of clay were utilized for particular vessels, how the clay was prepared for pottery production, and the proportions of materials that comprised glaze mixtures (d'Entrecolles 1712, 1722). As mentioned in the discussion of Bernard Palissy's efforts, the glaze mixture components and proportions were of the upmost importance in order to understand the final processes of porcelain production. Josiah Wedgwood was but one of the British and European pottery manufacturers who utilized this information to assist in the establishment of ceramic production facilities and devise a division of labor that created an integrated ceramic workshop Reilly 1992; Wood 1999). While d'Entrecolles' papers included a discussion about the kilns utilized at Jingdezhen, information about the size of those structures and how to build furnaces was not provided. Palissy had earlier admitted that he was unsure about the period of time in which a furnace should be fired. D'Entrecolles observed that the kilns of Jingdezhen were of notable size and were fired for "7 days and 7 nights" (d'Entrecolles 1712, 1722). His writings were described in later publications available to broader audiences, such as an article on porcelain in the 1797 *Encyclopedia Britannica*.

3. Jean-Baptiste Du Halde

Aided by Jean-Baptiste Du Halde's (1674 CE-1743 CE) publication of *The General History of China* (1735), d'Entrecolles' papers were widely available throughout the Western world (Baldwin 1993; Burrison 2008; Gunn 2011; Rujivacharakul 2011). A portion of d'Entrecolles' letters were printed in Charleston's *South Carolina Gazette* making these texts available in America (*South Carolina Gazette* March 5, 1744). For a potter who had access to the raw materials described by d'Entrecolles, these letters would have been a valuable asset in the establishment of a pottery facility.

4. Robert Dossie

Robert Dossie (1717 CE-1777 CE) wrote on the methods of chemistry, pharmacy, agriculture, and arts (Gibbs 1953). His writings and scientific discoveries were deemed revolutionary for the time and his musings have been collected and curated by the Royal Society of Arts (Gibbs 1953; Lowengard 2006). Aside from his writing, Dossie was a practicing physician and agriculturalist, writing *An Essay on the Medical Nature of Hemlock* (1760) and *Memoirs of Agriculture* (1768). However, of importance to the discussion of ceramic technology, he also wrote *Handmaiden to the Arts* (1758, 1795).

Discovered within this text is a far more complete discussion of an ash glaze recipe when compared to d'Entrecolles letters. This first passage from Dossie's text outlines the production of ash glaze.

> More perfect transparent glazing prepared with wood-ashes
>
> Take of sand forty pounds, of wood-ashes, perfectly burnt, fifty pounds, of pearl-ashes ten pounds, and of common salt twelve pound
>
> This will make an admirable glazing, where the ashes are pure, and a strong fire can be given to flux it when laid on a ware. It will be perfectly free from imperfection of the above, and will be very hard and glossy; and where the expense can be allowed, it may be made more yielding to the fire by the addition of borax, in which case no alteration need be made in proportion of the other ingredients (Dossie 1795: 377).

He also described each specific color of glaze, to including subdivisions of minor colors within colors ranges (Dossie 1795: 388).

> Another preparation of a fine green glazing

> Take of any the yellow glazing already given, and add to it an equal quantity of any of the blue glazes given below. Mix them thoroughly well together by grinding, and they will produce a green that will be bright and good, in preparation to the yellow and blue used for its composition
>
> This is the readiest way of forming greens for every purpose, as by the choice of the kind of yellow and blue, and the variation of proportion of one to the other, all shades and tints of green may be certainly produced.

Dossie's text served as a recipe book ample for providing valuable information to ceramic producers. At about the same time that Dossie wrote *Handmaiden to the Arts* Josiah Wedgwood became an integral figure in British ceramic history.

5. Josiah Wedgwood

Josiah Wedgwood (1730 CE-1795 CE) was born into a family of potters in Burslem, England. Wedgwood's father's death in 1739 led him to an early start in pottery production where he worked as a "thrower" in the pottery of his eldest brother, Thomas, to whom he was later apprenticed (Burton 1904, 1922; Church 1908; Dolan 2004; Reilly 1992; Wedgwood 1913). Thomas refused Josiah a partnership in the family business, so Josiah moved to a small pottery run by John Harrison. After his stint with Harrison, Josiah moved on to work at the pottery factory operated by Thomas Wheildon in Fenton. From the experience gained under Wheildon, Wedgewood opened a pottery of his own. An attack of smallpox seriously weakened him, and as a result he had his right leg amputated in 1768. Without use of his right leg, Wedgwood was forced to abandon throwing, but he subsequently gained superior insight into every industrial component of the pottery enterprise (Burton 1922; Dolan 2004; Reilly 1992).

This holistic view of ceramic production encouraged his experimentation with ceramic methods and technologies. Wedgwood's first pottery was located at his cousin's Ivy House and later at the Brick House factory. At these works, Wedgwood made many molds and also prepared clay mixes (Burton 1922; Church 1908; Dolan 2004; Reilly 1992). In 1769, he opened a new factory at Etruria in partnership with Thomas Bentley. Adjacent to the factory was a village where workmen and their families were afforded the opportunity to live in hospitable surroundings.

A growing interest by English consumers in domestic, non-utilitarian vessels had begun about the time in which Wedgwood established his pottery operations. In 1757, English potteries had successfully produced soft paste white wares that emulated Chinese porcelain in general appearance (Burton 1922; Dolan 2004; Reilly 1992). At the time it was not possible for these manufacturers to replicate hard paste ceramics due to the lack of high quality clay in England. In 1768, William Cookworthy, a rival potter, received an English patent to produce white glazed earthenware. While these ceramic objects were not the same quality as porcelain the white color provided the appearance of purity and high quality, much like porcelain would (Dolan 2004; Reilly 1992). Between the years of 1744 and 1767, Cookworthy and Wedgwood had each sent agents to the western section of North Carolina to acquire pure white clay, called “Cherokee Clay,” in order to produce their whitewares (Vlach 1990a). These English agents would pass through the area of the Edgefield district of South Carolina, oblivious to the kaolin-rich landscape, on their way to the smaller clay pits in North Carolina (Figure 4.25). Extraction of kaolin from America came to a halt immediately following a 1768 discovery of kaolin in Cornwall, England (Vlach 1990a). With the discovery of kaolin in England, Wedgwood greatly improved his ordinary utilitarian pottery by introducing durable and simple everyday wares which were desired by households in England and elsewhere.

Figure 4.25. Map display of North Carolina and South Carolina showing the route taken by Thomas Griffiths in search of "Cherokee clay," Vlach 1990a: 1.

Wedgwood experimented with barium sulphate called "caulk," and from it produced a material called jasper in 1773. Jasperware, which was used for a whole host of ornaments, blends metallic oxides, often blue, with separately molded reliefs, generally white. Some such reliefs were designed for Wedgwood by John Flaxman. Other wares included black basalts, frequently enhanced by encaustic colors like red, to imitate Greek vases (Dolan 2004; Reilly 1992).

Upmost concerns for any pottery operation were the kiln structure and the firing process. Potteries were often financially ruined if a kiln encountered a catastrophic failure or if a load of wares was improperly fired. To prevent the threat of a kiln's collapse, Wedgwood worked directly with brick masons to create a structurally sound furnace vault. Kilns built by Wedgwood and his brick masons were still in operation 100 years after construction (Burton 1922; Dolan 2004; Reilly 1992). For his ceramic inventiveness, primarily for inventing the pyrometer to measure oven temperatures, Wedgwood was elected a fellow of the Royal Society of Arts in 1783.

Wedgwood possessed the vision to indentify a growing marketplace and capitalize upon its demands. His innovations of creating a village adjacent to the pottery ensured the presence of a dedicated and steady workforce. For later entrepreneurs entering into the manufacture of ceramics on an industrial scale, Wedgwood's innovations provided valuable sources of inspiration and resolve.

6. Dr. Abner Landrum

Dr. Abner Landrum (1784-1856) is credited with the establishment of the Pottersville manufacturing facility in Edgefield in the early portion of the 19th century. He took influence from numerous potters who preceded him. As a reflection of this influence Dr. Landrum named his third child Wedgwood and his fourth child Palissy. Dr. Landrum was the son of Samuel Landrum, who had moved to South Carolina from North Carolina in 1773. The Landrum family was associated with pottery families such as the Cravens of Randolph County, North Carolina. Similar to Robert Dossie, Dr. Landrum was an agriculturalist and trained physician. He sought entrepreneur opportunities throughout his life, which included establishing *The Hive*, a local Edgefield newspaper. *The Hive* was a Unionist-slanted publication which clashed with the views of the growing class of agricultural plantation operators in the Edgefield area. *The Hive* printed articles on national affairs, science, and art (Baldwin 1993; Montgomery 2010; Todd 2008).

To support the Pottersville pottery facility, Dr. Landrum established a village, much like Wedgwood, of families adjacent to the kiln site (Baldwin 1993). The village, referred to as Pottersville or Landrumsville, contained the pottery, turning shops, wheelwright, miller, a blacksmith, and nearby residences for the workers and their families (Baldwin 1993). Robert Mills (1825) claimed that Dr. Landrum was an "ingenious and scientific man." As a well-read scientific man, Dr. Landrum was able to discern the raw materials necessary of ceramic production (Todd 2008).

Scholars who have conducted research on Dr. Landrum and Edgefield stoneware suggest that the inspiration to establish a pottery was based upon knowledge gained through family connections and past experiences in day-to-day pottery operations (Greer 1981; Koverman 1998; Vlach 1990a; Zug 1986). He likely learned fundamental concepts regarding pottery production that could have influenced his later interest in operating a stoneware production facility. While Dr. Landrum could have learned these fundamental concepts regarding pottery production, clay acquisition, vessels formation, and kiln firing, it is likely that this would not have been a sufficient basis for his innovations in glaze technology. He likely acquired additional information and knowledge regarding glaze technology to make the technological shift from the utilization of salt-glaze to alkaline glaze.

Challenged to discover Dr. Landrum's knowledge acquisition regarding the use of alkaline glaze, scholars have connected him to numerous individuals engaged in ceramic production. One of the first attempts to link him to learning about alkaline glaze focused on his possible knowledge acquisition through William Cookworthy and Richard Champion (Greer 1970, 1980; Vlach 1990a; Steen 2012). Both Cookworthy and Champion possessed information regarding pottery production while living in England. Cookworthy had been issued ceramic patents that he utilized in production and Champion had been a business partner in these operations. Champion would later acquire land in

Camden, South Carolina, in 1784. With interests focused on the discovery of suitable replacement for caustic lead glazes in pottery production, Greer (1970) and Vlach (1990) postulate that Champion likely discussed the ceramic industry and chemical characteristics regarding various glaze techniques, which could have included an alkaline glaze and potential applications.

Another hypothesis for alkaline glaze knowledge acquisition suggests that as a learned man, Dr. Landrum gleaned essential information regarding production through publications available during the period (Burrison 1983; Todd 2008; Steen 2012). Burrison and Todd suggest that the primer for Landrum's innovation of alkaline glaze was spurred by Jean-Baptise Du Halde's *General History of China* (1738). Included within this text were the letters written by d'Entrecolles. The *South Carolina Gazette* in Charleston, South Carolina printed a portion of these letters on March 5, 1744. For Landrum to have acquired knowledge from the Du Halde text he would have either needed a copy of the 80 year old newspaper article or a copy of the book. Both propositions present plausible explanations for an aspiring pottery entrepreneur.

The previously mentioned interest to replace lead glaze, utilized as a ceramic sealant, could possibly have created inspiration for Dr. Landrum and the altered usage of alkaline glaze. Recent documentary research has focused upon social interactions that directly linked him to ceramic production in Philadelphia, Pennsylvania. In 1801, John Beale Bordley published *Essays and Notes on Husbandry and Rural Affairs* where the use of lead glazes was discussed (Steen 2012). However, in 1801 an alternative to lead glaze was actively being sought and Bordley observed that, "our own country abounds in materials for producing the most perfect, durable, and *wholesome* glazing. These materials are *wood, ash, and sand*" (Bordley 1801, emphasis added). Bordley also stated that Cook, a brick maker, experimented with these materials and had successfully applied them to earthenware and stoneware (Bordley 1801; Steen 2012). Notably, the American Philosophical Society for the Promotion of Useful Knowledge, located in Philadelphia since 1769, possessed both a copy of *General History of China* and *Handmaiden to the Arts* prior to the Bordley 1801 publication (Goodman per comm. 2013).

Prior to the establishment of the Pottersville kiln site, Dr. Landrum traveled to Philadelphia to learn about porcelain production techniques (Smedley 1883; Steen 2012). Smedley discussed Landrum's visit to Philadelphia and claimed that, "he visited potters in Pennsylvania seeking advice on making porcelain and fine wares (Smedley 1883; Steen 2012). Genealogical clues suggest that Dr. Landrum's visit to Philadelphia potteries occurred at some point around 1810. This approximate 1810 date would have been precipitated by his 1809 discovery of high-quality clay in the Edgefield district. On July 15, 1809, the *Augusta Chronicle* printed an article in which Dr. Landrum claimed to have discovered high quality clay in the Edgefield district that possessed the compositional characteristics necessary to manufacture ceramics (*Augusta Chronicle* July 15, 1809). Additionally, his northward journey, meant for the acquisition of porcelain knowledge, occurred in advance of his 1812 request to the state of South Carolina for financial support for the establishment of a porcelain production facility in Edgefield (Landrum 1812). For Dr. Landrum to successfully produce porcelain he had to acquire an understanding of the application process of alkaline glaze. Equipped with the knowledge regarding porcelain production he returned to South Carolina to begin his ceramic production enterprise.

To gain financial support for his pottery facility, Dr. Landrum petitioned the State of South Carolina for a grant to provide start-up capital for his planned industrial enterprise. He submitted his request as “Praying for Legislation assistance in the Establishment of a Queensware or Porcelain manufactory” (Appendix A) (Landrum 1812). In December 1812, the office of the governor awarded him $2,000 to subsidize the establishment of his factory in the Edgefield district (Koverman 2009; Landrum 1812). The 1820 federal industrial census recorded $8,000 as the monetary funds dedicated to establish the factory. To put those sums in context, $1 in 1812 provided the purchasing power of $13 to $17 in 2012, and $1 in 1820 provided the equivalent of $16 to $20 today (EH.net 2013; Friedman 2013).

Dr. Landrum request to the state of South Carolina established his intent to develop and manufacture “Queensware or Porcelain” at his Edgefield complex. This documentary evidence indicates that he was attempting to enter into the ceramic industry in an effort to produce ceramics for residents of the upcountry. In a later, undated document, presumably written three years after the receipt of the startup grant, he detailed the outcome of his labor (Appendix A).

> for the last three years been prosecuting at a considerable expense of time, labor, & money an exhaustive course of experiments…..he has been enabled to produce specimens of the most elegant <u>Porcelains</u> or Chinaware; …a good quality of <u>Delft</u> or <u>Queensware</u>; a quality of <u>Stoneware</u> superior in texture and glazing to the best European, with the additional advantage also over that of enduring, uninjur’d quick transitions from heat to cold; a composition of <u>mortars</u> superior to those of Wedgwood; <u>Crucibles</u>, preferred by the artists to the best Hessian
> (Landrum SC Report n.d., emphasis in original)

Thus Dr. Landrum claimed to have been able to fabricate the material which he had initially set out to produce. However, his discussion of stoneware is what provides a clue as to why Pottersville produced stoneware rather than other materials. In this passage Landrum suggested that his products were better than those of Josiah Wedgwood. Wedgwood was a known producer of quality goods and thus the South Carolina Legislature had provided a local business with funds to try to complete with that industrial icon.

Dr. Landrum also claimed that his wares were superior to Hessian Crucibles. Hessian crucibles were developed by the 15th century CE and were traded to Scandinavia, Britain, Portugal, and the American colonies. They consisted of small, durable ceramic vessels similar to those that had been used since the late Middle Ages by alchemists, chemists, assayers, minters and metallurgists (Stephan 1995; Cotter 1992; Martinon-Torres 2006). These crucibles were constructed to withstand extreme fluctuation in temperatures. The factors responsible for Dr. Landrum claim of their superior quality are unknown and several historically documented attempts to replicate their construction have failed (Cotter 1992; Plot 1992 [1677]; Percy 1875). In 1677, Hessian crucibles were described as a "mystery" and numerous ceramicists had attempted to discover the method of manufacture.

In 2006, researchers analyzed 50 Hessian crucibles in an attempt to discover the elemental properties of these mysterious objects. The result of that project suggested that the clay used to produce Hessian crucible possessed high amounts of Alumina, at approximately 36% (Martinon-Torres et al. 2006; Martinon-Torres and Freestone 2008; Martinon-Torres and Rehren 2009). Elemental analyses of Pottersville waster fragments utilizing a Scanning Electron Microprobe also found the presence of high levels of Alumina, at approximately 24%. The two weighted percentages are not comparable between these investigations of Hessen crucibles and Pottersville fragments due to differences in equipment and the sampled elements. However, both investigations found relatively high Alumina content. Dr. Landrum likely focused on Hessian crucibles as an example of his capabilities to further stake a claim to the high quality of his wares. These lines of documentary evidence indicate that the quality of stoneware produced led him to focus on stoneware production rather than porcelain. Archaeological evidence and extant vessels known to have been produced at Pottersville consisted of stoneware and no known examples of porcelain, queensware, or delft from Edgefield potteries exist.

This chapter presented a history of ceramic production and innovators, or nations of innovation, which have altered ceramic technology from a previously successful state to a different successful state. The periodic shifts in ceramic technologies suggest that once an innovative technology was accepted by a social group that that innovation persisted for an extended period of time. The acceptance and subsequent replication of the innovation is what became the doxa or the accepted manner in which a particular object was created over the course of history. Chinese production of porcelain from this chapter is a prime example of the long duree that can occur once an innovation takes hold and becomes doxa within a particular social group.

The attempts to replicate porcelain drove agents of change to discover the technologies long understood by Chinese potters. Outside of China other ceramic producing nations possessed their own history of ceramic production. However, in an attempt to gain a foothold into potentially economically advantageous markets entrepreneurs sought ways to alter these pre-existing methods to create porcelain. These agents of change pushed against their established production methodologies by altering kiln and glaze technologies in an attempt to recreate porcelain. These changes brought forth new technologies that were successful and persisted over time while falling short in their heterodoxic attempts to recreate the centuries old porcelain technology.

Agents, such as Dr. Landrum, sought to alter the current affairs of ceramic production in an effort to achieve a financial advantage in a particular marketplace. By his actions it was clear that Dr. Landrum wanted to create porcelain for a local, regional, or possibly even national scale. The orthodoxy of his day very likely suggested that the safe action for this business venture would have been the production of salt-glazed stoneware or another successful American design. However, Dr. Landrum, in a heterodoxic move, acquired financial support from the state of South Carolina in an attempt to recreate a millennia-old technology--porcelain. Dr. Landrum was afforded the opportunity to push back against the economic forces of Europe in an attempt to create a self-sufficient industry in the American South. As an agent of change he was unable not recreate porcelain, but did adapt Chinese glaze technology to the application onto stoneware. Through his inability to replicate porcelain Dr. Landrum created alkaline-glazed stoneware which has persisted in the American South to this day.

Dr. Landrum marshaled various types of resources and shifted ceramic technologies in a new and lasting direction. To better understand the roots of his development of alkaline glaze and stoneware production, excavations were undertaken at the Pottersville kiln site in 2011. The Edgefield archaeological project and the investigation report presented in chapters 5 and 6, focused on Dr. Landrum's ceramic industry which began at some point between 1812 and 1817.

Chapter 5
Archaeological Investigations of Pottersville, South Carolina

Archaeological investigations were conducted at the Pottersville kiln site (38ED011) in Edgefield during the summer of 2011. The goal of the 2011 fieldwork was to identify the dimensions of the kiln and any architectural features associated with the kiln design. Locating and identifying key architectural elements would allow for a better understanding of kiln technology in the American south region during the early 19th century and daily operations around the Pottersville kiln. This chapter provides a discussion of the research plan and findings from the 2011 investigations.

I. Fieldwork Plan

Archaeological investigations took place from May 23 through July 1, 2011. Research was led by the University of Illinois at Urbana-Champaign (UIUC), which hosted a summer field school for undergraduate and graduate students. UIUC collaborated with the Diachronic Research Foundation, the South Carolina Department of Natural Resources, and the University of South Carolina in conducting this archaeological field school. Advice and guidance on methods for investigating kiln remains were also provided by archaeologists Timothy Scarlett, J.W. Joseph, Linda Carnes-McNaughton, and Christopher Espenshade; these analysts had extensive experience in excavating other kiln sites dating to the 19th century (Carnes-McNaughton 1995; Espenshade 2002; Scarlett et al. 2007).

When excavating the remains of the Pottersville kiln, the team started with the following procedures and protocols, which were modified in response to the conditions and exigencies of the site and its archaeological record.

(1). Excavate the first 15cm to 30cm of the top soil, saving the sod layer in a tarp for analysis.

(2). Excavation depths should start as arbitrary 10cm levels and then switch to strata when natural or cultural strata are identified and datable artifacts are observed. The exterior of the kiln structure would likely provide data for determining date ranges of activities. The interior of the kiln should be mostly free of datable artifacts.

(3). Search for and identify activity areas adjacent to the kiln.

(4). If the kiln had a super-structure (e.g., pole-supported wall and roof), activities such as drying and storage may have occurred in the immediate vicinity surrounding the kiln remains.

(5). Identify the kiln dimensions

> (a). sub-divide in sections along the long axis
>
> (b). initial predictions ranged from 6 to 12 feet in width and 15 to 30 feet in length.

(6). Indentify the interior and exterior of the kiln

> (a). The front firebox and back wall are highly significant for sampling and analysis
>
> (b). Exterior walls might have a high density of artifacts and wasters (the latter consist of fragments of pottery that failed and broke a part during past firings of the kiln).
>
> (c). Interior kiln space might have artifacts from the last firing
>
> > (1). additional small debitage over years of firing might be present
> > (2). floor sample and analyze what materials were used to construct the floor.

(7). Wasters will likely be distributed adjacent to the kiln and downhill from the kiln.

(8). Assess the kiln appearance and whether termination of kiln activities resulted from catastrophic failure of the structure or intentional abandonment and demolition.

(9). Examine ponds in the vicinity to determine whether these were naturally formed or the result of past borrow pits from which clay was mined and water later collected.

(10). Kiln furniture types

(a). Search for evidence of whether the kiln furniture (if any) consisted of premade forms or of expedient forms.

(b). Search for marks found on vessels to determine if they relate to the functions of kiln furniture and stacking of vessels within the kiln.

Educational objectives for the field school included the historical background of the Edgefield district, discussion of the Pottersville landscape, and an overview of kiln technologies. Specific goals of the project were to locate and identify several key kiln architectural features, including:

- Ware chamber: the linear space within the kiln in which objects were situated during the firing process.
- Firebox: entry into the kiln and location where the firing process was initiated.
- Chimney: rear of the kiln where heat and smoke were expelled from the kiln.
- Bagwall: connection point between the firebox and ware chamber; protected the first vessels from flames in the firebox.
- Exterior walls: perimeter of the kiln.

During the course of the field school 24 excavation units were inserted into the hillside to expose these key architectural features and others which relate to kiln design and technology. Measurements for the archaeological grid and excavation units were laid out in metric units; the kiln was likely constructed utilizing an English system of measurement. Excavation units and elevations will be discussed using the metric system, and measurements regarding the kiln dimensions will utilize the English system. This Chapter 5 provides details on excavations units, levels, and features, including numbers of artifacts uncovered in each location. Chapter 6 will address analysis of those artifacts in greater detail. Given the longitudinal space of the excavation area multiple archaeological units were investigated simultaneously by the field school team. In order to discuss the excavation process, unit summaries will be presented by specific location, rather than in numerical sequence.

Pottersville Kiln

II. Feature 1: Pottersville Kiln.

Feature 1 is an analytic label employed to describe the exposed outlines of the entire Pottersville kiln. During the course of excavation the field crew uncovered architectural elements which display the important hallmarks of kiln technology. By discovering these architectural elements, the early 19th century Edgefield kiln technology can be better understood. Feature 1 was indentified during the excavations and encompasses the front wall, flue, firebox, ware chamber, and chimney. Feature 1 is 105 feet long and 12 feet wide (Figure 5.1). The ware chamber was identified through the examination of 19 excavation units and measured 90 feet in length. The firebox is situated at the base of a hillside and the chimney is location 100 feet away on the uphill slope. The lowest floor elevation of feature 1 is located in the firebox at 137.3544 meters (m) above mean sea level (amsl) and the highest floor elevation is 141.2544m amsl or a difference of 3.9m. The slope of the floor of the Pottersville kiln is 8.21 degrees. Feature 1 is constructed with 1ft x 1ft x 4in refractory bricks. Refractory bricks consist of a mix of kaolin clay and sand. Approximately 7,500 refractory bricks went into the construction of the Pottersville kiln.

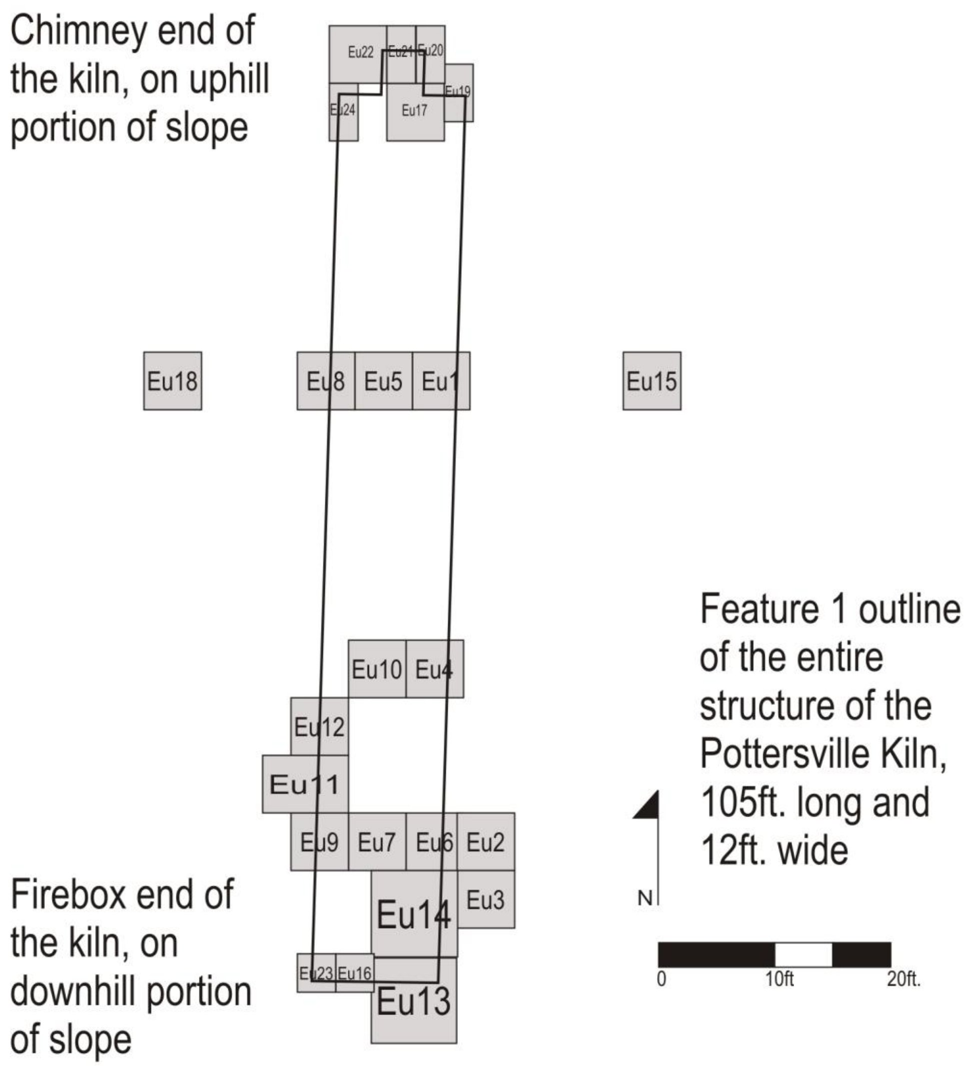


Figure 5.1. Feature 1, the Pottersville kiln.

The 2011 archaeological investigations targeted various locations along the slope of the hillside where the Pottersville kiln lay buried. Due to this longitudinal space, excavations units were initiated and terminated throughout the space without contiguous numbering. The following discussion will explore each of these excavation units in feature sequence rather than numerical sequence. This section will begin at the downslope feature, the firebox, and conclude at the furthest location upslope, the chimney. The goal of feature ordering is orient report by space rather than time.

B. Features 3 and 4: Firebox and Front wall

The area of excavation at the lowest elevation along the hill slope exposed large portions of the kiln's firebox. The firebox is comprised of EU 13, EU 14, EU 16, and EU 23. After locating the bagwall the archaeology team predicted that the firebox would be situated downslope from those excavation units that exposed the bagwall. Exposed stone was discovered downslope and the team selected this location for EU 13. Once excavation of EU 13 began, the team discovered a heavy density of stoneware artifacts and a course of cut granitic stone. As the excavation team continued exploration additional articulated cut stone appeared in the form of a vertical wall. EU 13 was excavated to sterile soil. The vertical wall uncovered in EU 13 was designated as Feature 3 or the "front wall." (Figure 5.2).

The space between the front wall and the bagwall comprised the spatial contours of the Pottersville kiln's firebox. EU 14 was inserted adjacent to and north of EU 13 and adjacent to and south of EU 6, EU 7, and EU 9. Within EU 14 a level of rubble was encountered, similar to that discovered in the bagwall space of the kiln. However, unlike previous units EU 14 displayed large amounts of non-articulated bricks that appeared to have comprised part of the kiln's barrel vault. The fallen brick was very likely from a collapse event; these non-articulated brick remains were removed as one cultural stratum. Beneath that layer of bricks the research team uncovered hard, compacted soil. Inside the kiln space and under the remains of the fallen bricks the team designated this unit between the front wall and the bag wall as Feature 4, Firebox. Excavations of the firebox would subdivide EU 14 into a smaller 1m x 3m unit, excavating to sterile soil beneath the kiln floor.

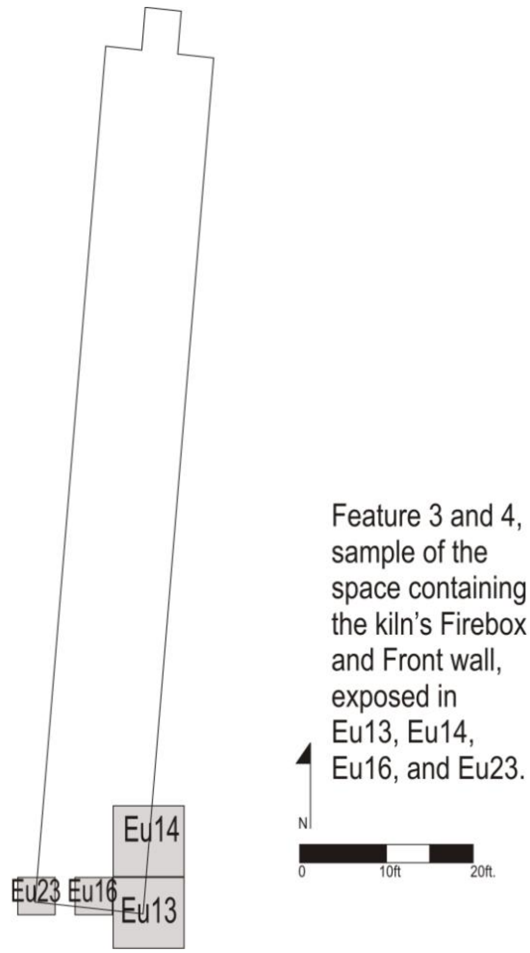


Figure 5.2. Features 3 and 4.

During excavations of EU 13 a void was discovered along the front wall. Initially thought to be a flue, the voided space was later determined to be a door. EU 13 did not expose the entire door width, so the team inserted EU 16, a 1m x 1m unit, adjacent to and west of EU 13. EU 16 was an exploratory unit opened to discover the door width. The door height was measurable in EU 13. After excavating the topsoil from EU 16, the left limit of the kiln door was uncovered. The front door measured 30 inches wide and 36 inches in height.

A second, exploratory unit was inserted to the west of EU 16. EU 23 was opened to locate the front left corner of the kiln wall. Locating both front corners of the kiln would confirm the outer contours of the barrel vault style of construction. The front left corner of the Pottersville kiln was located in this EU 23 confirming that the kiln was 12 feet in exterior width. Utilizing both front corners, and later the two rear corners, it was then possible to confirm the kiln's full spatial footprint.

<u>A. Feature 3:</u>

Feature 3 consists of a cross-section sample of the kiln architectural element known as the "exterior front wall" (Figure 3). Feature 3 was indentified during the excavations of EU 13. The average opening elevation was 138.730m amsl and the average closing elevation was 137.105m amsl. Feature 3 was first identified when archaeologists uncovered a course of horizontally stacked stones. The stacked stones were cut from natural granitic materials which can be found within one mile surrounding the Pottersville kiln site. From top to bottom the exterior wall consisted of seven courses of stone. Stones and of different width and each was approximately 4 inches in height. Traversing down the wall, beneath the seventh course of stone, the top of the arch of the kiln "flue" or "fire mouth" was constructed into this exterior wall. The fire mouth remains were bricked closed. The fire mouth and the stone that supports the wall around the fire mouth consist of 10 courses of stones in height from top to bottom. The final stone discovered at the base of the wall was laid directly upon the original hillside surface. No evidence was uncovered that indicated that the kiln builders excavated a space for the kiln footprint or otherwise excavated "builders trenches" in this area.

In total the exterior wall is 17 course of stone high creating a wall approximately 6 feet in total height. Granitic stone was employed to construct the exterior wall and terminated at the corner of the kiln where the front and side walls joined. Additional stone, often called “buttress stone”, by architectural historians of kilns, was situated along the perimeter of the kiln. These buttress stones were not cut nor prepared in the same manner the front exterior wall stones. The front right corner of the kiln wall displayed several large buttress stones; however, these were not as numerous as the buttress stones included in the exterior side walls. These buttress stone supports were likely installed in response to an early firing event in which the kiln shifted while curing or settling; similar exigencies and resulting maintenance construction have taken place at modern-day groundhog kilns. This buttress material at the Pottersville kiln was likely added to the front corner to provide strength and prevent further weakening of the kiln.

On the left side of EU 13 the remains of another fire mouth is visible, and after uncovering the right front corner of the kiln, it appears plausible that the Pottersville kiln actually possessed 3 fire mouths (Figure 5.3). The fire mouth that was fully excavated is 2.5 feet wide x 3.5 feet tall. When the areas of the three fire mouths are combined the total air intake would have been 26.25 square feet. To ensure proper heating of the kiln the amount of air brought into the kiln must not exceed the amount of air allowed to escape the kiln; thus the dimension of the fire mouths should be equal to or larger than the chimney.

Figure 5.3. Sampled exposure of the Pottersville kiln’s front wall and right fire mouth.

Another air inlet was also present on the kiln front: a loading door. The loading door was 2 feet wide and 2.5 feet in height. The right and left side of the door was place 5 feet from the right and left side exterior walls making it equidistant between the two and centered upon the front wall. The loading door would have been one of the main points of access to load and unload vessels from the ware chamber. The loading door would have been slowly bricked closed during the initial stages of the firing process. During excavation the archaeological team did not find the front loading door to still be bricked closed, since the kiln was very likely unloaded one last time prior to site termination.

B. Feature 4:

Feature 4 consists of a cross-section sample of the kiln architectural element known as the “firebox.” Feature 4 was indentified during the excavations of EU 13 and 14. The average opening elevation of Feature 4 was 139.081m amsl and the average closing elevation was 137.3544m amsl. The dimension of the firebox is 12 feet wide x 10 feet long x 6 feet deep. The firebox was the space within the kiln where wood was burned enabling the kiln to reach the high temperatures of 1200-1300 degrees Celsius for the production of stoneware pottery.

Air was brought into the firebox through the fire mouth in the front exterior wall. Burning wood and air flow allowed heat and fly ash to circulate throughout the ware chamber and out toward the chimney. The team subdivided EU 14 and excavated a space of 3 meters x 1 meter to investigate a sampling of less than 50% of the total firebox. Within the firebox 4,480 artifacts were recovered. These artifacts likely represent the vessels from the final firing. These artifacts were uncovered from beneath bricks from the kiln’s barrel vault and on top of the firebox floor. These artifacts were very likely from the final firing since that space would typically be clear of all impediments to fire the kiln and allow air access throughout the space.

The lowest level of heavy artifact concentration displayed vessels that were under-fired. These stoneware vessels were 10YR 5/8 Yellow in color and still have glaze lightly adhered to the vessel walls. The glaze is 10YR 8/2 White in color and can be rubbed or washed away from the artifact. Under-firing of these vessels would have occurred if a large amount of oxygen was allowed to fill a portion of the kiln space. In the space above the under-fired artifacts was a section of significantly fired and hardened vessels. These vessels were in a portion of the kiln that achieved stoneware temperatures. These vessels very likely had some sort of defect or damage that made them unusable and they were later discarded in this region of the firebox. Further elaboration on the final firing is provided below in the discussion section of this chapter.

Unit Summaries for Features 3 and 4

Excavation Unit 13 Summary

EU 13 measured 3m x 3m and was located at N956 E954 on the site grid. The site datum was located at UTM E414040 and N3741550 latitude. The excavation team identified exposed stones near the base of the hillside location of the kiln. EU 13 was situated so that the exposed stones were in the center of the excavation space. These exposed stones were identified as part of the kiln's exterior wall. EU 13 was excavated in two levels, and after the termination of Level B1 excavations continued in this space but would be later designated as Feature 3 and Feature 4.

Level A1's average opening elevation was 139.176m amsl and the average closing elevation was 138.730m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish Gray in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=1,097), Glass (n=20), Whiteware (n=17), Nails (n=87).

Level B1's average opening elevation was 138.730m amsl and the average closing elevation was 138.689m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish Gray in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=90), Whiteware (n=1), and Nails (n=19).

Excavation Unit 14 Summary

EU 14 measured 3m x 3m and was located at N959 E954 on the site grid. EU 14 would be excavated in three levels prior to being redesignated as Feature 3. EU 14 would connect EU 13 to EU 5 and EU 7. EU 14 and later Feature 4 were interpreted as the "Firebox" of the kiln.

Level A1's average opening elevation was 139.741m amsl and the average closing elevation was 139.486m amsl. Soils within the excavation area were 10 YR 3/4 Dark Yellowish Brown in color and a Sandy texture. Artifacts uncovered at this depth included: Stoneware (n=259), Glass (n=5), Whiteware (n=20), Pearlware (n=1), and Nails (n=58).

Level A2's average opening elevation was 139.486m amsl and the average closing elevation was 139.081m amsl. Soils within the excavation area were 7.5 YR 7/1 Light Gray, 4/4 Brown, 3/4 Dark Brown, 4/3 Brown, 5/3 Strong Brown, 4/4 Brown in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=128), Glass (n=10), Whiteware (n=10), and Nails (n=84).

Level B1's average opening elevation was 139.081m amsl and the average closing elevation was 139.012m amsl. Soils within the excavation area were 10 YR 6/4 Light Yellowish Brown, 3/3 Dark Brown, 5/2 Grayish Brown, 5/4 Yellowish Brown in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Charcoal, Stoneware (n=1017), Glass (n=1), Whiteware (n=2), and Nails (n=166).

Excavation Unit 16 Summary

EU 16 measured 1m x 1m and is located at N955.5 E953 on the site grid. EU16 was inserted in order to determine the width of the kiln door. The unit was terminated after Level A2 and the discovery of the door edge.

Level A1's average opening elevation was 139.409m amsl and the average closing elevation was 139.263m amsl. Soils within the excavation area were 10 YR 5/3 Brown in color and a Sandy texture. No artifacts were recovered in this exploratory excavation unit.

Level A2's average opening elevation was 139.263m amsl and the average closing elevation was 139.053m amsl. Soils within the excavation area were 10 YR 5/3 Brown in color and a Sandy texture. No artifacts were recovered in this exploratory excavation unit.

Excavation Unit 23 Summary

EU 23 measured 2m x 1m and was located at N959 E951 on the site grid. EU23 was inserted to locate the kiln's southwest exterior corner. The unit was terminated after Level A2 and the discovery of the doorway or southwest corner edge.

Level A1's average opening elevation was 139.358m amsl and the average closing elevation was 139.230m amsl. Soils within the excavation area were 10 YR 4/2 Dark Grayish Brown in color and a Sandy texture. No artifacts were uncovered in this exploratory excavation unit.

Level A2's average opening elevation was 139.230m amsl and the average closing elevation was 139.056m amsl. Soils within the excavation area were 10 YR 3/2

Very Dark Grayish Brown in color and a Sandy texture. No artifacts were uncovered in this exploratory excavation unit.

Feature 3 Summary

When excavation of EU 13, EU 14, EU 16, and EU 23, revealed a cross-section of the front wall of the Pottersville kiln, the next levels of excavation in those units were labeled as arbitrary levels a1 to b3 of Feature 3. Feature 3, Level a1's average opening elevation was 138.730m amsl and the average closing elevation was 138.595m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish-Gray in color and a Sandy Clay texture. Artifacts discovered at this depth included: Stoneware (n=587), Whiteware (n=41), and Nails (n=115).

Level a2's average opening elevation was 138.595m amsl and the average closing elevation was 138.223m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish-Gray in color and a Loamy texture. Artifacts uncovered at this depth included: Stoneware (n=112) and Nails (n=11).

Level a3's average opening elevation was 138.223m amsl and the average closing elevation was 138.058m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish-Gray in color and Loamy in texture with clusters of a Clay texture. The clay was refined and appears to be potters clay. Artifacts discovered at this depth included: Stoneware (n=78), Nails (n=12), and Clay (n=1).

Level b1's average opening elevation was 138.058m amsl and the average closing elevation was 137.780m amsl. Soils within the excavation area were 10 YR 6/2 Light

Brownish-Gray and a Loamy texture with clusters of a Clay texture. Artifacts recovered at this depth included: Stoneware (n=41), Whiteware (n=1), and Nails (n=8).

Level b2's average opening elevation was 137.780m amsl and the average closing elevation was 137.589m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish-Gray in color and a Loamy texture. Artifacts uncovered at this depth included: Stoneware (n=57) and Nails (n=5).

Level b3's average opening elevation was 137.589m amsl and the average closing elevation was 137.105m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish-Gray in color and Loamy texture.. Artifacts discovered at this depth included: Stoneware (n=44) and Nails (n=11).

Form	**Total**
Bases	40
Jug Spouts	24
Strap Handle	33
Lug Handle	2
Rims	30
Nails	181
Glass	0
Whiteware	46

Table 5.1. Diagnostic artifacts uncovered in Feature 3.

Feature 3 and the excavation units which occupied the horizontal space above the Front Wall uncovered the following diagnostic artifacts. These artifacts are discussed in further detail as a portion of Chapter 6.

Feature 4 Summary

When excavation of EU 13 and EU 14, revealed a cross-section of the firebox of the Pottersville kiln, the next levels of excavation in those units were labeled as arbitrary levels a1 to b2 of Feature 4. Feature 4, Level a1's average opening elevation was 139.081m amsl and the average closing elevation was 138.731m amsl. Soils within the excavation were 7.5 YR 4/3 Dark Brown in color and a Clay texture. Artifacts uncovered at this depth included: Stoneware (n=891) and Nails (n=20).

Level a2's average opening elevation was 138.731m amsl and the average closing elevation was 138.6832m amsl. Soils within the excavation area are color 7.5 YR 4/3 Dark Brown and a Clay texture. Artifacts discovered at this depth included: Stoneware (n=152), Whiteware (n=1), and Nails (n=2).

Level a3's average opening elevation was 138.683m amsl and the average closing elevation was 138.486m amsl. Soils within the excavation area were 7.5 YR 4/4 Brown with concentrations of 6/4 Light Brown in color in the north portion of the unit and a Sandy texture. Artifacts recovered at this depth included: Stoneware (n=97) and Nails (n=9).

Level a4's average opening elevation was 138.486m amsl and the average closing elevation was 138.096m amsl. Soils within the excavated area were 7.5 YR 4/2 Dark Brown in color and a Clay texture. Artifacts uncovered at this depth included: Charcoal, Shell (n=3), Stoneware (n=942), Metal (n=2), Glass (n=10), Whiteware (n=22), Mocha ware (n=1), Nails (n=232), and Brick (n=4).

Level b1's average opening elevation was 138.096m amsl and the average closing elevation was 137.708m amsl. Soils within the excavation area were 7.5 YR Reddish-Yellow in color and a Sandy Soft texture. Artifacts discovered at this depth included: Stoneware (n=2251) and Whiteware (n=1).

Level b2's average opening elevation was 137.708m amsl and the average closing elevation was 137.354m amsl. Soils within the excavation area were 7.5 YR 2.5/2 Very Dark Brown in color and a compact soil/rock texture. Artifacts recovered at this depth included: Charcoal, Stoneware (n=103), and Nails (n=101).

Feature 4 and the excavation units which occupied the horizontal space above the Firebox uncovered the following diagnostic artifacts. These artifacts are discussed in further detail as a portion of Chapter 6.

Form	Total
Bases	448
Double Collar Spout	20
Single Collar Spout	7
UNK Spouts	33
Strap Handle	42
Lug Handle	29
Rims	248
Lids	3
Nails	670
Glass	19
Whiteware	56

Table 5.2. Diagnostic artifacts uncovered in Feature 4.

IV. Feature 6: The Kiln's Bagwall

The archaeology team placed several excavation units downslope (south) from Feature 2 in the area of similar distribution of exposed granitic stones. The following discussion will provide details of EU2, EU3, EU6, EU7, EU9, EU11, and EU12, which exposed portions of the bagwall of the kiln (Figure 5.4). EU2 was inserted along a north-south based line extending southward from Feature 2 and established with a laser transit total station. EU2 was be situated in-line with EU1 and was located where exposed stones were visible. EU2 displayed large granitic stones and fire hardened clay. EU3 was inserted adjacent to and south of EU2. It was hypothesized during the course of the excavations that the large stones observed in EU2 were a portion of the kiln's exterior wall. After a portion of the kiln wall was uncovered in EU1, it was determined that EU2 and EU3 were exterior portions of the wall and that the large stones constituted buttress materials. Once it was inferred that EU2 and EU3 had exposed the exterior of the kiln space, EU6 was placed adjacent to and west of EU2.

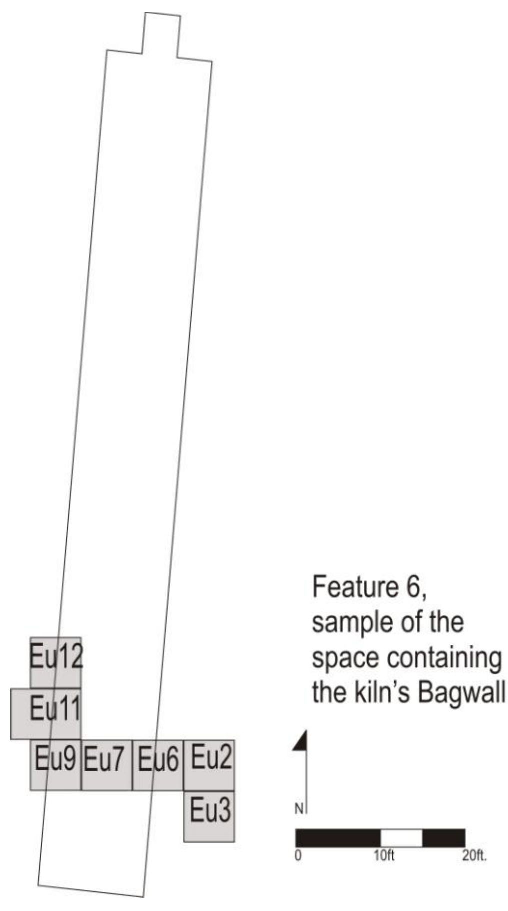


Figure 5.4, Feature 6 and a cross-section sample of the Bagwall section of the Pottersville kiln

After excavations commenced within EU6 it was quickly determined that the team had indeed discovered additional kiln architecture. Unlike the wall located within

EU1, the wall exposed in EU6 was heavily burned and degraded. EU6 contained large amounts of rubble and unarticulated construction and arch brick materials. However, a portion of the wall which was intact in EU6 contained the first recognizable facets of a skew block. Later determined to be cut at 40 degrees of angle, the skew block was the portion of the kiln's base walls that connected the arched surface of the brick walls to the lower-positioned, vertical walls.

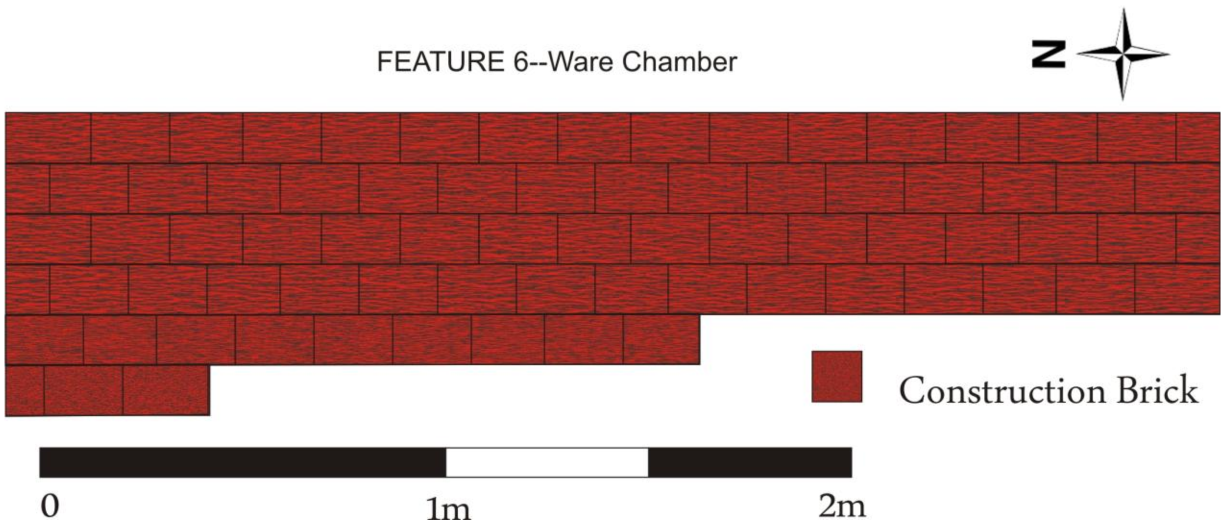


Figure 5.5: Plan Profile of Feature 6, interior wall segment nearest the firebox

Following the excavation procedures utilized upslope, EU7 was inserted adjacent to and west of EU6. EU7 continued to produce rubble, a portion of which had fallen in a linear, north-south orientation. Finding that this portion of fallen brick could be a portion of the bagwall, excavation in EU6 was halted. EU9 was opened adjacent to and west of EU7 and uncovered the west boundary of this location. EU9 displayed multiple courses of construction brick. During labwork, this extent and sample of the interior wall was designated as Feature 6 to define a segment of the architectural brick employed to construct the kiln interior (Figure 5.5). The bricks in Feature 6 were heavily burned and melted (Figure 5.6). Extreme temperature in this region had hardened the floor materials into near stone-like density, making excavation beneath the floor impractical.

Figure 5.6. Feature 6 interior west wall of the ware chamber, photo taken from the firebox and just before the space that the bagwall likely was built.

Due to extensive amount of melting and glaze affixed to the bricks in Feature 6, it was hypothesized that this portion of the kiln was a part of, or connected to, the firebox. In an effort to determine the extent of the firebox, EU11 was inserted adjacent to and north of EU9. EU11 continued with the same architectural discoveries; burned wall and fire-hardened floor. To locate the area where the firebox and ware chamber joined, EU 12 was inserted adjacent to and north of EU11. EU12 displayed identical wall and floor similarities with EU9 and EU11. Later analysis determined that this area within the kiln structure represented the connection point of the ware chamber and firebox.

Unit Summaries for Feature 6

Excavation Unit 2 Summary

EU 2 measured 2m x 2m and was located at N962 E958 on the site grid. EU2 was down slope from EU1 and was selected based upon exposed stones and orientation of structural materials discovered in EU1. EU2 was excavated in three levels, and terminated at Level A3.

Level A1's average opening elevation was 141.673m amsl and the average closing elevation was 140.165m amsl. Soils within the excavation area were 7.5 YR 4/2 Brown in color and a Sandy texture. Artifacts discovered at this depth included: Stoneware (n=49) and Nails (n=4).

Level A2's average opening elevation was 140.165m amsl and the average closing elevation was 140.110m amsl. Soils within the excavation area were 7.5 YR 4/2 Brown in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Charcoal, Stoneware (n=189), Glass (n=3), Whiteware (n=5), and Nails (n=11).

Level A3's average opening elevation was 140.110m amsl and the average closing elevation was 139.916m amsl. Soils within the excavation area were 7.5 YR 6/2 Pinkish Grey in color and a Sandy Clay texture. Artifacts discovered at this depth included: Charcoal, Stoneware (n=110), Whiteware (n=1), and Nails (n=23).

Excavation Unit 3 Summary

EU 3 measured 2m x 2m and was located at N960 E958 on the site grid. EU3 was excavated down in two levels. EU3 is adjacent to EU2 and was inserted to explore exterior kiln walls and buttress materials. The buttress stones situated in EU3 were granitic and too large to remove from the excavation unit; for this reason EU3 was terminated at the base of Level A2.

Level A1's average opening elevation was 139.916m amsl and the average closing elevation was 139.875m amsl. Soils within the excavation area were 7.5 YR 4/2 Brown in color and a Sandy texture. Artifacts uncovered at this depth included: Stoneware (n=58), Glass (n=3), Whiteware (n=1), Nails (n=7).

Level A2's average opening elevation was 139.875m amsl and the average closing elevation was 139.709m amsl. Soils within the excavation area included 7.5 YR 4/2 Brown in color and a Sandy texture. Artifacts discovered at this depth were: Stoneware (n=58), Glass (n=3), and Whiteware (n=1).

Excavation Unit 6 Summary

EU 6 measured 2m x 2m and was located at N976 E956 on the site grid adjacent to and west of EU2. Initially this lower region of the kiln was assumed to be the firebox and EU6 was opened in an effort to expose the feature. Later determined to be a portion of the ware chamber, EU6 did display architectural materials related to the "bagwall." Based upon stratagraphic discoveries in EU 2, EU6 was excavated in two levels. Excavations were terminated at the base of A2 when the team encountered a hardened floor surface. It was later interpreted that EU6 and the adjacent excavations units were situated where the firebox and ware chamber joined.

Level A1's average opening elevation was 141.575m amsl and the average closing elevation was 141.515m amsl. Soils within the excavation area were 10 YR 5/3 Brown in color and a Clay texture. Artifacts uncovered at this depth included: Stoneware (n=72), Whiteware (n=2), and Nails (41).

Level A2's average opening elevation was 141.515m amsl and the average closing elevation was 141.284m amsl. Soils within the excavation area were 10 YR 6/4 Light Yellowish Brown and 5 YR 5/4 Reddish Brown in color and a Sandy and Clay texture. Artifacts discovered at this depth included: Stoneware (n=58), Whiteware (n=18), and Nails (n=33).

Excavation Unit 7 Summary

EU 7 measured 2m x 2m and was located at N962 E954 on the site grid. EU7 was excavated in two levels. The excavation team discovered the interior kiln floor and terminated the excavations at the bottom of Level B1.

Level A1's average opening elevation was 140.133m amsl and the average closing elevation was 139.947m amsl. Soils within the excavation area were 10 YR 4/3 Brown in color and Sandy texture. Artifacts uncovered at this depth included: Stoneware (n=126), Whiteware (n=1), Nails (n=29), and Stone (n=1).

Level B1's average opening elevation was 139.947m amsl and the average closing elevation was 139.625m amsl. Soils within the excavation area were 10 YR 6/2

Light Brownish Grey in color and a Sandy texture. Artifacts discovered at this depth included: Stoneware (n=211), Nails (n=10).

Excavation Unit 9 Summary

EU 9 measured 2m x 2m and was located at N962 E952 on the site grid. EU1 was excavated in five levels. EU9 exposed the kiln's west, buttressed wall and a portion of the kiln's interior space.

Level A1's average opening elevation was 140.031m amsl and the average closing elevation was 139.934m amsl. Soils within the excavation area were 10 YR 5/2 Grayish Brown in color and a Sandy texture. Artifacts uncovered at this depth included: Stoneware (n=94), Whiteware (n=2), and Nails (n=12).

Level A2's average opening elevation was 139.934m amsl and the average closing elevation was 139.839m amsl. Soils within the excavation area were 10 YR 4/2 Dark Grayish Brown in color and a Sandy texture. Artifacts uncovered at this depth included: Stoneware (n=111), Whiteware (n=8), and Nails (n=20).

Level A3's average opening elevation was 139.934m amsl and the average closing elevation was 139.778m amsl. Soils within the excavation area were 10 YR 4/4 Dark Yellowish Brown in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=74), Whiteware (n=2), Porcelain (n=1), and Nails (n=24).

Level B1's average opening elevation was 139.947m amsl and the average closing elevation was 139.778m amsl. Soils within the excavation area were 10YR 6/2 Light Brownish Gray in color and a Sandy texture. Artifacts uncovered at this depth included: Stoneware (n=215), Whiteware (n=7), Metal (n=1), and Nails (n=26).

Level B2’s average opening elevation was 139.778m amsl and the average closing elevation was 139.456m amsl. Soils within the excavation area were 7.5 YR 6/2 Pinkish Grey in color and a Sandy texture. Artifacts uncovered at this depth included: Stoneware (n=154), Glass (n=3), Whiteware (n=4), and Nails (n=55).

Excavation Unit 11 Summary

EU 11 measured 2m x 3m and was located at N964 E952 on the site grid. EU10 was excavated in four levels. Excavations were terminated in the B Levels portion of the bottom of level B2 displayed a relatively impenetrable floor. Level B3 was situated in a portion of EU11 outside and to the west of the kiln wall in order to explore a semi-circular anomaly in the buttressed wall.

Level A1’s average opening elevation was 140.340m amsl and the average closing elevation was 140.132m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish Grey in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=238), Whiteware (n=11), Nails (n=38), and Metal (n=1).

Level B1’s average opening elevation was 140.132m amsl and the average closing elevation was 139.689m amsl. Soils within the excavation area were 10 YR 6/1 Grey in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=397), Whiteware (n=13), Yellow ware (n=1), Pearlware (n=1), and Nails (n=63).

Level B2’s average opening elevation was 139.689m amsl and the average closing elevation was 139.969m amsl. Soils within the excavation area were 10 YR 5/1

Grey in color and a hard, Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware fragments (n=15).

Level B3's average opening elevation was 140.102m amsl and the average closing elevation was 139.866m amsl. Soils within the excavation area were 10 YR 5/1 Grey in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=39), Whiteware (n=1), and Nails (n=1).

Excavation Unit 12 Summary

EU 12 measured 2m x 2m and was located at N966 E953 on the site grid. EU11 was excavated in three levels. Excavations were terminated at the Level B1 after the discovery of relatively impenetrable floor.

Level A1's average opening elevation was 140.102m amsl and the average closing elevation was 139.866m amsl. Soils within the excavation area were 10 YR 5/1 Grey in color and a hard, Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=66) and Nails (n=4).

Level A2's average opening elevation was 139.866m amsl and the average closing elevation was 139.450m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish Grey in color and Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=78), Pearlware (n=1), and Nails (n=12).

Level A3's average opening elevation was 140.450m amsl and the average closing elevation was 140.320m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish Grey and 10 YR 7/2 Light Grey in color and a Sandy Clay texture. Artifacts discovered at this depth included Stoneware (n=132).

Level B1's average opening elevation was 140.320m amsl and the average closing elevation was 139.599m amsl. Soils within the excavation area were 10 R 5/3 Weak Red in color and a Sandy texture. Artifacts uncovered at this depth included Stoneware (n=19).

Feature 6 and the excavation units which occupied the horizontal space above the Bagwall uncovered the following diagnostic artifacts. These artifacts are discussed in further detail as a portion of Chapter 6.

Form	**Total**
Bases	75
Jug Spouts	11
Handles	26
Rims	59
Nails	298
Glass	9
Whiteware	52

Table 5.3. Diagnostic artifacts uncovered in Feature 6.

<u>V. Feature 8: Walkway along kiln exterior</u>

Our archaeology team placed two excavation units upslope from the area of the bagwall and uncovered the location of a walkway along the exterior wall of the kiln structure. This walkway was later labeled as Feature 8. The sample of the space of this walkway, exposed as Feature 8, was uncovered in EU4 and EU10 (Figure 5.7). EU 4 was placed 4m north of EU2 to expose a large outcrop of exposed stones. These exposed stones were shaped in a manner that suggested the possibility of a side entry or supplementary firebox. While the exact length of the kiln was unknown the time of the placement of this excavation unit, by that time in the field season it was clear to the team that the Pottersville kiln was longer than expected. Kilns of 50 ft. or more often possess side firing boxes which provide additional capacity to obtain firing temperatures associated with the production of stoneware. The team did not locate a side firing box, but did encounter a walk-way which was later labeled as Feature 8 (Figures 5.8, 5.9, and 5.10).

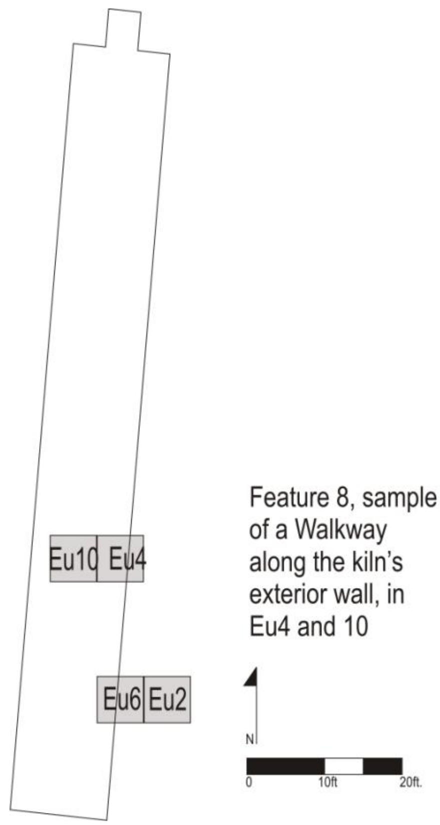


Figure 5.7. Feature 8.

The walkway labeled as Feature 8 consists of flat courses of flat stone, 6 stones in width connected to the exterior kiln wall and constructed outward. This walkway would have facilitated movement of persons and work activities along the kiln exterior. During operation of the kiln, laborers likely worked to alter the level of oxygen flowing into the kiln through stoking ports built into the barrel vault of the kiln. Heat-affected block uncovered in the vicinity of Feature 2 displayed evidence of the presence of stoking ports in the kiln vault. EU10 was placed adjacent to and west of EU4. EU10 contains bricks from the interior kiln space and was the only portion of the kiln excavated which displayed articulated bricks from the arched, barrel vault of the kiln interior walls.

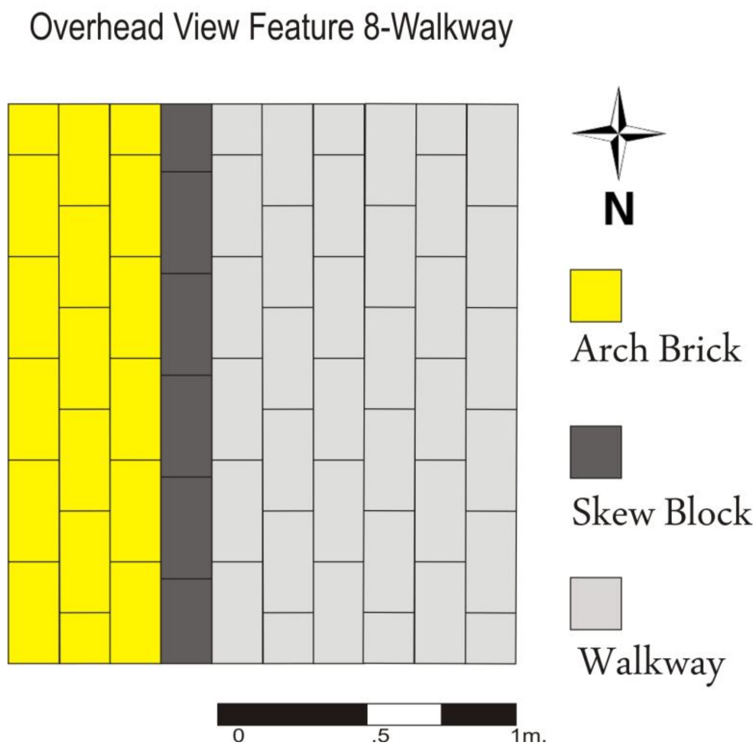


Figure 5.8**.** Overhead view of Feature 8 and adjacent kiln space on the east wall of the barrel vault of the Pottersville kiln. The walkway allowed for movement along the kiln exterior.

Figure 5.9**.** Feature 8 and adjacent kiln space on the east wall of the barrel vault of the Pottersville kiln. Image from firebox end looking north.

Figure 5.10**.** Feature 8 and adjacent kiln space on the east wall of the barrel vault of the Pottersville kiln. Image from east outside of the kiln looking west into the interior of the kiln.

Unit Summaries for Feature 8

Excavation Unit 4 Summary

EU 4 measured 2m x 2m and was located at N967 E957 on the site grid. EU 4 was excavated in two levels and was terminated at the base of Level A2.

Level A1's average opening elevation was 140.994m amsl and the average closing elevation was 140.697m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish Grey in color and a Sandy Clay texture. Artifacts discovered at this depth included: Stoneware (n=82), Glass (n=3), Whiteware (n=2), and Nails (n=19).

Level A2's average opening elevation was 140.697m amsl and the average closing elevation was 140.470m amsl. Soils within the excavation area color 10 YR 7/2 Light Grey in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=40), Glass (n=1), and Nails (n=4).

Excavation Unit 10 Summary

EU 10 measured 2m x 2m and was located at N967 E956 on the site grid. EU 10 was excavated in two levels. Adjacent to the west of EU 4, EU 10 was an exploratory unit in an effort to search for a possible side loading or firing chamber. Excavations within this space were terminated at Level A2. Kiln architecture within this space did not suggest the presence of either feature, but rather a similar interior kiln space uncovered in Feature 2.

Level A1's average opening elevation was 140.990m amsl and the average closing elevation was 140.861m amsl. Soils within the excavation area were 10 YR 6/2

Light Brownish Grey in color and a Sandy Clay texture. Artifacts uncovered at this depth included Stoneware (n=55).

Level A2's average opening elevation was 140.861m amsl and the average closing elevation was 140.608m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish Grey in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=135) and Nails (n=4).

Feature 8 and the excavation units which occupied the horizontal space above the Walkway uncovered the following diagnostic artifacts. These artifacts are discussed in further detail as a portion of Chapter 6.

Form	**Total**
Bases	38
Jug Spouts	7
Strap Handle	7
Lug Handle	1
Rims	31
Lid	1
Nails	125
Glass	4
Whiteware	24

Table 5.4. Diagnostic artifacts uncovered in Feature 8.

VI. Feature 2: Kiln's Ware Chamber

Excavations began near the crest of the hillside in a region initially thought to be near the front of the kiln. EU1, EU5, and EU8 would later be labeled as Feature 2, which comprises a profile sample of the space of the ware chamber. After clearing brush and overgrowth from the hillside, the archaeological team discovered exposed stones in the topsoil. These stones appeared large in size and were embedded into the soil. Large stones were often utilized for exterior walls or buttressing materials and were typically associated with the construction of groundhog kilns (Baldwin 1993; Burrison 2008; Rhodes 1981; Sweezy 1984; Vlach 1990a; Zug 1986). Without aid of geophysical equipment it was determined that this space would be an informative location for EU1. The exposed stones in EU1 immediately informed the team that exterior wall materials were situated in this location. An initial hypothesis suggested that the kiln was orientated southeast to northwest; however these newly discovered exterior wall materials shifted the orientated north to south. EU1 continued to display buttress stone, exterior wall blocks, and arch bricks. Once EU1 was terminated it was understood that the team had discovered the kiln east wall. The directional orientation of that wall could be discerned by the angle of the base of the arch's side wall. EU5 was inserted adjacent to and west of EU1 in an effort to locate the kiln's west wall. EU5 continued to display arch bricks, but no indications of the west wall. EU8 was opened adjacent to and west of EU5. Similar to EU1, archaeologists quickly discovered exterior wall and buttress materials in EU8. At this point the team had opened three excavation units with a combined exposed space of 2m x 6m. Excavation units 1, 5, and 8 were designated as Feature 2 as a sample profile of the space of the ware chamber (Figure 5.11).

Feature 2 contained architectural materials related to the ware chamber: walls, arch, and floor. Excavations began by examining the remains of the collapsed arch. After initial exploration into the arch it was assumed that the arch collapsed at one moment in time creating a singular depositional event. The excavation team then removed the remains of the fallen arch in one excavation level. Directly beneath the arch remains were the materials of the kiln floor. With the floor and exterior wall exposed, the team next investigated the deeper layers of Feature 2 to search for other possible features and sterile sediments beneath the kiln floor. The team subdivided the Feature 2 unit at the west wall completely exposing the interior wall. During excavations the subdivided unit exposed multiple soil color changes which were later determined to be separate construction events. Feature 2 was terminated at the point where the base of the wall met sterile sediments.

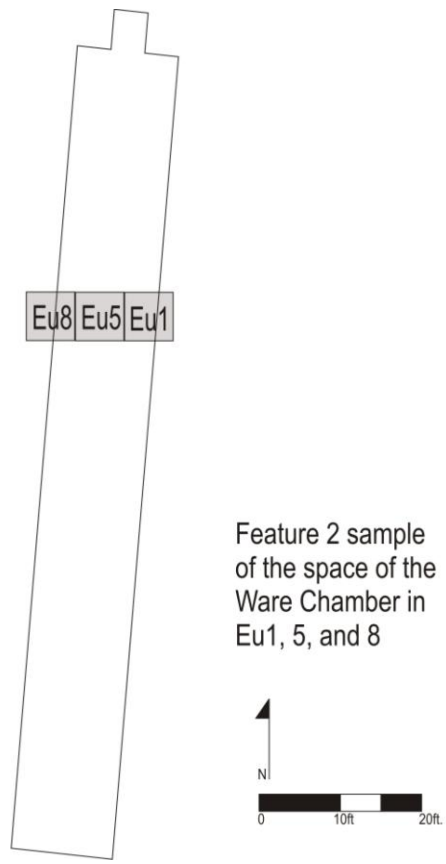


Figure 5.11. Feature 2, sample plan view of the Pottersville kiln

A. Feature 2: Ware Chamber Sample.

Feature 2 is a sample of the space of the kiln architectural element known as the ware chamber. Feature 2 was indentified during the excavations of EU 1, 5, and 8 (Figure 12). The average opening elevation was 141.623m amsl and the average closing elevation was 139.965m amsl. Feature 2 was identified when archaeologists uncovered an expanse of collapsed kiln bricks that spanned from an east to a west wall. Beneath the arch bricks laid a flat surface, or kiln floor. The kiln floor possessed a sandy texture and is Munsell color 2.5YR 4/8 Red. Exterior kiln walls were delineated, providing the east and west boundaries of the ware chamber. The exterior wall was constructed of two different material types. The interior portion of the kiln walls were constructed of standard red masonry brick (typically 2 in. thick x 4 in. wide x 8 in. long) while the exterior walls were constructed of refractory bricks (4 inches (in). thick x 1 ft. wide x 1 ft. long). Refractory bricks were utilized for both the exterior wall and the arch which spans from wall to wall. The masonry brick are Munsell 10R 4/4 Weak Red in color and are heavily discolored to 10R 2.5/1 Reddish Black. Discoloring of the interior kiln walls was an effect of both kiln firing temperatures and fly-ash, which consists of particulate matter from burning wood that traveled through the ware chamber during the firing process. During the course of excavations a section of masonry brick was removed in order to view the exterior kiln wall. The exterior wall was constructed of refractory brick and also showed signs of surface alteration due to the firing process. The color alteration of the exterior wall resulted from the same processes as those that affected the red brick interior wall (Figure 5.12).

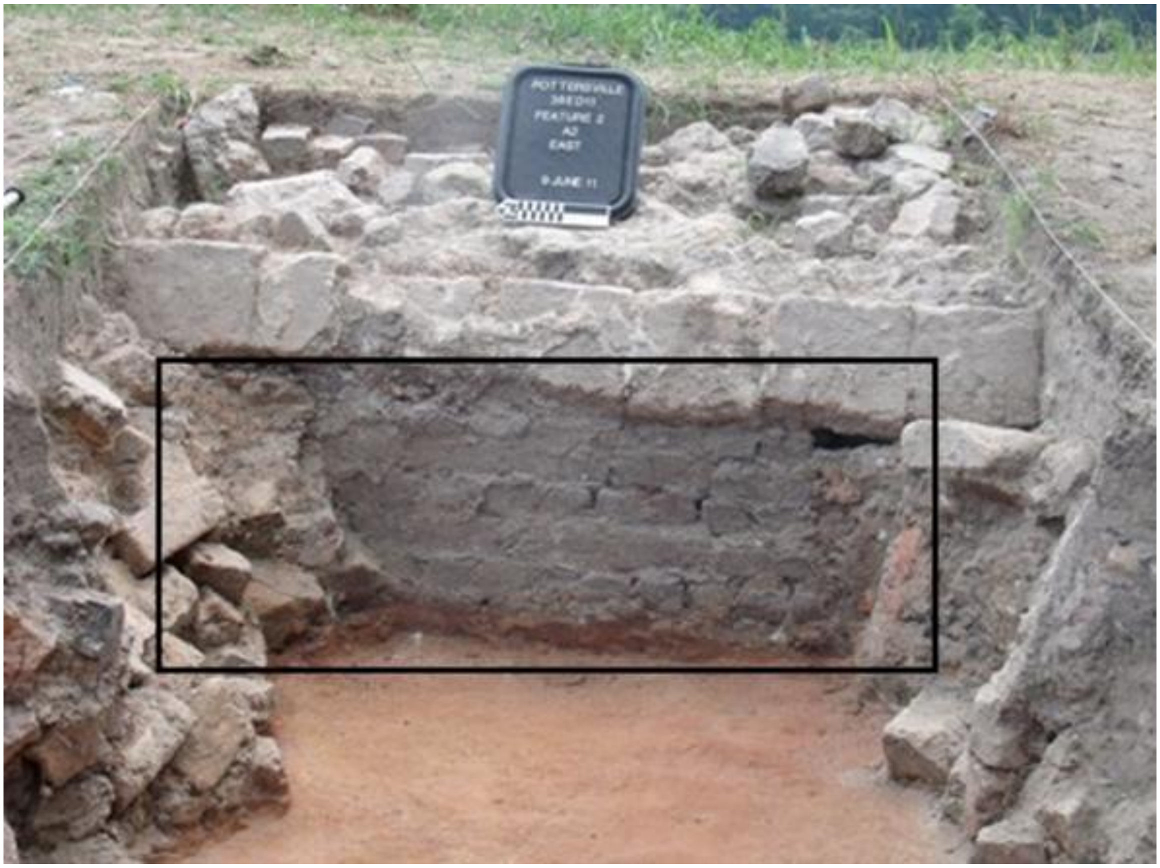


Figure 5.12. Sample of heat altered brick utilized within the ware chamber to constrict the over interior space.

A total of seven floor levels were excavated within Feature 2 (Figure 4.14). Each excavated floor level displayed differences in color relative to the other, adjacent floor levels. Artifacts were also discovered in each of the seven floor levels. The top of the original (deepest) floor level was delineated at 140.315m amsl while the top of the seventh floor was at 141.623m amsl. The red brick wall can also be viewed as a construction event to modify the kiln space. Laid in staggered bricks stacked two rows deep, the red brick wall is the final effort to further reduce the kiln's interior space within the ware chamber. The first course of brick was laid upon the top of the final floor. By adding the red brick interior wall to both sides, the kiln dimensions were decreased from 10 ft. in interior space width down to 9 ft. in width. The final estimated volume of the ware chamber was a mere 3,510 cubic ft., down from the originally constructed 6,480 cubic feet.

The seven successive floors suggest an intentional constriction of the kiln interior over time (Figure 5.13). The reduction of the interior space would have allowed for fewer vessels and/or shorter vessels to be fired while consuming less firewood and other valuable resources. It is unclear at this juncture if the purpose was to adjust the space in response to shifting demands for pottery vessels sizes or simply to increase wood burning and heat convection efficiencies. An interpretation of purposeful construction of space at Pottersville was strengthened by the results of a later survey of a similar kiln in Edgefield, located at the Stony Bluff site. The Stony Bluff kiln was in operation during the Potterville kiln's later years. A survey into the ware chamber at Stony Bluff indicates that this kiln was the same dimension as the later, constructed dimensions of the Potterville kiln; however the floor at Stony Bluff appears to have consisted of only one stratragraphic level installed at the outset of the Stony Bluff kiln's construction (Calfas 2012).

One can expect to find the remains of broken pottery in the floor space of such a ware chamber at Pottersville due to either of two likely reasons. The first involves vessel failure and the second concerns vessel supports. When a vessel fails during kiln firing, the large sherds would be removed from the interior space in order to maintain a clear working environment. Removing sherds would maximize the space within the ware chamber. However, it is also difficult to remove every small sherd. During excavations, stoneware sherds discovered in the ware chamber in Feature 2 were smaller than 2cm in diameter. Much like sweeping activities, it can be assumed that when small sherds were encountered that these fragments would be tossed toward the kiln wall in order to remove them from the main work space within the ware chamber. Fragments tossed against the interior wall could later provide a secondary function within the ware chamber. These sherds were often uses as “shims” and separators for new vessels to be fired and were referred to as “kiln furniture.”

Figure 5.13. Sample profile of the west wall with seven identifiable stratagraphic layers. The survey rod, which displays one-foot colored increments, is resting against the interior of the west exterior wall; the wall is constructed of fire brick and displays discoloration due to heat alteration.

Saggers are cylindrical containers and other larger-scale separators that were the most common type of kiln furniture utilized in ceramic manufacturing centers. The historical and archaeological records related to Pottersville are devoid of any discussion or materials that would indicate that saggers were utilized at Pottersville. Saggers enable manufacturers to maximize interior kiln space by allowing for the stacking and separation vessels from one another within enclosed cylinders. In contrast, in the loading of an alkaline glaze kiln, vessels could be stacked without the use of saggers. This open separation and stacking of vessels also allowed for fly ash to travel throughout the kiln space and to adhere to each vessel; this produced an ornamental effect in the coloration of the glaze the vessel exteriors during firing. Thus the use of saggers would not have been particularly beneficial for stacking large utilitarian vessels, and saggers were often used for smaller vessels at other production sites. However, since the Pottersville kiln was constructed with a slope of 8.21 degrees, leveling of the vessels would have been important.

Sherds were utilized as shims under the low end of a vessel in order to offset the slope within the Pottersville kiln. Previously fired sherds could be used against the unglazed vessel base without concerns that the sherd would adhere to the vessel. At the base of the original (deepest) floor level uncovered in Feature 2, the team discovered an early modern machine cut nail which dates to 1790-1810. Such artifacts relate to the construction of the Pottersville kiln sometime between 1809 and 1817. The cut nail could have come to rest in this location within the ware chamber by numerous processes but two are most likely. First, the nail could have fallen onto the kiln floor during the construction of an overhead wooden structure that rose over the exterior of the kiln. Such a structure would have been necessary to protect the kiln from weather during operation and during the post-firing cool down. This would suggest that the wooden structure may have been built at the same time that the base of the kiln walls were erected and before completion of the kiln's long ware chamber.

The more likely cause of deposition of this cut nail was that it was utilized in the construction of a wooden framework that supported the arch of the kiln's barrel vault during its construction. A wooden framed scaffold would have been used to create a uniformed curvature of the arch throughout the length of the kiln is barrel vault covering the ware chamber. Such wood scaffolds are often constructed for the entire length of the kiln or by segment. Scaffolds allow arch bricks to be laid across the span of the kiln. Once mortar between the arch bricks has dried the scaffold can be moved to the next section, removed, or burned in place during the initial firing and curing of the kiln (Cardew 1969; Gregory 1977; Olsen 1973, 1983). Only one nail was recovered in this space so it is more likely that the arch mold was moved or dismantled in this space leaving the nail to fall upon the floor. Many more, similar nails would have been present if the scaffold had been burned in place during initial firings of the kiln to solidify the bricks of the barrel vault.

An architectural element called a "skew" block was found at the location where the arch and lower walls of the barrel vault met within the ware chamber of the Pottersville kiln. A skew block was made of the same materials as the exterior wall block and arch brick, and the interior edge of the skew block is cut to form an angle. This angle became the first portion of the arch; the base angle for the Pottersville kiln's skew block was 40 degrees. The 40 degree base angle afforded an analyst with the ability to reconstruct the curvature and span of the arch of the barrel vault, calculating both the number of 1 ft. wide arch blocks to span across the 10 foot wide space between kiln walls (n=35) and the maximum height from floor to top-center of the arch of the barrel vault (8 ft.).

Square ports were typically cut into the arch roof of such kilns to maintain visual access to the space within the ware chamber. These ports could also be utilized to alter the amount of oxygen allowed into the ware chamber. By altering the amount of oxygen, heated air could be pulled into a given section of the kiln to intensify the fire and increase the temperature. Such ports allowed for equal distribution of heat to the upper regions in the kiln's interior (Leach et al. 1976, Lovejoy 1935, Robson 1954).

Buttress stones and other materials were discovered along the exterior of Features 2, 3, 4, and 5. Buttressing provided strength to the kiln's barrel vault. The curve of the kiln arch placed outward pressure on the exterior walls. Due to mass and pressure approximately 1 cubic ton of force was likely placed upon the base of the exterior walls of the Pottersville kiln. Buttress stones at Pottersville extended outward and upward along kiln walls. This construction technique provided added weight and friction which absorbed the outward pressure placed upon the exterior walls. Materials used for buttressing at Pottersville were granitic materials and local clay. The clay intermixed with the stone was heated during the kiln firing process, which allowed the material to act as a mortar between the stones.

Unit Summaries for Feature 2

Excavation Unit 1 Summary

Excavation Unit (EU) 1 measured 2m x 2m and is located at N976 E958 from the site datum which was designated N1000 E1000 in meters. Location of EU1 was selected based upon exposed stones which appeared represent the remains of an exterior wall constructed of granitic material (Munsell color 5G 4/1 Dark Greenish Grey). These exposed stones appeared to have been structural elements and were articulated in the soil in a general north-south orientation. EU1 was excavated in four levels. After the termination of Level A4, excavations continued in this space but would be later designated as Feature 2.

Level A1's average opening elevation was 141.872m amsl and the average closing elevation was 141.826m amsl. Colors of soils within the excavation area included 10 YR 5/3 Brown, 10 YR 6/3 Pale Brown, and mottled 10 YR 5/3-6/3 Red with Sandy Clay texture. Artifacts discovered at this depth included: Stoneware (n=36), Whiteware (n=7), and Nails (n=11).

Level A2's average opening elevation was 141.826m amsl and the average closing elevation was 141.807m amsl. Soils within the excavation area were 10 YR 4/2 Dark Grey in color and had a Sandy clay texture. Artifacts uncovered at this depth included: Charcoal, Bone (n=1), Stoneware (n=78), Whiteware (n=7), and Nails (n=28).

Level A3's average opening elevation was 141.807m amsl and the average closing elevation was 141.656m amsl. Soils within the excavation area were 10 YR 5/2 Grey Brown in color and Hard Sandy Clay texture. Artifacts discovered at this depth included: Charcoal, Bone, Stoneware (n=48), Whiteware (n=19), Yellow ware (n=2), and Nails (n=33).

Level A4's average opening elevation was 141.656m amsl and the average closing elevation was 141.673m amsl. Soils within the excavation area were 10 YR 6/1

Grey in color and Sandy texture. Artifacts discovered at this depth included: Stoneware (n=34), Whiteware (n=6), and Nails (n=5).

Excavation Unit 5 Summary

Excavation Unit 5 measured 2m x 2m and was located at N962 E956 on the site grid, inserted adjacent to and west of EU1. EU1 displayed signs of architectural arch bricks and EU5 was opened in an attempt to determine the extent of the feature. EU5 was excavated in two levels. Due to the discovery of an interior wall, excavations were terminated at the base of Level A2.

Level A1's average opening elevation was 140.470m amsl and the average closing elevation was 140.056m amsl. Soils within the excavation area were 7.5 YR 3/2 Dark Brown in color and Sandy texture. Artifacts discovered at this depth included: Stoneware (n=80), Glass (n=1), Whiteware (n=7), Pearlware (n=1), and Nails (n=27).

Level A2's average opening elevation was 140.056m amsl and the average closing elevation was 140.102m amsl. Soils within the excavation area were 7.5 YR 5/4 Brown in color and Sandy texture. Artifacts discovered at this depth included: Stoneware (n=42), Glass (n=4), Whiteware (n=10), Yellow ware (n=1), and Nails (n=11).

Excavation Unit 8 Summary

Excavation Unit 8 measured 2m x 2m and is located at N976 E954 on the site grid. EU8 was excavated in one level. EU8 exposed the kiln's west buttressed wall. After the termination of Level A1 excavations continued in this space but would be later designated as Feature 2.

Level A1’s average opening elevation was 141.347m amsl and the average closing elevation was 141.428m amsl. Soils within the excavation area were 10 YR 7/2 Light Grey and 10 YR 7/4 Very Pale Brown in color and sandy clay texture. Artifacts uncovered at this depth included: Stoneware (n=166), Whiteware (n=12), and Nails (n=29).

Feature 2 Summary

When excavation units EU1, EU5 and EU8 revealed a cross-section of the ware bed of the kiln structure, the next levels of excavation in those units were labeled as arbitrary levels a1-b4 of Feature 2 (Figures 5.14 and 5.15). Feature 2 represents a cross-section sampling of the ware bed floor and interior space (Figure 5.14). Level a1’s average opening elevation was 141.623m amsl and the average closing elevation was 141.357m amsl. Soils within the excavation area were Munsell color 5YR 4/1 Dark Gray in color and Sandy in texture. Artifacts discovered at this depth included: Stoneware (n=50), Whiteware (n=5), and Nails (n=6).

Level a2’s average opening elevation was 141.357m amsl and the average closing elevation was 140.882m amsl. Soils within the excavation area ranged in color from 2.5YR 4/8 Red to 2.5 YR 7/16 Red Yellow and exhibited a Sandy texture. Artifacts discovered at this depth included: Bone, Stoneware (n=208), Whiteware (n=6), Nails (n=29), and an experimental object (n=1). The experimental object is white with blue glazing and very likely represents an attempt to create whiteware or porcelain. Abner Landrum was granted $2,000 by the state of South Carolina to produce porcelain at Pottersville and this artifact likely represents part of his efforts to do so (Landrum 1812).

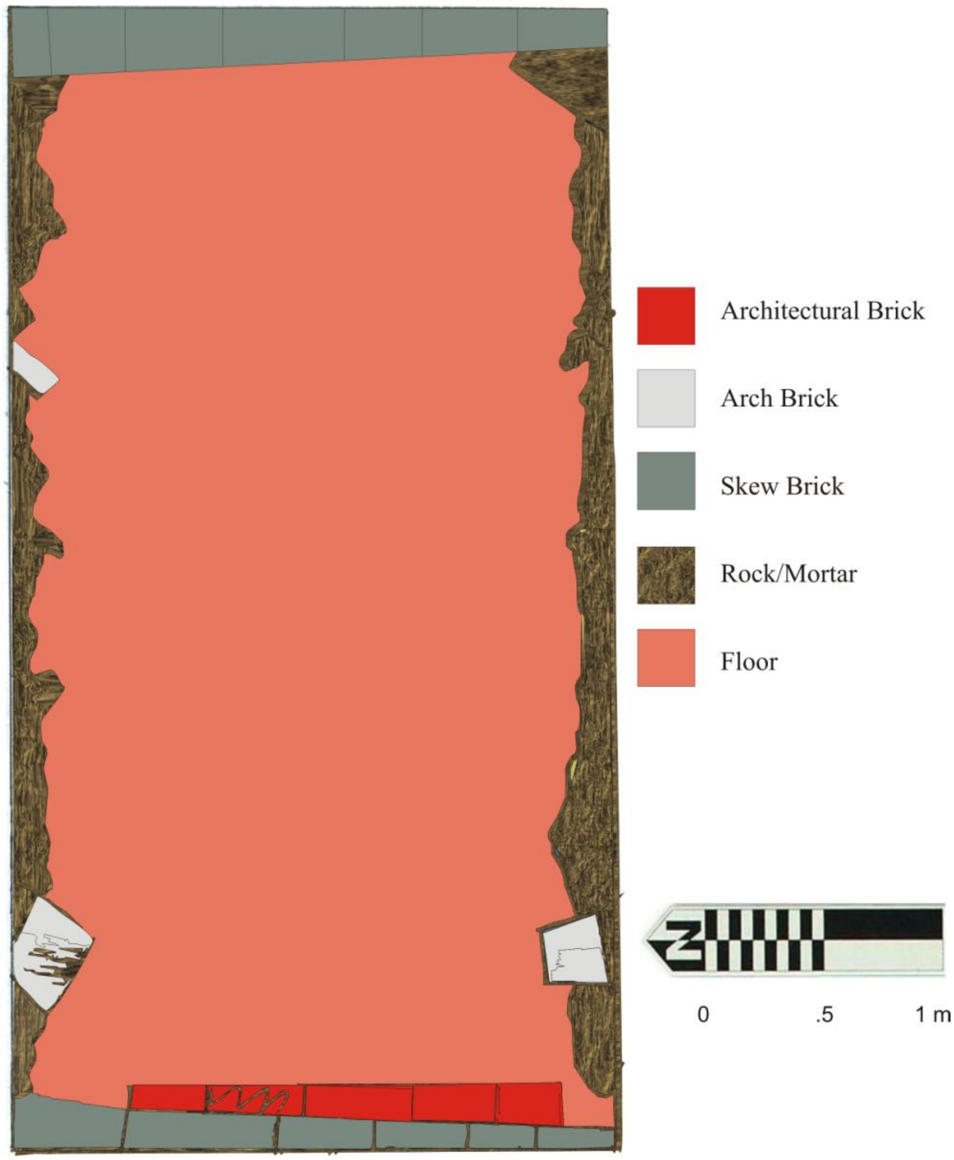


Figure 5.14. Overhead view of Feature 2. Feature 2 provides a cross-section sample of the ware chamber, which was 9 feet in width.

Level b1's average opening elevation was 140.882m amsl and the average closing elevation was 140.592m amsl. Soils within the excavation were 10R 7/3 Pink mottled in color with 10YR 6/6 Brownish Yellow and a Sandy Loamy texture. Artifacts uncovered at this depth included: Stoneware (n=37) and Nails (n=9).

Level b2's average opening elevation was 140.592m amsl and the average closing elevation was 140.566m amsl. Soils within the excavation area were 10R 4/6 Yellowish Red mottled with 10YR 5/6 Strong Brown in color and a Sandy texture. Artifacts discovered at this depth included: Stoneware (n=51) and Nails (n=1).

Level b3's average opening elevation was 140.566m amsl and the average closing elevation was 140.315m amsl. Soils within the excavation area were 10R 4/2 Red mottled with 10YR 5/6 Strong Brown in color and a Clay texture. Artifacts uncovered at this depth included: Stoneware (n=13).

Level b4's average opening elevation was 140.315m amsl and the average closing elevation was 139.965m amsl. Soils within the excavation area were 2.5 YR 4/8 Red in color and a Clay texture. Artifacts discovered at this depth included Stoneware (n=33).

Feature 2 and the excavation units which occupied the horizontal space above the Ware Chamber uncovered the following diagnostic artifacts. These artifacts are discussed in further detail as a portion of Chapter 6.

Form	Total
Bases	13
Jug Spouts	4
Strap Handle	11
Lug Handle	6
Rims	31
Nails	179
Glass	8
Whiteware	77

Table 5.5. Diagnostic artifacts uncovered in Feature 2.

Figure 5.15. Overhead view of Feature 2. Feature 2 provides a cross-section sample of the ware chamber, which was 9 feet in width. Image taken from the west exterior wall facing east.

VII. Feature 5: Kiln Chimney

At the crest of the hillside a group of excavation units were inserted in an attempt to locate the chimney end of the Pottersville kiln. The chimney location consists of EU 17, EU 19, EU 20, EU 21, EU 22, and EU 24. Exposed stones were visible in this area of the kiln site. EU 17 was inserted equidistant between, and on-line with, exposed stones on the east and west side of the observable kiln contours. The chimney was predicted to be centered along the rear of the kiln and EU 17 was placed over the center of that likely feature location. EU 17 did not reveal the chimney; however a rubble pile in the southeast corner of EU 17 enabled the team to locate the east wall of the kiln. To regain architectural elements, EU 19 was inserted adjacent to and east of EU 17. The structural wall in EU 19 terminated and turned 90 degrees to the west. The kiln corner in EU 19 was identified as the northeast corner of the kiln's ware chamber. To follow this westward turned wall, EU 20 was inserted adjacent to and west of EU 19. Within EU 20 the westward wall terminated and turned 90 degrees north. This wall segment extended 5 feet to the north, terminated and turned 90 degrees to the west. To follow the wall from EU 20, EU 21 was inserted adjacent to and west of EU 20. The wall segment continued east to west through EU 20. EU 21 was inserted adjacent to and west of EU 20 in an attempt to further locate the east-west wall. EU 21 displayed the termination of the wall segment and a 90 degree turn to the south. The southward wall extended 5 feet prior to turning 90 degrees to the west and then 5 feet before turning 90 degrees south. At this point, the team discovered that the farthest extent of the kiln had been identified. EU 24 was inserted adjacent to and south of EU 21 in order to identify any connection point between the chimney and the ware chamber (Figure 5.16).

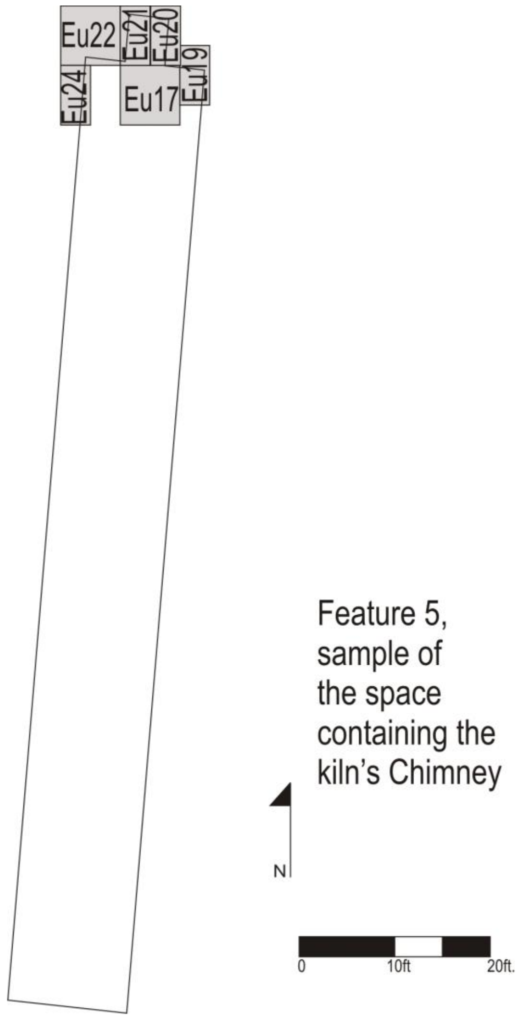


Figure 5.16. Feature 5, excavation units uncovering the chimney base of the Pottersville kiln.

Feature 5 consists of the base of the kiln architectural element known as the kilns "chimney." Feature 5 was indentified during the excavations of EUs 18-24 (Figure 5.16 and 5.17). The average opening elevation was 141.254m amsl and the average closing elevation was 140.857m amsl. The dimensions of the chimney base were 5 feet wide x 5 feet long. With a maximum dimension of 25 square feet, the air outlet space would have been slightly smaller when compared to the combined air intake at the fire mouths at the front end of the Pottersville kiln. This similar dimension would have allowed for heated air to be pulled from the front of the kiln to the chimney in the rear. The pulling of heated air uphill allows for stoneware temperature to be obtained near the rear of the kiln. A door 2 feet wide was situated in the exterior wall of the chimney. This door would have provided another location of the ware chamber to be loaded and unloaded. The door would have been bricked close before to firing.

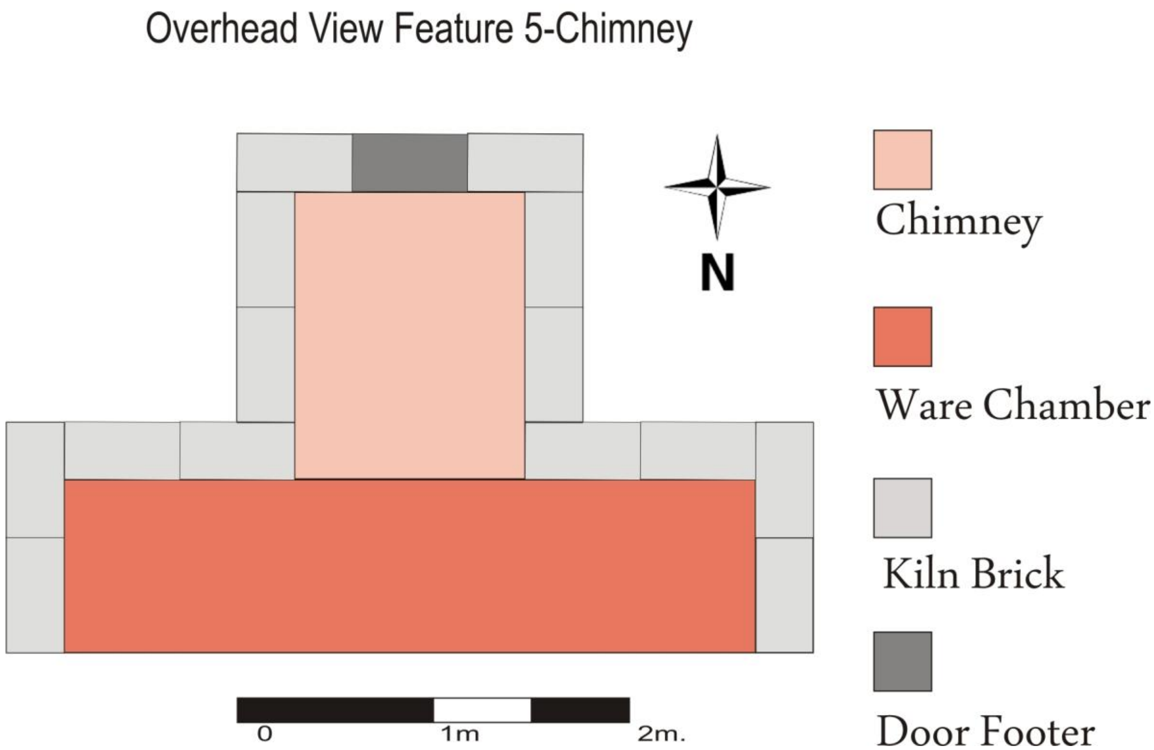


Figure 5.17. Plan view of Feature 5 the chimney base of the Pottersville kiln

Unit Summaries for Feature 5

Excavation Unit 17 Summary

EU 17 measured 2m x 2m and was located at N986 E959 on the site grid. The excavation team situated EU 17 around exposed stones near the top of the hillside location of the kiln. EU 17 and the adjacent units were inserted to locate and determine the size of the kiln's chimney base. EU 17 was excavated in three levels and after the termination of Level A3 excavations continued in this space but would be later designated as Feature 5.

Level A1's average opening elevation was 141.921m amsl and the average closing elevation was 141.665m amsl. Soils within the excavation area were 10 YR 5/3 Brown in color and a Sandy clay texture. Artifacts discovered at this depth included: Charcoal, Stoneware (n=411), Glass (n=9), Whiteware (n=5), Porcelain (n=1), Nails (n=16), and Metal (n=3).

Level A2's average opening elevation was 141.665m amsl and the average closing elevation was 141.404m amsl. Soils within the excavation area were 10 YR 6/3 Pale Brown in color and a Sandy texture. Artifacts uncovered at this depth included: Stoneware (n=83), Nails (n=4), and Metal (n=1).

Level A3's average opening elevation was 141.404m amsl and the average closing elevation was 141.271m amsl. Soils within the excavation area were 10 YR 5/4 Yellowish Brown in color and a Sandy texture. Artifacts recovered at this depth included: Stoneware (n=114), Glass (n=5), Whiteware (n=1), and Nails (n=3).

Excavation Unit 19 Summary

EU 19 measured 2m x 1m and was located at N988 E959 on the site grid. EU 19 was excavated in two levels and after the termination of Level A2 excavations continued in this space but were later designated as Feature 5.

Level A1's average opening elevation was 141.920m amsl and the average closing elevation was 141.771m amsl. Soils within the excavation area were 7.5 YR 4/6 Strong Brown in color and a Sandy texture.

Level A2's average opening elevation was 141.771m amsl and the average closing elevation was 141.342m amsl. Soils within the excavation area were 10 YR 5/3 Brown in color and Sandy Clay texture. Artifacts from EU 19 were curated together, and the combined unit totals included: Stoneware (n=253), Glass (n=25), Whiteware (n=9), and Nails (n=53).

Excavation Unit 20 Summary

EU 20 measured 2m x 1m and was located at N990 E961 on the site grid. EU 20 was excavated in four levels and after the termination of Level A2 excavations continued in this space but would be later designated as Feature 5.

Level A1's average opening elevation was 141.962m amsl and the average closing elevation was 141.871m amsl. Soils within the excavation area were 7.5 YR 5/4 Yellowish Brown in color and a Sandy texture. Artifacts recovered at this depth included: Stoneware (n=100) and Whiteware (n=2).

Level A2's average opening elevation was 141.871m amsl and the average closing elevation was 141.807m amsl. Soils within the excavation area were 10 YR 6/3 Pale Brown in color and a Sandy Clay texture. Artifacts uncovered at this depth included: Stoneware (n=253), Glass (n=25), Whiteware (n=9), Nails (n=17), and Metal (n=1).

Level B1's average opening elevation was 141.807m amsl and the average closing elevation was 141.621m amsl. Soils within the excavation area were 10YR 5/3 Brown in color with a Sandy Clay texture. Artifacts recovered at this depth included: Stoneware (n=85), Glass (n=8), Whiteware (n=2), Nails (n=7), and Metal (n=1).

Level B2's average opening elevation was 141.621m amsl and the average closing elevation was 141.258m amsl. Soils within the excavation area were 7.5 YR 5/6 Strong Brown in color with a Sandy Clay texture. Artifacts recovered at this depth included: Stoneware (n=150), Glass (n=2), and Nails (n=17).

Excavation Unit 21 Summary

EU 21 measured 1m x 2m and was located at N989 E962 on the site grid. EU 21 was excavated in two levels and after the termination of Level A2. EU 21 displayed a portion of the exterior buttressed wall of the kiln and chimney walls.

Level A1's average opening elevation was 142.061m amsl and the average closing elevation was 141.850m amsl. Soils within the excavation area were 10 YR 5/3 Brown in color and a Sandy texture. Artifacts recovered from EU20 A1 were curated and totaled with EU 21 Level A1.

Level A2's average opening elevation was 141.85m amsl and the average closing elevation was 141.572m amsl. Soils within the excavation area were 10 YR 6/2 Light Brownish-Gray in color and a Sandy Clay texture. Artifacts recovered at this depth included: Stoneware (n=305), Glass (n=2), Whiteware (n=3), and Nails (n=13).

Excavation Unit 22 Summary

EU 22 measured 2m x 2m and was located at N990 E957 on the site grid. EU22 was excavated in two levels and after the termination of Level A2 excavations continued in this space but were designated as Feature 5.

Level A1's average opening elevation was 141.9101m amsl and the average closing elevation was 141.769m amsl. Soils within the excavation area were 10 YR 5/3 Brown in color and a Sandy texture. No artifacts were recovered in this excavation unit.

Level A2's average opening elevation was 141.769m amsl and average closing elevation was 141.57m amsl. Soils within the excavation area were 10 YR 6/3 Pale Brown in color and a Sandy texture. Artifacts recovered at this depth included: Stoneware (n=239), Glass (n=6), Whiteware (n=3), and Nails (n=4).

Excavation Unit 24 Summary

EU 24 measured 1m x 2m and was located at N986 E957 on the site grid. EU 24 was excavated in one level. Level A1 displayed ware chamber architecture and was terminated due to lack of chimney architecture.

Level A1's average opening elevation was 141.799m amsl and the average closing elevation was 141.585m amsl. Soils within the excavation area were 10 Yr 5/3 Brown in color and a Sandy texture. Artifacts recovered at this depth included Stoneware (n=60).

Feature 5 Summary

When excavation of EU 17, EU 19, EU 20, EU 21, EU 22, and EU 24, revealed a cross-section of the chimney of the Pottersville kiln, the next levels of excavation in those units were labeled as arbitrary levels a1 to a2 of Feature 5. Feature 5, Level a1's average opening elevation was 141.254m amsl and the average closing elevation was 140.988m amsl. Soils within the excavation area were 2.5 YR 4/8 Red in color and a Loamy texture. Artifacts uncovered at this depth included Stoneware (n=81).

Level a2's average opening elevation was 140.988m amsl and the average closing elevation was 140.857m amsl. Soils within the excavation area were 2.5 YR 4/8 Red in color and a Clay texture. Artifacts recovered at this depth included: Stoneware (n=24) and Nails (n=3).

Feature 2 and the excavation units which occupied the horizontal space above the Ware Chamber uncovered the following diagnostic artifacts. These artifacts are discussed in further detail as a portion of Chapter 6.

Form	**Total**
Bases	56
Jug Spouts	29
Strap Handle	49
Lug Handle	8
Rims	56
Nails	134
Glass	62
Whiteware	28

Table 5.6. Diagnostic artifacts uncovered in Feature 5.

VIII. Exploratory Units

During the third week of fieldwork in the 2011 project, archaeologists with New South Associates provided a two-person team to conduct a ground penetrating radar (GPR) survey at the site. The GPR team confirmed that the discoveries along the hillside of the Pottersville kiln were indeed one contiguous feature, rather than a sequence from of multiple kilns from separate construction events. The GPR survey also revealed several other geophysical anomalies located outside of the kiln space. Interested in labor sites and debitage deposits associated with the kiln, the team selected two GPR anomalies to explore through excavation units: anomalies A1 and A2. EU 15 was established to investigate anomaly A1 and EU 18 targeted anomaly A2 (Figure 5.18).

EU 15 was inserted into the uphill side of the slope and 4m east of the kiln walls discovered in association with GPR anomaly A1. Pottery production sites often contain waster piles near kiln walls and this unit was set to explore the potential of such a feature. This waster pile location contained only one excavation unit, yet displayed valuable information. Most often, broken materials are taken away from the operation space in and around the kiln; however small fragments are often left along the kiln sides. The waster discovered in association with EU 15 contained small amounts of stoneware and large quantities of kiln and architectural brick. Piling of brick near the kiln would have provided additional insulation for the kiln. Insulation is paramount near the back of the kiln since these spaces were often more difficult to achieve and maintain high firing temperatures.

EU 18 was inserted into the uphill side of the slope and 6m west of the kiln walls discovered in association with Feature 2. GPR anomaly A2 detected materials at 20-80 cm in depth. Similar to other portions of the excavation site the first level of soils displayed large amounts of stoneware. EU 18 was terminated at a depth of 25cm once sterile soil was encountered. Future field season excavations could explore this region and the other associated geophysical anomalies further to determine if this area contains archaeological material or was part of agricultural activities later impacting the area.

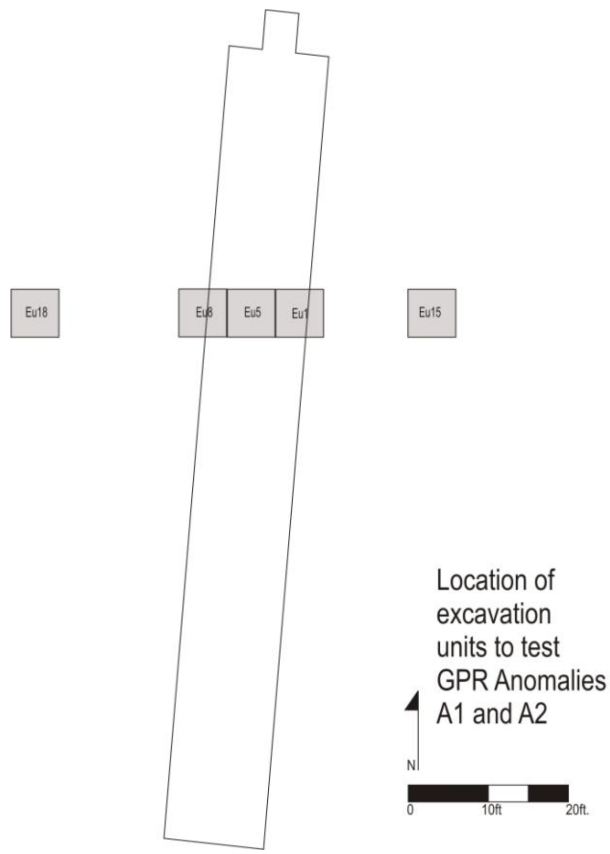


Figure 5.18. Excavation Units 15 and 18 in area of GPR anomalies A1 and A2 at Pottersville kiln site.

Excavation Unit 15 Summary

EU 15 measured 2m x 2m and was located at N976 E967 on the site grid. EU 15 was an exploratory unit placed outside of the kiln space to test for a waster pile. EU 15 displayed large amounts of kiln bricks and some stoneware fragments. The unit was terminated at the base of Level A2 after encountering sterile soil.

Level A1's average opening elevation was 141.601m amsl and the average closing elevation was 141.260m amsl. Soils within the excavation area were 10 YR 5/2 Grayish Brown in color and a Sandy texture. Artifacts discovered at this depth included: Stoneware (n=73), Glass (n=20), Whiteware (n=36), Bone, Brick (n=1), and Nails (n=162).

Level A2’s average opening elevation was 141.260m amsl and the average closing elevation was 141.074m amsl. Soils within the excavation area were 7.5 YR 4/3 Brown and mottled 25% with 10YR 6/6 Brownish in color and a Sandy texture. Artifacts recovered from this depth included: Stoneware (n=34) Whiteware (n=11), and Nails (n=19).

Excavation Unit 18 Summary

EU 18 measured 2m x 2m and was located at N976 E967 on the site grid. EU 18 was an exploratory unit placed outside of the kiln space to test GPR anomaly A2. The unit was terminated at the base of Level A2 after encountering sterile soil.

Level A1’s average opening elevation was 140.673m amsl and the average closing elevation was 140.515m amsl. Soils within the excavation area were 7.5 YR 6/8 Reddish Yellow in color and a Clay texture. Artifacts uncovered at this depth included: Stoneware (n=358) and Whiteware (n=6).

Level A2’s average opening elevation was 140.525m amsl and the average closing elevation was 140.453m amsl. Soils within the excavation area were 2.5 YR 4/8 Red in color with a hard clay texture. Artifacts uncovered at this depth included: Stoneware (n=28).

IX. Additional Archaeological Fieldwork Focused on Edgefield Stoneware Kilns

The 2011 archaeological investigations at the Pottersville kiln site concluded on July 1, 2011. During the process of research archaeologists inserted and examined 24 excavation units in an effort to determine the Pottersville kiln’s architectural design.

Through this investigation, researchers unearthed intact portions of America's first alkaline glazed stoneware manufacturing facility. The 2011 archaeological research discovered unexpected information regarding this American kiln technology. These discoveries led to a reexamination into the origins of alkaline glaze stoneware and the kiln technology utilized for its manufacture in the early decades of the Edgefield district. The preceding discussion detailed the excavations and features at the Pottersville site, and Chapter 5 will provide an analysis of artifacts in those contexts.

Fortunately, the Pottersville kiln was not the only production facility in the Edgefield district. Documentary and archaeological research identified a total of 14 production facilities that operated from 1815 to 1900 in that region. Many of those Edgefield district stoneware facilities have been destroyed or the exact location has yet to be determined. Fortunately, collaborations between the author, landowners, and local archaeologists have yielded important information regarding two production facilities that were contemporary to the Pottersville site. The following discussion summarizes research at the Reverend John Landrum and Stony Bluff kiln sites to indentify similarities and differences utilized in stoneware production at those kilns.

A. Rev. John L Landrum kiln site

The Rev. John Landrum (JL) kiln site (38AK497) is located in Aiken County and is situated approximately 15 miles south of the town of Edgefield, South Carolina. The JL kiln site was operated from approximately 1817 to 1867. The JL facility was listed on the 1817 survey map cited by Mills in 1826 and the site was known to be abandoned by 1867 when then-owner Lewis Miles left the tract of land to open a different manufacturing facility elsewhere (Mills 1826; Baldwin 1993: 44). This JL site is situated near two water sources called Gopher Branch and Horse Creek. The remains of two kilns are located near the mid-point of the north slope of a small hill at the JL site. Down the hill towards the creeks are the remains of a stone foundation of a historic-period structure, possibly a mill or workshop. To the northeast of one of the kilns, near the base of the hill, the current terrain does not match the contours displayed in a 2011 U.S.G.S. topographic map for the area, indicating that the land has been disturbed at some time since the 1987 survey period of that map. The disturbed are a displayed little to no clay, which suggests that this could have been an area of a clay extraction pit. Extant surface clay was 10YR 6/8 Brownish-Yellow to 10YR 8/2 Very Pale Brown in color.

The JL kiln was constructed after the Pottersville kiln was established. Archaeological investigations of the JL kiln, in comparison with Pottersville, can provide insight into the maintenance or shifts in production methods in the early 1800s in Edgefield. However, archaeological investigations at the JL site, 38AK497, have thus far been limited. In 1987 a general archaeological survey was conducted at the site to determine the integrity of the archaeological record. In 2009, I conducted a surface collection at the site to gather samples for an Edgefield district elemental analysis study (discussed in Chapter 8 of this dissertation). Finally, in 2011 archaeologist Carl Steen, who has served as a field technician for the 1998 survey at the JL site, and students from the UIUC archaeological field school conducted an intensive survey to identify the exact location of the JL kiln remains within the 38AK497 site.

Testing at 38AK497 discovered the remains of two kilns and these archaeological features are referred to as “Kiln A” and “Kiln B” (Castille et al. 1988; Steen 2011). Kiln A was discovered during the 1987 survey and Kiln B during the 2011 survey. The authors of the survey described Kiln A as possessing characteristics similar to those found in the excavations of the Pottersville kiln, including a surface depression, north-south orientation of a kiln, and white fire brick remains. Additional information about Kiln A was provided in the following survey summary:

> Test Unit 1 was placed along the east edge of the suspected kiln structure referred to as Kiln A. This structured appeared as an oblong depression with brick and stone rubble scattered at the north end. Test unit was placed along the east rim of the depression in an attempt to locate possible foundation remnant of the kiln. Excavation was terminated at 3.3 feet below surface because a brick foundation was encountered at a depth of about 3 feet. It is oriented north-south. The foundation is at least 2 brick thick. The bricks are large, soft, white firebrick, characteristic on all kiln sites examined during this survey. The width of the feature could not be determined because it extended into the west wall of the unit. This foundation probably represents either a wall or floor of a kiln. Artifacts found during the excavation of Test Unit 1 included only a few ceramic and brick fragments. (Castille et al. 1988:73)

Kiln B yielded both similar and differing results when compared to Kiln A and the Pottersville kiln. Kiln B is situated on a near-flat slope while the other two kilns are positioned on a slope of approximately 8 to 10 degrees. Kiln B is oriented northwest to southeast while Kiln A and Pottersville are oriented south to north. The one similarity is the size of the Kiln B in relation to the Pottersville kiln. The extent of Kiln B could not be fully explored since the feature entered into private property, however it can be determined that the kiln structure was at a minimum 70 feet in length and the interior walls were approximately 9 feet apart (Steen 2011). The research conducted in 1987 and 2011 coupled with the findings at the Pottersville kiln site all suggest that these early Edgefield kilns possessed a similar construction design. The owners and designers of these early kilns were members within the same family. It is therefore a strong likelihood that the information about kiln technology was shared within that group. However, at this point since JL Kiln A and Kiln B have not been fully excavated, it is unclear if the Pottersville kiln design was replicated or altered in some manner to increase efficiency at the later JL site.

Artifacts recovered during the 1987, 2009, and 2011 research projects at JL have confirmed that during manufacturing operations potters at the JL kiln created alkaline glaze stoneware vessels similar to those created at Pottersville. JL kiln vessel types included bowls, jars, and jugs. Authors of the 1988 archaeological survey reported that potters at the JL site incorporated incised rings around the shoulders of the jugs (Castille et al. 1988:85). These incised rings consisted of circular groves cut into the shoulder of stoneware jugs during the throwing process. Additionally, both surveys at the JL site discovered kiln furniture (Figure 5.19). Kiln furniture was very likely utilized during the firing process so that vessels could be stacked toward the top of the kiln's barrel vault. However, few samples have been discovered in Edgefield archaeological surveys and researchers are unsure about how often and what type of kiln furniture was utilized during firing operations.

Ceramic sherds are spread for hundreds of meters in all directions around the remains of the two kilns at the JL site. One of the most interesting sherds collected during survey of the site was a vessel base with an impressed "X" (Figure 6) (Joseph 2007). Incised marks of many different shapes and designs have been noted on many other artifacts originating from the JL site. Several pieces of kiln furniture were found near the mouth of the JL kilns, and these items appear to have been used over numerous firings due to the amount of residual glaze on the exterior of the objects.

Figure 5.19. Kiln furniture, stoneware separators, discovered at Kiln B at the JL site. Photo Carl Steen.

B. Stony Bluff Production Facility

The archaeological survey conducted at the Stony Bluff kiln site (38AK854) also provided insights into kiln technology utilized in the early 19th century Edgefield production facilities. The location of the Stony Bluff kiln has been identified by local historians; however archaeologists have yet to perform a survey at the site. These historians suggest that the observable terrain at Stony Bluff is similar to the observed terrain at Pottersville and they suggested that the foundations of the kiln remained intact just beneath the surface (Figure 5.20). Based upon excavation of the Pottersville kiln site and the observed terrain at Stony Bluff it is a strong likelihood that many of the early Edgefield stoneware kilns were constructed utilizing similar designs. To undertake a preliminary test of this hypothesis, an archaeological survey was executed at Stony Bluff in 2012 with a focus on the kiln dimensions and the basic characteristics.

The goal of the Stony Bluff survey was to identify any existing kiln architecture and examine the degree of similarity of dimensions of basic design of the Stony Bluff, JL, and Pottersville kilns. The investigation plan for the survey was to place 3 excavation units in the area of the Stony Bluff kiln to target the front wall/fire mouth, the ware chamber, and chimney. By locating these architectural elements we sought to determine the size of the Stony Bluff kiln and determine if similar kiln construction designs were utilized in these early kilns within the Edgefield district.

Figure 5.20. Stony Bluff kiln site (38AK854).

1. Fieldwork Plan

Archaeological survey took place in May 2012. Research was led by the UIUC in collaboration with Carl Steen of the Diachronic Research Foundation and Sean Taylor of the South Carolina Department of Natural Resources. The survey research design was based upon information learned through excavations at the Pottersville and JL kiln sites. Knowledge gained from these previous excavations allowed the research team to develop the following survey protocol designed to explore architectural features related to 19th century stoneware industry.

(1). Establish Datum and Grid in the area of kiln.

(2). Probe areas of higher elevation. The barrel vault of the kiln was assumed to have collapsed or removed. Based upon previous fieldwork the higher elevations are often locations in which there would be better preservation of the physical representation of the kiln exterior walls. By indentifying the walls it is assumed that probing will aid in the discovery of the kiln's terminal points which will allow for pinpoint establishment of excavation units in the region of specific features.

(3). Establish three excavation units, one at each terminal point of the kiln and the third widthwise across the kiln in order to examine the kiln ware chamber.

(4). Excavation depths are established by natural and cultural strata. Use of arbitrary excavations levels are utilized until natural or cultural strata are encountered. For excavation levels without identifiable changes in strata arbitrary depths of 25cm were utilized. The exterior of the kiln structure and associated artifacts can provide data and inferences for dating; the interior of the kiln should be mostly free of datable artifacts.

(5). Identify the kiln dimensions to examine construction design in relation to Pottersville and other early kilns within the Edgefield district.

(6). Indentify interior/exterior of the kiln. To facilitate comparison of kiln architectural elements from multiple sites, feature numbers assigned to excavation units are identical to those utilized during 2011 fieldwork at Pottersville.

(a). Feature 1: This label is utilized to represent the full dimensions of the Stony Bluff kiln
(b). Feature 2: Ware chamber will provide the width and height of the kiln.
(c). Feature 3 and 4: Firebox will provide the initial point to establish a measurement of kiln's length
(d). Feature 5: Chimney is the final portion of the kiln and will provide the termination of the kiln's length.

Over the course of this archaeological survey, 3 excavation units were inserted to expose key architectural features and other materials relate to kiln design and technology. Measurements for the archaeological grid and excavation units were laid out in metric units; the kiln was likely constructed utilizing an English system of measurement. Due to heavy forestation in the area of the Stony Bluff kiln site, all excavation units were recorded with the aid of a high resolution global positioning system (GPS) receiver and all depths are recorded in below surface measurement (bsl). Excavation units and elevations will be discussed using the metric system, and measurements regarding the kiln dimensions will utilize the English system. Given the longitudinal space of the excavation area, multiple archaeological units were investigated simultaneously by the survey team. The following discussion will address Features 2-5, followed by an overall summary of the Stony Bluff's kiln structure labeled as Feature 1 (Figure 5.21).

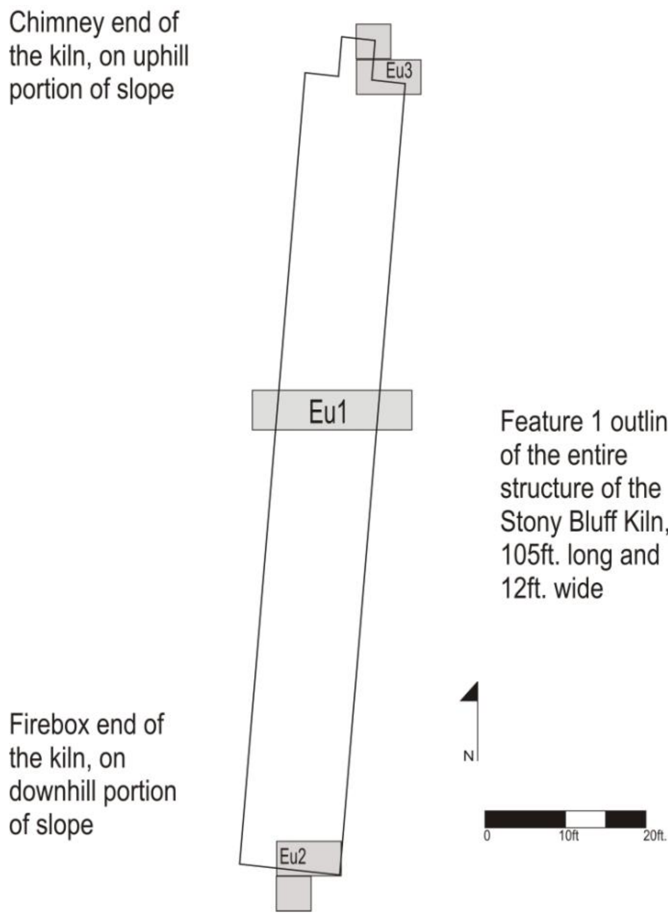


Figure 5.21. Feature 1, the Stony Bluff kiln.

Unit Summaries for Feature 3 and 4

Excavation Unit 2 Summary

Excavation Unit (EU) 2 measured 1m x 2m and is located at 1000N 1000W, measured in meters, and is 119.76m above mean sea level (amsl). EU 2 was expanded to include a 1m x 1m section down slope to fully expose the footer of the kiln's front wall. Location of EU2 was selected based upon a depression in the terrain's natural surface which appeared to represent the remains of the front exterior wall. This depression appeared similar to surface contours discovered at the JL and Pottersville kiln sites. This depression was oriented north-south and likely represented the space probable for the firebox. EU2 was excavated in five levels and terminated upon the discovery of sterile sediments beneath intact architectural materials (Figure 5.22).

Figure 5.22. Stony Bluff kiln site, Features 3 and 4, a sampled portion of the front wall and firebox in EU 2.

Level A1's average opening elevation was 119.76m amsl and the average closing elevation was 119.51m amsl. Colors of soils within the excavation area included 7.5 YR 6/4 Light Brown in color with a Sandy texture.

Level A2's average opening elevation was 119.51m amsl and the average closing elevation was 119.30m amsl. Colors of soils within the excavation area included 7.5 YR 6/4 Light Brown in color with a Sandy texture.

Level A3's average opening elevation was 119.30m amsl and the average closing elevation was 119.10m amsl. Colors of soils within the excavation area included 7.5 YR 6/4 Light Brown in color with a Sandy texture.

Level A4's average opening elevation was 119.10m amsl and the average closing elevation was 118.85m amsl. Colors of soils within the excavation area included 7.5 YR 6/4 Light Brown in color with a Sandy texture.

Level A5's average opening elevation was 118.85m amsl and the average closing elevation was 118.75m amsl. Colors of soils within the excavation area included 7.5 YR 6/4 Light Brown in color, Sandy texture. EU 2 was terminated at the base of Level 5 after sterile sediments were discovered below the base course of construction stone for the fire mouth.

Feature 3 Firebox and Feature 4 Front wall/Fire mouth

Discussion

Excavation Unit 2 is a sample of the space of the kiln architectural element known as the firebox and fire mouth. The excavation unit was established 1m x 2m to explore an observed depression in the terrain. During survey the excavated soils contained limited artifacts and disarticulated architectural materials. These construction materials consisted of broken rubble fragments, none larger than 8 inches in diameter. The kiln was very likely disassembled after manufacturing activities ceased and the broken material and tossed outward and away from the kiln.

While the kiln architecture was not intact, researchers did however encounter the floor of the firebox and the base course of construction stone of the front wall/flue in Level A5. The floor of the ware chamber was indentified due to color difference in the soil and remnants of the kiln front wall/fire mouth (Figure 5.23). The space indentified as the firebox floor was 7.5 YR 8/6 Reddish Yellow in color. At the floor, the soil texture changed to a hard packed surface. This surface is hardened over time due to the regularity in which this space encountered kiln firing temperatures. The space where the floor and front wall join displays a similar appearance when compared to the JL and Pottersville kiln sites.

Figure 5.23. Stony Bluff kiln site, Feature 3 and 4, sampled space of the kiln's front wall and firebox exposed in EU2.

Unit Summaries for Feature 2

Excavation Unit 1 Summary

Excavation Unit (EU) 1 measured 1m x 8m and is located at 1020N 998W, measured in meters, and is 124.73 meters (m) above mean sea level (amsl) (Figure 5.24). Location of EU1 was selected based upon ridges in the terrain's natural surface which appeared to represent the remains of the east and west exterior walls. These ridges appear similar to surface contours discovered at other kiln sites in the Edgefield District. These ridges are oriented in a general north-south orientation. EU1 was excavated in six levels and excavations were terminated after the discovery of sterile sediments beneath intact architectural materials.

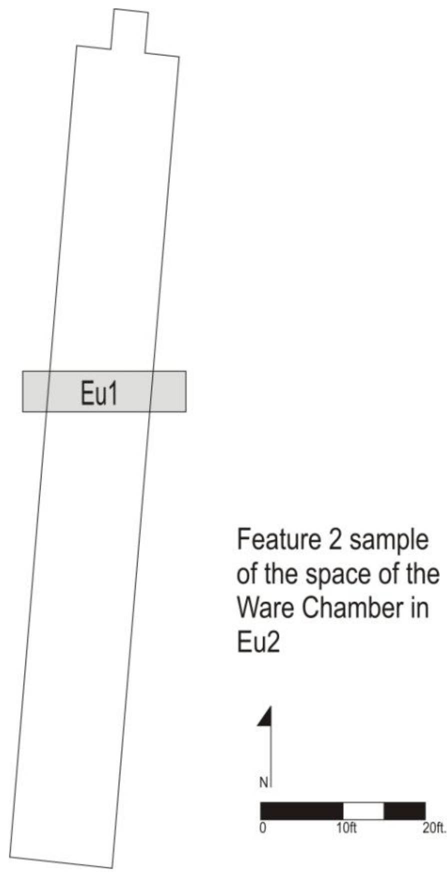


Figure 5.24. Feature 2, sample profile of the Stony Bluff kiln.

Level A1's average opening elevation was 124.73m amsl and the average closing elevation was 124.50m amsl. Colors of soils within the excavation area included 7.5 YR 6/6 Reddish Yellow in color with a Sandy texture.

Level A2's average opening elevation was 124.50m amsl and the average closing elevation was 124.30m amsl. Colors of soils within the excavation area included 7.5 YR 6/6 Reddish Yellow in color with a Sandy texture.

Level A3’s average opening elevation was 124.30m amsl and the average closing elevation was 124.0m amsl. Soils within the excavation area were 2.5 YR 4/6 Red in color with a Sandy clay texture.

Level A4’s average opening elevation was 124.0m amsl and the average closing elevation was 123.80m amsl. Soils within the excavation area were 10 YR 6/4 Light Yellowish Brown in color with a Sandy texture.

Level A5’s average opening elevation was 123.80m amsl and the average closing elevation was 123.70m amsl. Soils within the excavation area were 7.5 YR 3/3 Dark Brown in color with a Sandy texture, mottled with 7.5 3/3 Dark Brown in color with a Sandy texture.

Level A6’s average opening elevation was 123.70m amsl and the average closing elevation was 123.50m amsl. Soils within the excavation area were 7.5 YR 4/6 Strong Brown in color with a Sandy texture.

Feature 2 Ware chamber

Discussion

Excavation Unit 1 was a sample of the space of the kiln architectural element known as the ware chamber. The excavation unit was established 8m in width due to the observed ridges. During survey the excavated soils contained limited artifacts and disarticulated architectural materials. These construction materials included broken rubble fragments, none larger than 8 inches in diameter. The kiln was very likely disassembled after manufacturing activities ceased, and the broken material was tossed outward and away from the kiln. The rubble thrown away from the kiln created the earthen ridges wider than the actual kiln.

Archaeologists were able to indentify one architectural artifact, a “skew” block, in the fragments of rubble. A skew block is found at the location where the arch of the kiln’s barrel vault and the lower, upright walls join. A skew block is made of the same materials as the exterior wall block and arch brick, and the interior edge of the skew block is cut to form an angle. This angle becomes the first portion of the arch of the barrel vault; the base angle for the Stony Bluff kiln’s skew block was 40 degrees. The 40 degree base angle affords the opportunity to reconstruct the span of the arch, calculating both the number of 1 ft. wide arch blocks to span across the 10 foot wide space between kiln walls (n=35) and the maximum height from floor to top-center of the arch (8 ft.). This skew block exhibited the same angle of orientation as those uncovered at the Pottersville kiln site.

While the kiln architecture was not intact at the Stony Bluff kiln site, researchers did encounter the floor of the ware chamber in Level A5. The floor of the ware chamber was indentified due to color differences in the soil and remnants of the east kiln wall. The kiln floor was 10 R 4/8 Red in color with a Sandy texture. The west wall was not intact, but an observed color difference provided an inference as to where the wall had once been located. The west wall color is 7.5 YR 4/6 Strong Brown, and Sandy in texture. The interior measurement between the east and west wall was 10 feet and the exterior measurement was 12 feet (Figure 5.25). The interior and exterior measurements identically match those at Pottersville. Combined with the above details regarding the skew block it can be calculated that the exterior of the barrel vault of the Stony Bluff kiln would have been 6 feet in height.

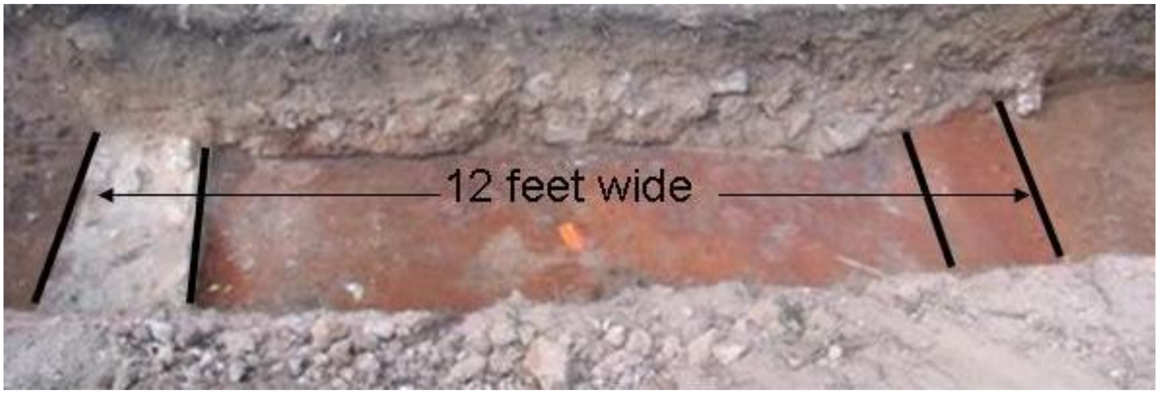


Figure 5.25. Stony Bluff kiln site, Overhead view of Feature 2. Feature 2 provides a cross-section sample of the ware chamber, which was 10 feet in interior width and 12 feet in exterior width. Image taken north to south.

Unit Summaries for Feature 5

Excavation Unit 3 Summary

Excavation Unit (EU) 3 measured 1m x 2m and is located 1035N 998W, measured in meters, and is 130.17m above mean sea level (amsl) (Figure 5.26). EU 3 was expanded to include a 1m x 1m section upslope to fully expose the footer of the kiln's chimney wall. Location of EU3 was selected based upon measurements from the front exterior wall. To test the hypothesis that Edgefield kilns are built of similar size EU3 was inserted 105 feet along the linear design of the Stony Bluff kiln. EU3 was excavated in two levels and was terminated at the discovery of sterile sediments. During excavations 10 stoneware fragments were discovered. The fragments were not diagnostic and were returned to the excavation unit during back filling.

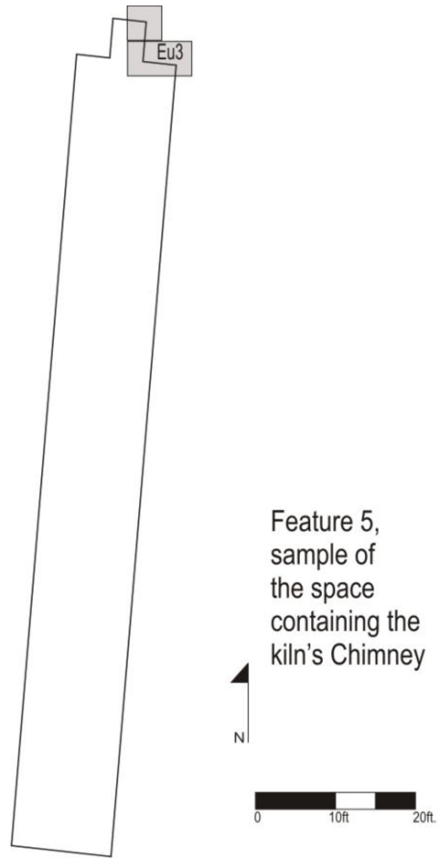


Figure 5.26. Stony Bluff kiln site, Feature 5, excavation units uncovering the chimney base of the Pottersville kiln.

Level A1's average opening elevation was 130.17m amsl and the average closing elevation was 129.95m amsl. Colors of soils within the excavation area included 7.5 YR 7/6 Reddish Yellow in color with a Sandy texture.

Level A2's average opening elevation was 129.95m amsl and the average closing elevation was 129.50m amsl. Colors of soils within the excavation area included 7.5 YR 6/8 Reddish Yellow in color with a Sandy texture, in the interior space and 7.5 YR 8/6 Reddish Yellow in color with a Sandy texture, in the exterior space.

Feature 5 Chimney Base

Discussion

Excavation Unit 2 is a sample of the space of the kiln architectural element known as the chimney base. The excavation unit was established 1m x 2m in order to test the before mentioned kiln construction hypothesis.

During excavation of EU3 the research team did not encounter any architectural materials. While the excavation until did not yield architectural materials the team did discover soil color and sediment concentration differences. The space identified as the kiln interior was a slightly darker color. This soil color difference was very likely due to diverse heating temperatures contained inside of the chimney as compared to the exterior of the kiln. Additionally, the interior soils contained inclusions of brick and mortar associated with chimney construction while the exterior space was sterile and possessed fieldstone which was commonly utilized for buttress material. The furthest point associated with the kiln construction is 105 feet from the front wall discovered in EU3 (Figure 5.27).

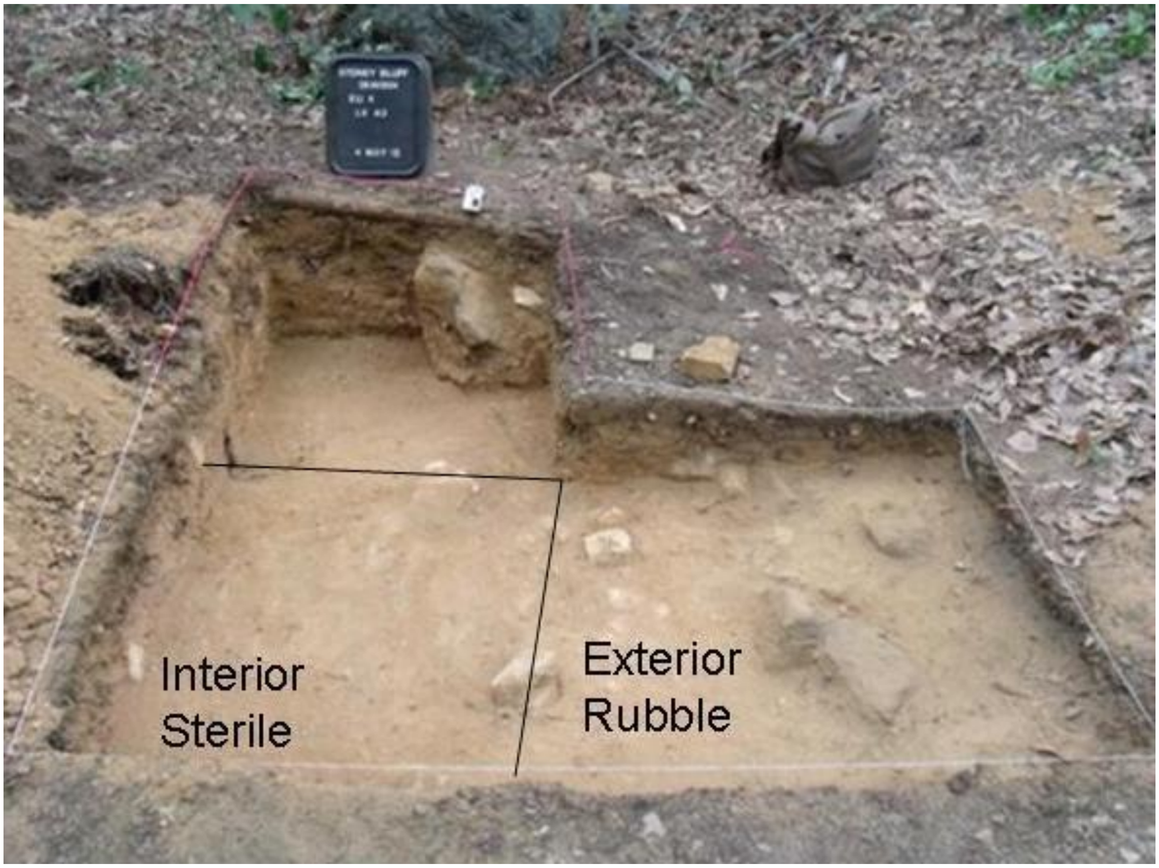


Figure 5.27. Sample of the kiln's chimney space at 105 feet upslope from the front wall.

Feature 1 Stony Bluff Kiln

Discussion

The Stony Bluff kiln is situated in a heavily forested area, the surrounding area possesses rich clay and water resources, and naturally occurring stone materials are appropriate for buttress materials. The archaeological survey of the kiln suggests that the Stony Bluff kiln was 105 feet in length, 6 feet in exterior wall height, with an interior space of 9 feet wide, and an exterior of 12 feet in width. These dimensions are identical to those at the Pottersville kiln site. The Stony Bluff kiln appears to have only one built floors while the floor at the Pottersville kiln suggest episodes of construction to possibly constrict the interior space. Additionally, the excavation units at Stony Bluff did not unearth intact architectural materials while the Pottersville excavation discovered a near fully intact kiln minus a collapsed arch. Other kilns are known to have operated within the close vicinity. Due to the operation of other kilns it is likely that the architectural materials from Stony Bluff were removed after manufacturing activities ceased and those materials were likely reused in other locations in the vicinity.

Through the process of this survey, it is inferred that the Stony Bluff kiln was constructed utilizing the same design as those at the JL and Pottersville kilns. Of key importance is the fact that Stony Bluff and Pottersville kilns were constructed within approximately 35 years of one another. During this time span several other kilns site were constructed in the Edgefield district. The conclusions from this survey provide an innovative starting point for any additional kiln related research project in the region. These findings should not suggest that all kilns of this period are constructed in the same manner. However, these findings can provide a point of departure for the genesis of other alkaline glazed stoneware kilns in the American South.

The preceding archaeological investigations focused on stoneware manufacturing at three early kiln sites in the Edgefield district. The evidence discovered in at these kiln sites suggest that technologies utilized at these sites were not a variation on European traditions, which informed the construction of the Southern groundhog kilns, but rather had different technological influences. Through a reexamination of kiln technologies utilized across Asia, Europe, and Great Britain in time periods before the construction of these Edgefield kilns, we can now identify the design influences of those three kilns.

Chapter 6
Archaeological Revelations at the Pottersville Site

During the 2011 archaeological field season data discovered provided new perspectives on the development of alkaline-glazed stoneware and production methodologies in the Edgefield District. The previous chapter detailed each of the 2011 excavation units by stratum and materials situated within those excavation units. The following discussion provides an analysis to the architectural and artifactual materials uncovered during the course of fieldwork. This chapter provides interpretations of the architecture and artifacts uncovered in the 2011 excavation units. The interpretations allow for a hypothesis of activities that occurred at the Pottersville kiln site by reconstructing activities which supported stoneware production at the facility.

I. Pottersville Kiln

Research regarding pottery in the Old Edgefield District attempts to better understand the process of alkaline-glazed stoneware production in the first decades of the 19th century. Pottersville was the first kiln that produced alkaline-glazed stoneware. Archaeological investigations at the Pottersville site had the potential to reveal new data on the technological developments implemented in the production facility. Before beginning excavations the research team compiled available materials related to known styles of kiln design in the American South. Based upon historical research, oral histories, and current pottery knowledge it was hypothesized that Pottersville might have been akin to a groundhog style kiln. Such groundhog kilns were typically semi-subterranean, 20-30 feet in length, 10-12 feet in width, and situated near the crest of a hill. Articulating an excavation plan based upon such design elements the following kiln features were sought in order to understand construction methods and firing properties being utilized in early 19th century South Carolina. By investigating such kiln features the research project could address technological questions and potentially generate new list of queries raised by the archaeological data uncovered at Pottersville.

- Ware chamber: linear space within the kiln where objects are situated during the firing process.
- Firebox: entry into the kiln and location where the firing process is initiated.
- Chimney: rear of the kiln where heat and smoke are expelled from the kiln.
- Bagwall: connection point between the firebox and ware chamber; protects the nearest vessels from flames in the firebox.
- Exterior walls: perimeter of the kiln.

The 2011 investigations revealed that the Pottersville kiln was constructed as a barrel vault 105 ft. in length and 12 ft. in width. The firebox was on the downslope end and measured 10 ft. long by 12 ft. wide. The chimney was on the upslope end, with a chimney base that measured 5 ft. long by 12 ft. wide. This kiln was likely designed by Dr. Landrum and built with the labor of enslaved African Americans in approximately 1813. Pottersville thus was not a groundhog kiln, but something much larger. While a groundhog kilns typically range 20-30 feet in length, the Pottersville kiln was over three times that scale.

This archaeological revelation generates new research questions. Where did this kiln design originate? The first, and possibly most logical, place to search is Europe. During this period of time stoneware vessels were being manufactured with a great deal of success in Germany and France. In Europe numerous kiln designs were being utilized, however none of this length was utilized for the production of stoneware. In Germany, one of the more common kiln designs utilized in the production of stoneware was the Cassel kiln. Cassel kilns consisted of a down-draft kiln approximately 45-60 ft. in length and thought to utilize a design that was the predecessor of the groundhog kiln layout (Baldwin 1993; Zug 1986). While the length was shorter and the draft style was different, Cassel kilns do hold a similarity to another kiln type connected to the topic, Asian Anagama kilns. Both kiln types are similar in length, possessing an egg shaped arched roof near the front, and are downdraft in design. Neither of these kiln designs presents notable similarities, such as a multiple elements of corresponding structural elements, with the kiln at Pottersville.

In England, coal-fired Newcastle kilns were utilized in the production of many ceramic object types, such as brick, stonewares, and tiles. Newcastle kilns were built low to the ground and ranged from 10 to 35 ft. in length (Baldwin 1993; Rhodes 1981). The understanding of how to build and operate Newcastle kilns would have made the Atlantic voyage with English immigrants possessing kiln knowledge as they moved to America.

> Horizontal kilns of the Newcastle type are simple in design and easily constructed. The low horizontal shape facilitates setting some types of ware. They are economical of fuel. However temperatures are apt to vary from front to back and the position of the fireplace may cause severe discoloration of wares placed toward the front of the kiln, since the heat is released from one point only. It will be seen that Newcastle kilns of this kind are not different in principle from the old Korean kilns except for the upward slope of the latter, certainly a good feature since it increased the draft (Childe 1983: 76-77).

Newcastle kilns display some points of similarity with the Pottersville kiln. However, the difference in length and location on the landscape do not provide enough evidence of correspondences to relate the two kiln types in a persuasive manner.

Other types of kiln designs utilized in Asia can next be considered. Much of the Western world was involved in trade with Asian countries, which included the acquisition of fine wares such as porcelain. Porcelain and utilitarian wares from China had alkaline glazes applied to surfaces producing a smooth exterior finish. With an analytical focus shifted to Asia, a corresponding kiln design for the Pottersville structure can be discovered.

Dragon or Snake kilns used in China, Korea, Taiwan, and other Asian countries were built as barrel vaults along a hill slope, low to the ground, and ranged from 50-150 ft. or more in length and 8-10 ft. in width (Chen 1986; Hsu 1995; Lao et al. 1986; Zeng 1997; Zhang 1985). As noted above, efficient heating through a long kiln was a difficult operation to manage. Dragon kilns possessed stoking ports along the linear span of the arched roof (Bradford 2004; Hsu 1995; Needham 2004). Stoking ports were typically located in tandem; if one was located on the right side of the kiln arch, it was accompanied by another on the left side. During excavations of Feature 2, the ware chamber, at the Pottersville kiln, the team discovered two blocks which displayed heavier amounts of burning when compared to other blocks in and around the feature. By allowing oxygen and possibly other burnable materials in through the stoking port, additional heat would affect the surrounding block, thus burning this region more than others. To access the stoking ports on a Dragon kiln, workers utilized a walkway to traverse the incline of the kiln during firing operations; Feature 8 at the Pottersville kiln is interpreted as just such a walkway.

The Pottersville kiln was situated along an 8-degree hill slope. As Childe (1983: 76-77) observed, sloping kilns increased draft properties which better distributed heat throughout the kiln. Asian kilns were constructed with a slope of 2 to 20 degrees incline (Li 1979; Hsu 1995). The “High kiln” in China possessed very similar attributes compared to the Pottersville kiln. The High Kiln was built during the Ming Dynasty and was 105 ft. in length and contained 26 sets of stoke holes along the arch roof line (Bradford 2004).

Figure 6.1. Dragon kiln in 1893 in operation near Jingdezhen, China, Needham 2004: 356

Figure 6.1 shows one such Dragon kiln which is still operated in Jingdezhen, China (also known as Ching-te-Chin). While the front wall appears similar in height, only 1 fire mouth is presumed present and the arch is more pointed near the top. The Pottersville kiln may have been inspired by Asian designs, but built with European construction techniques. After centuries of kiln operations, Europeans discovered that a lower profile arch allows for even distribution of heat throughout the kiln space (Cardew 1969). Low profile arches were being utilized in Newcastle and in other kiln types throughout Europe during the 19th century. However, European potteries did not fire kilns which utilized alkaline glaze. Ceramists prior to Landrum attempted to recreate porcelain with less than ideal results. These attempts at porcelain production were likely constrained by limitations in the quality of the clay, by the production and firing techniques utilized, or a combination of those factors. Consider the possibility that firing difference or difficulties were the limitation for European porcelain production. These limitations could likely have been caused by differences in kiln technologies; European manufacturers utilized Newcastle or Bottle kilns while Chinese producers fired porcelain in Dragon and Anagama kilns. Dr. Landrum considered his clay discovery appropriate for the production of porcelain, which likely could have eliminated one of the above limitations. Thus, to eliminate another production flaw, Landrum likely sought out a kiln design that had proven appropriate for the firing of porcelain. Therefore, for his plans in Edgefield it would have been advantageous to construct a kiln which was known to be effective in producing pottery utilizing such alkaline glazing techniques.

One might speculate that Dr. Landrum first built a smaller-scale groundhog kiln at Pottersville and constructed the large 105 ft. long kiln later in time. However, such a proposition is not supported by the evidence that he desired to produce porcelain, a product primarily associated with Asian manufacturing approaches. The likelihood that Dr. Landrum launched his pottery enterprise by constructing the 105 ft. long kiln is also supported by the scale of funds he requested in his 1812 grant application and the extent of facilities reported in the 1820 industrial census.

A. Historic Nails

I now focus the discussion on historic period nails uncovered at the Pottersville kiln. Documentary evidence has not been found that would suggest that nails were produced in the Edgefield District during the kiln's operation period. Nails utilized at the Pottersville kiln were likely transported into the region sometime during or after the date range of their manufacture. Nail manufacturing techniques provide bounded date ranges that allow for details regarding construction and possible repairs to the kiln and nearby structures.

The earliest group of nails potentially relate to the construction of the kiln. Within this earlier group two types of early modern machine cut nails were discovered during the Pottersville excavations: sprigs and brads (n=18) which date from 1790 to 1805, and a combination of lath (n=15), common (n=10) and sprigs and brads (n=2) which date 1790-1810. These nails serve as another means to confirm that the Pottersville kiln was built in the early decades of the 19th century. Nails also suggest that the kiln was in operation during the 1830s. Modern machine cut nails which date from 1815-1830 (n=216) and 1830+ (n=1354) were discovered throughout the excavation site (Table 6.1) (Appendix C). These modern machine cut nails are most commonly referred to as siding or shingle nails.

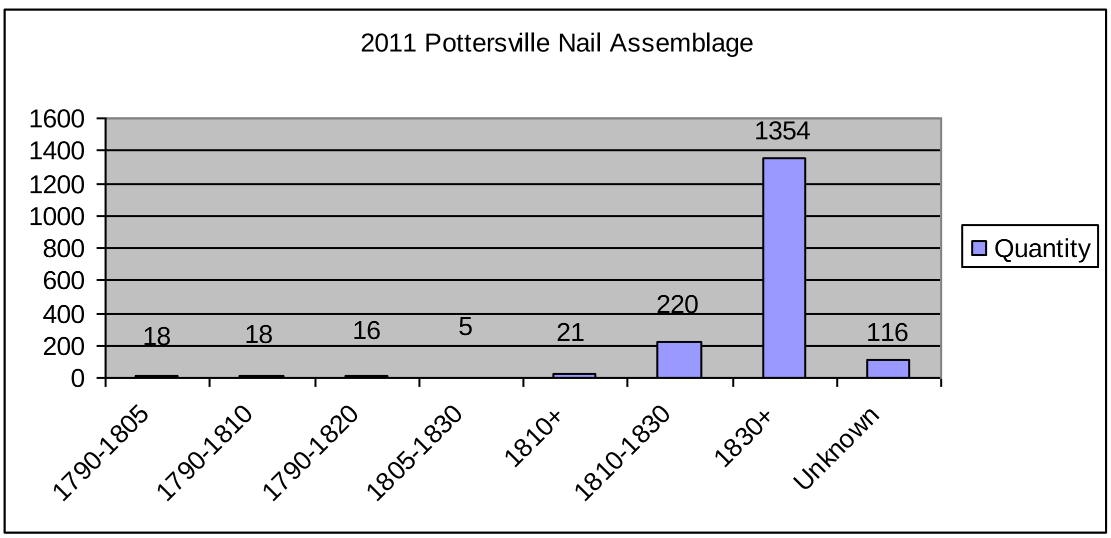


Table 6.1. Nail types, by manufacturing date, uncovered during the 2011 archaeological field work at the Pottersville kiln site (Data T. Butler).

Nails at the Pottersville kiln would likely have been utilized to fasten a wooden superstructure over the barrel vault. Such a structure has been documented in association with both dragon kilns and modern American groundhog kilns (Figure 5.2).

Figure 6.2. Contemporary groundhog kiln with wooden superstructure, Aiken, South Carolina. Courtesy Gary Dexter.

Additionally, nails were likely utilized to fasten an interior wooden support system during construction or repairs to the kiln's barrel vault. These wooden support systems provided the kiln builders with a frame that spanned between the two vertical walls, creating a template for the curvature of the barrel vault (Figure 6.3). Contemporary potters either remove the wooden support system once the barrel vault has dried or leave it in place. If the wooden support system is left within the barrel vault it would then be burnt off during the initial kiln firing. In this instance, once the wood has been consumed by the fire, the nails that fasten the support structure would fall to the kiln floor.

Figure 6.3. Wooden support system spanning the exterior walls.

During the course of the 2011 excavations the team uncovered a total of 1,764 nails, of a variety of different types (Appendix C). To determine if either of the above hypotheses held true for the Pottersville kiln, historic period nails were described as being either situated on the exterior or in the interior to the barrel vault. Nails located along the kiln's exterior would likely have been deposited after the barrel vault was constructed while nails within the kiln space would likely have been deposited during initial construction or during potential episodic repair to the kiln roof.

First I considered the nails along the exterior of the barrel vault. During the course of laboratory analysis it was determined that 1,144 of the 1,764 nails historic period nails were situated along the exterior of the kiln's barrel vault (Appendix C). Even though nail type and manufacture dates vary, all of the 1,144 nails, with the exception of 10 spikes, fall into the category of common nail (Appendix C). These common nails vary in length and could be utilized in an array of fastening operations. Contemporary kiln superstructures tend to be constructed with wooden plank walls and roofs. The walls and roof would protect the kiln from adverse weather conditions; high winds or rain would prevent a kiln firing or terminate one already in progress due to decreased heating potential. Nails were uncovered in nearly all excavation units and the density of the nails throughout the site suggests that such a wooden superstructure spanned the length of the Pottersville kiln (Figure 6.4). The nail assemblage possesses a high quantity of nails manufactured 1830+ (n=1,354) which suggests that the kiln's superstructure had possibly been improved in the 1830 or later (Appendix C). The wooden superstructure was likely left to deteriorate over time or possibly dismantled and the wood repurposed elsewhere. The 2011 excavations did not yield wood artifacts or post molds that would have suggested further information regarding the wooden superstructure. However, spikes uncovered during excavation suggest that large wooden beams, likely for vertical or cross-support were utilized in the construction of the superstructure.

To determine if a wooden support system was potentially utilized for construction or repairs to the barrel vault of the Pottersville kiln, an interior space nail count was similarly conducted. Of the remaining 620 nails, 404 were situated within the kiln's interior space. The space of the chimney (n=3), bagwall (n=0), and walkway (n=0) displayed few historic period nails, while the firebox (n=355) and ware chamber (n=46) possessed the highest nail density (Figure 6.5) (Appendix C). Feature 2, the ware chamber, displayed nails at every level of excavation; a1 n=5, a2 n=20, b1=9, b2 n=1. Level b2 of Feature 2 was the base of the Pottersville kiln and displayed sterile soil.

Within Level b, one Early Modern Machine cut nail, with a manufacture date of 1790-1810, was uncovered (Phillips 1993). Level b2 was covered at some point after construction due to episodic filling and leveling of the kiln's ware chamber. Through this discovery, I suggest that this artifact likely fell to the floor during the construction of the wooden support structure or during the kiln's initial firing sometime around 1813.

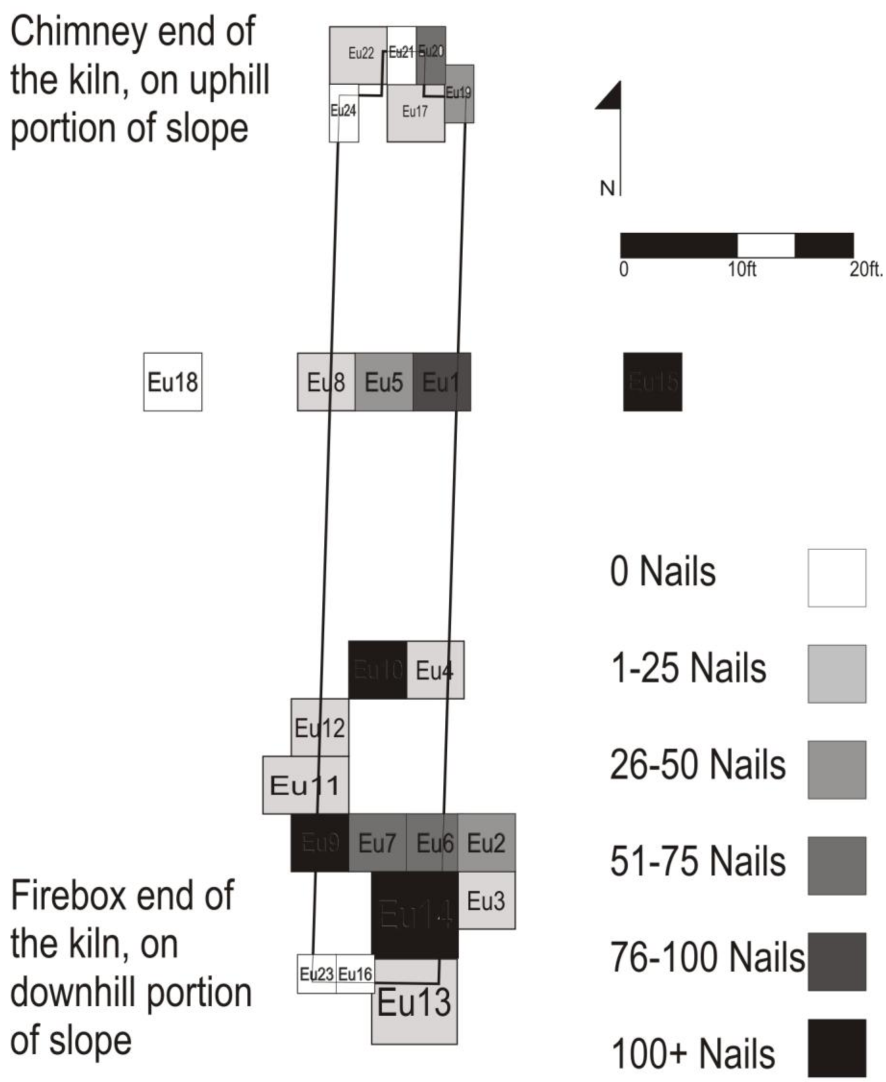


Figure 6.4. Density of nails situated along the exterior of the barrel vault.

The nails situated within the firebox also suggest that a wooden support system was utilized during the kiln's construction or repair; however, how these artifacts came to this position is less obvious. Of the 355 nails within the kiln's firebox, n=101 were situated along the floor and the remaining 254 nails were located in the space between the kiln floor and the interior section of the kiln's collapsed barrel vault (Appendix C). With the knowledge that the firebox would have been kept clear of all materials it is unlikely that the floor was built up and constricted over time. These 254 nails were likely deposited by environmental processes after the kiln's termination. The Pottersville kiln was constructed along an 8 degree slope; I suggest that materials, such as soils, nails, and other artifacts, were deposited within the firebox after heavy rains. However, the density of nails does suggest that a wooden support system was utilized for construction or repairs uphill from the firebox. Due to the density of nails within the kiln's barrel vault, I hypothesize that when construction or repair activities occurred that a wooden support structure was utilized and that these materials were left in place and burnt off during the subsequent kiln firing.

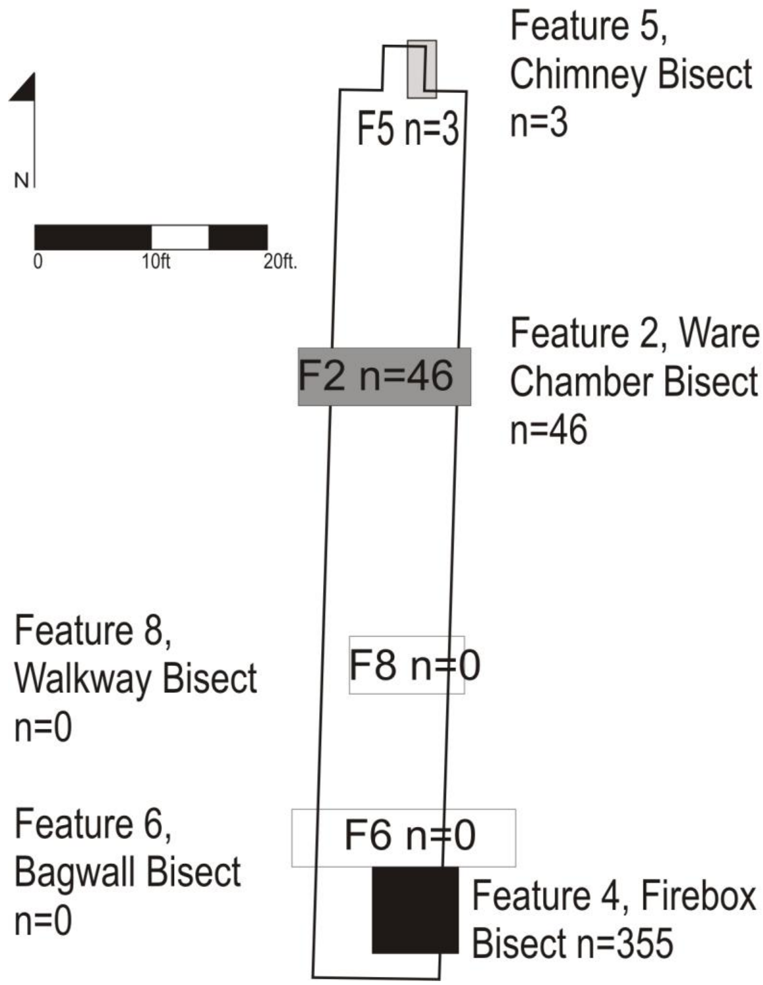


Figure 6.5. Density of nails situated along the interior of the barrel vault.

<u>B. Whiteware Artifacts</u>

The 2011 Pottersville kiln excavations uncovered various whiteware artifacts (n=324). Of these 324 whiteware artifacts n=196 were from individual artifacts. During laboratory analysis, I was able to indentify different manufacturing date ranges based upon either design or finishing and decorative attributes of the whiteware artifacts: 1815-1850 (n=1), 1820-1830 (n=17), 1827-1828 (n=9), 1829-1839 (n=39), 1840-1849 (n=57) (Noël Hume 1970; Miller and Hunter 1990; Miller 1980; South 1977) (Table 6.2). The 1840-1849 whiteware fragments provide insight into the longevity of the Pottersville kiln.

The exact terminal date for the Pottersville kiln is unknown; however, since the group of whiteware fragments date to the 1840s it is inferred that the kiln was in operation at this period. These whiteware vessels were likely utilized for personal food consumption during daily routine kiln operations. I conclude that when these objects were broken during these routine consumption activities that the whiteware fragments were discarded and added to the pile of wasters along the kiln exterior. During laboratory analysis I was unable to identify a definitive origin of manufacture for any artifact in this assemblage.

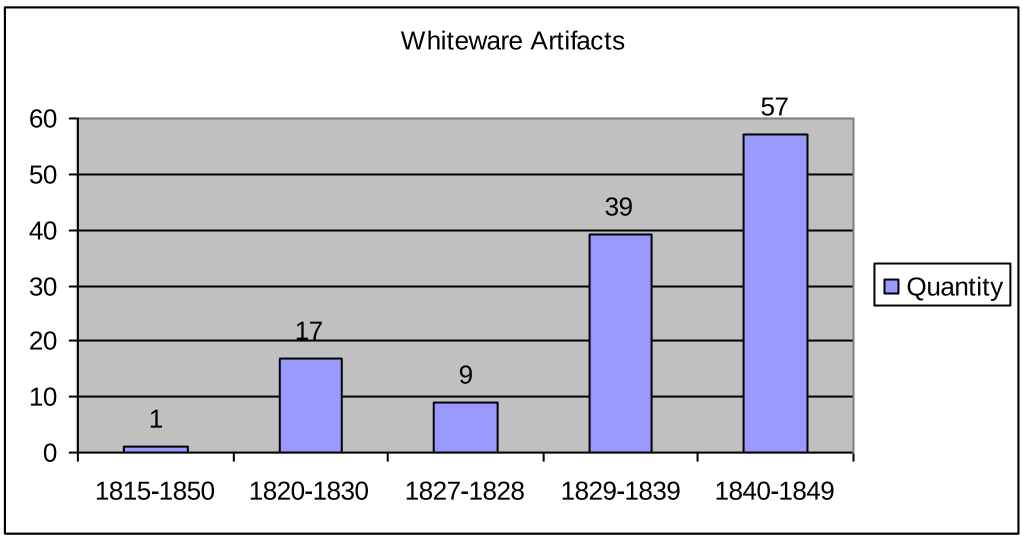


Table 6.2. Date ranges for whiteware artifacts, National Park Service Artifact Database

C. Glass Artifacts

Glass artifacts (n=122) were also recovered during the 2011 excavations. Of these 122 glass fragments, n=66 were from unique vessels (Appendix C). These glass artifacts were uncovered only in the A1 and A2 levels of excavation units throughout the site. During the course of laboratory analysis I was unable to indentify details that would suggest time period of manufacture. Due to the lack of indentifying details it is undetermined if these artifacts are contemporary to the kiln's operation or remains of later activities.

D. Termination of the Pottersville Kiln

The archaeological record provides insight as to why Pottersville ceased manufacturing. Located within the firebox were 4,377 stoneware vessel fragments. The team designated the space beneath the collapsed arch as Feature 4 Level a1. Level a1 consisted of 891 stoneware artifacts. Level A1 and the four levels that followed were located high enough in elevation that these would have prevented loading of firing wood and intake of air through the front fire mouth making kiln operation impossible. Thus it was determined that the artifacts within Feature 4 were from the final firing at the kiln. Excavations were terminated with Level b1. Level b1 was what should be expected when viewing a kiln firebox; charred remains of wood and burnt stoneware. Above the charred floor remains is a layer of sand and stoneware 10 YR 5/8 Yellow in color. The stoneware fragments in this excavation layer possesses 10 YR 8/2 White glaze. The color of the 984 stoneware fragments in this layer was attributed to excessive introduction of oxygen which caused the vessels to become underfired. The exposure to oxygen oxidized the vessels body giving them the 10 YR 5/8 Yellow hue. Additionally since the vessels did not reach an appropriate firing temperature they remain rough to the touch and continue to deteriorate over time (Figure 6.6).

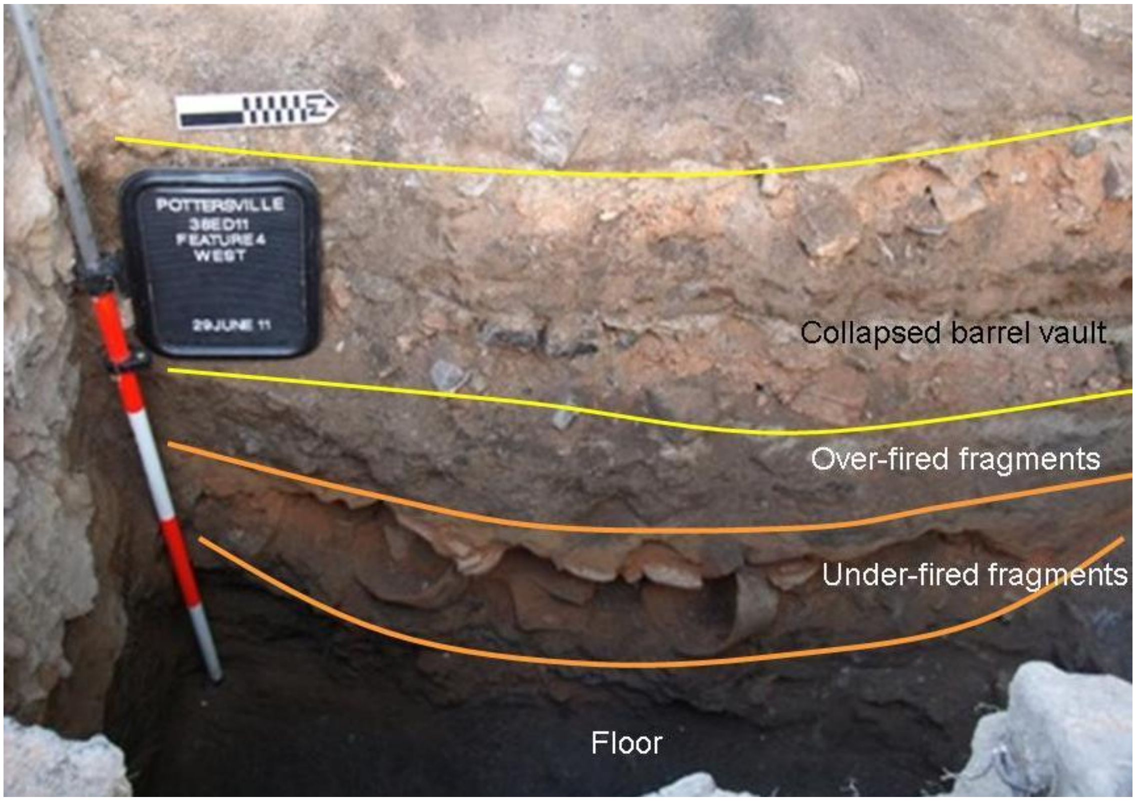


Figure 6.6. Sample of Feature 4, firebox. Underfired fragments suggest a catastrophic failure at the Pottersville kiln.

It is hypothesized that these vessels in Feature 4 Level b1 were situated in a portion of the kiln that experienced a roof or wall collapse. The collapse was however not catastrophic enough to prevent full firing and glazing of the remaining wares within the chamber. This is evident by the 891 sherds in Level a1 Feature 4. Level a1 artifacts are completely vitrified, smooth to the touch, and possess 2.5Y 3/2 Very Dark Grayish Brown glaze with 2.5Y 2/0 Black running glaze. Mending of these vessels was made possible by the large density of sherds located within the firebox from both Level a1 and Level a4. The vessels from this final firing were in the form of 2 to 4 gallon straight walled storage vessels (Figure 6.8). 1 to 2 gallon liquid storage vessels (Figure 6.7) and half gallon bowls (Figure 6.9). Fragmented vessels were excavated in-situ with a large quantity of sherds recovered. The highest density of vessels sherds came to rest against the exterior wall.

Figure 6.7. Reconstructed storage jug situated within Feature 4.

If indeed the arch of a portion of the barrel vault collapsed it can be assumed that repairs were not planned. The firebox very likely became a dumping site for unusable vessels after that partial collapse. During the process of unloading the usable vessels the failed vessels were thrown against the wall in the firebox maintaining a clear path for unloading operations. There would have been no reason to transport broken vessels to a waster pile if part of the kiln lay in ruins. For these reason it is surmised that operations at Pottersville terminated in the 1840s after a failure along the kiln arch or wall.

E. Stoneware Artifacts:

During the 2011 field season at the Pottersville kiln site 13,090 stoneware sherds were recovered. Of these 13,090 stoneware objects 4,377 were situated within the kiln's firebox (Feature 4). Only a portion of these 4,377 stoneware fragments situated in the firebox could be cross-mended to reconstruct vessels. Vessel failure during firing is a common event at any kiln site and these broken vessels are most often discarded in the waster pile. The waster pile is often located away from the kiln operational vicinity; this ensures that the area of operation around the kiln can be kept accessible. Failed vessels are loaded into a wheel barrow of some other apparatus and relocated at the waster pile. By the fact that sherds were recovered from the kiln it should be assumed that not every broken object made it to the waster pile. Small object most likely either fell from the wheel barrow or were tossed along the kiln during clean up operations. Of the 8,713 sherds not located within the firebox approximately 90% or more are 10cm in diameter or smaller. These 8,713 sherds have a wide range in color and vessel typology and led to zero mends during the laboratory process. Complete detail of all artifacts is located in Appendix C.

However, the failed vessels discovered in the Feature 4 enable an understanding of the Pottersville kiln's final firing and vessels forms being created. The firebox became an impromptu waster pile due to the catastrophic collapse of a portion of the kiln. The storage vessels recovered are approximately 50cm in height and 25cm in diameter. The vessel bodies are 2cm thick at the base and .5cm wide at the shoulder. The base diameter is 25cm in diameter and the rim opening is 13cm. The vessels have two 10cm wide lug handles located 2cm beneath the top of the rim. These storage vessels are not what are thought to be the typical vessel form of the period. Pottersville storage vessels commonly possess ovoid bodies which curve outward from a narrow base and become wider at the middle to shoulder and then smaller toward the mouth. The vessels situated within Feature 4 are straight walled in form (Figure 6.8). These straight walled vessels were likely intended for a different function, as a churn rather than storage vessel, or possibly a shift in vessel form design based upon choice decided by the owner, potter, or market.

Figure 6.8. Straight wall storage vessel (49cm) situated within Feature 4.

Conversely, the storage jugs within Feature 4 do resemble the typical region form. The storage jugs are approximately 20cm wide at the base, 25cm wide at the widest point in the body, and 20cm wide at the shoulder, with a spout opening of 3cm. The spout is a double collar and the vessel has one strap handle which is connected on the shoulder 2cm beneath the spout. The double collar spout was thought to be a common design of the

Pottersville kiln. However Feature 4 also included single collar spout (n=7) jugs (Figure 6.9).

Figure 6.9. Single collar jug spout (left and center) and double collar jug spout (right).

Stoneware bowls situated within Feature 4 provide insight on how vessels were being stacked within the kiln ware chamber. Alkaline glaze adheres to all surfaces with which it comes into contact. In laboratory work, 10 bowl profiles were determined. The bowls are approximately 15cm wide at the base and 30cm wide at the rim. Rims of the bowls remained unglazed which allowed vessels to be stacked mouth to mouth and then base to base. Two pairs of vessels were mended in which the one, or both, of the vessels failed during firing causing the top bowl to slump inside of the bottom bowl fusing them together (Figure 6.10).

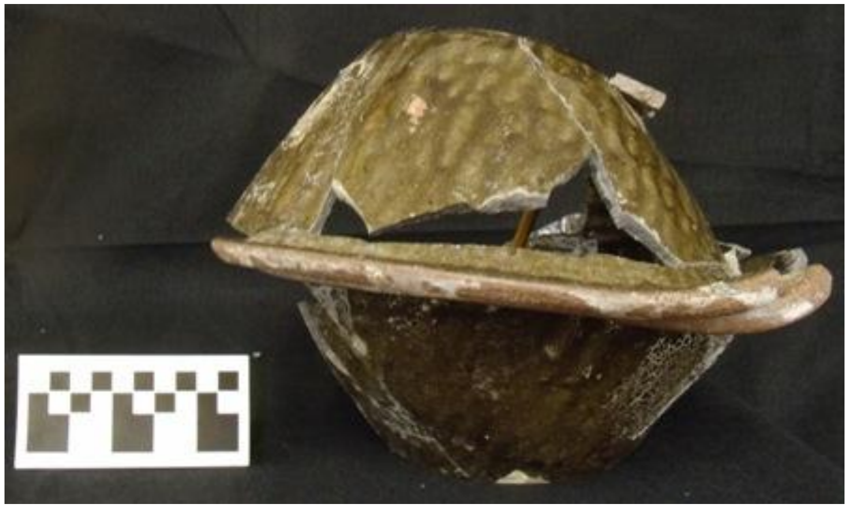


Figure 6.10. Bowls situated within Feature 4 that display evidence of vessel stacking.

Extant and archaeologically recovered Edgefield vessels are often seen with incised lines or makers markers along the base or shoulder. Stamped or incised letters often are attributed as a makers mark. However, scholars have often speculated about the intent or meaning of incised slashes "/" and crossed lines "X." These markings are often considered to be maker's marks or gallon markings (Baldwin 1993; Castille 1998). Within Feature 4 vessel fragments were recovered that display incised lines along the shoulder (Figure 6.11).

The two straight walled storage vessels have four and six slash marks respectively (Figure 6.12). Of these two vessels the one with four slash marks is only slightly smaller than the one with six slashes; the difference in size in approximately a half gallon in volume. By viewing the vessels side-by-side I infer that these particular marks are not gallon indicators.

Figure 6.11. Stoneware jug fragments with incised “X” and “/” marks situated within Feature 4.

Figure 6.12. Two straight walled storage vessels, forward vessel (46cm in height) has 4 inscribed on the shoulder, rear vessel (49cm in height) has 6 inscribed on the shoulder.

In seeing vessels from a single firing event I propose a different hypothesis; these marking are sagger marks for placement within the kiln ware chamber. Saggers are cylindrical containers and other larger-scale separators that were the most common type of kiln furniture utilized in ceramic manufacturing centers. To effectively heat the kiln and prevent cool places proper loading of the kiln is paramount. This means that smaller vessels should be situated in front of large vessels. With the straight walled storage vessels, the smaller vessel has two fewer slash marks than does the larger vessel. Hundreds of vessels were fired at given time; if these marks are indeed sagger marks they would have assisted persons loading the kiln to ensure proper heating.

F. Dave Drake Artifacts

Archaeology not only uncovered detailed information about ceramic technology employed at Pottersville but also specific people forced into employment at the kiln. Many of the scholars that have researched Pottersville and Edgefield stoneware turn their attention to Dave Drake, the enslaved master potter. Research into Dave's life and his products provide enough information for a project all unto itself, however, it is relevant to include him in this discussion based upon artifacts discovered at Pottersville. Pottersville is where Dave is thought to have learned to read, write, and become a master potter. Of the 13,090 artifacts recovered during the 2011 excavations two bear incised markings attributable to Dave. The first is a portion of a storage vessel rim 30cm in diameter. Dave threw and wrote his name in vessels of similar size during the 1830 and 1840s (Koverman 1998, 2005). These vessels are typically 30 to 40 gallons in capacity and are some of the largest known to have been created in Edgefield during this period. The other sherd displays a short script incised in the vessel body. Prior to firing the vessels in the kiln the word “you” was scribed into the clay body (Figure 6.13). An image of this artifact was shared with scholar Jill Koverman of the McKissick Museum in order to determine if the script matched any of Dave’s known writing samples. After analysis, Koverman, confirmed that the style and flow of writing matched that of Dave Drake (Koverman per. comm. 2011). These two waster fragments serve as a powerful reminder that enslaved Africans were integral members in the southern tradition of alkaline-glazed stoneware.

Figure 6.13. Stoneware fragment with the word “You” inscribed. Hand writing is attributed to Dave Drake,

The above data and interpretation of the archaeological record presents the history regarding Pottersville and Edgefield stoneware. The activities which occurred at the Pottersville kiln site should be considered as industrial in scale, rather than as a folk or craft enterprise of more modest scale. These inferences provide information about mass-produced stoneware and lead to further points of analysis. The following outlines the plausible industrial setting at Pottersville.

II. Stoneware Manufacturing at Pottersville

Stoneware was the production material of the research site. The discussion in Chapter 4 provided an overview of relevant ceramic histories, technologies, and the processes for producing ceramic goods. A potter must understand all of the facets of pottery production and kiln firing dynamics to maintain a successful operation. Potters must be able to calculate the number of vessels the kiln can hold, how much clay should be prepared for turning operations, and the amount of fuel the kiln will consume during a single firing. The section that follows explores the probable, sequential pottery activities at the Pottersville kiln site in an effort explicate these interrelated practices.

To regularly operate an industrial ceramic operation a sequence of daily actions are performed by laborers who worked at the kiln site. In the case of Pottersville numerous enslaved African-American laborers worked at this and other Edgefield District kiln sites. Local Edgefield historians Holcombe and Holcombe (1989:22) observe that the "District's ceramic entrepreneurs would never have been able to manufacture such large quantities of Edgefield wares without the slave participation." Local newspapers listed enslaved laborers with skills in pottery production and these enslaved African Americans most likely participated in all phases of the production process. Those production activities included: building and maintaining the kiln; digging and transporting clay; working and grinding raw clay in "pug" mills; chopping wood for fuel; preparing glaze mixtures and clay pastes; turning the pottery wheels and shaping the vessels; and loading and unloading the kiln firings.

A. Firing Capacity

It is useful to first consider a kiln's firing capacity since the amount of vessels that can be fired will inform other activities which support this action. A kiln's firing capacity can provide an indication of the likely amount of raw materials that were regularly needed to support ongoing pottery operations. To maximize resources and obtain the highest possible return on investment, plantation owners typically worked enslaved laborers as many hours as possible (Dew 1994; Genovese 1965; Lewis 1979; Starbin 1970). When available work was limited, plantation owners often rented their field hands to neighboring landowners. Small scale industrial operations in the American South were often beneficiaries of these practices, renting laborers for a period of days, months, and in some cases an entire year (Dew 1994; Genovese 1965; Lewis 1979; Starbin 1970). Tasks such as chopping fire wood would be useful for both industrial and residential purposes, whereas excavation of clay would be needed primarily for stoneware production.

Based upon historical research, oral histories, and current knowledge of stoneware production in the American South it was hypothesized that Pottersville might have been akin to a groundhog style kiln: semi-subterranean, 20-30 ft. in length, 10-12 ft. in width. However, after six weeks of archaeological fieldwork during the summer of 2011 researchers determined that the Pottersville kiln was not a typical groundhog kiln, but rather something larger-much larger. While the Pottersville kiln was constructed with the average width of a groundhog kiln, approximately 12 ft. wide, Landrum and his labor force built the barrel vault to 105 ft. in length. Scholars such as John Burrison have collected ethnographic information regarding Southern stoneware potters and their potteries. If the Pottersville kiln had been of a groundhog design these sources would provide fairly direct evidence about elements of kiln operations at a site like Pottersville. However, the Pottersville kiln was much larger than the traditional Southern groundhog kiln. Therefore, this body of scholarship on smaller, groundhog kilns provides a useful starting point about production from which expanded calculations of production activities can be generated.

B. Manufacturing of Stoneware

To calculate the raw materials needed to maintain constant operations at the kiln the following questions are considered as a starting point: how many vessels could a potter or group of potters produce in a day; and how many vessels could fit inside the kiln. Answers to these questions will also provide evidence of how much clay was processed and how much fuel was needed for each kiln firing. Additionally, one can work to determine the levels of demand for storage vessels within the Edgefield District during the period of the kilns operations. By 1820, Edgefield was the third most populated district in the South and an "industrial" sized kiln would have been advantageous to produce the colossal amount of vessels sought-after to store food for bondsmen. In the Edgefield District, pork was the main staple of the enslaved laborer diet. In order to pickle enough pork to feed approximately 12,000 laborers in 6-week period of time an excess of 10,000 6-gallon vessels were necessary for storage (Burton 1998; Covey 2009; Dunaway 2003; Faust 1981; Vlach 1990a; Warman 2003). I provide 6-weeks as the minimum amount of time it likely would have taken to initiate the pickling process through consumption of the prepared rations. At 105 feet in length, Potterville possessed the interior capacity to rapidly produce a large volume of stoneware vessels to fulfill the storage demands of the Edgefield District in 1820.

How many vessels could be produced within each firing of the Pottersville kiln? The Pottersville kiln was 105 feet in length, 10 feet in interior width and 6 feet in height. Archaeological investigations in 2011 revealed and mapped the architectural features of the kiln, which included sections that would not have contained stoneware during a firing sequence. To determine the interior kiln capacity, the length of the firebox (10 feet) and the chimney (5 feet) are subtracted from the overall measurement of the structures length. The remaining space of the ware chamber was 90 feet in length. By calculating the length, width, and height of the barrel vault of the ware chamber (to include the curve of the arch) one can determine that the total interior volume of Pottersville equaled 6,480 cubic feet. While 6,480 cubic feet was the maximum interior ware chamber space, archaeological evidence suggests that the Pottersville kiln was reduced during operations. A total of seven floor levels were excavated within Feature 2. Each excavated floor level displayed differences in color relative to the other, adjacent floor levels. The seven successive floors suggest an intentional constriction of the kiln interior over time. The reduction of the interior space would have allowed for fewer vessels and/or shorter vessels to be fired while consuming less firewood and other valuable resources. The final constriction event would have reduced the ware chamber volume by 2,700 cubic feet which made the minimum interior volume of 3,780 cubic feet.

The ware chamber volume allows for the calculation of the kiln's holding capacity. Based upon measurements of artifacts recovered during excavations it can be calculated that a 1-gallon vessel occupied approximately 1 cubic foot of space. If a kiln of this size were to be loaded to its fullest capacity the ware chamber could hold a maximum of 6,480 gallons of stoneware vessel volume. In fact, due to kiln firing dynamics and loading methods, approximately one-quarter to one-third of the ware chamber space would consist of open spaces between and above stacked columns of vessels. Therefore, the maximum of 6,480 cubic feet for the interior holding capacity of the ware chamber should be reduced due to 1) open spaces allowing for efficient flow of heated air and accompanying flow of fly ash in the convection current and 2) open spaces resulting from stacking of various vessel forms.

Fly-ash consists of the heated, organic particulate material which travels airborne from the firebox to the chimney. During flight through the ware chamber fragments suspended within heated air drop throughout the ware chamber and land upon stoneware vessels. Fly-ash, in part, creates the glossy exterior finish and in some cases the running of materials down along the vessel wall. Additionally, the vessel walls on the majority of Edgefield storage vessels are curvilinear in nature; these curved exterior vessel walls do not allow for close stacking when compared to vessels with straight-wall exteriors. However, since Edgefield District kilns were intended for industrial operations stacking vessels as close as possible would likely have maximized the space within the ware chamber. For the calculations presented here, one-quarter of the ware chamber space is assumed to have consisted of open spaces, devoid of stoneware vessels, resulting in 4,860 cubic feet volume of stacked vessels.

To create useful estimations regarding a potters work day it is important to understand how long it would have taken to create 4,860 gallons in volume of stoneware vessels. Related evidence can be obtained from ethnographic studies of “folk potters.” Folk potters are often considered those who practice traditional pottery techniques and utilize materials in vernacular practices taught over generations (Burrison 1984, 2007, 2010; Greer 1981; Sweezy; 1984; Zug 1986). Research on the pottery production methods of the Meaders family and other early 20th century pottery clans, indicates that many folk potters utilized manually turned potters wheels rather than mechanical wheels. An 1820 industrial census similarly indicated that the Pottersville operation relied on four, manually turned wheels. Using such equipment, Cheever Meaders, a master potter, created 75-100 gallons of stoneware vessels (or 15 of six-gallon vessels) in an 8-hour work day. To relate Cheever's output to the bonded laborers at Pottersville, the length of the work day should be reevaluated. At 34 degrees latitude, South Carolina averages 12 hours of daylight during the spring to fall months (astro.unl.edu). If Cheever's output provides a useful measure as an analogy for the Pottersville work force, then we can assume that 1 potter would have produced approximately 150 gallons (or 25 of six-gallon vessels) of stoneware per day. With four wheels in operation at Pottersville in 1820, four potters turning clay could produce 600 gallons (or 100 of six-gallon vessels) of stoneware per day, taking approximately 8 days to manufacture the 4860 gallons (or 810 of six-gallon vessels) that would fill the Pottersville kiln's ware chamber.

C. Extraction of Raw Clay

How much clay did it take to produce 4,860 gallons of storage vessels? Studying the production activities of Cheever Meaders, John Burrison observed that a potter typically uses 5 pounds of clay to make a 1/2 gallon vessel, 10 pounds for a 1-gallon vessel, and 22 pounds for a 6-gallon vessel (Burrison 1984). Potters typically use a declining rate of clay inputs in constructing larger vessels. For any vessel, the predominant masses of clay are employed in constructing the base and lower vessel walls. Based upon observations of intact vessels produced throughout the Edgefield region and now in private or museum collections, I find that stoneware storage vessels typically range from 1/2 to 40 gallons. In order to calculate clay usage, potter production, and kiln loading capacity it is useful to select one particular size. Ethnographic research provides detailed information regarding 6-gallon vessels which can be used to calculate the useful statistics (Burrison 1984). By considering the 6-gallon vessel as an average sized object it becomes possible to calculate the amount of clay necessary for operations. The group of potters would have created 810 6-gallon vessels to fill the 4860 cubic feet interior of the Pottersville kiln's ware chamber for a single family. By factoring 22 pounds of clay per 6-gallon vessels it is apparent that the Pottersville potters would needed 17,820 pounds of clay for turning operations. This means that nearly 9 tons of processed clay would have been quarried and prepared for a single kiln firing event.

A next step in analysis is to calculate the volume of raw mineral resources necessary to produce 9 tons of processed clay for the use on the turner's wheels. The clay mining industry defines two separate classes of clay, surface and subsurface. Subsurface clay deposits are most often associated with large scale mining and production operations. In the current, ceramic industry, subsurface extracted clays are most often associated with brick and whiteware ceramic manufacturing. These mineral deposits are often buried under 50 to 100 or more feet of overburden (Howe 1914; Lovejoy 1935; Mellor 1914; Searle 1915; Rhodes 1981; Wilson 1927). Overburden limits the amount of water allowed to enter the material and protects the resource from the effects of natural weathering (Howe 1914; Lovejoy 1935; Mellor 1914; Searle 1929, 1938; Rhodes 1981; Wilson 1927). Within subsurface clay are the two major materials associated with pottery production: kaolin and quartz.

As these are the primary materials necessary for production the mining industry calculates the specific gravity for each in order to determine the economic viability of a clay resource. Specific gravity is the density of a substance divided by the density of water (1 gram/cubic cm). Specific gravity expresses the weight of a material in relation to volume. By understanding this ratio it is possible to calculate the volume for 9 tons of raw clay.

Research at the Pottersville site has located clay resources with little to no overburden inferring that the 19th century pottery operations utilized weathered surface clays. Clay is best utilized for pottery production after it has been extracted from the soil and exposed to rain, wind, and sun. The lack of overburden suggests that clay adjacent to the Pottersville kiln site would have undergone weathering prior to being excavated from the soil. Rainfall weathers the clay body by erosion, swelling, and cracking as water passes through toward the subsoil. Surface clays are less likely to retain water because of erosion, swelling, and cracking and become weathered and lighter when compared to clay beneath overburden. Clay beneath overburden cannot break apart as quickly and thus retains rain water for a longer period of time. Thus, a differentiation between the specific gravity for subsurface and surface clays must be made clear prior to calculating the weight by volume. Subsurface specific gravity for kaolin (2.6) and quartz (2.65) is higher than that of surface clays due to the amount of parent water and supplementary materials which have entered in the raw clay during the process of weathering. Surface clay consists of those materials located at or near the ground surface or situated near creeks and stream beds. The specific gravity of surface clay ranges from 1.75 to 2 which can be calculated to 109 to 125 pounds of surface clay per cubic foot. For calculation purposes I consider the specific gravity of 2, or 125 pounds per cubic foot. Thus to quarry one ton of clay, a potter would exhume an area of 16 cubic feet. A single firing at the Pottersville kiln consumed nine tons of clay or a quarried area of 144 cubic feet.

Pottersville operated for nearly four decades, consuming upwards of 9 tons of clay per firing. What type of scar was inflicted upon the landscape as a measure of forced labor to extract those resources? Approximately 1/4 mile north of the Pottersville kiln site landowners are treated to a scenic pond which in modern times is often utilized for recreational purposes. A close inspection of the geography surrounding the pond determines that an intermittent stream is located at the up and downstream points of this pond. Due to the size of the streams and the surrounding landscape it is inferred that this pond is not a natural geologic feature but rather a creation of quarrying activities. Often the best clays for pottery production can be discovered in low areas near stream beds; some of the richest kaolin clay deposits in China are situated along streams and rivers (Cardew 1969; Rhodes 1981). The relatively close proximity of this pond to the Pottersville kiln site meant that clay could be quarried for current land holdings. Thus, landowners could utilize these local materials rather than purchase and haul clay from a non-local source. The current size of the Pottersville pond is 1000 feet long, 400 feet wide at the north end, 200 feet wide at the south end, and an average depth of 5 feet (ranges from 3 feet deep along the banks to 15 deep near the center). Thus, the approximate volume of the pond is 1.5 million cubic feet. The current about of overburden in the area around the pond is approximately one-foot in-depth. The amount of overburden would have likely accounted for no more than 300,000 cubic feet which would leave approximately 1.2 million cubic feet of clay that could have been removed from the landscape. At 144 cubic feet per firing, 1.2 million cubic feet of clay would have provided the Pottersville enterprise with enough clay for 8,333 firings.

The clay extracted from the pond north of Pottersville was most likely strictly utilized for pottery production and not for the manufacture of brick. Red clay appropriate for the production of common brick is situated to the north-northwest of Pottersville. In this location, evidence of heavy clay extraction is clearly visible. Kiln brick was a necessary building material; however, the pond clay does not possess the elemental properties of fire clay. If kiln brick was produced on-site, a small white clay vein location 200m east of the kiln could have been the extraction site. The white clay vein possesses few impurities which makes these natural materials ideal for the manufacture of kiln brick.

Historical evidence suggests that Pottersville was fired once or twice per month. Over the life-span, the Pottersville kiln likely had less than 750 firing events and not the 8,333 firing suggested by the size of the borrow pit. Thus it should be postulated that the clay extracted from the borrow pit was dug from the intermediate streambed. The stream would have naturally cut into the soils and clay to create the streambed. The geologic events that created the streambed would have exposed clay beneath the shallow overburden. A labor force would have been able to quarry clay from the vertical terrain eliminating the time consuming process of digging through the overburden. Quarrying activity would have widened the pre-existing terrain that would lead to the later construction of the pond. However, the location of turn-able stoneware clay within close proximity to the kiln does suggest that the Pottersville kiln was situated in this precise location due to the large quantity of the raw materials for stoneware production: clay, wood, and water. Aerial images of Pottersville and this northern pond display differential vegetation growth in the area around the pond. A 10 foot wide path which begins at the north edge of the pond traverses southward to likely workshop locations (Figure 6.14). Building a kiln in a location where all materials could be transported a short distance by wagon would decrease cost and increase return on investment.

Figure 6.14. Google Earth image that displays the proximity of the Pottersville kiln the likely clay borrow pit.

Through the course of my research I have discovered that many, if not all, of the Edgefield district kiln sites are situated adjacent to extremely rich potting clay. Figure 12 projects the geologic materials nearest the surface and the kiln locations situated south from the Pottersville kiln are locate in a region of clay and mud. This region of clay and mud was ideal for discovering clay appropriate for the production of stoneware. By constructing a kiln next to a clay bed there would be no need to transport heavy clay over extended distances. I conducted elemental analysis at a number of historic stoneware production sites in the Edgefield District. My research goal, which will be discussed in a subsequent chapter, attempted to gain an identifiable and distinct elemental signature for each of the six kiln sites investigated. Broken sherds from a kilns waster pile have been tested revealing a unique elemental fingerprint associated with the kiln site. Open access to Pottersville and the surrounding area has afforded the opportunity to extract clay samples from the pond. Clay samples were exhumed from the bank of the pond and analyzed to determine the elemental fingerprint. In laboratory analysis, this clay was formed into test wedges, fired at stoneware temperatures, and tested in the same manner as the associated waster shards. The resultant data confirmed that clay from this pond immediately north of the Pottersville kiln is elementally similar to the clay used to created stoneware within that kiln. Over the course of 40 years of operation the clay mining process at Pottersville created the space in which the pond is today made visible.

D. Processing Raw Clay

To maintain constant kiln functions a group of laborers would have been required to prepare the raw clay for turning operations. Clay as it comes from the quarry site is not automatically ready for the potter’s hands. Rather raw clay must be processed though a structure known as a “pug mill” in order to grind impurities and create homogeneous clay paste. Raw clay resources often contain sediments, vegetation, and air pockets. When significant inclusions are left in the raw clay body during firing the different expansion rates could cause failures in the paste creating holes and or cracks in the ceramic vessel body, all of which will diminish the integrity and quality of the final product. For example, naturally occurring sediments in raw clay will have a different heating expansion rate when compared to the expansion rate of clay. To eliminate poor surface qualities and failures during the firing process clay paste must be homogenized and blended to a uniform consistency. Once the clay paste is homogenized it will expand at a constant rate when heated and create a smooth unified surface.

Field work at Pottersville in the summer of 2013 provided additional corroboration of the industrial scale of work there. We located the “pug mill” in which clay was processed. It was located approximately 60 feet down-slope from the front of the dragon kiln and was much larger in scale than the examples of such pug mills from late 1800s sites that were used in smaller-scale, craft enterprise potteries in the Carolinas (Thornock 2013). Archaeologically, the pug mill might be one of the more difficult work areas to identify due to the ephemeral natural of its construction. Pug mills are often assembled of wooden planks and roughly hewn beams or posts. The superstructure of the mill was often built much like a child’s swing; four angled legs, two on each side separated by a long cross beam. Down the center is another pole connected to a milling stone. Above the milling stone wooden or metal rods, which serve as mixing paddles, are attached horizontally in a random pattern. The milling stone and mixing paddles are contained within a wooden tub where raw clay and water were combined. To turn the milling stone and mixing paddles through the mixture of clay and water a mule or other draft animal was hitched to the horizontal pole. Mixing paddles churn through the clay when rotated. The churning motion through the raw clay creates a more homogenous consistency (Figure 6.15).

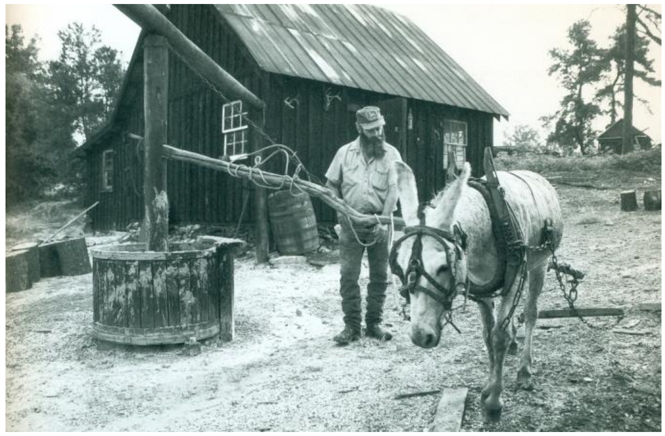


Figure 6.15. Chester Hewell and a mule turned pug mill. Burrison 2010: 45.

Raw clay sources collected from the pond during the 2011 field season were examined to determine the amount and size of sediments naturally occurring in a random sample. From the sample of pond clay 3 pounds were selected for this examination. The 3 pounds of clay were mixed with 1 gallon of purified water and left to sit for 24 hours. This clay and water mixture was passed through metal stacking sieves of the following mesh diameters: 2 millimeters (mm), 1.4mm, 1mm, 500microns (µ), 250µ, and 125µ. The minimum sieve size (125µ) was selected based upon the typical size of sedimentary inclusion situated within archaeological samples recovered from Pottersville and other Edgefield production facilities. These inclusions are optically visible and measurable during elemental analysis while utilizing the Scanning Electron Microprobe (SEM). These inclusions are a mix of naturally occurring sediments and ash. While under magnification in the SEM inclusions were measured and are typically no larger than 250 microns (µ). Sediments were collected in the individual sieve containers and then weighed with an OHAUS Scout Pro 400 gram (g) scale and yielded the following weights: 2mm (3.9g), 1.4mm (2.9g), 1mm (2.8g), 500µ (7.7g), 250µ (11.7g), and 125µ (1.5g). While the overall volume of sedimentary inclusions does not constitute a large percentage of the total clay body the amounts discovered are plentiful enough to limit vessel quality. Inclusions left in the clay body could protrude through the vessel wall creating an uneven surface or weak zone in the vessel wall which could allow for a failure during the firing process.

The 9 tons of clay would need to be loaded and unloaded into the pug mill in incremental throughput on a continual basis to process the material (Brunvand 1978, 1996; Keno et al. 2007; Ward 2008). Pug mills operated by folk potters vary in size; however, the wooden tubs tend to be approximately three to five feet in diameter and three to five feet in depth. A 9 cubic foot operating space could accept approximately 1/2 ton of clay at any given time. Burrison (2008) recorded, in the Meaders interview, that the preparation of clay in the pug mill often "took several hours." Other sources similarly indicate that this preparation time was 2 to 4 hours in duration (Norsker 1990**)**. Considering the high level of preparation of Pottersville clay it is inferred that each pug mill session might have taken the upper limit 3 to 4 hours. During the course of a 12 hour work day it would have been possible to process approximately 2 tons of clay or 5 days to mill an entire 9 ton load.

After the raw clay is processed it is ready for turning. To ensure pottery production could operate through multiple weather conditions a workshop would have been an additional structure in the pottery village. Inside of the workshop, or turning shed, all of the necessary tools for production would have been available to the potter: scales, lifter, jolly, and turning wheel. Scales are employed by potters to create a known gallon capacity. To form a 6-gallon storage vessel a potter would need to begin with a 22 pound block of clay. This block of clay would go through additional homogenizing by kneading and wedging. A ball of clay is thrown toward a wire, slicing the ball into two halves; the ball is then thrown together on a table (Figure 6.16). Once the ball is back into a single form it is repeatedly wedged. In the wedging process, clay is repeatedly kneaded on a porous surface to draw some of the water out while distributing the moisture evenly, eliminating hard spots in the clay. In the process, air bubbles are forced out of the clay, ensuring that these bubbles will not heat and cause the clay to explode in the kiln. Properly wedged clay is very smooth, with an even texture which is easy to work with. During the wedging process the potter will periodically stop to hand knead the ball of clay. This kneading and wedging is the last opportunity to remove air pockets from the clay body.

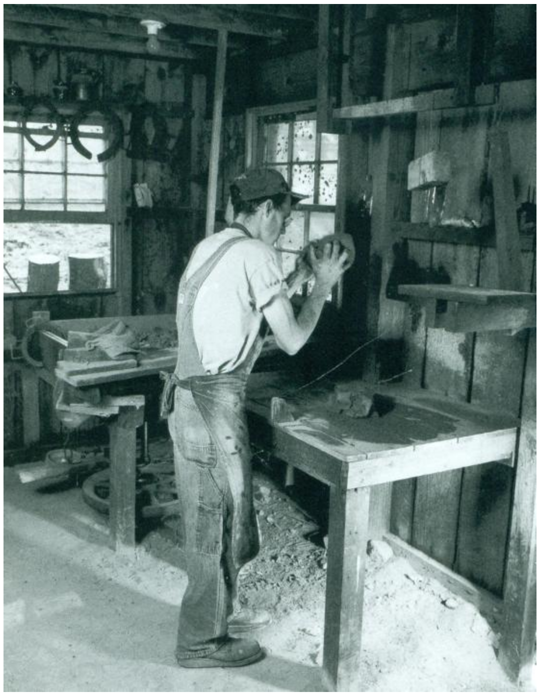


Figure 6.16. Matthew Hewell kneading clay on a potters table. Burrison 2010: 45.

Once a ball of clay is weighed, kneaded, and wedged, the potter can begin to turn the mass into a vessel. Potters in the Edgefield District were known to have utilized a "kick-wheel" or a "treadle wheel" to create vessels in the workshop. The 1820 Industrial census recorded 4 wheels in operation at the Pottersville site. The kick wheel has two flat metal wheels, one at either end of a vertical shaft. The bottom wheel is kicked in a forward direction, turning the vertical shaft which then turns the top wheel, also called a "headblock." The headblock is the location where the clay ball is centered to create the stoneware vessel. The top wheel and vertical shaft are the same for a treadle wheel while the lower mechanism is different. The treadle mechanism is a peddle linked to a horizontal bar which is connected to the vertical shaft by the use of a heavy flywheel (Burrison 2008).

In the summer of 2011, one gear approximately 10 inches in diameter, similar to that attached to the flywheel as described by Burrison (2008), was discovered during a metal detector survey to the south of the Pottersville kiln. The metal detector survey was conducted by the South Carolina Institute of Archaeology and Anthropology (SCIAA). SCIAA conducted the survey in an effort to identify possible concentrations of metal artifacts, such as nails, in an area believed to be suitable locations for kiln outlots. The gear was located along a flat parcel of land which possesses a natural spring. Potters and historians from the local Edgefield area have long speculated that this location would have been the location for the turning shop. The area around the flywheel will be subject to further geophysical and archaeological survey in future field seasons.

Associated with the potter's wheel could have been a "jolly" or "jigger." This apparatus was heavily utilized by potteries in the northern United States at the time that

Pottersville was in operation. The purpose of such mechanisms was to push down onto the clay ball and open the center to establish the base of the vessels. The jolly would have been positioned to create a void at the bottom of the clay ball leaving a consistent thickness for the vessel base. If the vessel base was left too thin, the bottom would fail by bursting outward during the firing process. Vessel bases recovered during excavations were both complete and fragmented. The complete vessel bases had a body width of 5 to 8mm while the failed bases tended to be 4mm or less in width. The consistency in vessel base sizes suggests that some mechanism was in place in order to maintain the regular width.

To fire 9 tons of stoneware, the Pottersville kiln utilized wood as its fuel source. If the Pottersville kiln design was based upon an Asian Dragon kiln configuration, a simple comparison of the amount of wood needed per firing can prove informative. The area in and around the Pottersville kiln is rich with coniferous and deciduous trees. The trees in the kiln area appear to be a re-growth of forest stands which has occurred in the past 75 years. A USDA aerial photograph displays the area surrounding the kiln space under heavy agricultural productivity, thus the current forested areas would have been a later renewal of the area.

Research into a Dragon style of kiln indicates that a single firing would have needed to consume roughly 10 cords of wood (Finlay 1998; Needham 2004; Sayers 1951). One cord of wood equates to 1 ton of weight; this means that enslaved laborers working the kiln site not only had to quarry 9 tons of clay but also collected 10 tons of fire wood. One of the major questions raised by modern day potters is whether the historic kilns were firing hard or soft wood. Deed records reveal information related to this question. Documents relating to the number of kiln firings that occurred in any given month or year have yet to be discovered. However, an 1820s land deed shows the timber rights and cash outlay required for kiln firing wood (Edgefield Deeds, Baldwin 1993). This deed record observes expenses such as "hardwoods at a cost of $40 per year and pine timber at $60 per year." This transaction also stipulates that the kiln operation had to be "reduced to no more than 24 firings per year" (Edgefield Deeds, Baldwin 1993). This documentary evidence indicates that both types of wood were likely being utilized for kiln firings. Another calculation made by possible through these documents, is the number of firings which occurred in any given month. Evidence from modern day Dragon kiln firings in China suggest that a 100-foot kiln takes approximately two to three days to load, three days to fire, three to five days to cool, and two days to unload for a total estimate of 11 days (Finlay 1998; Needham 2004; Sayers 1951, 1987). Thus, it is plausible that Pottersville, and other Edgefield kilns, could be loaded, fired, and unloaded two to three times in a single month. At some point during firing operations the Pottersville kiln was possibly fired three times per month based upon the wood purchase agreement, "*no more than* 24 firings per year (Edgefield Deeds, Baldwin 1993, emphasis added). By combining the amount of clay, fire wood, and the amount of time needed to create stoneware storage vessels, it is probable that the Pottersville kiln operated throughout the entire year. This year around manufacturing process likely churning out thousands of gallons of stoneware to meet the growing need of the region truly making this is early industry in South Carolina.

The Pottersville production facility provides an archaeological example of how the daily methods and techniques of pottery production were executed by the laborers and overseers at the kiln site. Dr. Landrum's establishment and operation of the Pottersville kiln was conducted within a set of doxa that he was immersed in from an early age. The Pottersville kiln was industrial in scale and operation; this is seen through the deed records that suggest the number of monthly firings. The industrial operations would have dictated a production schedule and potentially would have appeared similar to a production district within the Wedgwood potteries in England.

The Pottersville kiln structure was a divergence away from the ceramic industries of America and Europe. Rather than constructing a Cassel kiln or a bottle kiln, Dr. Landrum constructed a Chinese dragon kiln in his attempts to create porcelain. Constructing and operating a dragon kiln should be viewed as a heterodoxic break from the institutionalized ceramic industrial technology and a return to an age-old technology that had been successful for centuries. In building the dragon kiln Dr. Landrum did not follow Chinese construction convention but rather also broke free of those designs by building the kiln with European construction methods. The use of square kiln brick rather than stone was a means to improve upon the Chinese kiln design. Through the power of owner and operator, Dr. Landrum established and designed a kiln with similarities between two rival continents while making it his own.

The labor system utilized by Dr. Landrum held similarities to Wedgwood in England while at the same time diverging from the social conventions regarding slavery in antebellum South Carolina. Dr. Landrum relied upon a labor force that did not possess the ability to move freely. Wedgwood had established housing neighboring his potteries to ensure labor would be readily available. The Pottersville kiln operation utilized slave labor to conduct a portion of the daily activities at the site. The use of enslaved African

Americans in an industrial setting was uncommon in the antebellum South. So in an effort to maintain a reliable workforce similar to industrialists before him, Dr. Landrum broke with southern tradition by operating an industrial operation and providing enslaved labors with skills. The following chapter will explore industrial slavery and how the institution of slavery existed within the larger context of southern ideology.

Chapter 7
Republican Ideals, Planter Ideology, and Rural Industry

In the American South the peculiar institution of slavery was a system in which millions of people over multiple generations engaged with the social rules and norms that created and perpetuated a "Southern ideology." The development and perpetuation of American slavery provided the landed gentry with the means to advance their personal and economic interests. Due to social hierarchy, white landowners or businessmen were allowed to maintain and reinforce these regional social rules and norms. Over generations, the foundation and continuation of the slavery system reinforced the legitimacy of landowners' power and subjugation of the enslaved African population.

This chapter is focused upon the social system of slavery in the antebellum south. Part I discusses historical and theoretical perspectives regarding southern ideology and the southern social structure. This section provides an economic perspective as to why slavery was socially accepted in the American South. Part II explores two of the theoretical debates that surrounded slave holders and their assumed daily duties as landowner. The slave holding pottery entrepreneurs exhibit traits suggested on both theoretical spectrums and provide a concept of how a combination of ideas can be blended to provide a holistic perspective on southern ideology. Part III provides insight into industrial slavery in both the American South and the Edgefield district of South Carolina. An examination of industrial slavery in the Edgefield district allows for an interpretation of the daily activities that likely occurred at the Pottersville kiln.

I. Southern Ideology and Social Structure

I use the term "ideology" in this analysis to consist of one of the principal means by which a dominant social group legitimizes its power over another group (Thompson 1984; Eagleton 1991:5). Legitimacy of a particular group's power is advanced by promoting the group's beliefs and values, and universalizing these beliefs so as to render them "taken of granted" and to denigrate any contrary ideals (Eagleton 1991:5). Thus, a "planter ideology" can be viewed as a Southern societal perspective which created a system that accepted and perpetuated white landowners' ability to subjugate others. Such an ideological structure was embedded into everyday life, and the related norms and beliefs were both consciously and unconsciously passed down through generations and often accepted by the Southern populace in a routinized, unconscious manner.

For the purposes of this discussion of the American South's system of slavery, I find it instructive to engage with the theoretical concepts of Pierre Bourdieu's (1977) "habitus" and Anthony Giddens' (1979) "structuration." These social theories facilitate an understanding of a social group at a particular place and time with respect to the initiatives, social structures, and histories that their actions created. Such a social group possessed a shared set of rules and behaviors which governed the daily actions of those within the social setting. Rules and behaviors allowed an observer to interpret a particular group's motivation within the context of history construction. The structure of these social rules and behaviors were carried out by persons who subscribed to those norms as they interacted with others, either from within or outside of their social structure. Norms consist of rules of conduct that delineate what is socially acceptable and provide a related framework of perceptions and expectations employed by the social actor who subscribes to these norms. The display of these norms occurs at the moment of social interaction. The beliefs and norms conducted by those in the social group are known as a “habitus,” or the actions and dispositions that one learns unconsciously through interactions within a social setting. The rules that govern a particular social group’s beliefs and practices are learned early in life and provide a baseline for evaluating and performing social conduct deemed appropriate by the group (Bourdieu 1977: 78-93; Giddens 1979:64-66).

Since these actions are learned and reinforced throughout an individual agent’s life these norms become second nature and are acted upon in a routinized way, often without conscious thought. However, it should be noted that the social setting, rules, and norms do not produce a static social structure. Alteration of the structure can be attributed to an individual’s actions. The actions of alteration can be attributed to personal decisions. These personal decisions are often associated with attempts to better one’s life. Personal decisions build new histories while maintaining appropriate beliefs and norms associated with the group’s social structure (Giddens 1979:64-73).

Upward mobility is often viewed as the ability to change one’s lot in life and is most often accompanied by increased economic holdings. Increasing one’s wealth and status was a common social theme for Southern landowners. In the case of the antebellum South, wealth was amassed by members of this social group and was often displayed through the acquisition of new parcels of land (McMurry 1988). Once new or larger parcels of land were acquired the use of slave labor was often implemented to realize the land’s economic potential. Actors within groups create history through their actions as it relates to their world-view. Through their actions, landowners engaged in the construction of history through their ever-shifting daily activities.

European Americans, particularly white males, found themselves in control of varying amounts of capital. Capital was often manifested in the form of land and enslaved labor. To achieve their personal and financial aspirations, generations of Southern elites engaged with and shaped the structure of slavery in both purposeful and routinized ways. For the purpose of this discussion, economic structures provide important considerations that impacted other facets of social life. Indeed one analyst has observed that in America "historical archaeology has always been about capitalism" (Handsman 1985:2). Capitalism can be viewed as "an economic system in which those who provide the capital control the production of goods" (Curtain 1998:47 [1990]; Orser 1994). Slave labor was forcibly controlled by landowners and utilized to cultivate parcels of land. Through agricultural output the financial value of any given parcel of land could be realized. Thus, capital encompassed all aspects of plantation life which went into the production of material goods and commodities. Additionally, goods included not only those materials cultivated on the plantation, but rather also goods and commodities produced in the surrounding region as a product of related enterprises.

Plantation owners are a focus of this chapter so to gain an understanding of a southern slave-holding ideology. I utilize the subject of the plantation owner as a tool for comparison based upon the fact that industry was not the norm in the American South. In the rare instances that industry did occur in the South it was often conducted by landowners that also possessed large land holdings and operated plantations. Industry was such a small subset of the economic activities in the South. I suggest that the differences between the social and managerial perspectives employed on a cotton plantation owner and a southern industrialist were relatively minimal. The following discussion will examine the concept of industrial slavery and the degree to which the enslaved population was overseen regardless of whether they lived on a cotton plantation or pottery kiln site.

II. Theoretical Concepts of Plantation Economics

To analyze facets of a planter class ideology, one can engage with the scholarly debate that has taken place in the field of American economic history. Two primary discourses within Southern economics can be represented by the arguments advanced by Eugene Genovese (1965) on one hand and by James Oakes (1982) on the other hand. These scholars examined the contours of capitalism and its relationship to Southern social structures.

A. Southern Paternalism

In 1965, Genovese engaged the topic of antebellum Southern economics and proposed that the planter class embraced a paternalistic, antibourgeois ideology which was opposed to the social values and norms displayed by a capitalistic North (Genovese 1965). He acknowledged that plantation owners were responding to the demands of a world economic marketplace by utilizing ingenuity and skill as both planter and leader of their own households and enterprises. Relationships within a family, community, and region paralleled the paternalistic nature of the master-slave relationship. The resultant social structure helped to form the values and customs by which the Southern gentry emphasized family, status, honor, wealth, and service (Genovese 1965: 21-22; Billings 1979: 13).

Slavery became the structural basis of a Southern ruling class comprised of the plantation owners. American slavery and the ruling class maintained power relations based upon an interrelated ideology of racial differences. The relationship between master and slave provide the framework for Genovese's argument, which was situated in a paternalistic social structure. Perceptions of racial differences were accompanied by class differences among white southerners. By applying class distinctions in the plantation and surrounding social space, landowners became the persons principally responsible for the education and discipline of those within their sphere of influence (Genovese 1965; Billings 1979; Phillips 1969).

A white landowner's sense of authority, superiority, and power extended beyond that of his family, and co-opted lower class whites and enslaved laborers. The paternalistic structure was thus based upon discipline with the enforcement of order resting upon the head of the house, plantation, and surrounding social networks. This stage of social performance included local church and courthouse activities, in addition to plantation activities. Genovese claims that half of the enslaved population resided on farms (10 or fewer slaves) rather than large plantations (50+ slaves). Due to the size of the free and enslaved populations, enslaved Africans on these small farms often resided within or adjacent to the landowner's place often residence (Evans 1962; Phillips 1969; Hopkins 1998[1938]; Troutman 1968). The close proximity of living conditions of promoted the performance of the rules and norms surrounding slavery which allowed for a routinized acceptance of the enslaved into the social unit. By living in close proximity the landowner perceived himself to be responsible for providing enslaved laborers with direction, discipline, and to also, in turn, deserve the benefit of their value and labor (Evans 1962; Phillips 1969; Troutman 1968).

Some historians have been persuaded by 19th century documentary evidence in social commentaries that claimed that slave owners barely knew their enslaved workforce beyond the few household servants (Russell 2008). However, multiple accounts exist which suggest that landowners indeed knew their workforce and the particular qualities which each enslaved laborer possessed (Pearson 1906; Thompson 1966; Yetman 1970a, 1970b). Evidence supporting this countervailing view can be found in the daily written materials used by heads of households. The names of enslaved Africans often appear on probate records, family Bibles, and personal journals. Larger plantations were often owned and operated by absentee masters. In these cases, landowners often left the daily operations to a trusted family member or an overseer who resided on the property and provided detailed reports to the landowner as to how efficiently the work force was operating (Burton 1985; Dew 1994; Moneyhon 1999; Pilcher 1966).

Reinforcing the proposition that slave masters knew their enslaved work force was a role on some plantations in which a select few slaves served. The slave-holding landowner often appointed an enslaved individual to serve as "driver" or assistant to aid in daily activities whether or not an overseer was utilized. Such drivers held increased levels of responsibility above that of the other enslaved laborers. Drivers often managed the enslaved labor force and reported crop conditions and other important agricultural information to the landowner or other white overseer. With supervision and direction from the landowner or overseer, such drivers were able to accomplish these day-to-day activities on the plantation (Dew 1974; Johnson 1986; Pargas 2006; Van Deburg 1976, 1977).

This more direct relationship with the landowner was not without benefit. Drivers, or enslaved persons with special skills, often earned incentives for their services and performance. Incentives paid to those with skills above and beyond the field hand were often in the form of additional clothing, food, or monetary reward (Anderson 1985; Bridgewater 2001; Eaton 1960; Fenoaltea 1984; Phillips 1925, 1929). Through such aspects of the paternalistic structure on the plantation, a landowner and skilled enslaved laborer could begin to slightly alter the previous elements of the social system of the racially-separated antebellum South.

Through the routine actions that occurred between master and slave, a select portion of the enslaved population was provided the opportunity to learn skills beyond those of their field hand counterparts. As industrialization grew in 19th century America, so too did the need for a malleable workforce. By educating the enslaved workforce in skilled tasks, the plantation owner "civilized" enslaved laborers to transform them into more profitable assets (Genovese 1965:389). However, this observation by Genovese is a bit short-sighted since persons from West Africa were often specifically targeted for enslavement due to their proficiency in numerous skilled trades. Nonetheless, by training slaves to conduct other labor activities, the landowner was able to rent the time and labor of those workers to fellow agriculturalists, businessmen, or companies involved in economic pursuits.

While this discussion is shaped by an economic theme it is also rooted in the context of social aspects, a family-based ideology, and the expression of "human passions" within this ideology (Edleman 2006:196). For example, a planter named James Martin (1750: 19-20) observed that through actions, the planter exhibited a mastery of his surroundings while purportedly operating within the "laws of humanity" and displayed "benevolence toward slaves." The observations made by Martin (1750) suggested that the planter was a skilled merchant, which supports the economic discussion, and a just ruler, which supports discussions on paternalism, aimed at altering the tarnished history of America and creating a new lasting history (Sheridan 1974:9-14; Greene 1999).

Enslaved laborers with high levels of proficiency in a task garnered a greater rental sum since less training by the renter was required. Enslaved African Americans who found themselves working in industrial settings often preferred working away from the plantation since treatment was often better and additional incentives could be obtained. Based upon the numerous industrial records which mention the expenditure of direct payments to the enslaved laborer, Genovese (1965) contends that these industrial workers took a level of pride in their labor. By doing a proficient job and taking pride in their industrial output an enslaved industrial worker can be viewed as having internalized some facets of the social structure of the slave-holding Southern system (Dew 1994; Genovese 1965; Starobin 1970a).

Thus, Genovese's (1965) analysis provides a framework in which once can apply concepts of habitus to examine the social structure of Southern white landowners of the antebellum. The underlying structure of Genovese's (1965, 1976, 1988, 1989, 1994) discussion was focused on the Southern population's behaviors and norms. In contrast, another trend in the study of economic history sets out to explain the structure of Southern society based squarely upon the shoulders of the almighty dollar.

B. Southern Economy

Standing against Genovese is a group of scholars who perceive the antebellum South as a capitalistic society. Within this school of thought, Southern plantation owners are viewed as being socially on par with the industrialists of the Northern states. James Oakes has led the charge to interpret the Southern landed gentry by portraying them as agrarian slaveholding entrepreneurial capitalists. Oakes (1983) claimed that the post colonial market economy in the South shifted the ideals away from paternalism and focused economic efforts towards free-market commercialism (Ashworth 2008; Censer 1996; Dusinberre 1996; Ford 2009; Sellers 1994; Shore 1982, 1986).

During America's colonial history different patterns of economic development emerged in regards to the slave-holding class. In Virginia, the aristocracy created its fortunes from the tobacco industry while in the low country of South Carolina and Georgia large plantation owners earned wealth through the rice and indigo trade. These Southern slave-holding elites saw profit margins diminish as world economic trends shifted in the years that followed the American Revolution (Edgar 1998; Kovacik and Winberry 1987; Lander and Ackerman 1973). However, agricultural exports would make a comeback as cotton was widely desirable in the world economic system.

With the invention of the cotton gin in 1793 the American South had an added economic reason to retain the institution of slavery. At the same time that the Southern economy was receiving an injection from the world's market interest in cotton, the dominant white landowners began to participate in political democratization. Politics coupled with religious reform set the basis for Southern ideology, freedom of land and labor (Daniels 1970; Freehling 1972, 1992; Lakwete 2005; Phillips 1905; Wright 1975).

Freedom did not mean the end of slavery; in fact, the slave-holding South spun the political and religious doctrine to proclaim these freedoms for white males. By creating this distinction the white landholder could be a religious slave-holding Republican. Protecting the institution of slavery also meant the protection of the new Southern economic base, cotton. Cotton was being grown in the Southern states and transported to the industrial North where mills spun the raw materials into more refined products for export to Europe (Edelson 2006; Yafa 2006).

The port cities of the American South were the interaction place where goods from the plantation were sold to European merchants. Of these ports cities Charleston, South Carolina was the most active (Edelson 2006: 176; Post 2009). The exchange of plantation goods on the Charleston docks was the primary means in which landowners could evaluate their annual productivity (Edelson 2006). It was this marketplace, and not the exchange prices of Europe, in which plantation owner-engaged. These agriculturalists realized the market extended beyond the docks; however, it was of little concern since the immediate return of investment was the targeted resource (Drayton 1802:144-147). Agricultural activities and employment strategies were constructed with the goal of obtaining the largest return on investment possible. A crop and harvest season led directly into a market season which provided a realm for continual economic activities. For the landowner, these cyclical events began and ended on the coastal docks (Drayton 1802).

During the colonial period landowners were economically self sufficient, often participating in systems of barter, exchange, credit, and debit. Thus, constant access to monetary funds was not a typical system for the antebellum period (Fraser 1989). However, to make the agriculture and export economies viable in the 19th century, plantation owners needed year-round access to funds in order to purchase more land, acquire additional slaves, or gather much needed clothing, food, or equipment for the plantation. Since the need was year-long, the earnings from the Charleston port were neither sufficient to last the entire year nor enough to support the expanding plantation (Fraser 1989:17; Schaper 1901; South Carolina State Senate at Large 1796). In 1796, as a response to this need for accessible funds, South Carolina voted to charter the Bank of South Carolina. By establishing the Bank of South Carolina plantation owners within the region could arrange loans in order to make capital improvements. Since the Bank of South Carolina was chartered by the state, all funds of the state were to be deposited into the system to be used as loan assets for the state's population. By 1810 additional private banks were established to provide assistance and take advantage of the agricultural economy (Fraser 1989:17; Schaper 1901).

Being active agents in all facets of agricultural output meant that the lifestyle shifted by the particular season. By alternating from producer to marketer, plantation owners learned business savvy, befitting of the Southern ideology and being masters of their domain (Fraser 1989). During the growing season the plantation owner was concerned with the amount of acreage under cultivation, the number of persons needed to operate this space effectively, and the quantity of resources necessary to support the labor force. While the planters had direct control over the labor force, they were unable to control the European marketplace and the unforeseen market fluctuations which frequently affected raw material and commodity prices (Edelson 2006). By understanding the rates of labor expenditures for their operations, plantation owners could closely manage the costs invested in producing their crops; thus, the results of market sales of their commodities was of great importance in determining the profitability of their annual investments.

The landowners possessed pervasive control over their land and slaves (Oakes 1983). Efficiency would thus be defined as the agricultural output which provided the greatest return on investment. To provide such a return, plantation management journals of the period suggested the "humane" treatment of the enslaved population; however, in the antebellum South this strategy was not followed to a significant degree (Oakes 1983: 154). Obedience of the plantation population was an integral part of the management of any given plantation. For example, a set of management recommendations in the *Farmer's Register* (Carter 1834) advised plantation owners to "always keep them under proper subjection."

An efficient plantation operated as a bureaucratic unit wherein a "chain of command" was maintained from the landowner through overseer to the enslaved laborer. Regardless of the person, enslaved or not, every person was purportedly subservient to the person above them such a hierarchy. This hierarchical system would distance the plantation owner from those lowest in the system. Contrary to Genovese's argument, Oakes (1983) asserts that by creating distance between working groups a level of placating social interactions between master and slave would not be achieved.

The agricultural management literature of the antebellum suggested that efficiency was of utmost concern to the landowner. In the antebellum period South, there was no one way in which slave holders operated any one given parcel of land managed their labor working that land. However, as Oakes (1983) claims, there was bountiful information about the management of a plantation which went as far as to describe crop and cattle management and the organization of slave and overseer activities (Carter 1834). By reading, listening, and learning this economic rhetoric, landowners both consciously and unconsciously internalized an incrementally changing social structure which provided economic ideals for successful management of business operations, whether agricultural or industrial (Cairnes 1863; Carter 1834; Genovese 1989; Gutman 1975; Woodman 1966).

Vital to understanding the efficient operation of the plantation or farm is the understanding about the actual ownership of enslaved labor. While some accounts painted a picture that most Southern whites owned slaves, in fact the reverse is true (Evans 1962; Troutman 1968). There was a great divide between economic classes; many whites during the antebellum period lived in poverty and less than four percent of the Southern population owned 50 or more slaves (Oakes 1983:38). The majority of the slaveholding Southerners operated small farms and owned fewer than 5 slaves (Evans 1962; Phillips 1969; Hopkins 1998[1938]; Troutman 1968).

Small-scale farmers were much more akin to subsistence agriculturists, holding people in slavery only during the active portions of the growing season. To recoup funds spent in the purchase of a field hand or to alleviate economic pressures during the slow months on the farm, these small-scale operators rented enslaved laborers to larger plantations, urban elite, or businesses in industrial settings (Evans 1962; Phillips 1969). Moving the labor force to where the work was needed eliminated the amount of time a slave was without work. This created a more efficient regional economic structure which was situated within a larger commodity network with a global demand for cotton. By this line of reasoning it is plausible that any one particular slave or group of slaves could be involved in the planting, cultivating, bundling, transporting, and spinning of cotton prior to the product leaving for the factories of the Northern states or Europe (Vollmers 2003). Historians such as Oakes have thus identified the causes of developments and changes in society through the collective production of material necessities of life. In Southern society, social classes and the relationship between them, were structured with political and societal norms that reflected the context of economic activity (Hopkins 1998[1938]; Troutman 1968).

III. Industrial Slavery

For the purpose of my discussion, I move off of the plantation and focus on the employment of enslaved laborers in industrial settings. Slavery in the context of industry has not been as expansively researched even though enslaved workers were widely used in such endeavors. Among the few historians and economists who have studied industrial slavery, there are many disagreements in regards to the profitability and efficiency of slave versus free labor.

In the decades that preceded the Civil War, industry in South Carolina began to gain acceptance, not by an overwhelming majority but by multiple businessmen who saw the need to locally transform raw goods into more refined materials (Gregg 1934; Wallace 1934). In South Carolina, available free white labor was not as prevalent as in other portions of the nation, so the use of enslaved labor was considered to be a feasible solution to employment needs within manufacturing settings (Gregg 1934; Terrill 1976). Consequently, while using enslaved laborers, white skilled tradesmen were still needed to train the non-free work force. Politicians, apprehensive of abolition, viewed the close proximity of free and enslaved labor as a danger to the social structure and feared that poorer-class, white workers would soon side with the enslaved and join the call for equality. The opposition to this fear claimed that, in fact, education and industry would further provide a social separation between the white skilled craftsman and the enslaved laborer due to the deployment of ideologies of racial and class differences (Wallace 1934).

From 1840 to 1850 about 5 percent of all enslaved laborers were being forced to work away from the plantations. These workers found themselves engaged in cotton mills, iron works, tobacco manufacturers, tanneries, processing of agricultural products, mining, timber, turpentine, fisheries and railroads (Starobin 1970a). Additionally, government agencies, from local to federal levels, were known to have utilized slave labor as a means of taxation or to offset public works construction costs (Starobin 1970a: 31–3).

Slaves who worked in industrial settings were either owned by the business owner (80% of the industrial slave workforce) or hired out by their owners for an agreed upon period of time (Starobin 1970b). The amount paid by the business owner to the slave owner was typically lower than the salary a free laborer would receive (Starobin 1970b). Annual slave rental rates were, on average, around 12 to 15 per cent of the purchase value of the slave whose labor was rented. For the slave owner, rental rates provided both a return on investment and also eliminated the need to feed, clothe, and house the enslaved person for the period of rental (Eaton 1960: 663). The requirement to "maintain" the rented laborer was an additional layer of expense for that workforce, as business operators typically did not provide food, clothing, or housing rations to free, white workers. This added expense could account for slaves' lower fiscal rates of hire. However, there is overwhelming evidence that suggests that slave labor, even with the expenses of accompanying food, clothing, and housing fees, was 25 to 40 per cent less costly than free white labor (Starobin 1970b: 155–62).

The work in an industrial setting was extremely difficult and often dangerous. To acquire a substantial return on rental investment, industrial work shifts of eighteen hours were common. Due to the poor employment conditions and extended work hours, labor in industrial settings such as mining and lumbering was more dangerous than working on the plantation (Dew 1974; Starobin 1970a; Whitman 1993). In these dangerous working environments, where whites and enslaved individuals worked at diverse tasks, it was often the enslaved laborer who were forced into the riskiest situations (e.g., with the steam engines and boilers in steamboats and railroads). Starobin (1970: 37, 42) estimated that the chance of death in the steamboat industry was one in ten and that of serious injury one in four. Manufacturers often worked teams of slaves around the clock, which resulted in accidents caused by fatigue and exhaustion. Fires were frequent in mills, mines, factories, steamboats, and turpentine distilleries, which led to the death or severe injury of enslaved African American. Environmental hazards also posed a threat to the industrial slave. Poisonous snakes and plants and malarial mosquitoes made lumbering and turpentine production work in the Southern forests hazardous (Starobin 1970a; Vollmers 2003).

The majority of research focusing on industrial slavery has been conducted by economic and accounting historians interested in the financial structure of industrial slavery. This scant body of research claims that enslaved laborers often received monetary sums when work exceeded the "normal" work day (Dew 1974; Flesher and Flesher 1980; Lewis 1979; Vollmers 2003; Whitman 1993). The consensus finding among these authors is that slaves actively engaged in incentive-based systems. These incentives were paid directly to the slave laborer in exchange for longer work hours or greater output during the employment period. Direct payment of money to the enslaved was a powerful incentive which often was associated with desired industrial output (Dew 1974; Lewis 1979; Starobin 1970a; Vollmers 2003; Whitman 1993). In some cases this increased labor led to greater responsibility placed upon and accepted by the enslaved laborer. Greater responsibility allowed laborers to become experts at a given trade and with greater skill came a rise to managerial positions, providing a shift in social status for those enslaved laborers (Dew 1974; Flesher and Flesher 1980; Lewis 1979; Vollmers 2003; Whitman 1993).

Eaton (1960: 663) speculated that the frequency of incentive payments in industrial slavery suggests the nascent stages of a salary system. Eaton further suggests that wage salaries to all workers would have eventually ended slavery had the Civil War not occurred. To the contrary, hiring out slaves was not an innovation of the 19th century but rather a familiar practice which dated back to the earlier, colonial period (Kay and Cary 1999 [1995]: 48–51). While not universal, some colonial slave owners provided monetary incentives to reduce slave resistance and increase productivity on plantations and in industries (Kay and Cary 1999 [1995]: 37).

Cash incentives were often viewed as an effective tool utilized in order to reduce resistance and escape by the enslaved (Starobin 1979: 99–104, 259). Plantation slaves often earned credits with area merchants by selling food products which they raised in garden plots adjacent to their cabins. While these garden plots often supplemented the food rations, excess goods could be exchanged for other goods or materials which were needed by the enslaved. In the industrial settings, cash incentives for increased labor appear to have been far more common practice. Documentary evidence suggests that about half of all industrial establishments that employed slave labor made incentive payments directly to the slave (Barney and Flesher 1994; Kay and Cary 1999; Starobin 1970b). Providing a wage or cash incentives did not lighten the Southern gentry's position against slavery or emancipation. The high rates of slave hire provided an excellent return on investment and are probably the best evidence of slavery's profitability and of the near certainty that owners would have been unwilling to forego such income voluntarily (Dew 1974; Lewis 1979; Starobin 1970b).

While not directly connected to industrial slavery, but supporting a claim that slave owners attempt to maximize the value of their enslaved work force, is the study of Barney and Flesher (1994) who analyzed productivity data from a Mississippi cotton plantation. They discovered that women were able to pick considerably more cotton than their male counterparts during the course of one year. The plantation owners were able to reorganize the workforce, reassigning field hands to different locations or tasks throughout the plantation. Similarly, Fleischman and Tyson (2000, 2004) looked at the records of numerous plantations and discovered how the plantation owner accounted for the enslaved laborers and their level of output. The result of this study concluded that plantation ledger books recorded slave evaluations which were utilized for various purposes. Plantation ledgers show that each slave was credited for work performed and that the amount of worked allowed them to acquire an equivalent amount of supplies from the plantation storehouse; most often luxury supplies such as tobacco and molasses were purchased (Fleischman and Tyson 2000, 2004).

The limited scholarly writings that focus on industrial slavery do provide an expanded perspective of the economic system in which enslaved laborers were deployed. It must be noted that these authors generally support the theoretic perspective advanced by Oakes based upon the materials being referenced. Focusing on the industrial setting does not afford an opportunity to confirm or deny Genovese's account of pervasive impact of a paternalistic ideology. However, by examining this regional history through an archaeological lens it is possible to provide additional data and analysis that adds new considerations for both the paternalist and economic frameworks.

A. Industrial Slavery in South Carolina

To examine the Pottersville case study with respect to theoretical perspectives, one can first examine industrial slavery in the relevant regional context. In 1810 the United States Industrial Census recorded the value of American industrial output at $127,694,602; South Carolina's portion of this total was a mere $2,174,147 (Wallace 1934). The disparity in these numbers is most often attributed to a sparse population, poor transportation infrastructure, economic recession, and the impacts of a Southern social identity on economic initiatives (Faust 1981; Freeling 1992; Edgar 1998; Wallace 1934). For the purpose of this discussion one can consider Southern social identity as an impediment to widespread industrial enterprise. Plantation owners had the power of their immediate surroundings under their control; they owned the land and labor and dictated which crops should be grown. Allowing for laborers, free or enslaved, to diversify their daily routine would introduce change into a plantation economic structure, potentially eroding the existing structures of social control. Industry fueled the creation of urban centers and a working class driven by 19th century economics (Faust 1981; Freeling 1992).

In 19th century South Carolina, cotton was the primary agricultural output fueled by demands from Northern industrial enterprises. Profits realized through agricultural ventures were then funneled back into the plantation. The more profitable cotton became the more land and slaves a southern planter could purchase (Genovese 1965). Plantation owners were leading figures in the South, high status men often serving as politicians and clergymen. These landowners stressed the importance of family, social status, and a code of honor. Plantation life provided the landowner with paternalistic sense of control where he controlled all daily activities. Politics and daily social interactions were the dealings of the Southern gentleman (Genovese 1965). Within this ideology, hard work and not economic gain should be the goal of a civilized society.

Growth in labor and not infrastructure meant plantation owners were susceptible to fluctuations in the economy. When cotton prices boomed planters were able to buy more land and slaves; however, when prices fell landowners were forced to conserve raw materials or risk losing money needed to operate the plantation. Feeding, housing, and clothing enslaved workers were costly ventures and during economic downturns undercut profitability. Without manufacturing facilities in the South, this singularly focused economic system created a marketplace for merchants linking Southern plantations to Northern manufacturers. At the beginning of the 19^{th} century plantation owners in the South understood that relying upon Northern industries was a costly layer, cutting into profit margins on the plantation. In order to best utilize locally grown goods, economic diversification became more attractive in the South. Cotton and woven materials, metals, glass, shoes, hides, and other materials were typical industrial products of the time. The 1810 Industrial Census recorded that South Carolina produced 73,975,914 yards of cloth, and all but 126,463 yards were produced in the Upcountry region of the state. In order to provide clothing materials for this enslaved population, cotton was locally spun into rough cloth. In Edgefield during this time period one cotton mill operated 154 cotton jennies and 5,741 spindles (the implements typical for textile industrial applications) (Census 1810).

While large manufacturing centers were not a normal occurrence in South Carolina, smaller local manufacturers produced much needed materials for the surrounding plantations (De Bow 1852). The growth of the enslaved population coupled with agricultural workflow meant that a portion of the slave laborers might go under-utilized for a portion of the year. To counteract surplus labor, plantation owners hired out slaves to work for other ventures (Clark 1965; Dew 1994). Small non-agricultural activities could operate during the season when field hands were least employed. In Charleston in 1776, a local planter employed thirty enslaved Africans during the non-agricultural season in order to weave raw cotton into cloth. One hundred and twenty yards of cloth were produced per week, supplying materials to make slave clothing for his and surrounding plantations (South Carolina Gazette 1777; Wallace 1934). Small scale industries which forced slave laborers to create goods for slave consumption was fairly common in South Carolina. In the Edgefield District enslaved laborers were forced to create stoneware vessels which were later utilized to store food provided to their fellow slaves working on agricultural plantations.

Once everyday materials were produced cheaply in local facilities landowners could cut out the middleman merchant and reallocate financial resources toward the purchase of additional land, equipment, or slaves. The use of enslaved labor in an industrial setting afforded workers with an opportunity to obtain occupational skills, with the weaving industry in 1776 Charleston being one such example. Industrial skills were above and beyond the normal everyday plantation agricultural work required of the enslaved. Working within an industrial setting provided those enslaved with valuable trade skills and this became an unintended consequence for the South Carolina plantation owners. Industrial skills of any nature would become a valuable resource which was provided to some enslaved Africans as the economic basis changed in America. Once emancipation arose or someone escaped the shackles of bondage they would have a skilled trade to offer to earn a living.

While training a slave to work outside of the plantation was not often desirable, landowners needed to have a work force which could be trained and available to work in numerous settings. In the 19th century, poor white laborers were often unreliable, tended to moved westward during territorial expansion, and often participated in labor strikes Wallace 1934). While it was an important task of the landed gentry to train the poor and lessen the economic drain on society, the white laborers were often viewed as troublesome and counterproductive by the gentry (Gregg 1934). However, none of these social actions were options for the enslaved population, making them preferable for localized manufacturing. They were tied to the landscape and could be trained to carry out these much needed industrial tasks. White business owners in the Southern iron, turpentine, and cotton industries often preferred enslaved workers in operations, including service as facility supervisors (Dew 1994; Lewis 1979; Starbon 1970). These enslaved supervisors were unable to strike or move to new locations, which meant that a skilled workman would always be present during day-to-day operations. By being directly involved with the business owner, enslaved laborers gained access to new social relationships in which their skill and work acumen were seen as an asset, thus altering their social status while in slavery.

This is not to say that working in an industrial setting was a better way of life for the enslaved laborer. Hours were similar if not longer in duration when compared to field hands (Dew 1974; Lewis 1979; Starobin 1970b; Vollmers 2003; Whitman 1993). Slaves who served as field or house hands often had little to no experience in a factory; the equipment which they were forced to use was initially foreign in nature and often dangerous to operate. The mining industry was among the most dangerous tasks forced upon a slave; the rate at which a slave was loaned was often higher since the occurrences of death were substantially higher. While financial incentives were often offered to the enslaved laborer, acts of resistance were also displayed in industrial settings (Lewis 1979; Starbon 1970). In South Carolina weaving facilities, equipment was often "mismanaged" or "damaged" due to lack of knowledge. The care for equipment, or lack thereof, was also seen as a sign of resistance or malingering. In an extreme case enslaved laborers initiated fires which consumed the industrial facility at Graniteville in South Carolina (Wallace 1934).

B. Slavery and Rural Industry in the Edgefield District

The 2011 archaeological excavations carried out at the Potterville kiln site, located in the Edgefield district, led to the discovery of a kiln structure five times larger than expected. As a result, the genesis of what has been perceived as a Southern folk pottery tradition can now be re-evaluated as having roots in a Southern industrial enterprise. However, unlike the historical documents and contextual evidence provided by the historians for the regional accounts, the history of slave laborers working the Edgefield kiln sites is less substantiated. The lack of any indications in documentary evidence that the Pottersville kiln was industrial in scale led to assumptions by historians that it was a small-scale folk pottery with a groundhog kiln design. Thus, through archaeological evidence, Pottersville can now provide a space to discuss industry without the aid of documentary evidence. While overwhelming direct evidence of slaves working in pottery production does not exist, the use of enslaved laborers in industrial settings was encouraged. In the *Edgefield Hive*, a newspaper owned and operated by Abner Landrum, an 1830 article observed:

> Our country-born negroes, particularly in the upper country, are as ingenious, and considering their opportunities, as intelligent, as the mass of our laboring white population. One advantage, our manufacturers will find in using their slaves in this new species of enterprise in the South, and it is sufficient to outweigh the disadvantages of inferiority of ingenuity, if it existed – their establishments will not be subject to those sudden derangements, which in other countries, follow the whims and caprices of those who are entire masters of their own persons and services (*Edgefield Hive* 1830).

The potential of using a workforce much like that mentioned in the Edgefield Hive is shown through a neighboring textile facility.

In Saluda, South Carolina, less than 10 miles away from Pottersville, a large textile facility was reported as "possessing expertise" in the use of enslave laborers and by 1849 the Saluda operation utilized nearly 100 workers in bondage (Miller 1981; Wallace 1934). The enslaved laborers at the textile mill were mostly rented on a yearly basis from neighboring agricultural plantations (Lander 1953, 1960; Preyer 1961; Terrill et al. 1976). Over a period of time, enslaved African American laborers at the textile plant became highly proficient. Due to this increased level of skill the plantation owners who rented the enslaved laborers to the textile operations increased the annual rates. Because of the increase in labor rent rates, the textile company stock holders voted to replace the work force with free white labors. The manufactory foreman, who was initially hesitant about slave laborers, quickly realized that labor output by the enslaved workforce created an “efficient operation." In the textile spinning rooms, slave laborers performed duties "promptly" and as efficiently as the superintendent had "ever seen" (Miller 1981). Similarly, white mill employees in the Saluda textile mill claimed that the slave laborers seemed to take a great interest in their work. These statements made by the superintendent and free white laborers convinced the stockholders to abandon their plan to hire white, wage-based laborers. In the years that followed, the Saluda textile mill continued to integrate enslaved laborers into the work force (Lander 1953; Miller 1981; Preyer 1961; Terrill et al. 1976).

Turning the focus back upon Pottersville, I have discovered few written documents relating to enslaved labor at the site. While the materials are scant a few local documents do, by name, refer to several enslaved African Americans as possessing pottery manufacturing skills: Daniel and Buster were listed as “Turners,” Baddler, Abram, Old Harry, young Harry, Sam, and George were listed as “pottery hands,” and Old Tom was listed as a “Waggoner” (Baldwin 1993: 74; Edgefield Deeds 46: 78; Edgefield Conveyances 1840-1869). To date there has not been a discovery of a ledger book or journal which directly discusses how many enslaved persons worked the

Edgefield kilns and what their specific tasks entailed. However, the Edgefield District's most famous potter, Dave Drake, is known to have been held in bondage. His enslavement is recognized through the signatures, dates, and poems which he scribed into wet clay on the exterior of the ceramic vessels that he created. Dave's skill as a potter is revered by scholars and potters today. To place Dave's skill in the context of the framework of Genovese and Oakes, one could claim that both perspectives hold true. Dave was employed as a skilled potter who made thousands of stoneware storage vessels. However he had a connection to Dr. Landrum which could be expressed as fitting within a social structure of paternalism. Upon the death of Dr. Landrum, Dave inscribed a vessel in commemoration "When Noble Dr. Landrum is dead//May Guardian angels visit his bed//14 April 1859." By this example, one can infer that Dave was not just a productive component in an industry, but also a member of the surrounding social group.

Dave Drake is the most well-known enslaved laborer connected to these sites. However, his output at the pottery wheel provides just one example of the broad array of elements and workers in the entire system of stoneware pottery production. The enslaved African Americans at the pottery sites most likely participated in all phases of the production process, such as: building and maintaining the kiln; digging and transporting clay; working and grinding raw clay in "pug" mills; chopping wood for fuel; preparing glaze mixtures and clay pastes; turning the pottery wheels and shaping the vessels; and loading and unloading the kiln firings. Further to this point, local Edgefield historians Holcombe and Holcombe (1989: 22) observe that the "District's ceramic entrepreneurs would never have been able to manufacture such large quantities of Edgefield wares without the slave participation." South Carolina historian Bridenbaugh (1990: 15-16, 139-141) echoed this conjecture in an unrelated text by stating “in the Carolinas the overwhelming majority of artisans were Negro slaves” (Baldwin 1993)

The 1820 Industrial Census affords a starting point to consider the work actions of the Edgefield District slave potters. The 1820 census listed four pottery wheels in operation at Pottersville. The Pottersville kiln site provides a framework of pottery production in the district. Thus Dave, Daniel, and Buster would have conducted daily activities as a potter or turner. After Pottersville was successful and fully operational, numerous other Landrum family kilns were built and also become operational. One possibility is that this team of potters rotated from site to site within the Landrum family’s three kiln operations over the years. Other outcomes could have included the workers’ education in stoneware production methods through their participation in the stoneware industry. Finally, these enslaved potters could have likely worked alongside white, wage-based laborers in the turning shops. Based upon the analogies from other Southern industrial slavery sites, any of these scenarios are plausible. While there are several possibilities regarding the number of slaves educated as potters, it is more likely that the other facets of pottery operations solely fell upon the shoulders of unskilled enslaved laborers.

By 1820, the Edgefield District’s white population was approximately half that of the enslaved (Burton 1985; Dodd and Dodd 1973). Within the Edgefield district the wealthy landowners wanted to focus upon educating and employing the poor white social class. Education and employment were thought to eliminate undesirable actions often associated with the poor white class. To this end, Edgefield’s wealthy elite sought to employ white males and in 1850 four-fifths of the male population was employed in industry or agriculture (Burton 1985). Also in 1850, 90.1% of the white male population claimed employment as farmer, laborer, artisan, business, or domestic (1850 US Census). With a limited white labor pool and a large enslaved population, it is safe to infer that the unskilled tasks of digging clay, chopping wood, and preparing raw materials were indeed everyday jobs that slaves were forced to complete. The team of Baddler, Abraham, Old Harry, young Harry, Sam, and George could have divided into groups in order to complete the necessary tasks of the pottery operations. Again, since the written documents are far from complete this list of names is very likely a partial list, with numerous unnamed laborers working alongside the named few.

Another 1830 article in the *Edgefield Hive* published by Dr. Landrum described the practice of renting enslaved laborers to fellow landowners in the backcountry:

> The very slaves of America (for the most part) have plenty of meat, bread, and other vegetables. Many after performing the portion of service required by their masters, earn from 25 to 37 1/2 cents for themselves, the balance of the day: and this day's work is often performed by a hired slave – here the proprietor is satisfied as well as the secondary who hires; and still a portion of the slave's time can be appropriated to his own benefit! Seeing such then is the condition of the slave how much more comfortable must be the situation of the master, or even the non-slave holding citizen of the republic, who husbands with prudence, all the means in his power to procure the comforts of life and the blessings of education (*Edgefield Hive*: Pottersville, May 14, 1830).

The practice of slave hiring has been confirmed at other Edgefield District stoneware manufacturing facilities.

In an 1840 court ruling Lewis Miles (son-in-law of Rev. John Landrum) and B.F. Landrum (son of Rev. John Landrum) both signed a promissory note in which they agreed to pay Rosela Blalock $125 for the "hire of a slave boy for a year" (Baldwin

1993:42). In the 1850 Manufacturing Census, Thomas Chandler is shown to have employed 11 men at his pottery facility (Castille et al, 1988). However, Chandler only claimed to have six male slaves at the time of the 1850 Slave schedule. By careful examination of these documents it can be considered that Thomas either rented enslaved laborers, hired white potters, or some combination in order to accumulate the 11 potters. In the Thomas Davies Papers, the Palmetto Brick Works ledger indicated that this operation rented "gangs" of enslaved laborers that were hired from neighboring slave owners (Baldwin 1993).

By reviewing documentary evidence regarding Southern history it is understandable why these historians each arrive at their particular conclusions. Of importance to my discussion is the fact that regardless of which theoretical framework one chooses to consider, the fact is both sides create substantial arguments for the creation of local histories and the perpetuation of social structures. The evidence suggests that the planter was both economically and paternalistically driven. Both theoretical arguments suggest that the planter should be celebrated as a practical philosopher who combined the virtues of husbandry with the sensibilities of an entrepreneur (Martin 1750:19-20; Ogilivie 1776; Greene 1999). Travel accounts and historical-period writings from the "old South" claim that a "good planter" would have been intimately involved in the day-to-day operations of production and it was his personal obligation to inspect every facet of productivity (Edelson 2006:196). Those who would move on to become successful planters were considered to possess a "mind shaped by liberal education" and be able to recognize what is seen in common practice. In order for planters to accomplish these tasks they would have needed to acquire the skills of agribusiness while learning how to impart this knowledge to an overseer or the enslaved field hand.

In light of this chapter, Dr. Landrum can be viewed as a paternalistic master while pushing back against the doxa of southern ideology by employing enslaved African-Americans in an industrial setting. His actions as a paternalistic owner are likely the manner in which Dave Drake learned to read and write. During Dr. Landrum's tenure as the Pottersville kiln owner it was illegal for a slave to become educated in the state of South Carolina, yet Dave wrote on the side of wet clay in a visible fashion. I suggest Dr. Landrum felt that it was his duty as the head of household to provide all of those under his charge regardless of the individual social status; free or enslaved.

Dr. Landrum published articles suggesting that enslaved African-American in South Carolina could work in industrial settings more efficiently than their free-white counterparts. This perspective stood in opposition that the enslaved should be laboring on plantations and also that it was the affluent southerner's responsibility to employ the free-white labor. Dr. Landrum exercised his power as the affluent businessman and conducted his operations in a manner that was likely most profitable. The power asserted by Dr. Landrum can also be seen in the establishment of the Edgefield district stoneware potteries. The following chapter explores access to raw resources and the intentional positioning of Stoneware facilities throughout the Edgefield district.

Chapter 8
Elemental Analysis of Edgefield Stoneware

This chapter focuses on my third dissertation research question: "What were the natural resources utilized for production at the Pottersville kiln site?" Elemental analysis conducted on stoneware fragments from Edgefield district kiln sites provides valuable information on this question. The results of the elemental study indicate the locations of the raw resources utilized in the production of stoneware, and provide useful implications regarding the likely division of labor at these stoneware manufacturing facilities.

In 1809 Dr. Landrum was cited as having discovered high-quality "chalk," or kaolin in South Carolina. Three years later the 1812 grant request suggested that he intended to use these raw resources to produce porcelain. However, Dr. Landrum did not describe the nature, location, or the extent of the chalk resources. Without knowledge regarding the location of these resources it is plausible that the Edgefield potteries drew clay from one source regionally or multiple sources locally. One large chalk source would likely suggest that the Edgefield district potteries purchased clay from a single location. However, if high-quality clay was a region phenomenon rather than local, kilns could have been built close to such a centralized location of clay, and that resource would have influenced site selection for kilns. The single source hypothesis would suggest that the wasters from each Edgefield kiln would appear elementally similar, while non-similar elemental signatures would indicate that kilns were located adjacent to regionally dispersed, high-quality resources. Depending on source location, kiln owners were either responsible for the transportation or mining of clay resources.

The mining of clay would have been a physically demanding endeavor, one task in which enslaved labor could have been utilized. Enslaved laborers could have been exploited to mine clay from a regionally centralized location or from a borrow pit located adjacent to each kiln site. Enslaved African Americans forced to work in a centralized clay mining facility would likely have been deployed for that one particular task. However, in the event that kilns were constructed adjacent to regionally dispersed, high-quality clay resources, entrepreneurs would possess more inclusive control over all facets of daily production activities. To mitigate costs over the entire production enterprise, enslaved labors likely would have been involved in a multitude of tasks that supported pottery operations. The elemental analysis reported in this chapter addresses this question of clay source locations and provide direct indications of the array of daily activities and tasks undertaken at the Edgefield stoneware production facilities.

I. Introduction

The Edgefield Pottery District in South Carolina was the location for the innovation of alkaline glazed stoneware in America. Alkaline glaze provided a low cost technique that made stoneware manufacturing a profitable enterprise with a corresponding consumer demand. As successful as the alkaline glaze on stoneware was, the specific manufacturing processes used in Edgefield potteries remain unknown. Due to the high volume of manufacturing, many vessels were broken in the kiln firing and those fragments, called “wasters,” were dumped in the close proximity of the kilns. These stoneware sherds can be found at the kiln sites today, and representative samples can be collected for analysis. These waster fragments provide clues into production techniques utilized at these facilities and how alkaline glazes were first developed and subsequently altered over time.

To explore research questions regarding the acquisition of raw resources and methods of manufacture, I employed a Scanning Electron Microprobe (SEM). The SEM provides elemental composition data in regard to the tested material. Data sets produced by the SEM assist in the determination of variations in paste, temper, and heating temperatures that existed in the production practices implemented across different kiln sites. The results of analysis from these data sets held the potential to provide an elemental signature of pottery produced in particular manufacturing facilities. Such an elemental signature could provide distinguishable characteristics for each kiln site, making it possible to compare the variation of materials selected during the manufacturing process. As detailed in the following discussion, this study revealed elemental signatures for pottery production at several different Edgefield production facilities.

This study begins with a discussion in parts II and II of the material type being tested and its process of manufacture. Part IV provides a general consideration of how potters likely acquired their raw resources. To identify the potter's natural environment each kiln location will be described by the geologic and hydrologic resources in parts V and VI. Parts VII-IX provide discussion of the results, findings, materials, and the methods utilized throughout this report. I conclude in part X of this chapter with a consideration of the significance of these findings in the context of my broader research question.

II. Stoneware

The manufactured material of interest in this analysis is alkaline glazed stoneware. The clays needed to produce stonewares must withstand high temperatures in the kiln. Clay resources with silica-rich clastic materials are ideal for this use. The typical firing temperature for stoneware ranges from 1200 to 1400 degrees Celsius, which expels water from the parent material and allows the clay to harden to a non-porous consistency (Barber 1909, Ramsey 1939, Greer 1981). At such high temperatures, the vessel becomes "stone like" and impervious to penetration or evaporation of moisture. High temperature firing works particularly well with large pieces of pottery. Due to the non-porous nature of stoneware, these vessels become useful storage containers for perishable items kept in local storage or exchanged in regional trade.

Alkaline glazes are made by combining hardwood ash and silica with clay and water. In the latter part of the 19th century, stoneware vessels were treated with alkaline glazes and typically fired in groundhog kilns. These kilns were a unique southern United States variation of climbing kilns built into hillsides and are similar in construction to Chinese dragon kilns. Dragon kilns have been utilized to create stoneware vessels in Asia since the 2nd century and the knowledge of their construction was known in Europe after missionaries returned from Asia in the 17th century (Baldwin 1993, Zug 1986). Semi-subterranean in construction, the groundhog kiln featured a door leading into a barrel vault of brick and rock construction, with a stack or chimney poking out of the ground uphill (Sweezy 1994:60). Ware was loaded in the low passageway or "ware-bed" and the fire was built in a sunken firebox, located just inside the door. The design allowed the stack to draw heated air, flames and ash through the pottery grouped inside, and thus, created the draft needed to generate the intense heat required to create stoneware. Due to the complexity of stoneware manufacturing a kiln's construction is of principal interest to understand the historical underpinnings related to Edgefield stoneware technologies.

III. Archaeological and Compositional Analysis

Many facets of the technological attributes of Edgefield stoneware production remain unknown to this day. In this part of my project, I examined the raw materials most likely used in the manufacturing process at six, separate production centers, the distances raw materials were transported to those centers, what variations can be seen from kiln to kiln. Vessels that failed during the firing process at a kiln are typically located in "waster piles" close to those kiln remains, and provide a valuable data source (Castille et al. 1988; Holcombe and Holcombe 1998: 76; Steen 1994). Each sherd can provide data such as color, thickness, and material inclusions which provide information for a developing data set on production variations from kiln to kiln. However, the investigation of raw clay is just as important in testing to determine if elemental signatures existed for each clay source in the surrounding area for each kiln. The elemental composition of the source clay would in turn be slightly altered when the vessels were subjected to high firing temperature in the kiln. The degree of alteration of the elemental composition of the clay through the heating processes also provides data for determining the range of firing temperatures implemented in those kilns.

IV. Spatial Analysis and Predictive Models of Resources

Studies in ceramic ecology provide a means for analyzing the possible links between the availability of natural resources and the production decisions made by social agents (Arnold 1988, Rockman 2002, 2003). The distribution and accessibility of different natural resources should be examined when discussing the knowledge needed to create a full-time ceramic production center. Areas deemed less fertile or inaccessible to agriculture display a higher potential for alternative uses (Arnold 2003), thus becoming likely target resources for craft production in the surrounding community. Predictive modeling can examine environmental constraints and limitations to understand suitable locations for non-agriculture activities (Myers 1989). These models can provide additional data for the analysis of relative variations in resource availability, associated production methods, and resulting artifacts over time (Callahan 1990; Crabtree 1966; Collins 1975; Sheets 1975). Similar to research of lithic technologies, the established chronology shifts the discussion from typology to the development in the methods of production (Bleed 2001).

V. Background

Archaeological research focusing on the Edgefield District kilns includes two surveys, conducted in 1987 and 1993. These two projects mapped kilns locations, the area surrounding the kilns which were the likely locations of workshops, tested the sites for the integrity of the kilns, and sampled vessels in order to establish a ceramic typology for the pottery centers. In 2009, I conducted an additional survey to collect data for this project. These three surveys yielded collections of representative waster fragments from multiple kiln sites which I utilized in the analytical portion of this project discussed below.

Historians have recorded a minimum of 14 stoneware production facilities that operated in the Edgefield region from 1815 to 1900. Due to site destruction and lack of access to private properties, not all 14 sites have samples represented in this project. The following discussion describes six of the manufacturing facilities from which provenance-verified waster samples were collected.

<u>A. Pottersville (38ED011)</u>

Pottersville is located in present day Edgefield County and represents the beginning use of alkaline-glazed stoneware vessels in the Americas. Pottersville is recognized as a nationally significant site based on historical, documentary evidence, and is listed on the National Register of Historic Places (NPS 2009). The *Camden Gazette* newspaper first published information about the Pottersville vessels, describing them as "the first of the kind" and "superior in quality" (C.G. 3 June 1819: 4-5). The quality of these vessels was later echoed by Robert Mills in his 1826 *Statistics of South Carolina* when he stated the stoneware was "stronger, better, and cheaper than any European or American ware of the same kind" (Mills 1826). In the early years of production, the center employed men and children of European heritage, though worker demographics subsequently shifted to mainly African-American laborers. Though the Pottersville manufacturing facility changed hands several times during its operation, it remained an integral site for stoneware manufacturing until closing in approximately 1843 (Castille et al. 1988: 50-51; Holcombe and Holcombe 1986: 49-51; Mills 1826: 523-524; Steen 1994: 31-32; Vlach 1990ab: 20-21).

Today, Pottersville is situated in an open pasture within one hundred meters of a modern road. A small stream is located four hundred meters to the east and a small pond approximately 1 km to the northeast. The kiln remains sit on the highest elevated point of the field, surrounded by a surface scatter of ceramic sherds in all directions (Figure 2.13). To the southeast, the downhill side of the kiln has the highest density of surface debitage. This deposit is at the mid-point between the kiln and the location where a turning shop was likely built in the early days of the productions site's operations (Castille et al., 1988, Steen 1994). Clay in this region varies in color from Munsell 10R 4/8 Red to 10YR 4/3 Brown and 10YR 8/4 Pale Yellow. The operators of the Pottersville production center were able to utilize the wealth of clay color variations at the site to produce a wide array of products for market.

B. John L Landrum (38AK497)

The John Landrum kiln site is located in Aiken County approximately 3km from the town of Eureka, SC. This site produced many of the common vessel types of Edgefield stoneware including bowls, jars, and jugs. The 1988 survey report states that the John Landrum site incorporated incised rings around the shoulders of the jugs. This attributes which may provide valuable data on stylistic pattern distributions and configuration for stacking vessels in the kiln, as subjects for future research.

This site is situated near two water sources called Gopher Branch and Horse Creek. The remains of two kilns are located near the mid-point of the north slope of a small hill. Down the hill towards the creeks are the remains of a stone foundation of a historic-period structure, possibly a mill or workshop. Clay in the area of the historic occupation was Munsell 10YR 6/8 Brownish-Yellow to 10YR 8/2 Very Pale Brown in color.

Ceramic sherds are spread for hundreds of meters in all directions around the remains of the two kilns. One of the most interesting sherds collected during survey of this site was a vessel base with an impressed "X" (Figure 8.1) (Joseph 2007). Incised marks of many different shapes and designs have been noted on many other artifacts originating from the John Landrum site. Several pieces of kiln furniture were found near the mouth of the kilns, these items seem to have been used over numerous firings in view of the amount of residual glaze on the exterior.

Figure 8.1. John Landrum Sherd with impressed "X"

C. B.F. Landrum (38AK496)

The B.F. Landrum kiln site is located near the junction of two water courses called Horse Creek and Bear Branch. This facility was operated by Benjamin Franklin Landrum, son of John, and previous to 1850 Benjamin had worked with Lewis Miles. Stoneware and other ceramic manufacturing continued through the Civil War and finally ceased in 1902 (Baldwin 1993:96). The kiln at the B.F. Landrum site was destroyed in the 1960s but the waster piles still exist near a small stream in the area (Castille et al. 1988:117). Due to the growth of the forest, and relative protection from natural elements, many of the vessels appear fresh from the kiln and display few signs of digenesis (Figure 8.2). Digenesis entails changes to sediment within geological materials after formation and typically occurs when materials are reheated to a temperature capable of exciting the materials physical bonds.

Figure 8.2. B.F. Landrum Waster Pile

Observable alterations to the landscape include an artificial pond approximately 400 meters from the site. Near the small stream there are numerous areas that suggest clay extraction took place in this location. The raw materials in the location around the creek ranged from 10YR 4/3 Brown sandy-clay to 10YR 8/1 Yellow clay. At present, the waster pile is the major feature in the area and the vast amounts of stoneware sherds from sixty years of production activities provide ample evidence for future, additional testing.

D. Miles Mills (38AK498)

The Miles Mills facility is located in an area known as Horse Creek and within this area several other entrepreneurs owned and operated kilns adjacent to Miles Mills (Steen 1994). Like Pottersville, Miles Mills changed hand numerous times throughout the nineteenth century; however, unlike Pottersville, Miles Mills remained in operation until 1924. The kiln site was situated near the town of Trenton and a train depot. Stoneware produced at Miles Mills was made available for both local and regional purchases. The Mills family purchased clay beds from the surrounding areas which would allow for the long term manufacturing in the region. Subsequent owners of Miles Mills tapped into various other stoneware styles creating vessels of differing shape (e.g., flower pots, storage vessels, etc.) and colors (e.g., yellow-wares and terra-cotta) (Baldwin 1993, Castille et al. 1988, Steen 1994).

The kiln was destroyed during the construction of a jeep trail that runs through the area. From this trail the remains of several waster piles are clearly visible. The waster piles are located on the north or downhill side of the jeep trail and proceed to the nearby creek. While viewing the location where the kiln once stood; outcrops of Munsell 7.5YR 8/1 White clay were clearly visible in a cut created by road grading.

E. Rhodes-Seigler (38AK495)

The Rhodes-Seigler production complex is located near the town of Eureka in Aiken County and within a portion of the Shaw Creek watershed. The two distinct kilns are separated by a smaller creek fed by Shaw Creek (Castille et al., 1988). This creek has a north-south bearing with the remains of the Rhodes kilns on the western side and the Seigler kiln on the eastern side. The Rhodes kiln was reconstructed from the earlier

Phoenix Factory and maintained separate borrow and waster piles during operations. The waster samples are from both kilns. Samples from each of these kiln sites were analyzed and are independently discussed below. The vessels from the two kiln sites can be differentiated by sight. The Rhodes kiln was the first site to incorporate slip decoration, the vessel wall is thinner, and the paste is lighter in color (Castille et al., 1988, Steen 1994).

VI. Geographic Information System Data Sets

A major component of this project was the creation of Geographic Information Systems (GIS) maps detailing area resources for analysis in this study and assist in guiding future archaeological investigations in the Edgefield District. I created these maps were created utilizing GIS ArcMap 9.3 computer program. Data files and metadata were downloaded from the South Carolina Department of Natural Resources (SCDNR) GIS clearinghouse: http://www.dnr.sc.gov/GIS/gisdownload.html. The datasets offered by the SCDNR are sufficiently robust to provide an ample basis for developing descriptive and predictive spatial analyses. The data selected include geology, water resources, and vegetation. Locational data on each kiln site were added to the GIS layers. To use the maps with the resources available, all of the data was projected into Universal Transverse Mercator (UTM) North American Datum 83 (NAD83).

I hypothesized that the natural resources utilized by any single kiln would be drawn from the nearby area in a manner shaped by kiln operators' efforts to make efficient use of resources and constrain related transport costs. The model is supported by cost-distance analysis of resource transport to kiln sites for production. Due to the weight of raw clay and timber for the kiln firings, I assigned resource zones at 1, 2.5, and 5 miles radii from the kiln locations. I hypothesize that owners primarily utilized resources in the most proximal zones to their kiln sites and only added more distant resources locations when necessary. I assigned additional buffer zones around area streambeds to allow for the impacts of high water and flood zones, which enabled me to further narrow the field of search for the clay sources.

A. Vegetation Resource Distribution

Kiln operation would have necessitated large quantities of lumber for fuel, to support a constant temperature of 1200-1400 degree Celsius for stoneware production. Though GIS data only display the vegetation characteristics of the modern forest, resin laden white pine was initially thought to have been the main forest material utilized by the stoneware potteries. Areas surrounding the kiln sites were not reforested by human intervention, and therefore can be employed to analyze likely forest growth patterns in the mid-nineteenth century (Figure 8.3).

The South Carolina vegetation data set was downloaded in state-sized raster files. To convert raster to shapefiles a dedicated computer took nearly 20 hours to convert the data. Unlike the geology map that can be viewed and interpreted for the entire Edgefield District, the vegetation map only shows detailed data differences when the map size is zoomed down into the concise space of the kiln, which is approximately 5 miles in diameter.

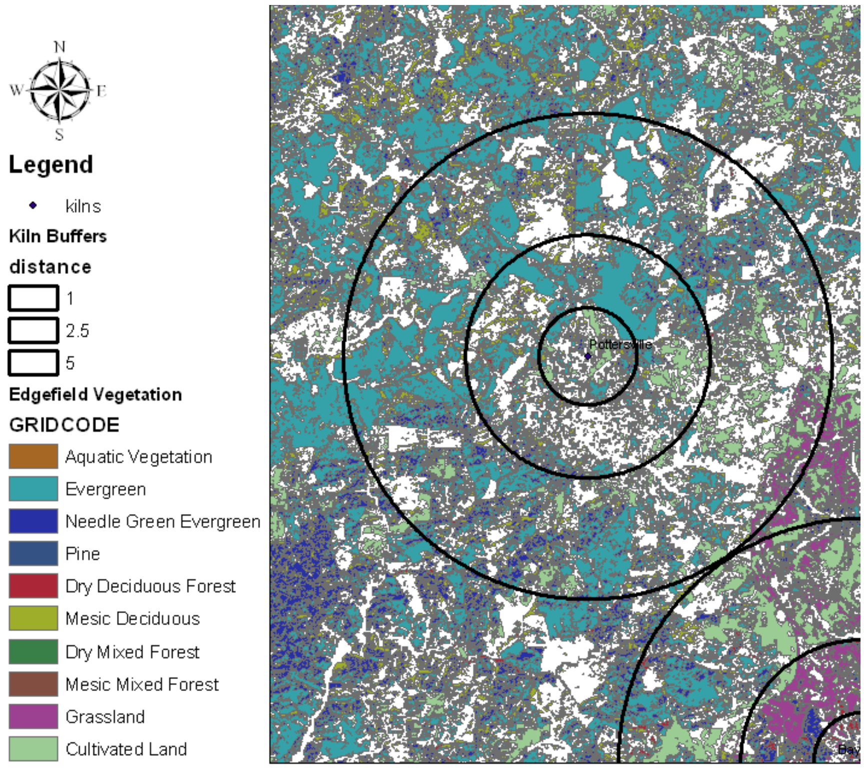


Figure 8.3. Map of the modern day vegetation at Pottersville.

B. Hydrology and Water Sources for Kilns

The hydrology of the Edgefield District is pivotal to understanding kiln processes since water is not only necessary for the manufacturing of ceramic vessels but can be an indicator of possible clay extraction sites. The area north of the fall line, where the Charlotte Terrane and Modoc geologies meet, typically has smaller waterways, whereas south of this region larger, faster-flowing creeks and rivers dominate the landscape. These fast-flowing waterways create deeper scars in the parent geologic material, which produces steep river banks. Since the good potting clay is often situated on terrain by water courses, the steep stream banks in the area likely provided pottery workers with more visible deposits of clay.

When creating the GIS database, I added 100-foot buffer zones around these waterways (Figure 8.4). Survey points were determined where contour lines indicated steep terrain in these flood zones. These maps also will be useful in future research projects to predict the locations of dwellings and workshops.

Geologic data maps can similarly provide valuable data on the variations in natural resources available to potters in the Edgefield District. To successfully produce alkaline-glazed stoneware, the manufacturing facilities required nearby deposits of wood, sand, and silica clays. The southeastern Appalachian Mountains offer a wide variety of geologic diversity caused by tectonic subduction and accreting land masses in this region. The Edgefield District is dominated by the Carolina Terrane, Upper Cretaceous, Paleocene/Eocene, Savannah River Terrane, and Charlotte Terrane (land masses deposited on top of each other due to plate-tectonics) (Figure 8.5). The soils in the region are primarily formed from metaigneous and metasedimentary rocks produced through sub-aqueous pyroclastics (Hibbard et al. 2002). This volcanic activity led to the production of felsic, mafic, and quartzite parent materials which are all silica rich. Through the processes of soil formation, the Edgefield District, as well as the southeastern United States, is situated near these silica outcrops, which provide valuable resources for stoneware pottery production.

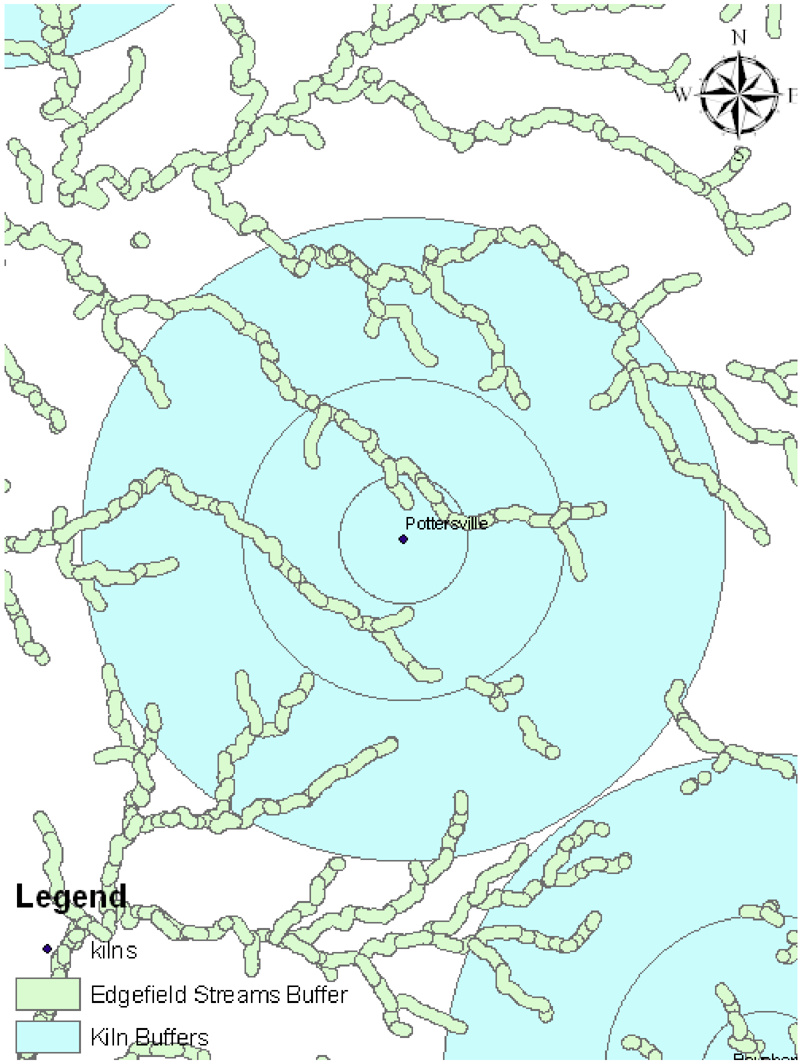


Figure 8.4. Map of the modern day hydrology at Pottersville

C. Geologic Evidence of Resource Distributions

When the kilns were plotted on these maps there was a clear geologic difference between Pottersville and the kilns situated in the Shaw Creek area (Figure 8.5). Pottersville is located near the fall line and in this area the parent geologic materials are Modoc and Charlotte Terrane. The Charlotte Terrane was formed during the Neoproterozoic due to an arc-arc collision with the Carolina Terrane and has a U-Pb zircon age of approximately 579-535 million years ago (Ma) (Wright 1997, Barker et al., 1998). The Modoc Zone is a 5-km thick oblique ductile shear zone and contains high metamorphic grade structures (Kish and Black 1982).

The remaining kilns are situated near three different parent materials: Upper Cretaceous, Paleocene/Eocene, and Savannah River Terrane. This band of geologic parent material stretches from the coastal plain of eastern North Carolina to Mississippi and has a K/Ar age of 91.3 Ma for the Upper Cretaceous and Paleocene/Eocene 56-34 Ma (Sundeen and Cook 1977). The Savannah River Terrane is a portion of the Carolina Slate Belt dating to 640-620 Ma (Steltenpohl et al. 2008). Inclusions of oceanic organics in the younger geologic materials, on top of the Savannah River Terrane, are due elevated sea levels between the Upper Cretaceous and Paleocene/Eocene epochs. Rivers and streams cut through this material created steep embankments which over time exposed clay veins in these low laying areas.

Based on this evidence of differing geologic events impacting the terrain of the Edgefield District, one can predict that the area will display a variety in elemental compositions in clay deposits. The Pottersville area will obviously be different due to the much older period of soil formation. The kilns in the Shaw Creek section will have similar compositions to one another; however, due to the wide variation of mixing ocean sediment and natural soil formations the elemental signatures should be distinguishable when analyzed with high resolution methods.

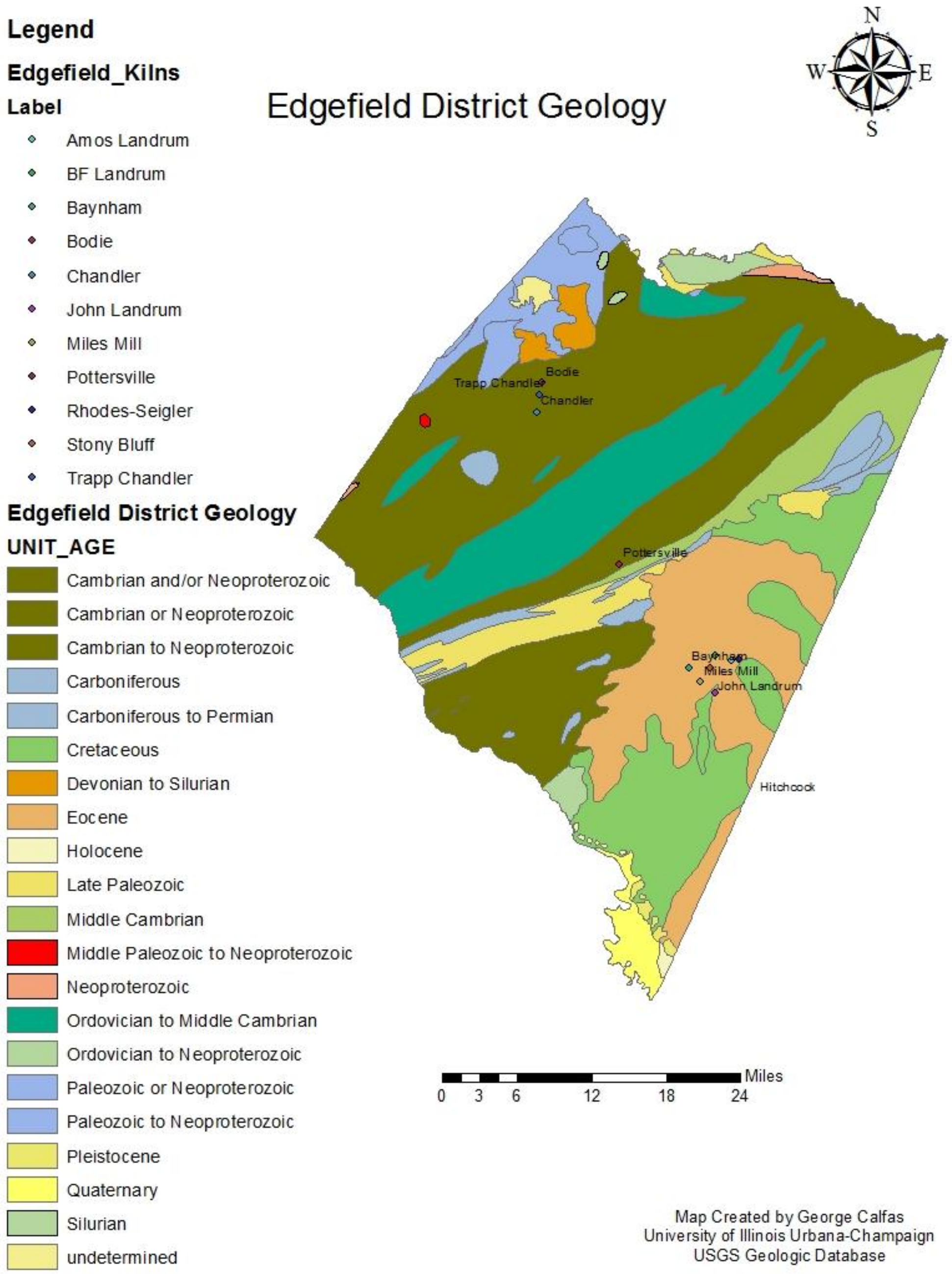


Figure 8.5. Map of the geologic variation which exist in the Edgefield District

D. Clay Resources for Pottery Production

To manufacture ceramics, kiln operators would need to develop an understanding of the compositional characteristics of the local clay veins. To produce stoneware, a clay body will be better suited if it to possesses high silica content which would withstand the high firing temperatures within the kiln (Greer 1981, Sweezy 1994). When potting clay is not sufficient enough to withstand these extreme temperatures, materials such as feldspar are added during the mixing process. Feldspar and other silica agents are used as a flux in order to maintain the vessels shape and allow for the clay's crystalline structure to adhere to itself during firing. Thus the potter benefitted by developing an understanding of the "pyrometric" properties of the clay sources (Sloan 1904).

The raw clay best suited to produce stoneware would be of high quality, free of excessive inclusions (Greer 1981). High-quality clay would be similar to the chemical composition of kaolin (hydrated silicate of alumina): Silica 46.5%, Alumina 39.5%, and water 14%. (Sloan 1904) The clay beds that I sampled in the Edgefield District displayed similar elemental compositions, ranging from 44.9-57.44% Silica and 29.27-44.39% Alumina. The quality of these samples indicates that little or no additional materials that would need to have been added for the vitrification process to take place during the kiln firing.

VII. Materials and Methods

A. Field Sampling of Clay and Ceramic Data

The field portion of this study began in May 2009 with the goal of collecting materials for analysis. The sherds sampled from the kiln sites were selected randomly at ten pace intervals. At the beginning of this project only three sites were available for research called: The Pottersville, John Landrum, and B.F. Landrum kiln sites. In January 2010, ceramic samples from three previously surveyed kilns were added to the data set for this project, from the sites called Miles Mills (38AK498), Rhodes (38AK495), and Seigler (38AK495) kilns. These latter samples and their provenience data were provided by archaeologists who conducted surveys of the sites in 1987 and 1993. The current data sets analyzed in this study consist of a relatively small sample size. However, preliminary results were very promising and provided a basis for future investigations. Representative samples of waster sherds were collected in the vicinity of each kiln site by walking in designated circles around the kiln or waster pile, stopping every ten paces to search for sherds until twenty or more samples were collected.

The sherds displayed a wide range of form (body, lip, and base) and color (grey, tan, and white). Due to exposure and the processes of weathering, the exposed paste surfaces have mostly faded into a dark grey color which made the paste color difficult to discern in the field. Paste colors were therefore examined and recorded after the vessels were returned to the laboratory, cleaned, and sliced into cross-sections.

To discover the potential sources that supplied the clay for the previously mentioned vessels, clay veins surrounding the kiln sites were sought out for sampling. Local potters creating reproductions of Edgefield stoneware assisted in showing the locations of areas which they believed represented historic extraction sites. Raw clay was sampled with an Oakfield 3/4 inch soil core probe to a depth of three feet. The depth at which any type of clay was discovered varied from one inch below surface level to as deep as two feet. Tightly compacted and fine grained sand was the typical material in those areas with buried clay deposits or no clay to the depth of three feet. The location of each sample site was recorded with a Trimble high resolution global positioning system (GPS) unit. This allowed for the later plotting of the potential extraction sites in the

Geographic Information System (GIS) database. As described by Sloan (1904), raw clay from the area displayed the following colors: red, tans, beige, and white. The red clays are assumed to have been used for lower fired materials such as bricks, while the lighter colored clays would have been more suitable for the malleable formation of stoneware vessels.

B. Compositional Instrumentation

Compositional analysis was accomplished with the JEOL JSM-840A Scanning Electron Microprobe. The SEM was selected for this project based upon the wide range of measureable elements. The SEM incident beam can be moved which allows for the collection of data point across multiple locations in one fixed sample. Additionally, the SEM is equipped with a visual monitor which allows for pinpoint samples to be collected avoiding inclusions which would alter the elemental signature of the sample. Also the SEM is equipped with Energy Dispersive X-ray (EDS). EDS can provide rapid qualitative, or with adequate standards, quantitative analysis of elemental composition with a sampling depth of 1-2 microns. X-rays may also be used to form maps or line profiles, showing the elemental distribution in a sample surface. However there are limitations associated with the SEM. The EDS collector is not sensitive enough to acquire data sets from light elements such as Hydrogen, Helium, and Lithium. Since samples must be no larger than 3cm by 1.5 cm test samples must be cut to size prior to testing. These limitations did not affect the project since samples were portions of waster fragments and were not from complete vessels. Additionally, since ceramic objects were being tested, the first element considered in the testing protocol was determined to be Fluorine (F).

C. Preparation and Labwork

Lab work began with the preparation of the ceramic sherds. The samples need to be cut approximately into 3cm long x 1.5cm wide x .5cm thick slices in order to be inserted into the JEOL JSM-840A Scanning Electron Microprobe (SEM). The portion to be cut away from the vessels was selected from an edge with similar dimensions needed by the SEM. This allowed for the minimal destruction of the overall vessel. To obtain an overall consistency of the cuts a Buehler Isomet Low-Speed Saw was utilized. The Buehler provides a smooth, flat surface which eliminates the need for further sanding. After the samples were cut to size they were carbon coated; a process necessary to prevent reflection of scattered electrons. After carbon coating the samples were inserted into the SEM utilizing a copper carriage.

Raw clay samples were tested in order to obtain the elemental signature from the surrounding area. Samples were diluted in sterile water where the light and heavy fraction materials were separated. Separation was conducted since this would have been a similar procedure conducted in a pug mill. The light fraction materials were poured onto a 1-inch x 1-inch microscope slide and allowed to dry. Once the light fraction clay was adhered to the slide it was carbon coated and inserted into the SEM. Test tiles were also created from the sampled clay. The goal was to understand the oxidation and the alteration of the elemental signature due to the heating process. Once fired, the tiles were sliced and prepared for testing just as the sherds mentioned above.

D. Instrumentation Labwork and Protocol

The JEOL JSM-840A SEM utilizes a heat-filament to focus the incident beam on the test sample through an electrostatic lens and create a secondary emission of electrons from the sample surface. Accelerated electrons enter into the solid object through *elastic* and *inelastic* processes, it is the inelastic or backscatter of electrons from the sample material that is collected by the detector (Egerton 2006, Freestone 1987, 1997; Williams 1983). The SEM provides pin-point compositional analysis that is paramount due to the lack of homogeneity created by the mixing of clay through the pottery production process. Accuracy of the computational elemental composition is aided by two designs of the SEM: 1) the sample being tested is situated on a stationary platform while the electron probe traverses in a raster pattern over the test field, and 2) spatial resolution of the sample is collected by the three lenses through which the electron probe travels.

The SEM was set at 15.0 KeV @10 eV/channel and elemental samples were taken at 5000x magnification where the beam size is approximately five nanometers in diameter. By selecting the energy levels the SEM can be initialized to detect the differing elemental ranges in the periodic table. For the Edgefield samples, the following elements have the data collection turned “on”: Fluorine (F), Sodium (Na), Magnesium (Mg), Alumina (Al), Silica (Si),Phosphorous (P), Sulfur (S), Chlorine (Cl), Potassium (K), Calcium (Ca), Scandium (Sc), Titanium (Ti), Chromium (Cr), Manganese (Mn), and Iron (Fe); all remaining elements are set for “auto-detect” to test for heavy elements. Copper (Cu) is turned “off” since the sample carriage is made from this material. The SEM backscatter provided different color images for each given elemental signature (Figure 8.6). The first electron probe test site was the inner vessel wall and subsequent test sites preceded perpendicular towards the outer vessel wall. The separation between test sites was 1mm. Wall thickness range was 7 to 9mm in width thus providing 7 to 9 analytical data sets. If an inclusion was encountered along the perpendicular path the data was still collected from the site (Figure 8.7). Each of the 7-9 data sets were exported into an Excel worksheet and the resultant data was then averaged creating one graphing point for each element. Averaging of the data set was needed for two reasons: 1) any given clay mass contains slight variation in oxidized weights and 2) the heating process alters the overall composition of the vessel wall. During this process the inclusion data set was removed from the overall clay chemical signature. The sherds average weight of Si was plotted against Al in the "Kiln Compositional" graph.

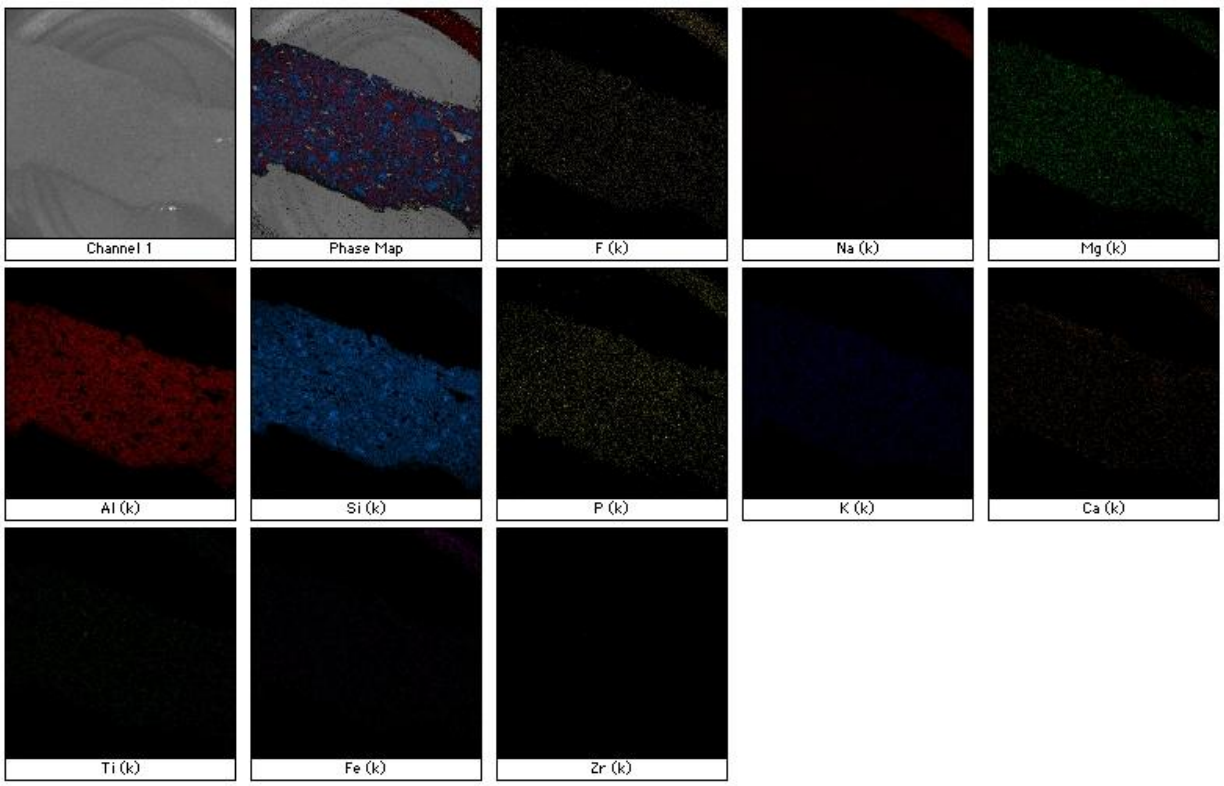


Figure 8.6. SEM Backscatter allows for the location of specific elemental clustering with the sample.

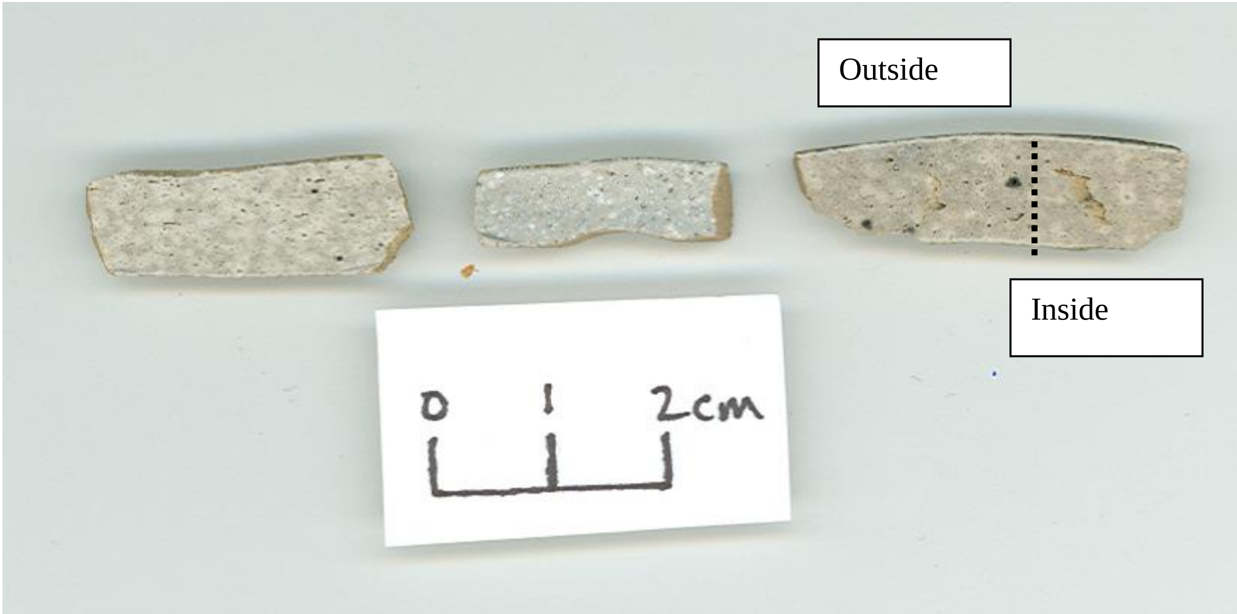


Figure 8.7. Image of sample cut from the larger vessel prior to SEM testing.

VIII. Results and Discussion

For any given kiln, waster sherd samples were examined that accounted for visually observable variations in clay and temper. The data presented demonstrates elemental composition variations in firing pottery that exist between kilns.

A. Pottersville (38ED011)

Ten samples of waster sherds were studied from the Pottersville kiln site. The average width of these sherds was 9.18mm and a Standard Deviation (SD) of 3.03; with the widest being 14.17 and the most narrow at 4.92mm. I provide this indication of SDs in this data discussion to indicate that vessels of various sizes were included. Various sizes were included to test if individual elements were altered differently from the exterior to interior vessel wall. The vessels are a wide range of colors from Munsell 7.5YR 8/1 to 7.5 YR 5/1 and 10YR 8/3 to 10YR 7/6. The elemental signature averages from the 10 sherds tested were as follows: Si 69.83%, Al 23.78%, Cl 0.56%, K 1.66%, Ti

0.62%, and Fe 1.83%. Sand and ash were the main temper used for these vessels; however other inclusions such as organics are found in the paste. A clay sample with Munsell 7.5YR 8/1 clay was selected for test tile firing. After the firing, this sampled clay appeared Munsell 7.5 YR 8/4 Pink.

<u>B. John L Landrum (38AK497)</u>

The survey at the John Landrum site collected twenty sherds. The average width was 9.15mm with a SD of 3.02. One sherd was greater than the SD with five sherds being 10mm or greater; none were less than the SD. Five sherds were in the Munsell 10YR white or grey with the remaining fifteen being 7.5YR Grey to Dark Grey. The elemental averages were: Si 58.86%, Al 19.76%, K 2.09%, Ti 1.44%, and Fe 2.77%. The samples from this location lacked an elemental presence for Chlorine. The paste is well prepared and few organic inclusions are visible. The temper for these vessels is a crushed sand and ash mix. A clay sample with Munsell 10YR 7/4 color was selected for test tile firing, and this sample changed after firing to a 7.5 YR 5/6 Strong Brown in color.

<u>C. B.F. Landrum (38AK496)</u>

Eleven samples were collected and tested from the B.F. Landrum site in 2009. Seven of the vessels were in the Munsell 7.5 YR Grey color palette and the remaining four were 10YR with slight variations of Brown. The width average was 7.93mm with a SD of 2.82. All of the vessels fell within the SD and with only two sherds exceeding 9mm. The elemental averages were: Si 61.42%, Al 19.76%, Cl 0.15% K 1.21%, Ti 0.84%, and Fe 2.02%. The temper type and proportions at this site is similar to the other kiln sites. However, the ash does seem to be more charred in these samples and there are more voids or air pockets, possibly from organics being vitrified. A clay sample with

Munsell 10YR 4/3 color was selected for test firing and the sample thereafter changed to 7.5YR 5/8 Strong Brown in color.

D. Miles Mills (38AK498)

The sixteen Miles Mills samples and associated provenience data were provided from the previous survey work conducted at the site (Steen pers. comm. 2009). Ten of the sherds were Munsell 10YR 8/1 White, five were 7.5YR Grey, and one was 7.5YR White. These vessels displayed a wide range of widths with the average being 9.20mm with an SD of 3.03mm. Two of the vessels are wider than the SD, one less than the SD, and the range of width is from 6.14mm to 13.72mm. The elemental averages were: Si 55.20%, Al 34.61%, Cl 0.37% K 1.21%, Ti 0.89%, and Fe 1.53%. The Munsell 7.5YR samples appear to have been produced with lower quality control evident in a large amount of organic inclusions with the remaining inclusions consisting of sand and ash temper. The Munsell 10YR 8/1 sherds are very well prepared with some organic inclusions and all have hematite (mineral form of iron oxide) as temper. This is the only group of samples from any of the sites tested that display this characteristic.

E. Rhodes (38AK495)

Samples from nineteen vessels from the Rhodes kiln, collected in the 1993 survey, were provided for analysis (Steen pers. comm. 2009). The elemental averages were: Si 58.20%, Al 25.10%, Cl 0.32% K 3.25%, Ti 0.41%, and Fe 2.18%. One sherd was Munsell 10YR 7/1 light grey and the remaining vessels were 7.5YR ranging from dark to light grey. Half of the sherds had a width within 5% of the average, 7.72mm and no sherds exceeded the 2.77mm SD. The paste of these vessels was well prepared with just minor organic inclusion and the temper is a fine grained sand and ash mix. Steen provided a Munsell 7.5 YR 8/4 Pink clay sample for the previous survey. Once fired this sample shifted slightly to 7.5 YR 8/3 Pink.

F. Seigler (38AK495)

Thirteen samples and the accompanying provenience data were provided from the 1987 field survey of the Seigler kiln. These sherds vary in width from 5.57mm to 14.66mm and have an average width of 9.02mm. Two sherds exceed the 3.00 SD and only three are within a 10% width range from the average. The elemental averages were: Si 66.19%, Al 26.18%, Cl 0.68% K 2.79%, Ti 0.39%, and Fe 2.45%. These samples vary in tint from Munsell 10YR 7/1 Light to 10YR 4/1 Dark Grey. Temper used for these vessels included ash and crushed sand; these amounts are discovered in higher proportions when compared to other kiln sites investigated in this study.

To determine the elemental composition of ceramics produced at any particular manufacturing facility, the range of elements in analyzed samples was evaluated for intra-site similarity and inter-site dissimilarity. The elements which provided the greatest significance in this analysis were Silica (Si) and Alumina (Al). By comparing the average oxidized weights of Si and Al for each kiln site, waster fragments provided detailed information which confidently allowed for the identification of consistent, elemental "signature" for each of the sampled production facilities (Table 8.1)

The Miles Mills kiln site is an exception for the one source hypothesis and this will be discussed below. For four of the six kilns, as the Si increased the Al decreased. This correlation is due to natural variations which exist within any particular clay body. The Miles Mills kiln site displays two distinct compositional patterns in which Si increased while Al decreases. For this reason, the distinct elemental patterns at Miles

Mills are due to clay being extracted from more than one location or the blending of two clay bodies. Documentary research has shown that the owners of the Miles Mills kiln obtained multiple land holdings specifically for raw clay extraction (Todd 2008). As mentioned, mixing is a possible way to explain the elemental variations; however, the combining of various clay sources would produce a greater variation within a singular elemental signature due mechanical preparation in the clay pug mill.

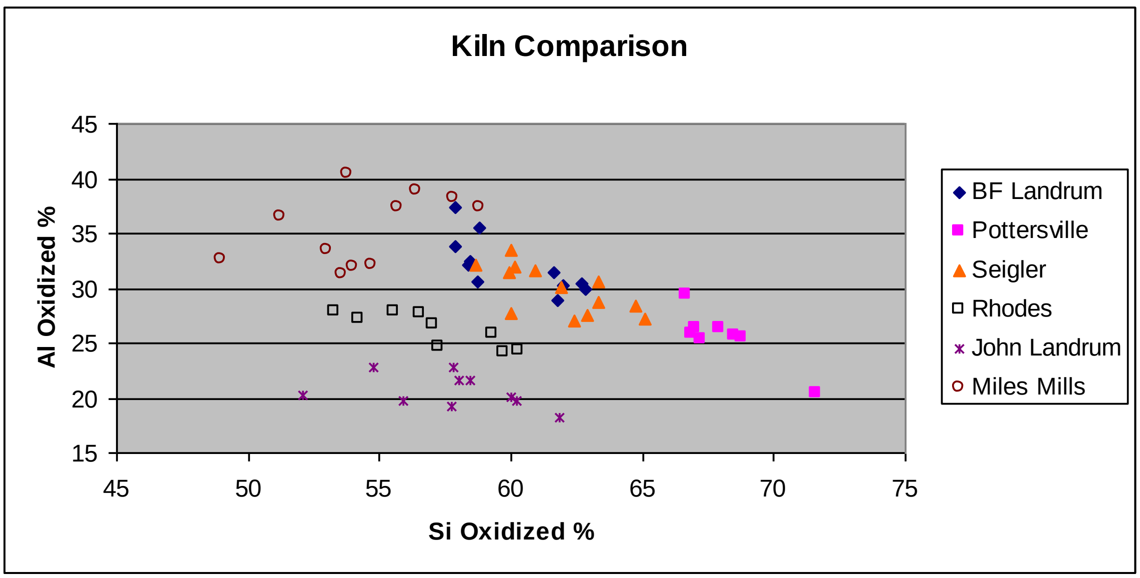


Table 8.1. Individual vessel samples analyzed with the SEM, when compared the oxidized Silica and Alumina percentages display kiln specific clustering (Chart by author).

Interestingly, the Rhodes and Seigler kilns, which are separated by a small creek, possess dissimilar elemental composition patterns to their waster sherd samples despite being situated in the same geologic area. Variation in the two elemental compositional patterns from these kilns indicated that not only were separate raw sources being utilized in the Edgefield District kiln, but distinct clay veins likely also possessed variable compositions across a relatively small region and close natural environment.

The comparison of Si to Al was not enough to provide a definitive compositional pattern for all kiln locations. The B.F. Landrum and Seigler kilns appear to possess similar elemental patterns through an initial comparison. To determine distinct elemental compositional patterns in raw clay extraction a second graph was designed to consider a third element, potassium (K). The B.F. Landrum and Seigler kilns were compared on a chart which compared Al against K. This graph suggests that even though the two kiln sites display overlapping Si and Al patterns, the Seigler site possesses higher levels of oxidized K, suggesting that the extraction sites were indeed separate (Table 8.2).

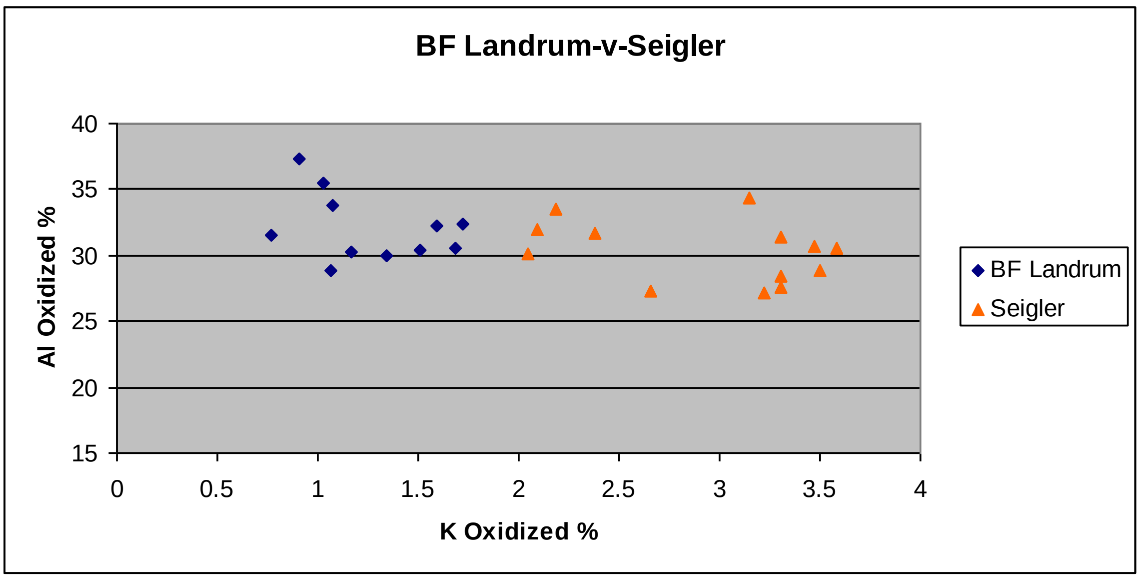


Table 8.2. Due to similarities in Table 1 Potassium is compared in relation to Alumina to display source variation (Image by author).

IX. Findings and Conclusions

This study was established with two main goals: 1) determine if definitive elemental compositional patterns from stoneware waster fragments could be determined with a Scanning Electron Microprobe (SEM), and 2) analyze the differences in elemental patterns between kiln locations.

The SEM was determined to be an acceptable instrument for elemental analysis of stoneware. The instrument's flexibility to collect pinpoint data sets allowed for clay paste samples to be collected from with sherd cross-sections while avoiding temper inclusions added during the pottery manufacturing process. The collection of pinpoint data sets confirmed the hypothesis that distinct, elemental compositional patters (or "elemental signature") could be indentified for various kilns throughout the test region.

The SEM determined elemental patterns for each of the kiln sites sampled. Through the series of statistical analysis it was determined that the stoneware kilns could be assigned a particular elemental signature. Additionally, each elemental signature was distinct from other samples in the region. The distinct nature of the elemental signature suggests that raw clay resources utilized for stoneware production were not acquired in one location. In view of the fact that each kiln displayed a distinct individual elemental signature it is very likely that the raw resources were situated within the close vicinity of the kiln site.

X. Elements of Resource Management at Edgefield Potteries

The findings of this elemental analysis suggest that the Edgefield stoneware entrepreneurs selected the locations for their kiln sites based upon access to regionally dispersed, high-quality clay resources. By constructing kilns adjacent to high-quality resources, kiln owners created a 19th century version of vertical integration in which all facets of production were conducted under their control. As described in chapter 6, it was socially appropriate for a landowner to exert control over their economic pursuits.

The centralization of all production activities allows for stoneware manufacturing to be described by *chaîne opératoire*. While chaîne opératoire is typically employed to describe the processes of stone tool production, I suggest that it is useful to interpret this particular stoneware production system since raw resources are acquired and transformed locally by a unified work force. The unified work force would have conducted a series of operations that likely included: chopping fire wood, mining clay, processing clay, turn processed clay into vessel form, and loading, firing, and unloading the kiln. In chapter 5, I explored each of these tasks while considering the sequence of pottery production. Through this examination, I posit how the work force was deployed at the Pottersville production facility on a daily basis. Each of these tasks were accomplished by laborers whose lives, work, and passions have been lost in the silence of the documentary record. Chaîne opératoire links these known operational tasks of production to those presently nameless persons and provides a means to reconstruct aspects of their daily activities.

Based upon Dr. Landrum's publications in the *Edgefield Hive*, I suggest that these muted individuals were enslaved African Americans held in bondage at the Edgefield stoneware kilns or adjacent properties. My hypothesis is supported by Dr. Landrum's statement that "up country" slaves were as capable as free-white workers in industrial settings and that the deployment of these enslaved laborers would far out weight any disadvantages. Additionally, the enslaved African-American artisans such as Dave Drake were known to have been forced into labor at some of these Edgefield kilns. Chaîne opératoire coupled with the scale of the Edgefield kilns provide descriptive insights as to how enslaved African Americans were forced into industrial labor. Industrial slavery is an untapped focal point in American history and projects such as these provide important information for understanding this underrepresented topic.

Chapter 9
Conclusions

In this final chapter, I review the research questions that provided direction for this project. Throughout this dissertation I have provided archaeological, historical, and documentary research that relate to the Edgefield district and the innovative alkaline glaze applied to utilitarian stoneware produced at the Pottersville kiln site. The archaeological project that focused upon the Pottersville kiln site has brought to light previously unknown details about stoneware production in the 19th century South Carolina. This dissertation has outlined these findings that ranged from predictable to highly unexpected results.

Through the course of this discussion, I analyzed archaeological and documentary evidence to examine the creation and maintenance of ceramic technologies, techniques, knowledge, and operations in 19th century Edgefield, South Carolina. To understand the production of ceramic vessels, I engaged with practice theory to infer how the history of ceramic technology could be altered at Pottersville. Additionally, I consider the analytical framework of a *chaîne opératoire* as a means to examine how all facets of production were related to one another within a complete industrial production sequence. These theoretical frameworks afforded interpretations of the archaeological record whereby the daily activities could be described based upon the existing architectural material which was present in the archaeological record.

I. Theoretical Framework for Examining Ceramic Technologies Research into Ceramic Material Culture

Historical and archaeological evidence provide valuable information regarding the transition of one technology to another. Over the course of this project, I have marshaled evidence to answer the research questions relevant to ceramic innovation at the Pottersville kiln site. In many instances evidence can be directly linked to a social actor who precipitated an innovation or development of a new ceramic technology. To interpret the significance of the actions executed by these agents of change, I chose to engage with "practice theory." Practice theory provided a means to discuss the social setting during a select period of history. The social setting combined with a motivated agent of change provided circumstances in which innovations led to the alteration of daily activities.

Especially useful with the framework of practice theory is the relationship between doxa, orthodoxy, and heterodoxy. I suggest that the persistence of any given technology is supported by the concept of doxa. Doxa allows for the continual production of techniques and technologies through a system of routinized, unconsciously learned actions that occur at a daily scale. For example, porcelain has been produced in China for more than a millennium. Successful recapitulation of this ceramic tradition in Chinese production centers was tied to the fact that production methods were replicated in routinized, unquestioned manner over time, leading to a high level of economic and social success. Such routinized replication of actions were conducted through an orthodoxy, or the perceived, correct means with which to continue the porcelain tradition in southeast China.

In the case of this research project, the moment of change occurred when an active agent chose to push back against the orthodoxy of the known traditions of ceramic production derived from China and Europe. During the 19th century, enterprises in America and Europe operated successful ceramic industries; however an agent of change desired to re-establish an older and presumably better method of ceramic production. Government support permitted the establishment of an American porcelain production facility in an attempt to recreate that desired tradition. Dr. Landrum was likely inspired to push against ceramic orthodoxy since a successful porcelain production facility would fill a void in the American marketplace and provide individual financial gain. Dr. Landrum refused to utilize accepted European kiln construction designs and ceramic preparation techniques while attempting to initiate methods previously successful in China. Dr. Landrum was not the first to attempt such a rejection of ceramic orthodoxy. In Europe, previous attempts failed to create porcelain, but produced other ceramic materials, such as whiteware, that were viewed as an innovation in ceramic traditions. Dr. Landrum also experienced an inability to recreate porcelain and, like his European counterparts, the fruits of his labor resulted in a different form of innovation: the application of alkaline glaze to stoneware which has become a long-standing southern ceramic tradition.

In 1812, Dr. Landrum stated his intent to create porcelain, yet he was ultimately unable to do so. He, much like Josiah Wedgwood, Palissy, and other ceramicists, was unable to fully realize the intent behind his push back against ceramic orthodoxy. To understand the failures of these agent actions the focus can be shifted to insights from an application of practice theory. Practice theory, specifically habitus and agency, state that agent actions are based upon possible outcomes and that rules and resources implicate social acts. Additionally, practical consciousness (knowledgeablity) regarding a particular task is executed as a portion of everyday life. These daily actions are facilitated when the related knowledge or innovation is accepted by the social group in which the agents operate. Based upon the information available in the early 19th century, one could speculate that Dr. Landrum and others should have been able to reproduce porcelain, as potteries in Europe and America possessed seemingly adequate technological expertise to match production successes of potteries in China. Yet, they failed to do so.

These ceramic innovators failed at the point where ceramic knowledge (doxa and orthodoxy) collided with production methods and materials. An application of practice theory again provides a useful framework to examine such constraints on actions. In addition to established knowledge and skills, and innovations in such methods, actors confront the varied affordances and constraints of their natural environment and the materials they seek to manipulate.

While innovators such as Dr. Landrum and Josiah Wedgwood had identified sources of high-quality clays and strategies for the materials composition of kilns, those materials presented constraints as to porcelain and affordances as to other production endeavors. I posit that materials possess unforeseen physical characteristics that presented such barriers during operational applications. These characteristics were dynamic and became constraints on the range of actions of those to the agents of change. Dr. Landrum stated that during a three-year period in his attempts to recreate porcelain he went through exhaustive experiments. Similarly Josiah Wedgwood could not fully succeed in porcelain production.

In the upcountry of South Carolina, Dr. Landrum discovered high-quality kaolin clay similar to that discovered in China. To replicate firing methods of Chinese porcelain, a dragon kiln, similar to those constructed in China, was constructed. Dr. Landrum possessed sufficient ceramic knowledge and resources to create porcelain. He had acquired the appropriate materials as well. However, at an unknown point during the ceramic production process, the interaction between potter and the physical characteristics of clay and kiln limited Dr. Landrum's ability to replicate porcelain.

I suggest that social theory could benefit from an exploration between the interaction of agent and materials as these likely provide evidence of incremental alterations in daily actions or doxa, rather than monumental shifts. I do not suggest that materials possess a level an agency, but rather physical characteristics can both facilitate and hinder an agent's ability to achieve desired results in the course of innovation. For example, Chinese potters were able to create porcelain from materials with similar characteristics utilized by Dr. Landrum. Their learned interaction with materials was not an instantaneous discovery, but one honed over centuries of ceramic production. It should be assumed that prior to the initial success of porcelain production these Chinese potters experienced failures, or rather alterations, to their ceramic technology. Alterations to ceramic technology are based upon the limitation of the physical characteristics of materials; over a period of time, agents learn how a given material's physical characteristics react during interaction with other materials during production. Potters learn how clay reacts to the heat of a kiln and these learned responses provide feedback for continual improvement of the whole system. Social actors are likely oblivious, not aware of contextuality of time-space, to these minor alterations since these changes might be part and parcel to efficiency and marketability. These slight alterations in action thus may not be immediately conscious and recursive in character since these changes affect social agents and their output over an undetermined period of time.

Dr. Landrum was unable to recreate Chinese porcelain because he was unaware of the step-wise changes to ceramic doxa. The wealth of porcelain production knowledge discovered in books and face-to-face discussions did not provide him with the nuanced interaction between agent and material. However, in a major shift of ceramic production, Dr. Landrum was able to engage with the physical characteristics of kiln and clay to create alkaline-glazed stoneware. This was the momentous event that can be viewed in the archaeological record and the point of departure for my specific research questions.

II. Ceramic Technologies: Kiln Innovations Leading to an Edgefield Industry

The first question which I sought to answer was what type of kiln Dr. Abner Landrum utilized to fire the ceramic vessels to which the innovative alkaline glaze technology was applied. The initial expectation for Landrum's kiln design was that of a groundhog kiln. These expectations were based upon ethnographic and historical research conducted by scholars who have focused on the late 19th and early 20th century alkaline stoneware production sites. Additionally, genealogical research described Landrum and his family as being of Scots-Irish heritage and educated in methods of ceramic production. Together this information suggested that a businessman of European heritage likely would have constructed a relatively small-scale, groundhog kiln. The groundhog kiln is considered to be derived from European kiln designs and would have been appropriate to Landrum's knowledge of ceramic production. Based on this evidence I initiated this study with the expectation that the Pottersville kiln was a groundhog kiln, built similar to the Cassel or Newcastle kilns of Europe.

During the summer of 2011, I led an archaeological field school in an effort to examine these kiln design questions. At the end of the 6-week archaeological fieldwork, the research team was able to locate and excavate architectural features of the Pottersville kiln. These buried remains were not indicative of a 20-foot-long groundhog kiln which would have been utilized for small-scale, personal or community consumption. Instead, the field school discovered the architectural remains of a 105-foot-long, industrial-scale kiln. The size and orientation of the Pottersville kiln was unlike any of the European kilns considered during the initial research.

To postulate a potential origin for Landrum's kiln, my research scope was widened to include contemporary kilns from Asia. By expanding the scope of research beyond Europe, I was able to discover kiln designs of similar length, width, height, and slope. Chinese dragon kilns have been utilized in the production of ceramics since the 6th century CE. Chinese potters routinely applied alkaline glaze to porcelain and stoneware that were fired in their dragon kilns. While historical evidence has provided details regarding ceramic knowledge acquisition, it is unclear as to how Landrum learned how to build and fire a Chinese dragon kiln. However, during the period in which Landrum built his kiln, direct trade between America and China had increased, which likely affected the communication of ideas and technological information between the trade partners.

During the course of research I was able to locate historical evidence that suggests that Landrum initially desired to manufacture porcelain. Landrum or some other similarly interested ceramists possibly requested information regarding porcelain and related kiln construction technologies being utilized in 19th century China. By acquiring kiln technology information directly from China, Landrum would have likely been able to produce porcelain and improve upon the wares produced by his American and European counterparts.

An 1809 newspaper report further supports this line of reasoning. Landrum suggested that he had discovered the ideal raw resources for ceramic production. European ceramic producers had also gained access to high-quality clay resources; however, those manufacturers were unable to produce porcelain of equal quality to the vessels produced in China. The inability of Europeans to produce porcelain was likely due to impurities in the clay, differences in kiln design, or both. If Landrum had indeed discovered kaolin appropriate for porcelain production, he may have been inspired to construct a kiln that was known to be utilized for porcelain manufacture in the factory towns of southeast China, such as Jingdezhen. Through this line of reasoning I suggest that Landrum was inspired by Chinese porcelain manufacturers and built a 105-foot-long dragon kiln in an attempt to recreate Chinese porcelain. The discovery of the 105 foot industrial kiln further provided intriguing research questions that relate to labor utilized for large-scale production, kiln holding capacity, firing duration, amount of fuel, and the number of firing events for any given period of time.

III. Republican Ideals, Planter Ideology, and Rural Industry

The second research question that I address focused on the social relations employed at the Potterville kiln site. This research question is firmly linked to kiln capacity and labor. By calculating the holding capacity, individual events within the production sequence of operations can be postulated. The ware chamber of the Pottersville kiln was 90 feet in length, 10 feet in interior width and 6 feet in height. By calculating the length, width, and height of the barrel vault of the ware chamber (to include the curve of the arch) it has been determined that a possible 6,480 cubic feet were available for during any single firing event. However, modern day potters leave approximately one-quarter of the ware chamber space void for the circulation and adherence of fly-ash onto vessels, which suggests approximately 4,860 cubic feet were available during any one firing event.

Extant stoneware vessels fill roughly one cubic foot of space per one gallon of vessel holding capacity. Thus, the potters who labored at Pottersville likely produced 4,860 gallons of stoneware vessel volume per firing. In 1820, four pottery wheels were in operation the Pottersville kiln. If the labor was divided evenly and if four potters were available for constant operation, each would turn 1,215 gallons of stoneware per kiln firing. Based upon ethnographic research and the inference of a 12-hour work day each of the four potters likely could have thrown 150 gallons of stoneware per day, filling the 1,215 gallon quota in approximately 8 days.

While a group of potters were gainfully employed at the pottery wheel an additional group of laborers likely prepared the raw materials for production. By calculating the amount of clay utilized to throw a stoneware vessel, it is possible to realize the amount of raw clay that created the 4,820 gallons. Again based upon ethnographic research and extant vessels my calculation is based upon the 6-gallon vessel. Thus, 810 6-gallon vessels could have filled the 4860 cubic feet interior of the Pottersville kiln's ware chamber. To throw a 6-gallon vessel a potter utilizes approximately 22 pounds of clay which equates to 17,820 pounds of clay for turning operations. This means that nearly nine tons of processed clay would have been quarried and prepared for a single kiln firing event. Modern day potters suggest that one person can quarry four tons of raw clay per day which suggests that a team of two to four laborers could mine the raw clay resources in a single day. Raw clay would have been processed in a pug mill at a rate of 1/2 ton of clay per two to four hours. At this rate it is likely that preparing raw clay for turning would have been a five day process.

The same group of laborers were likely responsible for the acquisition of fire wood utilized during the firing process. The amount of firing fuel would have been based upon the duration of the kiln's firing time. In China, modern day dragon kilns consume 10 tons of fuel during a single firing event which takes place in approximately 36 to 72 hours. A ton of fire wood takes up 128 cubic feet of space resulting in 1,280 cubic feet of fire wood per firing event. A person who routinely chops fire wood can typically prepare one cord of wood in two to three hours. If the same group of laborers who quarried the clay also chopped the fire wood this process likely would have taken one to two days to accomplish.

Labor at the Pottersville kiln was likely driven by the number of firings during any given month. Historic documents suggest that payments for fire wood were based upon one or two firings per month (Edgefield Deeds; Baldwin 1993). If there were two kiln firings per month, the labor inputs for resource preparation and vessel manufacturing time indicate that the Pottersville operations would have been a full-time venture.

Devoted to full-time manufacturing likely suggests that the Pottersville kiln owners utilized a dedicated work force. Local Edgefield historians Holcombe and Holcombe (1988:22) suggested that stoneware production was successful due to the use of enslaved labor. While the documentary evidence is not overwhelming there are a few citations which denote enslaved Africans as possessing pottery related job skills. This point of view is echoed in an article published in Landrum's newspaper where he advocates for the use of enslaved laborers for industrial activities. "One advantage… their establishments will not be subject to those sudden derangements, which in other countries, follow the whims and caprices of those who are entire masters of their own persons and services" (*Edgefield Hive* 1830). This evidence suggests that Landrum viewed enslaved labor as an efficient mechanism in which to maintain consistent industrial operations.

Based upon scale, I find that the production enterprise at the Pottersville kiln should be defined as industrial. Due to this definition and the knowledge that some slaves possessed pottery production skills, those operations in turn should be viewed as industrial slavery. Landrum suggested that enslaved labor was more efficient when compared to free, white wage laborers. While the white laborers likely had aspiration of improving their positions in life, the enslaved laborers typically were not offered such opportunities or allowed such aspirations. The proprietors of the Pottersville kiln site likely forced an unseen number of enslaved African Americans into industrial labor. Those industrial worker chopped wood, dug clay, drove the pug mill, turned the vessels, loaded the kiln, stoked the firebox, and unloaded the kiln as a portion of routine, daily activities at the Pottersville kiln. Daily pottery activities provided these enslaved industrial laborers with artisan skills that could have been put into use after emancipation. Accounts after the Civil War suggest that former slaves rented area kilns and created their own vessels for personal or market consumption (Todd 2008; WFP Oct 15, 1869).

The archaeological record and documentary evidence does not provide details as to whether the enslaved industrial laborers earned wage credits or other benefits as a part of these routine labor activities. However, it can be postulated that the enslaved potter Dave Drake was the recipient of at least one benefit to industrial slavery. At some point Dave learned to write, likely in connection with the type-setting tasks of Dr. Landrum's newspaper operation. Dave's use of words and script were often incised in the shoulders of wet clay vessels. During the kiln's years of operation it was illegal for a slave to become educated in the state of South Carolina, yet Dave possessed this knowledge. Dave's writings were not carried out in covert fashion but were overt and highly visible (Scott 1990). Upon the death of Dr. Landrum, Dave inscribed a vessel in commemoration: "When Noble Dr. Landrum is dead//May Guardian angels visit his bed//14 April 1859." Education and the ability to display this knowledge was surely a powerful tool during antebellum life.

IV. Elemental Analysis of Edgefield Stoneware

My third research question focused on whether there were particular sources for natural resources, principally clay, utilized for production at the Pottersville kiln site. Initially it was postulated that stoneware production in South Carolina could have either utilized locally available raw resources or acquired these materials through regional exchange networks. Due to the industrial-scale of the Pottersville kiln, I hypothesized that the raw materials were quarried in the area in the nearby vicinity of the kiln location rather than being obtained from regional sources.

To test this assumption, raw clay and waster samples were collected from kilns throughout the Edgefield district. The wasters were analyzed with the assistance of a Scanning Electron Microprobe (SEM). This portion of the project established two main goals to test the local acquisition hypothesis: (1) determine if definitive elemental composition patterns (or "signatures") from stoneware waster fragments could be determined with the SEM, and (2) determine if there were differences in the elemental signatures between kiln locations.

The SEM was able to determine elemental signatures for each of the kiln sites sampled. Through the series of statistical analyses it was determined that the stoneware kilns generate identifiable elemental signatures. Each elemental signature was distinct from other samples in the region. The distinct nature of the elemental signature suggests that raw clay resources utilized for stoneware production were not acquired in one location. Due to the fact that each kiln yielded identifiable elemental signature, it is very likely that the raw resources were situated within the close vicinity of each kiln site.

Based upon the knowledge that each kiln site possessed an elemental signature, I attempted to determine exactly where Landrum may have extracted the raw clay for the Pottersville facility. Raw clay was sampled from a large pond 1km north of the Pottersville kiln. This location was selected based upon aerial photographs and satellite imagery that suggested the possibility of an overgrown path between the two locations. The raw clay sampled from the pond possessed a closely related elemental signature as did the waster fragments. Based upon available information I find that clay for the Pottersville operation was very likely acquired locally rather than purchased regionally.

V. Ceramic Technologies: Glaze Innovations Leading to an Edgefield Industry

The final question addressed in this dissertation was what spurred this innovation, and where Landrum learned these techniques of production. Landrum had grown up in a family with ties to ceramic production. Ceramic production knowledge was likely a portion of Landrum's personal and cultural knowledge, which would have allowed him the ability to acquire new information regarding technologies. However, alkaline glaze was not routinely utilized in ceramic production outside of China.

The utilization of alkaline glaze has been suggested as knowledge gained through social interactions with a stoneware patent holding alchemist (Vlach 1990a), independent discovery by a learned scholar (Todd 2008), and interactions with entrepreneurs involved in ceramic production in the Mid-Atlantic (Steen 2012). The latter suggests that Landrum intentionally sought out information regarding production while the other two accounts suggest that he was immersed in ceramic production knowledge. However, each of these hypothesized possibilities share a common concept: that Landrum possessed knowledge regarding ceramic production prior to learning about and utilizing alkaline glaze recipes. Documentary research yielded information that suggested Landrum's entrepreneurial enterprise; he initially intended to create porcelain and not stoneware. To manufacture porcelain similar to vessels originating in China, Landrum would have likely sought information to recreate successful porcelain production processes. Landrum likely had access to texts similar to those written by Dossie, Du Halde, Palissy, and others. Landrum was able to successfully incorporate alkaline glaze recipes given that the technology was at a similar technical level as other ceramic glazes with which he had previously been acquainted.

VI. Concluding Comments

The archaeological discovery of a 105-foot-kiln placed Abner Landrum's entrepreneurial intent into clear view. At Pottersville, Landrum blended ceramic knowledge that he likely acquired in his formative years, with knowledge acquired in the pursuit of entrepreneurship, and theories about laborers to maintain a successful enterprise. Landrum utilized all of these concepts to establish an industrial ceramic complex, one that would become an integral facet of supporting the regional plantation system and persist into a current southern pottery tradition. Through this study of those innovations and production facilities, I hope too that aspects of the daily lives and accomplishments of the African-American artisans and workers of Edgefield have also been illuminated.

Some of the greatest moments in our scientific practice come when we launch rigorous investigations, based on robust, theoretically informed, and contextually tailored questions, only to see the archaeological record confront us with astonishing and unexpected revelations about the past. Some investigators demand that the expense of archaeology be justified by indications that documentary records and oral history accounts alone cannot provide ample evidence to understand particular cultural dynamics. Others insist that well-framed questions will always be best applied by addressing the often contrastive data sets of material culture, documents, and oral histories. A third observation can be equally poignant -- sometimes the archaeology will just astound us.

I have been privileged to experience such astonishment in the course of this dissertation study. Archaeological investigations of Pottersville have contributed significantly to a subject and period of history for which there is a remarkably sparse record in the archives. The documentary evidence concerning Pottersville presents elements of paradox. In the course of this study I have uncovered new insights from documents created by Abner Landrum. Those documents showed the early stages of planning to launch a pottery production, providing new details on product types and resources that inspired his aspirations and innovations. He and others later produced documentary records that show convincingly that they relied on enslaved African-American laborers for operating their pottery enterprises in the Edgefield pottery district during the antebellum period.

Those pottery production centers in Edgefield thus represented spaces of African-American craft and labor operating under the supervision of European American entrepreneurs. Yet, the documentary record of the antebellum period in the Edgefield area reveals very little about the names, lives, and lifeways of those many African Americans who lived and worked at Pottersville. The archaeological investigations of the production center at Pottersville detailed in this study provide a partial window onto the accomplishments of those African Americans. Hopefully future archaeological investigations, which lie beyond the scope of this dissertation, will also uncover new archaeological evidence in the residential sites associated with those craftspeople and yield more detailed evidence about their lives.

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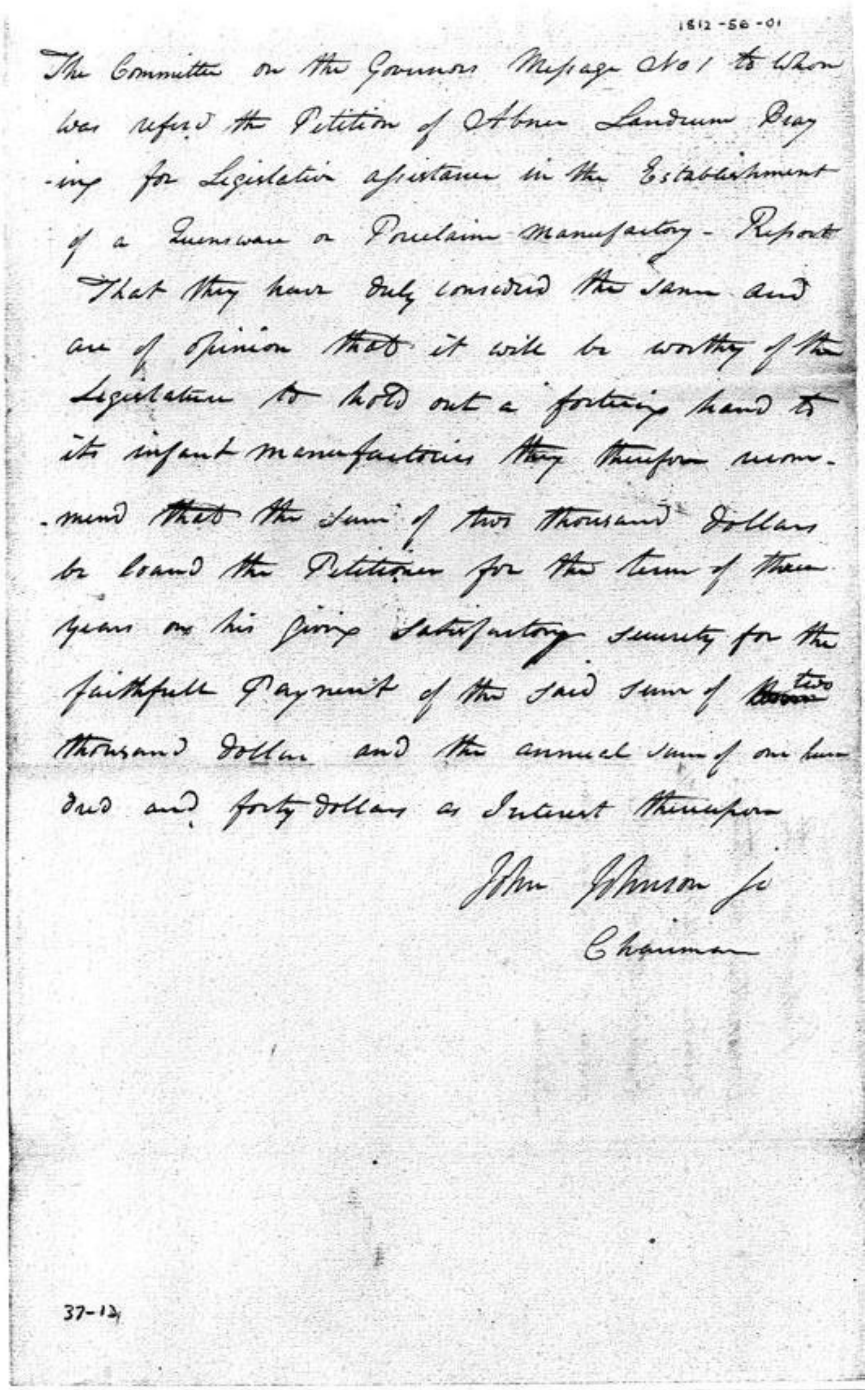
Appendix A. South Carolina Governor's Letters

Letters from Dr. Abner Landrum regarding ceramic production.



1812-56-01

The Committee on the Governors Message No 1 to whom was refered the Petition of Abner Landrum Praying for Legislative assistance in the Establishment of a Queensware or Porcelain Manufactory - Report That they have duly considered the same and are of Opinion that it will be worthy of the Legislature to hold out a fostering hand to its infant manufactories they therefore recommend that the sum of two thousand Dollars be loaned the Petitioner for the term of three years on his giving satisfactory security for the faithfull Payment of the said sum of two thousand dollars and the annual sum of one hundred and forty dollars as Interest thereupon

John Johnson Jr
Chairman

37-12

4 Petition of Abner
Landrum Praying

Comm^d on the section
of the Governors Message
respecting domestic
manufactures &c

R B Irwin

n.d. - 1800-01

The Honorable the President
and Members of the Senate.

Your Petitioner begs leave to represent to your honorable Body, that he has for the last three years been prosecuting, at a considerable expence of time, labor, & money, an extensive course of experiments on the chemical properties of the different earths; by which he has been enabled to produce specimens of the most elegant Porcelains or China ware; various kinds of Glass, from the black green to the best double flint; a good quality of Delft or Queens ware; a quality of Stone ware superior in texture and glazing to the best European, with the additional advantage also over that, of enduring, uninjur'd quick transitions from heat to cold; a composition of mortars superior to those of Wedgwood; Crucibles, prefer'd by the artists to the best Hessians; also artificial

19-

flints, which promise to supercede those imported from Europe.—— the most of these experiments have been reduced to prac=tical purposes; but the limited finances of your Petitioner has hitherto prevented him from making it of general and exten=sive utility to the Country, as the procu=ring of good workmen in earthen ware and Glass must be attended with consi=derable expence; your Petitioner therefore humbly prays such legislative aid as your honorable Body may think proper to grant, and your Petitioner as in duty bound will ever pray ——

Abner Landrum

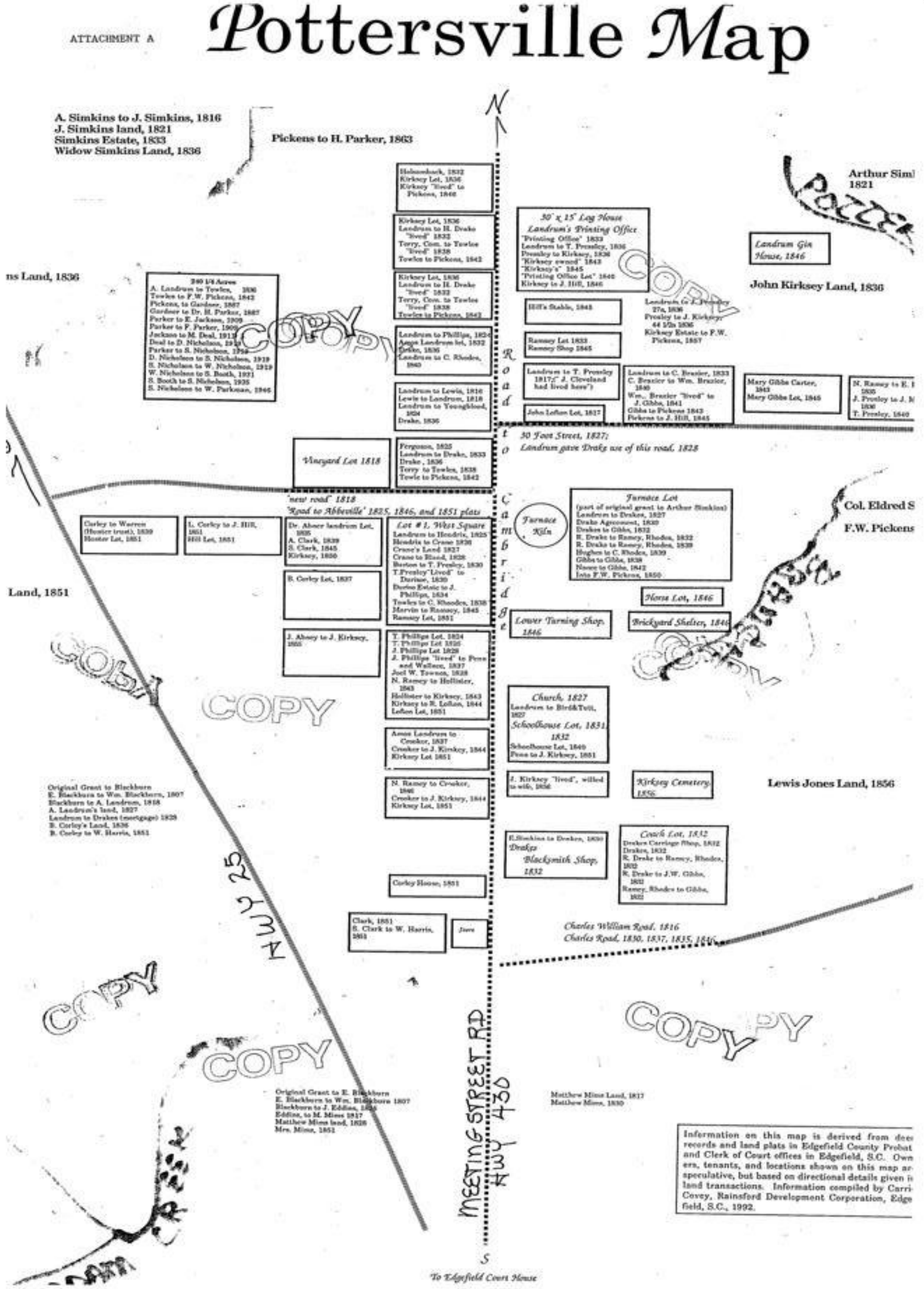
4

Petition of Abner
Landrum Praying

Comm^d on the Section
of the Governors Messag
respecting domestic
manufactures &c

R B Irvin

Appendix B. Pottersville Reconstructed Deed Map
Monday, Carrie 1995



APPENDIX C. Pottersville Artifact Database.

Bag# Unit# Stratum Quantity Material Type Form Color Design Decoration Date Range

Bag #	Unit #	Stratum	Qty	Material Type	Form	Color	Design	Decoration	Date Range
1.01	EU1	A1		Charcoal					
1.02	EU1	A1	4	Brick		Red			
1.03	EU1	A1		Mineral					
1.04	EU1	A1	1	Stoneware	1	Orange		Under Fire	
1.05	EU1	A1	1	Stoneware	Rim	Brown			
1.06	EU1	A1	1	Stoneware	Handle	Tan			
1.07	EU1	A1	1	Stoneware	Body	Red			
1.08	EU1	A1	2	Stoneware	Body	Light Green			
1.09	EU1	A1	1	Stoneware	Body	Green			
1.10	EU1	A1	16	Stoneware	Body	Olive			
1.11	EU1	A1	1	Stoneware	Body	Brown			
1.12	EU1	A1	1	Stoneware	Body	Dark Yellow			
1.13	EU1	A1	5	Stoneware	Body	Grey			
1.14	EU1	A1	1	Stoneware	Body	Brown			
1.15	EU1	A1	1	Stoneware	Body	Dark Green			
1.16	EU1	A1	1	White Ware	Body	White			
1.17	EU1	A1	3	White Ware	Body	White			
1.18	EU1	A1	1	White Ware	Body	Blue	Floral	Transfer Print	
1.19	EU1	A1	1	White Ware	Body	Blue		Hand Painted	
1.20	EU1	A1	1	White Ware	Body	Dark Blue	Foliate	Transfer Print	
1.21	EU1	A1	1	Common Nail	Complete		Modern Machine		1830+
1.22	EU1	A1	4	Common Nail	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
1.23	EU1	A1	1	Finished Nail	Complete		Early Machine		1815-1830
1.24	EU1	A1	5	Common Nail	Head		Modern Machine		1830+
1.25	EU1	A1							
5.01	EU2	A2		charcoal					
5.02	EU2	A2	1	Stoneware	Rim	Burnt			
5.03	EU2	A2	2	Stoneware	Rim	Green			
5.04	EU2	A2	1	Stoneware	Rim	Light Brown			
5.05	EU2	A2	1	Stoneware	Rim	Green			
5.06	EU2	A2	1	Stoneware	Handle	Light Green			
5.07	EU2	A2	1	Stoneware	Handle	Dark Green			
5.08	EU2	A2	1	Stoneware	Handle	Light Green			
5.09	EU2	A2	1	Stoneware	Handle	Light Green			
5.10	EU2	A2	1	Stoneware	Handle	Green			
5.11	EU2	A2	1	Stoneware	Handle	Green			
5.12	EU2	A2	6	Stoneware	Body	Brown			
5.13	EU2	A2	1	Stoneware	Body	Light Green			
5.14	EU2	A2	1	Stoneware	Body	Dark Green			
5.15	EU2	A2	1	Stoneware	Body	Burnt			
5.16	EU2	A2	1	Stoneware	Body	Dark Green			
5.17	EU2	A2	29	Stoneware	Body	Dark Green			
5.18	EU2	A2	2	Stoneware	Body	Burnt			
5.19	EU2	A2	1	Stoneware	Body	Burnt			
5.20	EU2	A2	13	Stoneware	Body	Light Brown			
5.21	EU2	A2	1	Stoneware	Body	Light Brown			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
5.22	EU2	A2	6	Stoneware	Body	Green			
5.23	EU2	A2	1	Stoneware	Body	Light Green			
5.24	EU2	A2	1	Stoneware	Body	Light Green			
5.25	EU2	A2	2	Stoneware	Body	Brown			
5.26	EU2	A2	3	Stoneware	Body	Green			
5.27	EU2	A2	26	Stoneware	Body	Light Green			
5.28	EU2	A2	13	Stoneware	Body	Green	Glaze Running		
5.29	EU2	A2	1	Stoneware	Body	Green			
5.30	EU2	A2	14	Stoneware	Body	Light Green	Glaze Running		
5.31	EU2	A2	20	Stoneware	Body	orange			
5.32	EU2	A2		Stoneware	Body	Bits			
5.33	EU2	A2	2	Stoneware	Base	Burnt			
5.34	EU2	A2	7	Stoneware	Base	Burnt			
5.35	EU2	A2	25	Stoneware	Body	Dark Green			
5.36	EU2	A2	1	Stoneware	body	Light Brown	incised		
5.37	EU2	A2	1	Glass	Body	Lime			
5.38	EU2	A2	2	Glass	Body	Clear			
5.39	EU2	A2	2	White Ware	Body	White			
5.40	EU2	A2	1	White Ware	Body	White	Molded		
5.41	EU2	A2	1	White Ware	Body	Blue	Feather Edged	Hand Painted	
5.42	EU2	A2	1	White Ware	Body	Blue	Floral	Transfer Print	
5.43	EU2	A2	1	Lath Nail	Complete		Early Machine		1790-1810
5.44	EU2	A2	2	Sprigs and Brads	Shank		Early Machine		1815-1830
5.45	EU2	A2	1	Common Nail	Complete		Early Machine		1815-1830

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
5.46	EU2	A2	3	Common Nail	Head		Early Machine		1815-1830
5.47	EU2	A2	3	Sprigs and Brads	Complete		Early Machine		1815-1830
5.48	EU2	A2	1	Finished Nail	Complete		Early Machine		1815-1830
9.01	EU2	A3		charcoal					
9.02	EU2	A3	1	Stoneware	Handle	Light Green			
9.03	EU2	A3	2	Stoneware	Rim	Burnt			
9.04	EU2	A3	1	Stoneware	Spout	Light Green			
9.05	EU2	A3	8	Stoneware	Body	Dark Green			
9.06	EU2	A3	2	Stoneware	Body	Tan			
9.07	EU2	A3	19	Stoneware	Body	Dark Green			
9.08	EU2	A3	1	Stoneware	Body	Light Green			
9.09	EU2	A3	10	Stoneware	Body	Light Green	Glaze Running		
9.10	EU2	A3	3	Stoneware	Body	Brown	Glaze Running		
9.11	EU2	A3	5	Stoneware	Body	Green			
9.12	EU2	A3		Stoneware	Body	Bits			
9.13	EU2	A3	1	White Ware	Rim	Blue	Shell Edged	Transfer Print	
9.14	EU2	A3	5	Common Nail	Complete		Modern Machine		1830+
9.15	EU2	A3	13	Common Nail	Shank		Modern Machine		1830+
10.01	EU1	A2		Charcoal					
10.02	EU1	A2	1	Bone					
10.03	EU1	A2	1	Stoneware	Rim	Brown			
10.04	EU1	A2	2	Stoneware	Rim	Light Green			
10.05	EU1	A2	1	Stoneware	Handle	Light Green			
10.06	EU1	A2	1	Stoneware	Base	Orange		Under Fire	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
10.07	EU1	A2	6	Stoneware	Body	Light Green			
10.08	EU1	A2	1	Stoneware	Body	Brown			
10.09	EU1	A2	3	Stoneware	Body	Tan			
10.10	EU1	A2	2	Stoneware	Body	Light Green			
10.11	EU1	A2	27	Stoneware	Body	Green			
10.12	EU1	A2	1	Stoneware	Body	Tan			
10.13	EU1	A2	7	Stoneware	Body	Light Green	Glaze Running		
10.14	EU1	A2	9	Stoneware	Body	Dark Green			
10.15	EU1	A2	3	Stoneware	Body	Green			
10.16	EU1	A2	3	Stoneware	Body	Green			
10.17	EU1	A2	9	Stoneware	Body	Green			
10.18	EU1	A2		Stoneware	Body	Bits			
10.19	EU1	A2	1	Stoneware	Rim	Green			
10.20	EU1	A2	1	White Ware	Rim	Blue	Shell Edged	Scalloped	
10.21	EU1	A2	1	White Ware	Rim	White		Molded	
10.22	EU1	A2	1	White Ware	Rim	Green	Banded (Brown)	Hand Painted	
10.23	EU1	A2	1	White Ware	Rim	White			
10.24	EU1	A2	1	White Ware	Body	White			
10.25	EU1	A2	2	White Ware	Body	White			
10.26	EU1	A2	4	Common Nail	Complete		Modern Machine		1830+
10.27	EU1	A2	20	Common Nail	Head		Modern Machine		1830+
10.28	EU1	A2	2	Common Nail	Complete		Early Machine		1815-1830
10.29	EU1	A2	2	Common Nail	Complete		Modern Machine		1830+
10.30	EU1	A2	1	Spike Nail	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
10.31	EU1	A2	1	Metal	Latch				
10.32	EU1	A2	1	Metal	Unk				
10.33	EU1	A2	3	Metal	Wire				
11.01	EU2	A3	1	Stoneware	Handle	Green			
11.02	EU2	A3	1	Stoneware	Rim	Green			
11.03	EU2	A3	1	Stoneware	Base	no color			
11.04	EU2	A3	1	Stoneware	Base	Burnt			
11.05	EU2	A3	6	Stoneware	Body	orange			
11.06	EU2	A3	21	Stoneware	Body	Dark Green			
11.07	EU2	A3	11	Stoneware	Body	Light Green			
11.08	EU2	A3	6	Stoneware	Body	Green			
11.09	EU2	A3	7	Stoneware	Body	Dark Green			
11.10	EU2	A3	3	Stoneware	Body	Brown			
11.11	EU2	A3		Stoneware	Body	Bits			
11.12	EU2	A3	2	Common Nail	Complete		Early Machine		1815s-1830s
11.13	EU2	A3	1	Common Nail	Head		Early Machine		1815s-1830s
11.14	EU2	A3	1	Common Nail	Complete		Moddern Machine		1830+
11.15	EU2	A3	1	Common Nail	Shank		Moddern Machine		1830+
11.16	EU2	A3	1	Metal	Bullet				
12.01	EU4	A1		EXP					
12.02	EU4	A1		Bone				Bird	
12.03	EU4	A1		Bone				Rodent	
12.04	EU4	A1	2	Stoneware	Rim	Light Green			
12.05	EU4	A1	2	Stoneware	Rim	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
12.06	EU4	A1	1	Stoneware	Rim	Green			
12.07	EU4	A1	1	Stoneware	Rim	Light Brown			
12.08	EU4	A1	1	Stoneware	Rim	Brown			
12.09	EU4	A1	1	Stoneware	Handle	Light Green		Strap	
12.10	EU4	A1	1	Stoneware	Handle	Green		lug	
12.11	EU4	A1	1	Stoneware	Spout	Green			
12.12	EU4	A1	2	Stoneware	Base	Light Green			
12.13	EU4	A1	1	Stoneware	Base	Light Brown			
12.14	EU4	A1	1	Stoneware	Base	Light Green			
12.15	EU4	A1	1	Stoneware	body	Brown			
12.16	EU4	A1	2	Stoneware	body	Light Brown			
12.17	EU4	A1	6	Stoneware	body	Green			
12.18	EU4	A1	1	Stoneware	body	Light Green			
12.19	EU4	A1	4	Stoneware	body	Green			
12.20	EU4	A1	2	Stoneware	body	Green			
12.21	EU4	A1	2	Stoneware	body	Green			
12.22	EU4	A1	50	Stoneware	body	Light Green			
12.23	EU4	A1		Stoneware	body	Bits			
12.24	EU4	A1		Stoneware	body				
12.25	EU4	A1		Stoneware	body				
12.26	EU4	A1	1	Glass	body	Clear			
12.27	EU4	A1	2	Glass	body	Green			
12.28	EU4	A1	2	White Ware	Rim	Blue	Edge Decorated (mol	Transfer Print	
12.29	EU4	A1	2	Common Nail	Complete		Early Machine		1815-1830

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
12.30	EU4	A1	2	Common Nail	Complete		Modern Machine		1830+
12.31	EU4	A1	2	Finished Nail	Complete		Modern Machine		1830+
12.32	EU4	A1	1	Common Nail	Heads		Early Machine		1815-1830
12.33	EU4	A1	2	Common Nail	Heads		Modern Machine		1830+
12.34	EU4	A1	1	Common Nail	Heads		Modern Machine		1830+
12.35	EU4	A1	4	Common Nail	Heads		Modern Machine		1830+
12.36	EU4	A1	2	Common Nail	Shank		Modern Machine		1830+
12.37	EU4	A1	2	Common Nail	Shank		Modern Machine		1830+
12.38	EU4	A1	3	Common Nail	Shank		Modern Machine		1830+
13.01	EU1	A3		Charcoal					
13.02	EU1	A3		Bone					
13.03	EU1	A3	1	Stoneware	Handle	Burnt			
13.04	EU1	A3	3	Stoneware	Body	Burnt			
13.05	EU1	A3	2	Stoneware	Body	Dark Green			
13.06	EU1	A3	9	Stoneware	Body	Light Green	Glaze Running		
13.07	EU1	A3	3	Stoneware	Body	Light Brown			
13.08	EU1	A3	23	Stoneware	Body	Light Green			
13.09	EU1	A3	7	Stoneware	Body	Light Brown			
13.10	EU1	A3		Stoneware	Body	Bits			
13.11	EU1	A3	1	White Ware	Body	Light Blue	Floral	Transfer Print	
13.12	EU1	A3	1	White Ware	Body	Blue			
13.13	EU1	A3	1	White Ware	Body	Dark Blue	Floral	Transfer Print	
13.14	EU1	A3	2	White Ware	Body	Blue		Transfer Print	
13.15	EU1	A3	1	White Ware	Rim	Dark Blue	Annular	Hand Painted	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
13.16	EU1	A3	1	White Ware	Body	Dark Blue		Hand Painted	
13.17	EU1	A3	1	White Ware	Body	Green	Foliate	Hand Painted	
13.18	EU1	A3	2	Yellow Ware	Handle Terminal	Yellow			
13.19	EU1	A3	2	White Ware	Rim	White			
13.20	EU1	A3	4	White Ware	Body	White			
13.21	EU1	A3	1	White Ware	Body	White			
13.22	EU1	A3	1	White Ware	Rim	White			
13.23	EU1	A3	1	White Ware	Body	White			
13.24	EU1	A3	1	White Ware	Rim (Plate)	White			
13.25	EU1	A3	1	White Ware	Foot Ring	Blue			
13.26	EU1	A3	2	Common Nail	Complete		Modern Machine		1830+
13.27	EU1	A3	1	Common Nail	Complete		Modern Machine		1830+
13.28	EU1	A3	1	Common Nail	Complete		Modern Machine		1830+
13.29	EU1	A3	2	Common Nail	Complete		Early Machine		1815-1830
13.30	EU1	A3	1	Spigs and Brads	Complete		Machine		1805-1820
13.31	EU1	A3	5	Common Nail	Head		Modern Machine		1830+
13.32	EU1	A3	5	Common Nail	Head		Modern Machine		1830+
13.33	EU1	A3	2	Common Nail	Head		Modern Machine		1830+
13.34	EU1	A3	2	Common Nail	Head		Modern Machine		1830+
13.35	EU1	A3	6	Common Nail	Shank		Modern Machine		1830+
13.36	EU1	A3	4	Common Nail	Shank		Modern Machine		1830+
13.37	EU1	A3	2	Common Nail	Shank		Modern Machine		1830+
13.38	EU1	A3	1	Metal	Screw		Unk		
13.39	EU1	A3	2	Metal	Unk				

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
14.01	EU3	A2	1	Stoneware	Rim	Light Green			
14.02	EU3	A2	1	Stoneware	Rim	Green			
14.03	EU3	A2	2	Stoneware	Rim	Light Brown			
14.04	EU3	A2	1	Stoneware	Rim	Burnt			
14.05	EU3	A2	2	Stoneware	Base	Tan			
14.06	EU3	A2	15	Stoneware	Body	Light Green			
14.07	EU3	A2	31	Stoneware	Body	Green			
14.08	EU3	A2	4	Stoneware	Body	Burnt			
14.09	EU3	A2		Stoneware		Bits			
14.10	EU3	A2	1	Stoneware	body	Light Brown	Incised		
14.11	EU3	A2	1	Glass	Body	Clear			
14.12	EU3	A2	1	Glass	Body	Lime			
14.13	EU3	A2	1	Glass	Body	Green			
14.14	EU3	A2	1	White Ware	Body	Blue	Floral	Transfer Print	
14.15	EU3	A2	2	Common Nail	Complete		Modern Machine		1830+
14.16	EU3	A2	5	Common Nail	Heads		Modern Machine		1830+
15.01	EU5	A1	1	Stoneware	Handle	Light Green			
15.02	EU5	A1	4	Stoneware	Spout	Green			
15.03	EU5	A1	3	Stoneware	Base	Burnt			
15.04	EU5	A1	49	Stoneware	Body	Light Green	Glaze Running		
15.05	EU5	A1	2	Stoneware	Body	Dark Green			
15.06	EU5	A1	13	Stoneware	Body	Light Brown			
15.07	EU5	A1	8	Stoneware	Body	Dark Green			
15.08	EU5	A1		Stoneware	Body	Bits			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
15.09	EU5	A1	1	Glass	body	Light Brown			
15.10	EU5	A1	3	White Ware	Body	White			
15.11	EU5	A1	1	Pearl Ware	Foot Ring	White			
15.12	EU5	A1	1	White Ware	Rim	Green	Feather Edged	Hand Painted	
15.13	EU5	A1	1	White Ware	Rim	Green	Banded	Hand Painted	
15.14	EU5	A1	1	White Ware	Rim	Blue	Feather Edged	Hand Painted	
15.15	EU5	A1	1	White Ware	Rim	Blue	Dot	Transfer Print	
15.16	EU5	A1	5	Cast Iron	Complete		Hand Wrought		1770-1820
15.17	EU5	A1	4	Common Nail	Complete		Modern Machine		1830+
15.18	EU5	A1	5	Common Nail	Head		Modern Machine		1830+
15.19	EU5	A1	1	Common Nail	Head		Modern Machine		1830+
15.20	EU5	A1	3	Common Nail	Complete		Modern Machine		1830+
15.21	EU5	A1	1	Common Nail	Head		Hand Wrought		
15.22	EU5	A1	2	Lath Nail	Complete		Early Machine		1790-1810
15.23	EU5	A1	2	Finished Nail	Complete		Modern Machine		1830+
15.24	EU5	A1	2	Finished Nail	Complete		Early Machine		1815-1830
15.25	EU5	A1	7	Common Nail	Shank		Modern Machine		1830+
16.01	EU1	A4	5	Stoneware	Body	Dark Brown			
16.02	EU1	A4	2	Stoneware	Body	Brown			
16.03	EU1	A4	9	Stoneware	Body	Green			
16.04	EU1	A4	3	Stoneware	Body	Green	Glaze Running		
16.05	EU1	A4	3	Stoneware	Body	Green			
16.06	EU1	A4	12	Stoneware	Body	Light Green			
16.07	EU1	A4	5	White Ware	Body	Blue		Hand Painted	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
16.08	EU1	A4	1	White Ware	Rim	Dark Green	Edge Decorated (molded)		
16.09	EU1	A4	1	Spigs and Brads	Complete		Machine		1805-1820
16.10	EU1	A4	1	Common Nail	Complete		Early Machine		1815-1830
16.11	EU1	A4	1	Common Nail	Complete		Modern Machine		1830+
16.12	EU1	A4	1	Finished Nail	Complete		Early Machine		1815-1830
16.13	EU1	A4	1	Common Nail	Head		Modern Machine		1830+
16.14	EU1	A4	1	Metal	Wire				
17.01	EU6	A1	1	Stoneware	Base	Tan			
17.02	EU6	A1	2	Stoneware	Rim	Tan			
17.03	EU6	A1	2	Stoneware	Spout	Green			
17.04	EU6	A1	1	Stoneware	Body	Tan			
17.05	EU6	A1	9	Stoneware	Body	Brown			
17.06	EU6	A1	19	Stoneware	Body	Green			
17.07	EU6	A1	9	Stoneware	Body	Dark Green			
17.08	EU6	A1	27	Stoneware	Body	Green			
17.09	EU6	A1		Stoneware	Body	Bits			
17.10	EU6	A1	1	Stoneware	body	Brown	grooved		
17.11	EU6	A1	1	Stoneware	Handle	Dark Green	lug		
17.12	EU6	A1	2	White Ware	Base	White			
17.13	EU6	A1	3	Common Nail	Complete		Modern Machine		1830+
17.14	EU6	A1	2	Common Nail	Complete		Modern Machine		1830+
17.15	EU6	A1	2	Common Nail	Complete		Early Modern		1815-1830
17.16	EU6	A1	1	Common Nail	Complete		Early Machine		1815-1830
17.17	EU6	A1	1	Common Nail	Complete		Early Machine		1815-1830

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
17.18	EU6	A1	1	Common Nail	Complete		Modern Machine		1830+
17.19	EU6	A1	1	Spigs and Brads	Complete		Machine		1810+
17.20	EU6	A1	1	Spigs and Brads	Head		Machine		1810+
17.21	EU6	A1	1	Common Nail	Head		Modern Machine		1830+
17.22	EU6	A1	1	Common Nail	Head		Modern Machine		1830+
17.23	EU6	A1	5	Common Nail	Head		Modern Machine		1830+
17.24	EU6	A1	4	Common Nail	Head		Modern Machine		1830+
17.25	EU6	A1	1	Finished Nail	Head		Modern Machine		1830+
17.26	EU6	A1	7	Finished Nail	Shank		Modern Machine		1830+
17.27	EU6	A1	4	Common Nail	Shank		Modern Machine		1830+
17.28	EU6	A1	4	Common Nail	Shank		Modern Machine		1830+
17.29	EU6	A1	1	Common Nail	Shank		Modern Machine		1830+
17.30	EU6	A1	1	Common Nail	Shank		Modern Machine		1830+
17.31	EU6	A1	1	Metal	Bolt				
19.01	EU2	A1	1	Stoneware	Handle	Light Green			
19.02	EU2	A1	1	Stoneware	Handle	Green			
19.03	EU2	A1	1	Stoneware	Rim	Light Green			
19.04	EU2	A1	1	Stoneware	neck	Light Brown			
19.05	EU2	A1	1	Stoneware	Base	Light Green			
19.06	EU2	A1	1	Stoneware	Base	Light Brown			
19.07	EU2	A1	1	Stoneware	Base	Dark Green			
19.08	EU2	A1	1	Stoneware	Base	Brown			
19.09	EU2	A1	1	Stoneware	Base	no color			
19.10	EU2	A1	1	Stoneware	Base	Dark Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
19.11	EU2	A1	14	Stoneware	Body	Light Green			
19.12	EU2	A1	2	Stoneware	Body	Brown			
19.13	EU2	A1	11	Stoneware	Body	Light Green	Glaze Running		
19.14	EU2	A1	5	Stoneware	Body	orange			
19.15	EU2	A1	1	Stoneware	Body	Light Brown			
19.16	EU2	A1	1	Stoneware	Body	Light Brown			
19.17	EU2	A1	1	Stoneware	Body	Light Green			
19.18	EU2	A1	1	Stoneware	Body	Green			
19.19	EU2	A1	1	Stoneware	Body	Green			
19.20	EU2	A1	1	Stoneware	Body	Brown			
19.21	EU2	A1		Stoneware	Body	Bits			
19.22	EU2	A1	1	Stoneware	Handle	Light Green		Strap	
19.23	EU2	A1	1	Common Nail	Shank		Moddern Machine		1830+
19.24	EU2	A1	1	Common Nail	Shank		Moddern Machine		1830+
19.25	EU2	A1	2	Common Nail	Complete		Moddern Machine		1830+
19.26	EU2	A1	1	Metal			File		
21.01	EU5	A2	1	Stoneware	Rim	Tan			
21.02	EU5	A2	3	Stoneware	Body	Light Green			
21.03	EU5	A2	1	Stoneware	Body	Dark Green			
21.04	EU5	A2	4	Stoneware	Body	Dark Green			
21.05	EU5	A2	11	Stoneware	Body	Green			
21.06	EU5	A2	18	Stoneware	Body	Light Brown			
21.07	EU5	A2	4	Stoneware	Body	Tan			
21.08	EU5	A2		Stoneware		Bits			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
21.09	EU5	A2	1	Glass	Body	Dark Green			
21.10	EU5	A2	1	Glass	Body	Clear			
21.11	EU5	A2	1	Glass	Body	Clear			
21.12	EU5	A2	1	Glass	Body	Lime			
21.13	EU5	A2	1	White Ware	Body	White			
21.14	EU5	A2	1	White Ware	Body	White			
21.15	EU5	A2	2	White Ware	Body	Blue	Dot	Hand Painted	
21.16	EU5	A2	1	White Ware	Rim	Green	Floral	Hand Painted	
21.17	EU5	A2	1	White Ware	Rim	Blue	Diamond Pattern	Transfer Print	
21.18	EU5	A2	1	White Ware	Rim	Blue	Molded	Hand Painted	
21.19	EU5	A2	1	White Ware	Rim	Blue	Dot	Transfer Print	
21.20	EU5	A2	1	White Ware	Body	Blue	Dot	Transfer Print	
21.21	EU5	A2	1	White Ware	Base	Black	Makers Mark		
21.22	EU5	A2	1	Yellow Ware	Body	Yellow			
21.23	EU5	A2	3	Common Nail	Shank		Modern Machine		1830+
21.24	EU5	A2	2	Common Nail	Head		Early Machine		1815-1830
21.25	EU5	A2	2	Common Nail	Head		Early Machine		1815-1830
21.26	EU5	A2	2	Common Nail	Complete		Modern Machine		1830+
21.27	EU5	A2	2	Common Nail	Head		Modern Machine		1830+
22.01	EU7	A1	1	Stoneware	Rim	Green			
22.02	EU7	A1	1	Stoneware	Rim	Light Green			
22.03	EU7	A1	1	Stoneware	Rim	Light Green			
22.04	EU7	A1	1	Stoneware	Rim	Tan			
22.05	EU7	A1	1	Stoneware	Rim	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
22.06	EU7	A1	1	Stoneware	Rim	Green			
22.07	EU7	A1	1	Stoneware	Spout	Brown			
22.08	EU7	A1	1	Stoneware	Spout	Green			
22.09	EU7	A1	1	Stoneware	Handle	Light Green			
22.10	EU7	A1	4	Stoneware	Base	Burnt			
22.11	EU7	A1	1	Stoneware	Base	Light Green			
22.12	EU7	A1	2	Stoneware	Base	Light Brown			
22.13	EU7	A1	41	Stoneware	Body	Green			
22.14	EU7	A1	12	Stoneware	Body	Tan			
22.15	EU7	A1	33	Stoneware	Body	Dark Green			
22.16	EU7	A1	16	Stoneware	Body	Burnt			
22.17	EU7	A1	3	Stoneware	Body	Light Brown			
22.18	EU7	A1	5	Stoneware	Body	Green			
22.19	EU7	A1		Stoneware	Body	Bits			
22.20	EU7	A1	1	stone		red pigment			
22.21	EU7	A1	1	White Ware	Body	Green		Hand Painted	
22.22	EU7	A1	2	Common Nail	Shank		Modern Machine		1830+
22.23	EU7	A1	2	Common Nail	Shank		Modern Machine		1830+
22.24	EU7	A1	1	Lath Nail	Complete		Early Machine		1790-1810
22.25	EU7	A1	3	Common Nail	Complete		Modern Machine		1830+
22.26	EU7	A1	1	Nail	Shank		UNK		
22.27	EU7	A1	1	Spigs and Brads	Complete		Complete Machine		1805-1820
22.28	EU7	A1	3	Common Nail	Shank		Modern Machine		1830+
22.29	EU7	A1	1	Spigs and Brads	Complete		Early Machine		1790-1805

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
22.30	EU7	A1	6	Common Nail	Head		Early Machine		1815-1830
22.31	EU7	A1	2	Common Nail	Shank		Modern Machine		1830+
22.32	EU7	A1	1	Spigs and Brads	Complete		Early Machine		1815-1830
22.33	EU7	A1	1	Common Nail	Head		Early Machine		1815-1830
22.34	EU7	A1	1	Common Nail	Complete		Modern Machine		1830+
22.35	EU7	A1	1	Common Nail	Complete		Early Machine		1815-1830
22.36	EU7	A1	2	Finished Nail	Complete		Early Machine		1815-1830
22.37	EU7	A1	2	Rosehead	Complete		Hand Wrought		
22.38	EU7	A1	2	Spigs and Brads	Complete		Early Machine		1790-1805
23.01	EU8	A1	3	Stoneware	Handle	Light Green			
23.02	EU8	A1	1	Stoneware	Handle	Light Green			
23.03	EU8	A1	1	Stoneware	Handle	Light Green			
23.04	EU8	A1	1	Stoneware	Handle	Brown			
23.05	EU8	A1	4	Stoneware	Rim	Light Green			
23.06	EU8	A1	2	Stoneware	Rim	Light Green			
23.07	EU8	A1	1	Stoneware	Rim	Light Green			
23.08	EU8	A1	2	Stoneware	Rim	Light Brown			
23.09	EU8	A1	1	Stoneware	Rim	Brown			
23.10	EU8	A1	1	Stoneware	Rim	Light Tan			
23.11	EU8	A1	1	Stoneware	Rim	Green			
23.12	EU8	A1	4	Stoneware	Rim	Light Green			
23.13	EU8	A1	2	Stoneware	Spout	Light Green			
23.14	EU8	A1	1	Stoneware	Base	Light Green			
23.15	EU8	A1	55	Stoneware	Body	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
23.16	EU8	A1	13	Stoneware	Body	Dark Green			
23.17	EU8	A1	73	Stoneware	Body	Tan			
23.18	EU8	A1		Stoneware	Body	Bits			
23.19	EU8	A1	7	White Ware	Body	White			
23.20	EU8	A1	2	White Ware	Body	White			
23.21	EU8	A1	1	White Ware	Rim	Blue	Diamond Pattern	Transfer Print	
23.22	EU8	A1	1	White Ware	Rim	Blue	Feather Edged	Hand Painted	
23.23	EU8	A1	1	White Ware	Body	Blue		Transfer Print	
23.24	EU8	A1	2	Common Nail	Complete				
23.25	EU8	A1	4	Common Nail	Complete		Modern Machine		1830+
23.26	EU8	A1	3	Common Nail	Head		Modern Machine		1830+
23.27	EU8	A1	4	Common Nail	Head		Modern Machine		1830+
23.28	EU8	A1	1	Common Nail	Head		Modern Machine		1830+
23.29	EU8	A1	2	Common Nail	Shank		Modern Machine		1830+
23.30	EU8	A1	1	Common Nail	Shank		Modern Machine		1830+
24.01	EU6	A2	1	Stoneware	Rim	Green			
24.02	EU6	A2	1	Stoneware	Rim	Light Green			
24.03	EU6	A2	1	Stoneware	Handle	Green			
24.04	EU6	A2	1	Stoneware	Handle	Green			
24.05	EU6	A2	1	Stoneware	Handle	Light Green			
24.06	EU6	A2	1	Stoneware	Handle	Brown			
24.07	EU6	A2	1	Stoneware	Base	Orange			
24.08	EU6	A2	1	Stoneware	Rim	Light Green			
24.09	EU6	A2	14	Stoneware	Body	Brown			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
24.10	EU6	A2	35	Stoneware	Body	Green			
24.11	EU6	A2	1	Stoneware	Body	Light Green			
24.12	EU6	A2		Stoneware	Body	Bits			
24.13	EU6	A2	1	White Ware	Body	Blue			
24.14	EU6	A2	2	White Ware	Body	Red	Foliate		
24.15	EU6	A2	4	White Ware	Body	Blue		Transfer Print	
24.16	EU6	A2	1	White Ware	Body	Brown		Hand Painted	
24.17	EU6	A2	2	White Ware	Base	Dark Blue		Transfer Print	
24.18	EU6	A2	1	White Ware	Body	Dark Blue	Floral	Transfer Print	
24.19	EU6	A2	1	White Ware	Rim	Blue	Edge Decorated	Transfer Print	
24.20	EU6	A2	1	White Ware	Body	Green	Foliate	Hand Painted	
24.21	EU6	A2	5	White Ware	Body	White			
24.22	EU6	A2	2	Common Nail	Complete		Modern Machine		1830+
24.23	EU6	A2	10	Common Nail	Complete		Modern Machine		1830+
24.24	EU6	A2	5	Common Nail	Complete		Modern Machine		1830+
24.25	EU6	A2	12	Common Nail	Head		Modern Machine		1830+
24.26	EU6	A2	2	Common Nail	Head		Modern Machine		1830+
24.27	EU6	A2	2	Common Nail	Head		Modern Machine		1830+
24.28	EU6	A2	2	Metal			Unk		
25.01	EU9	A1	1	Stoneware	Rims	Green			
25.02	EU9	A1	1	Stoneware	Rims	Green			
25.03	EU9	A1	1	Stoneware	Rims	Light Green			
25.04	EU9	A1	1	Stoneware	Rims	Light Brown			
25.05	EU9	A1	1	Stoneware	Rims	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
27.05	EU9	A2	1	Stoneware	Base	no color			
27.06	EU9	A2	1	Stoneware	Base	Light Green			
27.07	EU9	A2	1	Stoneware	Base	Green			
27.08	EU9	A2	24	Stoneware	Body	Burnt			
27.09	EU9	A2	8	Stoneware	Body	Green	Glaze Running		
27.10	EU9	A2	22	Stoneware	Body	Light Green			
27.11	EU9	A2	16	Stoneware	Body	Dark Green			
27.12	EU9	A2	3	Stoneware	Body	Dark Green	Glaze Running		
27.13	EU9	A2	5	Stoneware	Body	Light Green			
27.14	EU9	A2	25	Stoneware	Body	Dark Green			
27.15	EU9	A2		Stoneware	Body	Bits			
27.16	EU9	A2	4	White Ware	Body	White			
27.17	EU9	A2	1	White Ware	Body	White			
27.18	EU9	A2	1	White Ware	Body	Black		Transfer Print	
27.19	EU9	A2	1	White Ware	Body	Dark Blue		Transfer Print	
27.20	EU9	A2	1	White Ware	Body	Mulberry	Floral	Transfer Print	
27.21	EU9	A2	2	Common Nail	Complete		Modern Machine		1830+
27.22	EU9	A2	2	Common Nail	Complete		Modern Machine		1830+
27.23	EU9	A2	1	Rosehead	Complete		Handwrought		
27.24	EU9	A2	3	Common Nail	Head		Modern Machine		1830+
27.25	EU9	A2	1	Common Nail	Head		Modern Machine		1830+
27.26	EU9	A2	2	Lath Nail	Complete		Early Machine		1790-1810
27.27	EU9	A2	1	Lath Nail	Head		Early Machine		1790-1810
27.28	EU9	A2	1	Common Nail	Head		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
27.29	EU9	A2	1	Nail	Head		UNK		
27.30	EU9	A2	6	Nail			UNK		
28.01	EU9	A3	1	Stoneware	Spout	Green			
28.02	EU9	A3	1	Stoneware	Spout	Green			
28.03	EU9	A3	1	Stoneware	Rim	Light Green			
28.04	EU9	A3	1	Stoneware	Base	Burnt			
28.05	EU9	A3	1	Stoneware	Base	Light Brown			
28.06	EU9	A3	1	Stoneware	Base	Light Green			
28.07	EU9	A3	1	Stoneware	Base	Green			
28.08	EU9	A3	10	Stoneware	Body	Green			
28.09	EU9	A3	15	Stoneware	Body	Green			
28.10	EU9	A3	16	Stoneware	Body	Light Green	Glaze Running		
28.11	EU9	A3	6	Stoneware	Body	Burnt			
28.12	EU9	A3	2	Stoneware	Body	Dark Green	Glaze Running		
28.13	EU9	A3	18	Stoneware	Body	Burnt			
28.14	EU9	A3	1	Porcelain	Body	Light Blue			
28.15	EU9	A3	1	White Ware	Body	Mulberry	Swirls	Transfer Print	
28.16	EU9	A3	1	White Ware	Rim	Mulberry	Dots	Transfer Print	
28.17	EU9	A3	8	Common Nail	Complete		Modern Machine		1830+
28.18	EU9	A3	1	Spigs and Brads	Complete		Early Machine		1790-1810
28.19	EU9	A3	1	Spigs and Brads	Complete		Early Machine		1790-1810
28.20	EU9	A3	1	Common Nail	Complete		Modern Machine		1830+
28.21	EU9	A3	2	Lath Nail	Complete		Early Machine		1790-1810
28.22	EU9	A3	1	Lath Nail	Head		Early Machine		1790-1810

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
28.23	EU9	A3	2	Common Nail	Complete		Modern Machine		1830+
28.24	EU9	A3	1	Common Nail	Head		Modern Machine		1830+
28.25	EU9	A3	1	Common Nail	Shank		Modern Machine		1830+
28.26	EU9	A3	3	Nail			UNK		
28.27	EU9	A3	2	Nail			UNK		
28.28	EU9	A3	1	Nail			UNK		
28.29	EU9	A3	1	Metal			UNK		
30.01	EU10	A1	1	Stoneware	Rims	Burnt			
30.02	EU10	A1	1	Stoneware	Rims	Burnt			
30.03	EU10	A1	1	Stoneware	Rims	Green			
30.04	EU10	A1	1	Stoneware	Rims	Tan			
30.05	EU10	A1	1	Stoneware	Rims	Brown			
30.06	EU10	A1	1	Stoneware	Rims	Burnt			
30.07	EU10	A1	1	Stoneware	Rims	Light Brown			
30.08	EU10	A1	1	Stoneware	Rims	orange			
30.09	EU10	A1	3	Stoneware	Rims	Light Green			
30.10	EU10	A1	1	Stoneware	Handle	Green		strap	
30.11	EU10	A1	1	Stoneware	Spouts	Green			
30.12	EU10	A1	1	Stoneware	Spouts	Green			
30.13	EU10	A1	1	Stoneware	Base	Burnt			
30.14	EU10	A1	1	Stoneware	Base	Dark Green			
30.15	EU10	A1	1	Stoneware	Base	Dark Green	Glaze Running		
30.16	EU10	A1	1	Stoneware	Base	Light Green			
30.17	EU10	A1	1	Stoneware	Base	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
30.18	EU10	A1	1	Stoneware	Base	Brown			
30.19	EU10	A1	3	Stoneware	Base	Brown			
30.20	EU10	A1	3	Stoneware	Base	Light Green			
30.21	EU10	A1	3	Stoneware	Base	orange			
30.22	EU10	A1	3	Stoneware	Base	Brown			
30.23	EU10	A1	2	Stoneware	Base	Light Green			
30.24	EU10	A1	41	Stoneware	Body	Green			
30.25	EU10	A1	18	Stoneware	Body	Light Green			
30.26	EU10	A1	34	Stoneware	Body	Green			
30.27	EU10	A1	54	Stoneware	Body	Light Green			
30.28	EU10	A1	56	Stoneware	Body	Dark Green			
30.29	EU10	A1	1	Stoneware	Body	Green		white slip	
30.30	EU10	A1		Stoneware	Body	Bits			
30.31	EU10	A1	1	metal	button		flak		
30.32	EU10	A1	5	White Ware	Body	White			
30.33	EU10	A1	1	White Ware	Body	Light Blue	Ribbed	Molded	Blue Wash
30.34	EU10	A1	1	White Ware	Body	Red	Dots	Transfer Print	
30.35	EU10	A1	1	White Ware	Rim	Blue	Floral	Transfer Print	
30.36	EU10	A1	1	White Ware	Rim	Blue	Lines	Transfer Print	
30.37	EU10	A1	1	White Ware	Rim	Green	Banded	Hand Painted	
30.38	EU10	A1	1	White Ware	Rim	Light Blue	Floral	Transfer Print	
30.39	EU10	A1	1	Common Nail	Complete		Modern Machine		1830+
30.40	EU10	A1	1	Common Nail	Complete		Modern Machine		1830+
30.41	EU10	A1	1	Nail	Complete		UNK		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
30.42	EU10	A1	5	Common Nail	Complete		Modern Machine		1830+
30.43	EU10	A1	5	Common Nail	Complete		Modern Machine		1830+
30.44	EU10	A1	1	Common Nail	Head		Modern Machine		1830+
30.45	EU10	A1	2	Common Nail	Head		Modern Machine		1830+
30.46	EU10	A1	2	Common Nail	Shank		Modern Machine		1830+
30.47	EU10	A1	7	Finished Nail	Complete		Modern Machine		1830+
30.48	EU10	A1	5	Common Nail	Shank		UNK		
30.49	EU10	A1	5	Common Nail	Shank		Modern Machine		1830+
30.50	EU10	A1	2	Common Nail	Complete		UNK		
30.51	EU10	A1	1	Screw	Complete				
30.52	EU10	A1	1	Bolt	Complete		UNK		
31.01	EU7	B1	1	Stoneware	Rims	Light Green			
31.02	EU7	B1	1	Stoneware	Rims	Brown			
31.03	EU7	B1	1	Stoneware	Handle	Green		strap	
31.04	EU7	B1	3	Stoneware	Base	Burnt			
31.05	EU7	B1	1	Stoneware	Base	Light Green			
31.06	EU7	B1	1	Stoneware	Base	Brown			
31.07	EU7	B1	1	Stoneware	Base	Burnt			
31.08	EU7	B1	35	Stoneware	Body	Light Green			
31.09	EU7	B1	23	Stoneware	Body	Green	Glaze Running		
31.10	EU7	B1	23	Stoneware	Body	Brown			
31.11	EU7	B1	40	Stoneware	Body	Green			
31.12	EU7	B1	13	Stoneware	Body	Burnt			
31.13	EU7	B1	52	Stoneware	Body	Dark Green	Glaze Running		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
31.14	EU7	B1	7	Stoneware	Body	Light Brown			
31.15	EU7	B1	8	Stoneware	Body	Light Green			
31.16	EU7	B1	1	Stoneware	body	Light Green	marked		
31.17	EU7	B1	2	Common Nail	Complete		Modern Machine		1830+
31.18	EU7	B1	1	Common Nail	Head		Modern Machine		1830+
31.19	EU7	B1	1	Common Nail	Head		Modern Machine		1830+
31.20	EU7	B1	6	Common Nail	Complete		Modern Machine		1830+
31.21	EU7	B1	2	Common Nail	Shank		Modern Machine		1830+
31.22	EU7	B1	3	Nail			UNK		
31.23	EU7	B1	1	Common Nail	Complete		Modern Machine		1830+
31.24	EU7	B1	2	Finishing Nail	Complete		Modern Machine		1830+
31.25	EU7	B1	1	Common Nail	Complete		Early Machine		1815-1830
31.26	EU7	B1	1	Common Nail	Head		Modern Machine		1830+
31.27	EU7	B1	1	Common Nail	Complete		Modern Machine		1830+
31.28	EU7	B1	2	Common Nail	Complete		Modern Machine		1830+
31.29	EU7	B1	1	Lath Nail	Complete		Early Machine		1790-1810
31.30	EU7	B1	1	Spigs and Brads	Complete		Early Machine		1790-1805
31.31	EU7	B1	1	Metal			UNK		
32.01	EU6	A3	1	Stoneware	Base				
32.02	EU6	A3	3	Stoneware	Body	Light Green			
32.03	EU6	A3	5	Stoneware	Body	Green			
32.04	EU6	A3	1	White Ware	Body	White			
32.05	EU6	A3	1	Nail	Shank		UNK		
33.01	Feature 2	A1	1	Stoneware	Base	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
33.02	Feature 2	A1	1	Stoneware	Base				
33.03	Feature 2	A1	1	Stoneware	Rim	Light Green			
33.04	Feature 2	A1	3	Stoneware	Body	Green			
33.05	Feature 2	A1	2	Stoneware	Body	Light Green			
33.06	Feature 2	A1	1	Stoneware	Body	Dark Brown			
33.07	Feature 2	A1	1	Stoneware	Body	Dark Green	Glaze Running		
33.08	Feature 2	A1	1	Stoneware	Body	Light Green	Glaze Running		
33.09	Feature 2	A1	3	Stoneware	Body	Brown			
33.10	Feature 2	A1	1	Stoneware	Body	Light Green			
33.11	Feature 2	A1	1	Stoneware	Body	Green			
33.12	Feature 2	A1	1	Stoneware	Body	Dark Green			
33.13	Feature 2	A1	2	Stoneware	Body	Light Green			
33.14	Feature 2	A1	1	Stoneware	Body	Orange			
33.15	Feature 2	A1	1	Stoneware	Body	Green			
33.16	Feature 2	A1	8	Stoneware	Body	Light Green	Glaze Running		
33.17	Feature 2	A1	2	Stoneware	Body	Dark Green			
33.18	Feature 2	A1	2	Stoneware	Body	Brown			
33.19	Feature 2	A1	2	Stoneware	Body	Light Green			
33.20	Feature 2	A1	1	Stoneware	Body	Light Brown			
33.21	Feature 2	A1	6	Stoneware	Body	Light Green			
33.22	Feature 2	A1	1	Stoneware	Body	Green			
33.23	Feature 2	A1	2	Stoneware	Body	Green			
33.24	Feature 2	A1	3	Stoneware	Body	Dark Green			
33.25	Feature 2	A1	1	Stoneware	Body	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
33.26	Feature 2	A1	1	Stoneware	Body	Grey			
33.27	Feature 2	A1	1	White Ware	Body	White	Molded (Decoration Remnants?)		
33.28	Feature 2	A1	1	White Ware	Body	White			
33.29	Feature 2	A1	1	White Ware	Base	Yellow			
33.30	Feature 2	A1	2	White Ware	Body	Dark Blue		Transfer Print	
33.31	Feature 2	A1	1	Spigs and Brads	Complete		Machine Cut		1790-1805
33.32	Feature 2	A1	1	Common Nail	Complete		Modern Machine		1830+
33.33	Feature 2	A1	1	Common Nail	Head		Modern Machine		1830+
33.34	Feature 2	A1	2	Common Nail	Head		Modern Machine		1830+
33.35	Feature 2	A1	1	Common Nail	Shank		Modern Machine		1830+
34.01	EU11	A1	1	Stoneware	Base	Burnt			
34.02	EU11	A1	1	Stoneware	Base	Burnt			
34.03	EU11	A1	1	Stoneware	Base	Light Brown	Glaze Running		
34.04	EU11	A1	1	Stoneware	Base	Burnt			
34.05	EU11	A1	1	Stoneware	Base	Green			
34.06	EU11	A1	1	Stoneware	Handle	Green			
34.07	EU11	A1	2	Stoneware	Rim	Light Green			
34.08	EU11	A1	1	Stoneware	Rim	Green	Glaze Running		
34.09	EU11	A1	1	Stoneware	Rim	Light Green			
34.10	EU11	A1	1	Stoneware	Rim	Green			
34.11	EU11	A1	1	Stoneware	Rim	Green			
34.12	EU11	A1	25	Stoneware	Body	Green			
34.13	EU11	A1	4	Stoneware	Body	Burnt			
34.14	EU11	A1	6	Stoneware	Body	Dark Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
34.15	EU11	A1	8	Stoneware	Body	Light Brown			
34.16	EU11	A1	7	Stoneware	Body	Brown			
34.17	EU11	A1	4	Stoneware	Body	Brown			
34.18	EU11	A1		Stoneware	Body	Bits			
34.19	EU11	A1	2	Common Nail	Complete		Modern Machine		1830+
34.20	EU11	A1	1	Lath Nail	Complete		Early Machine		1790-1810
34.21	EU11	A1	1	Common Nail	UNK				
34.22	EU11	A1	1	Metal	Boot Heel				
35.01	Feature 2	A2	1	bone					
35.02	Feature 2	A2	1	EXP					
35.03	Feature 2	A2	1	Stoneware	Rim	Burnt			
35.04	Feature 2	A2	1	Stoneware	Rim	Light Green			
35.05	Feature 2	A2	1	Stoneware	Rim	Burnt			
35.06	Feature 2	A2	1	Stoneware	Rim	Light Brown			
35.07	Feature 2	A2	2	Stoneware	Rim	Brown			
35.08	Feature 2	A2	1	Stoneware	Rim	Light Brown			
35.09	Feature 2	A2	2	Stoneware	Rim	Burnt			
35.10	Feature 2	A2	1	Stoneware	Rim	Light Brown			
35.11	Feature 2	A2	1	Stoneware	Rim	Light Brown			
35.12	Feature 2	A2	1	Stoneware	Base	Green			
35.13	Feature 2	A2	1	Stoneware	Base	Green			
35.14	Feature 2	A2	1	Stoneware	Base	Green			
35.15	Feature 2	A2	1	Stoneware	Body	Green			
35.16	Feature 2	A2	1	Stoneware	Body	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
35.17	Feature 2	A2	25	Stoneware	Body	Light Green			
35.18	Feature 2	A2	4	Stoneware	Body	Brown			
35.19	Feature 2	A2	3	Stoneware	Body	Dark Green			
35.20	Feature 2	A2	6	Stoneware	Body	Green	Glaze Running		
35.21	Feature 2	A2	1	Stoneware	Body	Dark Green			
35.22	Feature 2	A2	62	Stoneware	Body	Burnt			
35.23	Feature 2	A2	7	Stoneware	Body	Light Brown			
35.24	Feature 2	A2	14	Stoneware	Body	Olive			
35.25	Feature 2	A2	35	Stoneware	Body	Green			
35.26	Feature 2	A2	32	Stoneware	Body	Burnt			
35.27	Feature 2	A2		Stoneware	Body	Bits			
35.28	Feature 2	A2	2	Stoneware	Rim	Light Green			
35.29	Feature 2	A2	1	Stoneware	Body	Light Green	Grooved		
35.30	Feature 2	A2	1	White Ware	Body	Blue	Foliate	Transfer Print	
35.31	Feature 2	A2	1	White Ware	Body	Light Blue	Floral		
35.32	Feature 2	A2	1	White Ware	Body	Light Brown	Edge Decorated	Transfer Print	
35.33	Feature 2	A2	2	White Ware	Body	White			
35.34	Feature 2	A2	1	White Ware	Rim	Blue	Edge Decorated (molded)		
35.35	Feature 2	A2	1	Spigs and Brads	Complete		Hand Wrought		
35.36	Feature 2	A2	1	Common Nail	Complete		Hand Wrought		
35.37	Feature 2	A2	2	Common Nail	Complete		Modern Machine		1830+
35.38	Feature 2	A2	1	Common Nail	Complete		Modern Machine		1830+
35.39	Feature 2	A2	1	Common Nail	Complete		Modern Machine		1830+
35.40	Feature 2	A2	2	Common Nail	Head		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
35.41	Feature 2	A2	2	Common Nail	Head		Modern Machine		1830+
35.42	Feature 2	A2	2	Finish	Head		Early Machine		1815-1830
35.43	Feature 2	A2	2	Common Nail	Head		Modern Machine		1830+
35.44	Feature 2	A2	3	Common Nail	Head		Modern Machine		1830+
35.45	Feature 2	A2	1	Common Nail	Shank		Modern Machine		1830+
35.46	Feature 2	A2	2	Common Nail	Shank		Modern Machine		1830+
35.47	Feature 2	A2	2	Common Nail	Shank		Modern Machine		1830+
35.48	Feature 2	A2	1	Common Nail	Shank		Modern Machine		1830+
35.49	Feature 2	A2	1	Common Nail	Shank		Modern Machine		1830+
35.50	Feature 2	A2	2	Finish	Shank		Modern Machine		1830+
35.51	Feature 2	A2	2	Finish	Shank		Modern Machine		1830+
35.52	Feature 2	A2	4	Metal			Unk		
35.53	Feature 2	A2	1	Spigs and Brads	Head		Early Machine		1790-1805
36.01	EU11	A2	3	Stoneware	Rim	Brown			
36.02	EU11	A2	1	Stoneware	Base	Light Green			
36.03	EU11	A2	2	Stoneware	Base	Brown			
36.04	EU11	A2	2	Stoneware	Body	Light Brown			
36.05	EU11	A2	6	Stoneware	Body	Green			
36.06	EU11	A2	1	Stoneware	Body	Tan			
36.07	EU11	A2	5	Stoneware	Body	Light Green			
36.08	EU11	A2	5	Stoneware	Body	Green			
36.09	EU11	A2	29	Stoneware	Body	Burnt			
36.10	EU11	A2	14	Stoneware	Body	Light Green			
36.11	EU11	A2	2	Stoneware	Body	olive			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
36.12	EU11	A2	1	Stoneware	Body	Light Brown			
36.13	EU11	A2	6	Stoneware	Body	Burnt			
36.14	EU11	A2	1	Stoneware	pipe	Burnt			
36.15	EU11	A2	1	Pearlware	Foot Ring	Brown	Banded	HandF55	
37.01	EU4	A2	1	Stoneware	Rim	Brown			
37.02	EU4	A2	1	Stoneware	Spout	Green			
37.03	EU4	A2	2	Stoneware	body	Brown			
37.04	EU4	A2	1	Stoneware	body	Light Brown			
37.05	EU4	A2	3	Stoneware	body	Dark Brown			
37.06	EU4	A2	3	Stoneware	body	Green			
37.07	EU4	A2	2	Stoneware	body	Dark Green			
37.08	EU4	A2	4	Stoneware	body	Burnt			
37.09	EU4	A2	23	Stoneware	body	Light Green			
37.10	EU4	A2		Stoneware	body	Bits			
37.11	EU4	A2	1	glass	body	lime			
37.12	EU4	A2	1	Common Nail	Complete		Modern Machine		1830+
37.13	EU4	A2	1	Common Nail	Shank		Modern Machine		1830+
37.14	EU4	A2	2	Common Nail	Complete		Modern Machine		1830+
38.01	EU12	A2	1	Stoneware	Rim	orange			
38.02	EU12	A2	1	Stoneware	Rim	Light Green			
38.03	EU12	A2	1	Stoneware	Rim	Burnt			
38.04	EU12	A2	1	Stoneware	Spout	Light Green			
38.05	EU12	A2	1	Stoneware	Handle	Light Green		strap	
38.06	EU12	A2	1	Stoneware	Handle	Light Green		strap	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
38.07	EU12	A2	2	Stoneware	Base	Burnt			
38.08	EU12	A2	1	Stoneware	Base	Brown			
38.09	EU12	A2	2	Stoneware	Base	Light Green			
38.10	EU12	A2	5	Stoneware	Base	Light Green	Glaze Running		
38.11	EU12	A2	1	Stoneware	Base	Green	Glaze Running		
38.12	EU12	A2	7	Stoneware	body	Light Green			
38.13	EU12	A2	30	Stoneware	body	Light Green			
38.14	EU12	A2	24	Stoneware	body	Green			
38.15	EU12	A2	7	Stoneware	body	Light Brown			
38.16	EU12	A2	2	Stoneware	body	Light Brown			
38.17	EU12	A2	9	Stoneware	body	orange			
38.18	EU12	A2	1	Stoneware	body	Light Green	Glaze Running		
38.19	EU12	A2	1	Stoneware	body	Light Green			
38.20	EU12	A2	1	Stoneware	body	Green			
38.21	EU12	A2	1	Stoneware	body	Burnt			
38.22	EU12	A2	1	Stoneware	body	Burnt			
38.23	EU12	A2		Stoneware	body	Bits			
38.24	EU12	A2	1	Finish	Complete		Early Machine		1805-1830
38.25	EU12	A2	1	Common Nail	Complete		Early Machine		1805-1830
38.26	EU12	A2	1	Common Nail	Shank		Modern Machine		1830+
39.01	EU12	A2	1	Stoneware	Rim	Green			
39.02	EU12	A2	1	Stoneware	Base	greeen			
39.03	EU12	A2	1	Stoneware	body	Light Brown			
39.04	EU12	A2	2	Stoneware	body	Brown			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
39.05	EU12	A2	5	Stoneware	body	Dark Brown			
39.06	EU12	A2	4	Stoneware	body	orange			
39.07	EU12	A2	13	Stoneware	body	Light Green			
39.08	EU12	A2	7	Stoneware	body	Green			
39.09	EU12	A2	1	Common Nail	Complete		Early Machine		1805-1830
40.01	Feature 3	A1	1	Stoneware	Rim	Brown			
40.02	Feature 3	A1	1	Stoneware	Rim	Brown			
40.03	Feature 3	A1	1	Stoneware	Rim	Brown			
40.04	Feature 3	A1	1	Stoneware	Rim	Brown			
40.05	Feature 3	A1	1	Stoneware	Rim	Brown			
40.06	Feature 3	A1	1	Stoneware	Rim	Dark Green			
40.07	Feature 3	A1	1	Stoneware	Rim	Dark Green			
40.08	Feature 3	A1	1	Stoneware	Rim	Dark Green			
40.09	Feature 3	A1	3	Stoneware	Rim	Dark Green			
40.10	Feature 3	A1	1	Stoneware	Rim	Green	Graze Runs		
40.100	Feature 3	A1	5	Common Nail	Head		Modern Machine		1830+
40.101	Feature 3	A1	3	Common Nail	Head		Modern Machine		1830+
40.102	Feature 3	A1	3	Common Nail	Head		Early Machine		1790-1820
40.103	Feature 3	A1	1	Spigs and Brads	Head		Machine		1810+
40.104	Feature 3	A1	1	Common Nail	Head		Modern Machine		1830+
40.105	Feature 3	A1	1	Common Nail	Head		Early Machine		1790-1820
40.106	Feature 3	A1	3	Finish	Head		Modern Machine		1830+
40.107	Feature 3	A1	3	Finish	Head		Modern Machine		1830+
40.108	Feature 3	A1	1	Spigs and Brads	Head		Machine		1810+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
40.109	Feature 3	A1	1	Common Nail	Head		Early Modern		1810-1830
40.11	Feature 3	A1	2	Stoneware	Rim	Green	Graze Runs		
40.110	Feature 3	A1	21	Common Nail	Shank		Modern Machine		1830+
40.111	Feature 3	A1	11	Common Nail	Shank		Modern Machine		1830+
40.112	Feature 3	A1	2	Common Nail	Shank		Modern Machine		1830+
40.113	Feature 3	A1	1	Common Nail	Shank		Modern Machine		1830+
40.114	Feature 3	A1	1	Common Nail	Shank		Modern Machine		1830+
40.115	Feature 3	A1	1	Common Nail	Shank		Modern Machine		1830+
40.116	Feature 3	A1	1	Common Nail	Shank		Modern Machine		1830+
40.117	Feature 3	A1	1	Common Nail	Complete		Early Machine		1790-1820
40.118	Feature 3	A1	1	Metal			UNK		
40.12	Feature 3	A1	11	Stoneware	Rim	Green	Graze Runs		
40.13	Feature 3	A1	3	Stoneware	Rim	Light Green			
40.14	Feature 3	A1	2	Stoneware	Rim	Light Green			
40.15	Feature 3	A1	1	Stoneware	Rim	Light Green			
40.16	Feature 3	A1	1	Stoneware	Rim	Light Green			
40.17	Feature 3	A1	1	Stoneware	Rim	Light Green			
40.18	Feature 3	A1	1	Stoneware	Rim	Orange			
40.19	Feature 3	A1	1	Stoneware	Handle	Burnt		Strap	
40.20	Feature 3	A1	1	Stoneware	Handle	Burnt		Strap	
40.21	Feature 3	A1	1	Stoneware	Handle	Burnt		Strap	
40.22	Feature 3	A1	1	Stoneware	Handle	Burnt		Strap	
40.23	Feature 3	A1	1	Stoneware	Handle	Burnt		Strap	
40.24	Feature 3	A1	1	Stoneware	Handle	Burnt		Strap	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
40.25	Feature 3	A1	1	Stoneware	Handle	Dark Green		Strap	
40.26	Feature 3	A1	1	Stoneware	Handle	Green		Strap	
40.27	Feature 3	A1	1	Stoneware	Handle	Green		Strap	
40.28	Feature 3	A1	1	Stoneware	Handle	Green		Strap	
40.29	Feature 3	A1	1	Stoneware	Handle	Green		Strap	
40.30	Feature 3	A1	1	Stoneware	Handle	Green		Strap	
40.31	Feature 3	A1	1	Stoneware	Handle	Green	Graze Runs	Strap	
40.32	Feature 3	A1	1	Stoneware	Handle	Light Green		Strap	
40.33	Feature 3	A1	1	Stoneware	Handle	Light Green		Strap	
40.34	Feature 3	A1	1	Stoneware	Handle	Light Green		Strap	
40.35	Feature 3	A1	1	Stoneware	Handle	Light Green		Strap	
40.36	Feature 3	A1	1	Stoneware	Handle	Dark Brown		Strap	
40.37	Feature 3	A1	1	Stoneware	Handle	Orange		Strap	
40.38	Feature 3	A1	2	Stoneware	Spout	Dark Brown			
40.39	Feature 3	A1	1	Stoneware	Spout	Dark Brown			
40.40	Feature 3	A1	1	Stoneware	Spout	Green			
40.41	Feature 3	A1	1	Stoneware	Spout	Green			
40.42	Feature 3	A1	1	Stoneware	Spout	Green			
40.43	Feature 3	A1	1	Stoneware	Spout	Green			
40.44	Feature 3	A1	2	Stoneware	Spout	Green			
40.45	Feature 3	A1	3	Stoneware	Spout	Green			
40.46	Feature 3	A1	1	Stoneware	Spout	Light Green			
40.47	Feature 3	A1	1	Stoneware	Base	Orange			
40.48	Feature 3	A1	1	Stoneware	Base	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
40.49	Feature 3	A1	10	Stoneware	Base	Burnt			
40.50	Feature 3	A1	1	Stoneware	Base	Burnt			
40.51	Feature 3	A1	9	Stoneware	Base	Burnt			
40.52	Feature 3	A1	4	Stoneware	Base	Light Green			
40.53	Feature 3	A1	2	Stoneware	Base	Light Green			
40.54	Feature 3	A1	1	Stoneware	Base	Green			
40.55	Feature 3	A1	1	Stoneware	Base	Dark Green			
40.56	Feature 3	A1	86	Stoneware	Body	Burnt			
40.57	Feature 3	A1	29	Stoneware	Body	Green			
40.58	Feature 3	A1	16	Stoneware	Body	Green			
40.59	Feature 3	A1	72	Stoneware	Body	Green			
40.60	Feature 3	A1	25	Stoneware	Body	Green	Graze Runs		
40.61	Feature 3	A1	38	Stoneware	Body	Dark Green	Graze Runs		
40.62	Feature 3	A1	4	Stoneware	Body	Light Brown			
40.63	Feature 3	A1	29	Stoneware	Body	Light Brown			
40.64	Feature 3	A1	7	Stoneware	Body	Brown			
40.65	Feature 3	A1	13	Stoneware	Body	Brown			
40.66	Feature 3	A1	83	Stoneware	Body	Brown	Graze Runs		
40.67	Feature 3	A1	25	Stoneware	Body	Dark Brown			
40.68	Feature 3	A1	23	Stoneware	Body	Dark Brown			
40.69	Feature 3	A1	40	Stoneware	Body	Orange			
40.70	Feature 3	A1		Stoneware	Body	Bits			
40.71	Feature 3	A1	1	Stoneware	Body	Green	dash		
40.72	Feature 3	A1	1	White Ware	Foot Ring	White (Burnt)			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
40.73	Feature 3	A1	14	White Ware	Body	White			
40.74	Feature 3	A1	2	White Ware	Base	White			
40.75	Feature 3	A1	1	White Ware	Rim	White			
40.76	Feature 3	A1	1	White Ware	Body	White			
40.77	Feature 3	A1	11	White Ware	Rim (Mends)	White			
40.78	Feature 3	A1	1	White Ware	Body	Light Blue	Floral	Transer Print	
40.79	Feature 3	A1	1	White Ware	Body	Red	Floral	Transfer Print	
40.80	Feature 3	A1	1	White Ware	Body	Dark Blue		Transfer Print	
40.81	Feature 3	A1	1	White Ware	Body	Light Blue	Molded (Ribbed)		
40.82	Feature 3	A1	1	White Ware	Rim	Blue	Foliate	Transfer Print	
40.83	Feature 3	A1	1	White Ware	Body	Light Brown / D	Angular Banded	Transfer Print	
40.84	Feature 3	A1	1	White Ware	Base	Brown / Light Bl	Edge Decorated (Ang	Transfer Print	
40.85	Feature 3	A1	1	White Ware	Body	Dark Blue	Feather Edged	Hand Painted	
40.86	Feature 3	A1	1	White Ware	Body	Dark Brown	Diamond Pattern	Transfer Print	
40.87	Feature 3	A1	1	White Ware	Rim	Blue		Transfer Print	
40.88	Feature 3	A1	1	White Ware	Body	Green		Transfer Print	
40.89	Feature 3	A1	1	Common Nail	Complete		Early Machine		1790-1820
40.90	Feature 3	A1	1	Common Nail	Complete		Modern Machine		1830+
40.91	Feature 3	A1	1	Common Nail	Complete		Early Machine		1790-1820
40.92	Feature 3	A1	1	Spigs and Brads	Complete		Modern Machine		1810+
40.93	Feature 3	A1	2	Common Nail	Complete		Early Machine		1810-1830
40.94	Feature 3	A1	3	Common Nail	Complete		Modern Machine		1830+
40.95	Feature 3	A1	3	Common Nail	Complete		Modern Machine		1830+
40.96	Feature 3	A1	7	Finish	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
40.97	Feature 3	A1	22	Common Nail	Complete		Modern Machine		1830+
40.98	Feature 3	A1	2	Common Nail	Head		Modern Machine		1830+
40.99	Feature 3	A1	4	Common Nail	Head		Modern Machine		1830+
41.01	EU11	A2	1	Stoneware	Spout	Light Green			
41.02	EU11	A2	2	Stoneware	Rim	Green			
41.03	EU11	A2	3	Stoneware	Rim	Dark Green			
41.04	EU11	A2	1	Stoneware	Handle	Dark Green			
41.05	EU11	A2	1	Stoneware	Base				
41.06	EU11	A2	1	Stoneware	Base	Green			
41.07	EU11	A2	1	Stoneware	Base	Green			
41.08	EU11	A2	24	Stoneware	Body	Dark Green			
41.09	EU11	A2	7	Stoneware	Body	Dark Green			
41.10	EU11	A2	11	Stoneware	Body	Burnt			
41.11	EU11	A2	2	Stoneware	Body	Dark Green			
41.12	EU11	A2	9	Stoneware	Body	Light Green			
41.13	EU11	A2	5	Stoneware	Body	Light Green			
41.14	EU11	A2	9	Stoneware	Body	Light Green			
41.15	EU11	A2	4	Stoneware	Body	Dark Green			
41.16	EU11	A2	2	Stoneware	Body	Light Green			
41.17	EU11	A2	2	Stoneware	Body	Dark Green			
41.18	EU11	A2	4	Stoneware	Body	Green			
41.19	EU11	A2	5	Stoneware	Body	Dark Brown			
41.20	EU11	A2	1	Stoneware	Body	Green			
41.21	EU11	A2	10	Stoneware	Body	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
41.22	EU11	A2	2	Stoneware	Body	Dark Green			
41.23	EU11	A2	3	Stoneware	Body	Brown			
41.24	EU11	A2	3	Stoneware	Body	Dark Green			
41.25	EU11	A2	9	Stoneware	Body	orange			
41.26	EU11	A2	4	Stoneware	Body	Light Green			
41.27	EU11	A2	1	Stoneware	Body	grey			
41.28	EU11	A2	1	Stoneware	Body	Light Brown			
41.29	EU11	A2		Stoneware	Body	Bits			
41.30	EU11	A2	1	Stoneware	Base	Green			
41.31	EU11	A2	1	Stoneware	Base	Dark Green			
41.32	EU11	A2	2	Stoneware	Base	Green			
41.33	EU11	A2	1	Lath Nail	Head		Early Machine		1790-1810
41.34	EU11	A2	1	Lath Nail	Complete		Early Machine		1790-1810
41.35	EU11	A2	2	Common Nail	Complete		Modern Machine		1830+
41.36	EU11	A2	2	Nail	Shank		UNK		
41.37	EU11	A2	2	Nail	Shank		UNK		
44.01	EU10	B1	1	Stoneware	lid	Brown			
44.02	EU10	B1	1	Stoneware	Rim	Light Green			
44.03	EU10	B1	1	Stoneware	Rim	Light Green			
44.04	EU10	B1	1	Stoneware	Rim	Light Green			
44.05	EU10	B1	1	Stoneware	Rim	Light Green			
44.06	EU10	B1	1	Stoneware	Rim	Green			
44.07	EU10	B1	1	Stoneware	Rim	Green			
44.08	EU10	B1	1	Stoneware	Rim	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
44.09	EU10	B1	1	Stoneware	Rim	Light Brown			
44.10	EU10	B1	1	Stoneware	Rim	Burnt			
44.11	EU10	B1	1	Stoneware	Rim	Burnt			
44.12	EU10	B1	1	Stoneware	Rim	Burnt			
44.13	EU10	B1	1	Stoneware	Rim	Burnt			
44.14	EU10	B1	1	Stoneware	Spout	Tan			
44.15	EU10	B1	1	Stoneware	Spout	Light Green			
44.16	EU10	B1	1	Stoneware	Spout	Light Green			
44.17	EU10	B1	1	Stoneware	Handle	Burnt		strap	
44.18	EU10	B1	1	Stoneware	Handle	Light Green		strap	
44.19	EU10	B1	1	Stoneware	Handle	Green		strap	
44.20	EU10	B1	1	Stoneware	Handle	Light Green		strap	
44.21	EU10	B1	1	Stoneware	Base	Burnt			
44.22	EU10	B1	1	Stoneware	Base	Burnt			
44.23	EU10	B1	1	Stoneware	Base	Burnt			
44.24	EU10	B1	1	Stoneware	Base	Burnt			
44.25	EU10	B1	1	Stoneware	Base	Burnt			
44.26	EU10	B1	1	Stoneware	Base	Burnt			
44.27	EU10	B1	1	Stoneware	Base	Burnt			
44.28	EU10	B1	1	Stoneware	Base	Burnt			
44.29	EU10	B1	1	Stoneware	Base	orange			
44.30	EU10	B1	1	Stoneware	Base	Light Brown			
44.31	EU10	B1	1	Stoneware	Base	Light Green			
44.32	EU10	B1	1	Stoneware	Base	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
44.33	EU10	B1	1	Stoneware	Base	Light Green	Glaze Running		
44.34	EU10	B1	11	Stoneware	Body	Brown			
44.35	EU10	B1	11	Stoneware	Body	Burnt			
44.36	EU10	B1	47	Stoneware	Body	Light Green	Glaze Running		
44.37	EU10	B1	61	Stoneware	Body	Green			
44.38	EU10	B1	54	Stoneware	Body	Dark Green			
44.39	EU10	B1	19	Stoneware	Body	orange			
44.40	EU10	B1	45	Stoneware	Body	Brown			
44.41	EU10	B1	64	Stoneware	Body	Burnt			
44.42	EU10	B1	12	Stoneware	Body	Dark Green	Glaze Running		
44.43	EU10	B1	19	Stoneware	Body	Light Green			
44.44	EU10	B1	2	Stoneware	Body	Brown			
44.45	EU10	B1	5	Stoneware	Body	Light Brown			
44.46	EU10	B1	7	Stoneware	Body	Light Green			
44.47	EU10	B1	4	Stoneware	Body	Green			
44.48	EU10	B1		Stoneware	Body	Bits			
44.49	EU10	B1	1	Stoneware	bone				
44.50	EU10	B1	1	Stoneware	Base	orange	stamped		
44.51	EU10	B1	1	Stoneware	strap Handle	Burnt			
44.52	EU10	B1	1	metal	button		flat		
44.53	EU10	B1		Pearlware	Foot Ring	White			
44.54	EU10	B1		White Ware	Knob	White	Molded		
44.55	EU10	B1		White Ware	Rim	Green	Banded	Hand Painted	
44.56	EU10	B1		White Ware	Rim	Green	Floral	Transfer Print	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
44.57	EU10	B1		White Ware	Body	Brown	Banded	Hand Painted	
44.58	EU10	B1		White Ware	Rim	Dark Blue	Feather Edged	Hand Painted	
44.59	EU10	B1		White Ware	Body	Dark Blue	Floral	Hand Painted	
44.60	EU10	B1		White Ware	Handle	Brown	Dots	Transfer Print	
44.61	EU10	B1		Yellow Ware	Rim	Yellow			
44.62	EU10	B1		White Ware	Body	White			
44.63	EU10	B1	4	White Ware	Body	White			
44.64	EU10	B1	1	Rosehead	Complete		Handwrought		
44.65	EU10	B1	1	Spigs and Brads	Complete		Early Machine		1790-1805
44.66	EU10	B1	1	Common Nail	Complete		Modern Machine		1830+
44.67	EU10	B1	2	Spigs and Brads	Complete		Handwrought		
44.68	EU10	B1	1	Common Nail	Complete		UNK		
44.69	EU10	B1	2	Common Nail	Complete		Modern Machine		1830+
44.70	EU10	B1	1	Common Nail	Complete		Modern Machine		1830+
44.71	EU10	B1	1	Flathead Nail	Complete		Handwrought		
44.72	EU10	B1	1	Common Nail	Complete		Modern Machine		1830+
44.73	EU10	B1	1	Common Nail	Complete		UNK		
44.74	EU10	B1	3	Common Nail	Shank		Modern Machine		1830+
44.75	EU10	B1	2	Common Nail	Complete		Modern Machine		1830+
44.76	EU10	B1	7	Common Nail	Shank		Modern Machine		1830+
44.77	EU10	B1	2	Common Nail	Head		Modern Machine		1830+
44.78	EU10	B1	3	Common Nail	Complete		Modern Machine		1830+
44.79	EU10	B1	1	Spigs and Brads	Complete		Early Machine		1790-1805
44.80	EU10	B1	2	Common Nail	Complete		UNK		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
44.81	EU10	B1	2	Common Nail	Shank		Modern Machine		1830+
44.82	EU10	B1	1	Nail			UNK		
44.83	EU10	B1	1	Common Nail	Shank		Early Machine		1815-1830
44.84	EU10	B1	5	Finished Nail	Complete		Modern Machine		1830+
44.85	EU10	B1	2	Common Nail	Complete		Modern Machine		1830+
44.86	EU10	B1	2	Common Nail	Complete		Modern Machine		1830+
44.87	EU10	B1	1	Common Nail	Complete		Early Machine		1790-1820
44.88	EU10	B1	3	Common Nail	Head		Modern Machine		1830+
44.89	EU10	B1	7	Common Nail	Shank		Modern Machine		1830+
44.90	EU10	B1	3	Common Nail	Shank		Modern Machine		1830+
44.91	EU10	B1	2	Finished Nail	Complete		Early Machine		1815-1830
44.92	EU10	B1	1	Spigs and Brads	Complete		Early Machine		1790-1805
46.01	EU15	A1		Bone					
46.02	EU15	A1	1	Stoneware	Rim	Green			
46.03	EU15	A1	1	Stoneware	Rim	Orange			
46.04	EU15	A1	1	Stoneware	Handle	Light Green	Strapped		
46.05	EU15	A1	1	Stoneware	Base	Dark Brown			
46.06	EU15	A1	1	Stoneware	Base	Dark Brown			
46.07	EU15	A1	1	Stoneware	Base	Light Brown			
46.08	EU15	A1	1	Stoneware	Base	Light Brown			
46.09	EU15	A1	1	Stoneware	Base	Light Green			
46.10	EU15	A1	1	Stoneware	Base	Light Green			
46.11	EU15	A1	1	Stoneware	Base	Light Green			
46.12	EU15	A1	1	Stoneware	Base	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
46.13	EU15	A1	1	Stoneware	Base	Green			
46.14	EU15	A1	1	Stoneware	Base	Dark Green			
46.15	EU15	A1	1	Stoneware	Base	Dark Green	Glaze Running		
46.16	EU15	A1	1	Stoneware	Base	Tan			
46.17	EU15	A1	2	Stoneware	Body	Orange			
46.18	EU15	A1	2	Stoneware	Body	Green			
46.19	EU15	A1	1	Stoneware	Body	Green			
46.20	EU15	A1	16	Stoneware	Body	Green			
46.21	EU15	A1	14	Stoneware	Body	Light Green			
46.22	EU15	A1	1	Stoneware	Body	Light Brown			
46.23	EU15	A1	3	Stoneware	Body	Brown			
46.24	EU15	A1	5	Stoneware	Body	Dark Brown			
46.25	EU15	A1	14	Stoneware	Body	Orange			
46.26	EU15	A1		Stoneware	Body	Bits			
46.27	EU15	A1	1	brick		red	incised		
46.28	EU15	A1	1	Glass	Base	Frosted			
46.29	EU15	A1	1	Glass	body	olive Green			
46.30	EU15	A1	1	Glass	body	Frosted			
46.31	EU15	A1	1	Glass	body	Clear			
46.32	EU15	A1	1	Glass	body	Clear			
46.33	EU15	A1	3	Glass	body	frosted			
46.34	EU15	A1	4	Glass	body	Clear			
46.35	EU15	A1	3	Glass	body	Clear			
46.36	EU15	A1	5	Glass	body	lime			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
46.37	EU15	A1	23	White Ware	Base (Mends)	White			
46.38	EU15	A1	1	White Ware	Body	Blue	Floral	Transfer Print	
46.39	EU15	A1	1	White Ware	Body	Green		Transfer Print	
46.40	EU15	A1	1	White Ware	Rim	White			
46.41	EU15	A1	1	White Ware	Base	Red	Floral	Transfer Print	
46.42	EU15	A1	1	White Ware	Spout	White			
46.43	EU15	A1	2	White Ware	Rim (Mends)	White			
46.44	EU15	A1	1	White Ware	Rim	White			
46.45	EU15	A1	2	White Ware	Rim (Mends)	Blue		Transfer Print	
46.46	EU15	A1	1	White Ware	Body	Blue	Floral	Transfer Print	
46.47	EU15	A1	1	White Ware	Body	White			
46.48	EU15	A1	1	White Ware	Rim	White			
46.49	EU15	A1	10	Common Nail			Modern Machine		1830+
46.50	EU15	A1	5	Common Nail	Complete		Modern Machine		1830+
46.51	EU15	A1	3	Common Nail	Complete		Early Machine		1815-1830
46.52	EU15	A1	6	Common Nail	Complete		Modern Machine		1830+
46.53	EU15	A1	2	Common Nail	Complete		Modern Machine		1830+
46.54	EU15	A1	2	Common Nail	Complete		Modern Machine		1830+
46.55	EU15	A1	1	Common Nail	Complete		Modern Machine		1830+
46.56	EU15	A1	2	Common Nail	Complete		Modern Machine		1830+
46.57	EU15	A1	3	Spigs and Brads	Complete		Machine		1810+
46.58	EU15	A1	1	Common Nail	Complete		Early Machine		1815-1830
46.59	EU15	A1	16	Finished Nail	Complete		Modern Machine		1830+
46.60	EU15	A1	2	Common Nail	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
46.61	EU15	A1	23	Common Nail	Head		Modern Machine		1830+
46.62	EU15	A1	1	Common Nail	Head		Modern Machine		1830+
46.63	EU15	A1	7	Common Nail	Head		Early Machine		1815-1830
46.64	EU15	A1	2	Common Nail	Head		Early Machine		1815-1830
46.65	EU15	A1	1	Common Nail	Head		Modern Machine		1830+
46.66	EU15	A1	2	Common Nail	Head		Modern Machine		1830+
46.67	EU15	A1	2	Spigs and Brads	Head		Machine		1810+
46.68	EU15	A1	1	Finished Nail	Head		Early Machine		1810-1830
46.69	EU15	A1	3	Finished Nail	Head		Modern Machine		1830+
46.70	EU15	A1	19	Common Nail	Shank		Modern Machine		1830+
46.71	EU15	A1	10	Common Nail	Shank		Modern Machine		1830+
46.72	EU15	A1	8	Common Nail	Shank		Modern Machine		1830+
46.73	EU15	A1	3	Common Nail	Shank		Modern Machine		1830+
46.74	EU15	A1	2	Common Nail	Shank		Modern Machine		1830+
46.75	EU15	A1	3	Common Nail	Shank		Modern Machine		1830+
46.76	EU15	A1	1	Common Nail	Shank		Modern Machine		1830+
46.77	EU15	A1	1	Common Nail	Shank		Modern Machine		1830+
46.78	EU15	A1	4	Finished Nail	Shank		Modern Machine		1830+
46.79	EU15	A1	7	Finished Nail	Head		Modern Machine		1830+
46.80	EU15	A1	1	Spigs and Brads	Head		Machine		1810+
46.81	EU15	A1	7	Finished Nail	Shank		Modern Machine		1830+
46.82	EU15	A1	1	Spike Nail	Complete		Modern Machine		1830+
46.83	EU15	A1	1	Metal	Bolt				
46.84	EU15	A1	1	Metal	Hook				

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
46.85	EU15	A1	3	Metal	Hook				
46.86	EU15	A1	1	Metal	Wire				
46.87	EU15	A1	1	Metal	Unk				
46.88	EU15	A1	1	Metal	Can				
47.01	EU15	A1	1	Metal	Unk				
47.02	EU15	A1	1	Metal			Buckle		
47.03	EU14	A1	1	Stoneware	Handle	Brown			
47.04	EU14	A1	1	Stoneware	Handle	Brown			
47.05	EU14	A1	2	Stoneware	Handle	Brown	Glaze Runs		
47.06	EU14	A1	1	Stoneware	Rim	Green			
47.07	EU14	A1	1	Stoneware	Rim	Brown			
47.08	EU14	A1	1	Stoneware	Rim	Burnt			
47.09	EU14	A1	1	Stoneware	Rim	Green			
47.10	EU14	A1	1	Stoneware	Rim	Brown			
47.11	EU14	A1	3	Stoneware	Spout	Light Green			
47.12	EU14	A1	1	Stoneware	Spout	Burnt			
47.13	EU14	A1	1	Stoneware	Rim	Green			
47.14	EU14	A1	1	Stoneware	Base	Orange			
47.15	EU14	A1	1	Stoneware	Base	Dark Green			
47.16	EU14	A1	1	Stoneware	Base	Light Green			
47.17	EU14	A1	1	Stoneware	Base	Dark Green	Glaze Runs		
47.18	EU14	A1	23	Stoneware	Body	Light Brown			
47.19	EU14	A1	40	Stoneware	Body	Burnt			
47.20	EU14	A1	22	Stoneware	Body	Green	Glaze Runs		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
47.21	EU14	A1	32	Stoneware	Body	Dark Green			
47.22	EU14	A1	20	Stoneware	Body	Orange			
47.23	EU14	A1	5	Stoneware	Body	Brown			
47.24	EU14	A1	15	Stoneware	Body	Light Brown			
47.25	EU14	A1	32	Stoneware	Body	Light Green			
47.26	EU14	A1	7	Stoneware	Body	Green			
47.27	EU14	A1	5	Stoneware	Body	Green			
47.28	EU14	A1	14	Stoneware	Body	Light Green			
47.30	EU14	A1	4	Stoneware	Body	Dark Green	Glaze Runs		
47.31	EU14	A1		Stoneware	Body	Bits			
47.32	EU14	A1		Stoneware	Body				
47.33	EU14	A1		Stoneware	Body				
47.34	EU14	A1		Stoneware	Body				
47.35	EU14	A1		Stoneware	Body				
47.36	EU14	A1		Stoneware	Body				
47.37	EU14	A1		Stoneware	Body				
47.38	EU14	A1		Stoneware	Body				
47.39	EU14	A1		Stoneware	Body				
47.40	EU14	A1		Stoneware	Body				
47.41	EU14	A1		Stoneware	Body				
47.42	EU14	A1		Stoneware	Body				
47.43	EU14	A1		Stoneware	Body				
47.44	EU14	A1		Stoneware	Body				
47.45	EU14	A1		Stoneware	Body				

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
47.46	EU14	A1		Stoneware	Body				
47.47	EU14	A1		Stoneware	Body				
47.48	EU14	A1		Stoneware	Body				
47.49	EU14	A1		Stoneware	Body				
47.50	EU14	A1		Stoneware	Body				
47.51	EU14	A1	2	Stoneware	Body	Light Brown	incised		
47.52	EU14	A1	1	Glass	Body	Frosted			
47.53	EU14	A1	1	Glass	Body	Frosted			
47.54	EU14	A1	1	Glass	Body	Lime			
47.55	EU14	A1	2	Glass	Body	Clear			
47.56	EU14	A1	6	White Ware	Body	White			
47.57	EU14	A1	2	White Ware	Foot Ring	White			
47.58	EU14	A1	1	Pearlware	Foot Ring	White			
47.59	EU14	A1	1	White Ware	Rim	Green	Hatches		
47.60	EU14	A1	1	White Ware	Rim	Blue	Curves	Transfer Print	
47.61	EU14	A1	1	White Ware	Body	Blue	Curves	Transfer Print	
47.62	EU14	A1	1	White Ware	Rim	Blue	Feather Edged	Hand Painted	
47.63	EU14	A1	1	White Ware	Body	Blue	Floral	Transfer Print	
47.64	EU14	A1	1	White Ware	Body	Blue			
47.65	EU14	A1	1	White Ware	Body	Dark Blue	Lines	Transfer Print	
47.66	EU14	A1	2	White Ware	Body	Burnt			
47.67	EU14	A1	1	White Ware	Rim	Mulberry	Banded	Hand Painted	
47.68	EU14	A1	1	White Ware	Rim	Brown	Banded	Hand Painted	
47.69	EU14	A1	1	White Ware	Rim	Brown	Banded	Hand Painted	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
47.70	EU14	A1	6	Common Nail	Head		Modern Machine		1830+
47.71	EU14	A1	8	Common Nail	Head		Early Machine		1815-1830
47.72	EU14	A1	10	Common Nail	Complete		Modern Machine		1830+
47.73	EU14	A1	8	Common Nail	Shank		Modern Machine		1830+
47.74	EU14	A1	4	Common Nail	Head		Modern Machine		1830+
47.75	EU14	A1	1	Common Nail	Shank		Modern Machine		1830+
47.76	EU14	A1	3	Common Nail	Complete		Modern Machine		1830+
47.77	EU14	A1	5	Common Nail	Complete		Modern Machine		1830+
47.78	EU14	A1	1	Common Nail	Shank		UNK		
47.79	EU14	A1	2	Common Nail	Complete		Modern Machine		1830+
47.80	EU14	A1	2	Common Nail	Shank		Modern Machine		1830+
47.81	EU14	A1	5	Common Nail	Shank		Modern Machine		1830+
47.82	EU14	A1	1	Common Nail	Complete		Early Machine		1815-1830
48.01	EU14	A1	2	Finished Nail	Complete		Early Machine		1815-1830
48.01	EU14	A1	1	T Head	Complete		Hand Wrought		
48.02	EU10	B2		Stoneware	Bits	Burnt			
48.03	EU15	A2	1	Stoneware	Base	Light Green			
48.04	EU15	A2	1	Stoneware	Base	Light Green			
48.05	EU15	A2	1	Stoneware	Base	Light Green			
48.06	EU15	A2	1	Stoneware	Base	Light Green			
48.07	EU15	A2	1	Stoneware	Base	Dark Green			
48.08	EU15	A2	1	Stoneware	Base	Light Brown			
48.09	EU15	A2	1	Stoneware	Base	Brown			
48.10	EU15	A2	1	Stoneware	Base	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
48.11	EU15	A2	1	Stoneware	Body	Tan			
48.12	EU15	A2	1	Stoneware	Body	Light Brown			
48.13	EU15	A2	11	Stoneware	Body	Green			
48.14	EU15	A2	13	Stoneware	Body	Dark Brown			
48.15	EU15	A2	1	Finished Nail	Complete		Modern Machine		1830+
49.01	EU15	A2	1	Common Nail	Complete		Modern Machine		1830+
49.02	EU15	A2	1	Spike Nail	Complete		Modern Machine		1830+
49.03	EU15	A2	8	White Ware	Rim (Mends)	White			
49.04	EU15	A2	1	Spike Nail	Shank		Modern Machine		1830+
49.05	EU15	A2	1	Common Nail	Head		Modern Machine		1830+
49.06	EU15	A2	2	Common Nail	Head		Modern Machine		1830+
49.07	EU15	A2	3	Common Nail	Head		Modern Machine		1830+
49.08	EU15	A2	3	Common Nail	Shank		Modern Machine		1830+
49.09	EU15	A2	3	Common Nail	Shank		Modern Machine		1830+
49.10	EU15	A2	2	Common Nail	Shank		Modern Machine		1830+
49.11	EU15	A2	1	Common Nail	Shank		Modern Machine		1830+
50.01	EU15	A2	1	White Ware	Base	White	Makers Mark		
50.02	EU15	A2	2	White Ware	Body	Dark Blue		Transfer Print	
50.03	EU14	A2		Stoneware					
50.04	EU14	A2	1	Stoneware	Rim	Green			
50.05	EU14	A2	1	Stoneware	Rim	Light Brown			
50.06	EU14	A2	1	Stoneware	Handle	Light Green			
50.07	EU14	A2	1	Stoneware	Handle	Burnt			
50.08	EU14	A2	1	Stoneware	Handle	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
50.09	EU14	A2	1	Stoneware	Base	no color			
50.10	EU14	A2	1	Stoneware	Base	Dark Green			
50.11	EU14	A2	1	Stoneware	Base	Green			
50.12	EU14	A2	1	Stoneware	Base	Light Brown			
50.13	EU14	A2	1	Stoneware	Base	Green			
50.14	EU14	A2	2	Stoneware	Body	Light Green			
50.15	EU14	A2	18	Stoneware	Body	Green			
50.16	EU14	A2	5	Stoneware	Body	Brown			
50.17	EU14	A2	11	Stoneware	Body	Light Green			
50.18	EU14	A2	2	Stoneware	Body	Light Green			
50.19	EU14	A2	2	Stoneware	Body	Tan			
50.20	EU14	A2	2	Stoneware	Body	Dark Green			
50.21	EU14	A2	1	Stoneware	Body	Dark Green	Glaze Running		
50.22	EU14	A2	33	Stoneware	Body	Light Green			
50.23	EU14	A2	1	Stoneware	Body	Tan			
50.24	EU14	A2	41	Stoneware	Body	Burnt			
50.25	EU14	A2		Stoneware	Body	Bits			
50.26	EU14	A2	4	Glass	Body	Lime			
50.27	EU14	A2	1	Glass	Body	Lime			
50.28	EU14	A2	5	Glass	Body	Solarized			
50.29	EU14	A2	4	White Ware	Body	White			
50.30	EU14	A2	1	White Ware	Body	Green	Floral	Hand Painted	
50.31	EU14	A2	1	White Ware	Body	Blue	Floral	Hand Painted	
50.32	EU14	A2	1	White Ware	Body	Gray	Floral	Hand Painted	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
50.33	EU14	A2	1	White Ware	Body	Purple	Floral	Transfer Print	
50.34	EU14	A2	1	White Ware	Body	Red	Curves	Transfer Print	
50.35	EU14	A2	1	White Ware	Rim	Brown	Banded	Hand Painted	
50.36	EU14	A2	12	Common Nail	Complete		Modern Machine		1830+
50.37	EU14	A2	7	Common Nail	Head		Early Machine		1815-1830
50.38	EU14	A2	2	Common Nail	Complete		Modern Machine		1830+
50.39	EU14	A2	12	Common Nail	Shank		Modern Machine		1830+
50.40	EU14	A2	10	Finished Nail	Complete		UNK		
50.41	EU14	A2	7	Common Nail	Head		Early Machine		1815-1830
50.42	EU14	A2	7	Common Nail	Shank		Modern Machine		1830+
50.43	EU14	A2	7	Common Nail	Head		Early Machine		1815-1830
50.44	EU14	A2	5	Finished Nail	Complete		Modern Machine		1830+
50.45	EU14	A2	10	Common Nail	Complete		Early Machine		1815-1830
51.01	EU14	A2	5	Common Nail	Complete		UNK		
51.01	EU14	A2	1	Metal			UNK		
51.02	EU9	B2	2	Stoneware	Spout	Burnt			
51.02	EU9	B2	31	Stoneware	Body	Light Green			
51.03	EU9	B2	1	Stoneware	Rim	Green			
51.03	EU9	B2	5	Stoneware	Body	Dark Green	Glaze Running		
51.04	EU9	B2	1	Stoneware	Rim	Green			
51.04	EU9	B2	24	Stoneware	Body	Light Green			
51.05	EU9	B2	1	Stoneware	Handle	Green			
51.05	EU9	B2	7	Stoneware	Body	orange			
51.06	EU9	B2	1	Stoneware	Handle	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
51.07	EU9	B2	15	Stoneware	Body	Green			
51.08	EU9	B2	21	Stoneware	Body	Burnt			
51.09	EU9	B2	20	Stoneware	Body	Dark Green	Glaze Running		
51.10	EU9	B2	4	Stoneware	Body	Green	Glaze Running		
51.11	EU9	B2	10	Stoneware	Body	Brown			
51.12	EU9	B2	3	Stoneware	Body	Light Brown			
51.13	EU9	B2	6	Stoneware	Body	Burnt			
51.14	EU9	B2	1	Stoneware	Body	Light Brown			
51.15	EU9	B2		Stoneware	Body	Bits			
51.16	EU9	B2	1	Stoneware	pipe	Tan		bird	
51.17	EU9	B2	1	Glass	body	olive Green			
51.18	EU9	B2	2	Glass	body	Clear			
51.19	EU9	B2	1	White Ware	Base	White			
51.20	EU9	B2	2	White Ware	Body	White			
51.21	EU9	B2	1	Common Nail	Complete		Early Machine		1790-1820
51.22	EU9	B2	2	Spigs and Brads	Complete		Machine		1805-1820
51.23	EU9	B2	1	Spike Nail	Complete		Modern Machine		1830+
51.24	EU9	B2	4	Common Nail	Complete		Modern Machine		1830+
51.25	EU9	B2	3	Common Nail	Complete		Modern Machine		1830+
51.26	EU9	B2	2	Common Nail	Complete		Early Machine		1815-1830
51.27	EU9	B2	5	Common Nail	Complete		Early Modern		1815-1830
51.28	EU9	B2	2	Common Nail	Complete		Early Modern		1830+
51.29	EU9	B2	1	Common Nail	Complete		Early Modern		1815-1830
51.30	EU9	B2	2	Common Nail	Complete		Early Machine		1815-1830

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
51.31	EU9	B2	8	Common Nail	Head		Modern Machine		1830+
51.32	EU9	B2	3	Common Nail	Head		Modern Machine		1830+
51.33	EU9	B2	8	Common Nail	Shank		Modern Machine		1830+
51.34	EU9	B2	3	Common Nail	Shank		Modern Machine		1830+
51.35	EU9	B2	5	Common Nail	Shank		Modern Machine		1830+
51.36	EU9	B2	1	Common Nail	Shank		Modern Machine		1830+
51.37	EU9	B2	1	Common Nail	Shank		Modern Machine		1830+
51.38	EU9	B2	3	Finished Nail	Shank		Modern Machine		1830+
52.01	EU9	B2	1	White Ware	Base	Dark Blue			
52.02	EU9	B2	1	Finished Nail	Complete		Early Machine		1805-1830
52.03	EU14	B1		Charcoal		Burnt			
52.04	EU14	B1	1	Stoneware	Spout	Burnt			
52.05	EU14	B1	1	Stoneware	Spout	Burnt			
52.06	EU14	B1	1	Stoneware	Spout	Burnt			
52.07	EU14	B1	1	Stoneware	Spout	Burnt			
52.08	EU14	B1	2	Stoneware	Spout	Burnt			
52.09	EU14	B1	1	Stoneware	Handle	Burnt			
52.10	EU14	B1	1	Stoneware	Handle	Burnt			
52.100	EU14	B1	10	Common Nail	Complete		Modern Machine		1830+
52.101	EU14	B1	20	Common Nail	Shank		Modern Machine		1830+
52.102	EU14	B1	12	Common Nail	Head		UNK		
52.103	EU14	B1	20	Common Nail	Shank		Modern Machine		1830+
52.104	EU14	B1	20	Common Nail	Shank		Modern Machine		1830+
52.105	EU14	B1	5	Finished Nail	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
52.106	EU14	B1	5	Common Nail	Shank		Early Machine		1815-1830
52.107	EU14	B1	5	Common Nail	Complete		Modern Machine		1830+
52.108	EU14	B1	3	Common Nail	Complete		Modern Machine		1830+
52.109	EU14	B1	5	Common Nail	Complete		Modern Machine		1830+
52.11	EU14	B1	1	Stoneware	Handle	Burnt			
52.110	EU14	B1	5	Common Nail	Complete		Modern Machine		1830+
52.111	EU14	B1	3	Common Nail	Shank		Modern Machine		1830+
52.112	EU14	B1	4	Common Nail	Shank		Modern Machine		1830+
52.113	EU14	B1	1	T Nail	Head		Hand Wrought		
52.114	EU14	B1	1	Common Nail	Complete		Modern Machine		1830+
52.115	EU14	B1	3	Common Nail	Head		Early/Modern Machine		1815-1830
52.116	EU14	B1	1	Finished Nail	Complete		Early Machine		1815-1830
52.117	EU14	B1	2	Spike Nail	Shank		Modern Machine		1830+
52.118	EU14	B1	2	Common Nail	Head		Modern Machine		1830+
52.119	EU14	B1	4	Finished Nail	Head		Modern Machine		1830+
52.120	EU14	B1	12	Common Nail	Complete		Modern Machine		1830+
52.12	EU14	B1	1	Stoneware	Handle	Burnt			
52.121	EU14	B1	2	Sprigs and Brads	Head		Machine Cut		1810+
52.13	EU14	B1	1	Stoneware	Handle	Burnt			
52.14	EU14	B1	1	Stoneware	Handle	Burnt			
52.15	EU14	B1	1	Stoneware	Handle	Burnt			
52.16	EU14	B1	1	Stoneware	Handle	Burnt			
52.17	EU14	B1	1	Stoneware	Handle	Burnt			
52.18	EU14	B1	1	Stoneware	Handle	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
52.19	EU14	B1	1	Stoneware	Handle	Burnt			
52.20	EU14	B1	1	Stoneware	Handle	Burnt			
52.21	EU14	B1	1	Stoneware	Handle	Burnt			
52.22	EU14	B1	1	Stoneware	Handle	Burnt			
52.23	EU14	B1	1	Stoneware	Handle	Burnt			
52.24	EU14	B1	1	Stoneware	Handle	Burnt			
52.25	EU14	B1	1	Stoneware	Handle	Burnt			
52.26	EU14	B1	1	Stoneware	Handle	Burnt			
52.27	EU14	B1	1	Stoneware	Handle	Burnt			
52.28	EU14	B1	1	Stoneware	Handle	Burnt			
52.29	EU14	B1	1	Stoneware	Rim	Burnt			
52.30	EU14	B1	1	Stoneware	Rim	Burnt			
52.31	EU14	B1	1	Stoneware	Rim	Burnt			
52.32	EU14	B1	1	Stoneware	Rim	Burnt			
52.33	EU14	B1	1	Stoneware	Rim	Burnt			
52.34	EU14	B1	1	Stoneware	Rim	Burnt			
52.35	EU14	B1	1	Stoneware	Rim	Burnt			
52.36	EU14	B1	1	Stoneware	Rim	Burnt			
52.37	EU14	B1	1	Stoneware	Rim	Burnt			
52.38	EU14	B1	1	Stoneware	Rim	Burnt			
52.39	EU14	B1	1	Stoneware	Rim	Burnt			
52.40	EU14	B1	1	Stoneware	Rim	Burnt			
52.41	EU14	B1	1	Stoneware	Handle	Burnt			
52.42	EU14	B1	1	Stoneware	Collar	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
52.43	EU14	B1	6	Stoneware	Body	Dark Brown	Glaze Runs		
52.44	EU14	B1	4	Stoneware	Body	Burnt			
52.45	EU14	B1	4	Stoneware	Body	Burnt			
52.46	EU14	B1	6	Stoneware	Body	Burnt			
52.47	EU14	B1	1	Stoneware	Body	Burnt			
52.48	EU14	B1	15	Stoneware	Body	Burnt			
52.49	EU14	B1	12	Stoneware	Body	Burnt			
52.50	EU14	B1	5	Stoneware	Body	Burnt			
52.51	EU14	B1	8	Stoneware	Body	Burnt			
52.52	EU14	B1	3	Stoneware	Body	Burnt			
52.53	EU14	B1	5	Stoneware	Body	Green			
52.54	EU14	B1	5	Stoneware	Body	Burnt			
52.55	EU14	B1	2	Stoneware	Body	Burnt			
52.56	EU14	B1	14	Stoneware	Body	Green	Glaze Running		
52.57	EU14	B1	6	Stoneware	Body	Burnt			
52.58	EU14	B1	6	Stoneware	Body	Burnt			
52.59	EU14	B1	102	Stoneware	Body	Burnt			
52.60	EU14	B1	30	Stoneware	Body	Burnt			
52.61	EU14	B1	26	Stoneware	Body	Burnt			
52.62	EU14	B1	22	Stoneware	Body	Burnt			
52.63	EU14	B1	25	Stoneware	Body	Burnt			
52.64	EU14	B1	40	Stoneware	Body	Burnt			
52.65	EU14	B1	23	Stoneware	Body	Burnt			
52.66	EU14	B1	40	Stoneware	Body	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
52.67	EU14	B1	44	Stoneware	Body	Burnt			
52.68	EU14	B1	100	Stoneware	Body	Burnt			
52.69	EU14	B1	100	Stoneware	Body	Burnt			
52.70	EU14	B1	40	Stoneware	Body	Burnt			
52.71	EU14	B1	45	Stoneware	Body	Burnt			
52.72	EU14	B1	200	Stoneware	Body	Burnt			
52.73	EU14	B1	4	Stoneware	Base	Burnt			
52.74	EU14	B1	2	Stoneware	Base	Burnt			
52.75	EU14	B1	1	Stoneware	Base	Burnt			
52.76	EU14	B1	2	Stoneware	Base	Burnt			
52.77	EU14	B1	1	Stoneware	Base	Burnt			
52.78	EU14	B1	1	Stoneware	Base	Burnt			
52.79	EU14	B1	1	Stoneware	Base	Burnt			
52.80	EU14	B1	1	Stoneware	Base	Burnt			
52.81	EU14	B1	1	Stoneware	Base	Burnt			
52.82	EU14	B1	1	Stoneware	Base	Burnt			
52.83	EU14	B1	1	Stoneware	Base	Burnt			
52.84	EU14	B1	1	Stoneware	Base	Burnt			
52.85	EU14	B1	1	Stoneware	Base	Burnt			
52.86	EU14	B1	1	Stoneware	Base	Burnt			
52.87	EU14	B1	1	Stoneware	Base	Burnt			
52.88	EU14	B1	6	Stoneware	Base	Burnt			
52.89	EU14	B1	11	Stoneware	Base	Dark Green	Glaze Running		
52.90	EU14	B1	1	Stoneware	Handle	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
52.91	EU14	B1		Stoneware	Body	Burnt			
52.92	EU14	B1	1	Glass	Body	Brown			
52.93	EU14	B1	1	White Ware	Rim	Blue	Feather Edged	Hand Painted	
52.94	EU14	B1	1	White Ware	Rim	Black	Dot	Transfer Print	
52.95	EU14	B1	1	Metal			Bracket		
52.96	EU14	B1	7	Spike Nail	Complete		Modern Machine		1830+
52.97	EU14	B1	7	Spike Nail	Complete		Modern Machine		1830+
52.98	EU14	B1	3	Sprigs and Brads	Complete		Early Machine		1790-1805
52.99	EU14	B1	3	Common Nail	Shank		UNK		
53.01	EU14	B1	2	Common Nail	Head		Modern Machine		1830+
53.02	EU14	B1	1	Metal	Boot Heel		UNK		
53.03	Feature 3	A1	1	Stoneware	Rim	Green			
53.04	Feature 3	A1	1	Stoneware	Base	Burnt			
53.05	Feature 3	A1	1	Stoneware	Base	Dark Green	Graze Runs		
53.06	Feature 3	A1	1	Stoneware	Base				
53.07	Feature 3	A1	1	Stoneware	Spout	Dark Green	Graze Runs		
53.08	Feature 3	A1	1	Stoneware	Spout	Green			
53.09	Feature 3	A1	1	Stoneware	Handle	Light Green		Strap	
53.10	Feature 3	A1	14	Stoneware	Body	Light Green	Graze Runs		
53.11	Feature 3	A1	13	Stoneware	Body	Green			
53.12	Feature 3	A1	16	Stoneware	Body	Dark Green			
53.13	Feature 3	A1	5	Stoneware	Body	Light Brown			
53.14	Feature 3	A1	2	Stoneware	Body	Burnt			
53.15	Feature 3	A1		Stoneware	Body	Bits			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
53.16	Feature 3	A1	1	White Ware	Body	White			
53.17	Feature 3	A1	1	Common Nail	Complete		Early Modern		1805-1830
53.18	Feature 3	A1	2	Finished Nail	Heads		Modern Machine		1830+
53.19	Feature 3	A1	1	Common Nail	Head		Modern Machine		1830+
54.01	Feature 3	A1	2	Common Nail	Head		Modern Machine		1830+
54.02	Feature 3	A1	1	Common Nail	Shank		Modern Machine		1830+
54.03	EU13	B1	1	Stoneware	Rim	Orange			
54.04	EU13	B1	1	Stoneware	Rim	Green			
54.05	EU13	B1	1	Stoneware	Rim	Green			
54.06	EU13	B1	1	Stoneware	Rim	Green			
54.07	EU13	B1	1	Stoneware	Rim	Green			
54.08	EU13	B1	1	Stoneware	Rim	Green			
54.09	EU13	B1	1	Stoneware	Spout	Green			
54.10	EU13	B1	1	Stoneware	Base	Green			
54.11	EU13	B1	1	Stoneware	Handle	Burnt			
54.12	EU13	B1	1	Stoneware	Handle	Green			
54.13	EU13	B1	12	Stoneware	Body	Dark Green	Graze Runs		
54.14	EU13	B1	22	Stoneware	Body	Green			
54.15	EU13	B1	12	Stoneware	Body	Green			
54.16	EU13	B1	1	Stoneware	Body	Light Green			
54.17	EU13	B1	3	Stoneware	Body	Light Green	Graze Runs		
54.18	EU13	B1	14	Stoneware	Body	Orange			
54.19	EU13	B1	3	Stoneware	Body	Dark Brown			
54.20	EU13	B1	11	Stoneware	Body	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
54.21	EU13	B1	1	Stoneware	Body	Burnt			
54.22	EU13	B1		Stoneware	Body	Bits			
54.23	EU13	B1	3	Common Nail	Complete		Modern Machine		1830+
54.24	EU13	B1	9	Common Nail	Complete		Modern Machine		1830+
54.25	EU13	B1	1	Sprigs and Brads	Head		Early Machine		1790-1805
54.26	EU13	B1	1	Common Nail	Head		Modern Machine		1830+
54.27	EU13	B1	5	Common Nail	Shank		Modern Machine		1830+
54.28	EU13	B1	1	Metal	Strap				
56.01	EU13	B1	1	Stoneware	Body	Light Brown	incised		
56.02	EU13	B1	1	White Ware	Body	White			
56.03	Feature 3	A2	3	Stoneware	Body	Burnt			
56.04	Feature 3	A2	3	Stoneware	Body	Dark Green	Graze Runs		
56.05	Feature 3	A2	2	Stoneware	Body	Dark Green			
56.06	Feature 3	A2	2	Stoneware	Body	Green			
56.07	Feature 3	A2	1	Stoneware	Body	Orange			
56.08	Feature 3	A2	1	Sprigs and Brads	Complete		Early Modern		1805-20
57.01	Feature 3	A2	1	Common Nail	Complete		Early Machine		1815-1830
57.02	Feature 3	A2	1	Common Nail	Complete		Modern Machine		1830+
57.03	EU17	A1		Charcoal					
57.04	EU17	A1	1	Stoneware	Rim	Light Green			
57.05	EU17	A1	1	Stoneware	Rim	Light Green			
57.06	EU17	A1	1	Stoneware	Rim	Green			
57.07	EU17	A1	1	Stoneware	Rim	Green			
57.08	EU17	A1	1	Stoneware	Rim	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
57.09	EU17	A1	1	Stoneware	Rim	Dark Green			
57.10	EU17	A1	1	Stoneware	Rim	Dark Green			
57.11	EU17	A1	1	Stoneware	Spout	Tan			
57.12	EU17	A1	1	Stoneware	Spout	Orange			
57.13	EU17	A1	1	Stoneware	Spout	Light Green			
57.14	EU17	A1	1	Stoneware	Spout	Light Green			
57.15	EU17	A1	1	Stoneware	Spout	Light Green			
57.16	EU17	A1	1	Stoneware	Handle	Light Green		Lug	
57.17	EU17	A1	1	Stoneware	Handle	Burnt		Lug	
57.18	EU17	A1	1	Stoneware	Handle	Dark Green		Lug	
57.19	EU17	A1	1	Stoneware	Handle	Green		Strap	
57.20	EU17	A1	1	Stoneware	Handle	Orange		Strap	
57.21	EU17	A1	1	Stoneware	Handle	Orange		Strap	
57.22	EU17	A1	1	Stoneware	Handle	Orange		Strap	
57.23	EU17	A1	1	Stoneware	Base	Orange			
57.24	EU17	A1	1	Stoneware	Base	Orange			
57.25	EU17	A1	1	Stoneware	Base	Light Green			
57.26	EU17	A1	1	Stoneware	Base	Light Green			
57.27	EU17	A1	1	Stoneware	Base	Light Green			
57.28	EU17	A1	1	Stoneware	Base	Light Green			
57.29	EU17	A1	1	Stoneware	Base	Light Green			
57.30	EU17	A1	1	Stoneware	Base	Light Green			
57.31	EU17	A1	1	Stoneware	Base	Light Green			
57.32	EU17	A1	1	Stoneware	Base	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
57.33	EU17	A1	1	Stoneware	Base	Light Green			
57.34	EU17	A1	1	Stoneware	Base	Green			
57.35	EU17	A1	1	Stoneware	Base	Green			
57.36	EU17	A1	1	Stoneware	Base	Brown			
57.37	EU17	A1	1	Stoneware	Base	Brown			
57.38	EU17	A1	1	Stoneware	Base	Brown			
57.39	EU17	A1	1	Stoneware	Base				
57.40	EU17	A1	38	Stoneware	Body	Orange			
57.41	EU17	A1	4	Stoneware	Body	Light Green			
57.42	EU17	A1	77	Stoneware	Body	Light Green	Glaze Running		
57.43	EU17	A1	87	Stoneware	Body	Green			
57.44	EU17	A1	20	Stoneware	Body	Green			
57.45	EU17	A1	33	Stoneware	Body	Light Brown			
57.46	EU17	A1	2	Stoneware	Body	Dark Green			
57.47	EU17	A1	53	Stoneware	Body	Brown			
57.48	EU17	A1	55	Stoneware	Body	Burnt			
57.49	EU17	A1		Stoneware	Body	Bits			
57.50	EU17	A1	2	Stoneware	Rim	Green	slash		
57.51	EU17	A1	1	Stoneware	Base	Light Green	marked		
57.52	EU17	A1	1	Stoneware	Body	Light Green	marked		
57.53	EU17	A1	1	Stoneware	Pipe	Orange			
57.54	EU17	A1	3	Metal	Nuts				
57.55	EU17	A1	1	Metal	Button			4 hole	
57.56	EU17	A1	3	Glass	Body	Lime			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
57.57	EU17	A1	1	Glass	Body	Lime			
57.58	EU17	A1	1	Glass	Body	Green			
57.59	EU17	A1	4	Glass	Body	Clear			
57.60	EU17	A1	1	Porcelain	Body	White			
57.61	EU17	A1	1	White Ware	Body	White			
57.62	EU17	A1	1	White Ware	Rim	Mulberry	Floral	Transfer Print	
57.63	EU17	A1	1	White Ware	Rim	Dark Blue		Hand Painted	
57.64	EU17	A1	2	White Ware	Body	Green	Curves	Hand Painted	
57.65	EU17	A1	1	Metal Mule Shoe	50%				
57.66	EU17	A1	4	Common Nail	Shank		Modern Machine		1830+
57.67	EU17	A1	11	Common Nail	Complete		Early/Modern Machine		1815-1830
57.68	EU17	A1	3	Metal			UNK		
57.69	EU17	A1	1	Metal	Strap				
58.01	EU17	A1	1	Bolt	Complete				
58.02	EU17	A1	1	Sprigs and Brads	Complete		Early/Modern Machine		1790-1805
58.03	EU18	A1	1	Stoneware	Rim	Orange			
58.04	EU18	A1	5	Stoneware	Rim	Green			
58.05	EU18	A1	1	Stoneware	Rim	Dark Green			
58.06	EU18	A1	1	Stoneware	Rim	Dark Green			
58.07	EU18	A1	1	Stoneware	Rim	Dark Green			
58.08	EU18	A1	1	Stoneware	Rim	Dark Green			
58.09	EU18	A1	1	Stoneware	Rim	Light Green			
58.10	EU18	A1	1	Stoneware	Rim	Light Green			
58.11	EU18	A1	1	Stoneware	Rim	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
58.12	EU18	A1	1	Stoneware	Rim	Light Green			
58.13	EU18	A1	1	Stoneware	Rim	Light Green			
58.14	EU18	A1	1	Stoneware	Rim	Dark Brown			
58.15	EU18	A1	1	Stoneware	Rim	Dark Brown			
58.16	EU18	A1	1	Stoneware	Lid	Light Green			
58.17	EU18	A1	1	Stoneware	Spout	Light Green			
58.18	EU18	A1	1	Stoneware	Spout	Light Green			
58.19	EU18	A1	1	Stoneware	Spout	Light Green			
58.20	EU18	A1	1	Stoneware	Spout	Dark Brown			
58.21	EU18	A1	2	Stoneware	Handle	Light Green	Strapped		
58.22	EU18	A1	2	Stoneware	Handle	Light Green	Strapped		
58.23	EU18	A1	1	Stoneware	Handle	Light Green	Strapped		
58.24	EU18	A1	1	Stoneware	Handle	Light Green	Strapped		
58.25	EU18	A1	1	Stoneware	Handle	Light Green	Strapped		
58.26	EU18	A1	1	Stoneware	Handle	Tan	Strapped		
58.27	EU18	A1	1	Stoneware	Handle	Brown	Strapped		
58.28	EU18	A1	1	Stoneware	Handle	Dark Brown	Strapped		
58.29	EU18	A1	1	Stoneware	Base	Light Green			
58.30	EU18	A1	1	Stoneware	Base	Light Green			
58.31	EU18	A1	1	Stoneware	Base	Light Green			
58.32	EU18	A1	1	Stoneware	Base	Light Green			
58.33	EU18	A1	1	Stoneware	Base	Light Green			
58.34	EU18	A1	1	Stoneware	Base	Light Green			
58.35	EU18	A1	1	Stoneware	Base				

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
58.36	EU18	A1	1	Stoneware	Base				
58.37	EU18	A1	1	Stoneware	Base				
58.38	EU18	A1	29	Stoneware	Body	Orange			
58.39	EU18	A1	29	Stoneware	Body	Light Green			
58.40	EU18	A1	157	Stoneware	Body	Light Green	Glaze Running		
58.41	EU18	A1	70	Stoneware	Body	Green			
58.42	EU18	A1	30	Stoneware	Body	Dark Green			
58.43	EU18	A1	1	Stoneware	Body	Burnt			
58.44	EU18	A1		Stoneware	Body	Bits			
58.45	EU18	A1	1	Stoneware	Pipe	Burnt			
59.01	EU18	A1	5	White Ware	Body	White			
59.02	EU18	A1	1	White Ware	Body	Brown	Mocha	Hand Painted	1815-1850
59.03	Feature 2	B1	1	Stoneware	Handle	Orange			
59.04	Feature 2	B1	1	Stoneware	Rim	Orange			
59.05	Feature 2	B1	4	Stoneware	Body	Light Green	Glaze Running		
59.06	Feature 2	B1	16	Stoneware	Body	Burnt			
59.07	Feature 2	B1	1	Stoneware	Body	Dark Green			
59.08	Feature 2	B1	13	Stoneware	Body	Green			
59.09	Feature 2	B1	2	Common Nail	Complete		Modern Machine		1830+
59.10	Feature 2	B1	1	Common Nail	Complete		Modern Machine		1830+
59.11	Feature 2	B1	1	Common Nail	Head		Modern Machine		1830+
59.12	Feature 2	B1	1	Common Nail	Head		Modern Machine		1830+
59.13	Feature 2	B1	1	Common Nail	Head		Modern Machine		1830+
59.14	Feature 2	B1	2	Common Nail	Head		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
59.15	Feature 2	B1	1	Common Nail	Shank		Modern Machine		1830+
60.01	Feature 2	B1		Stoneware		Bits			
60.02	Feature 2	B1	1	Stoneware	Pipe	Burnt			
60.03	Feature 2	B2	1	Stoneware	Base	Green			
60.04	Feature 2	B2	1	Stoneware	Handle	Green			
60.05	Feature 2	B2	1	Stoneware	Body	Green			
60.06	Feature 2	B2	2	Stoneware	Body	Tan			
60.07	Feature 2	B2	12	Stoneware	Body	Brown			
60.08	Feature 2	B2	1	Stoneware	Body	Olive			
60.09	Feature 2	B2	3	Stoneware	Body	Light Green			
60.10	Feature 2	B2	1	Common Nail	Shank		Modern Machine		1830+
61.01	Feature 2	B2	18	Stoneware	Body	Light Green	Glaze Running		
61.02	Feature 2	B2	12	Stoneware	Body	Burnt			
61.03	Feature 3	A2	1	Stoneware	Rim	Light Green	Graze Runs		
61.04	Feature 3	A2	1	Stoneware	Rim	Green			
61.05	Feature 3	A2	1	Stoneware	Rim	Burnt			
61.06	Feature 3	A2	1	Stoneware	Spout	Green		Pitcher	
61.07	Feature 3	A2	1	Stoneware	Spout	Light Green			
61.08	Feature 3	A2	1	Stoneware	Spout	Burnt			
61.09	Feature 3	A2	1	Stoneware	Handle	Dark Green			
61.10	Feature 3	A2	1	Stoneware	Handle	Green			
61.11	Feature 3	A2	1	Stoneware	Handle	Green			
61.12	Feature 3	A2	2	Stoneware	Handle	Light Green	Graze Runs		
61.13	Feature 3	A2	1	Stoneware	Handle	Dark Green	Graze Runs		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
61.14	Feature 3	A2	1	Stoneware	Handle	Tan			
61.15	Feature 3	A2	1	Stoneware	Base	Green			
61.16	Feature 3	A2	1	Stoneware	Base	Green			
61.17	Feature 3	A2	1	Stoneware	Body	Dark Brown			
61.18	Feature 3	A2	2	Stoneware	Body	Brown			
61.19	Feature 3	A2	2	Stoneware	Body	Light Brown			
61.20	Feature 3	A2	3	Stoneware	Body	Dark Green			
61.21	Feature 3	A2	6	Stoneware	Body	Dark Green			
61.22	Feature 3	A2	22	Stoneware	Body	Green			
61.23	Feature 3	A2	3	Stoneware	Body	Green			
61.24	Feature 3	A2	3	Stoneware	Body	Light Green			
61.25	Feature 3	A2	3	Stoneware	Body	Light Green			
61.26	Feature 3	A2	1	Stoneware	Body	Orange			
61.27	Feature 3	A2	11	Stoneware	Body	Burnt			
61.28	Feature 3	A2		Stoneware	Body	Bits			
61.29	Feature 3	A2	4	Stoneware	Rim	Green		20 cm	
61.30	Feature 3	A2	1	Common Nail	Complete		Modern Machine		1830+
61.31	Feature 3	A2	1	Common Nail	Complete		Modern Machine		1830+
61.32	Feature 3	A2	2	Common Nail	Complete		Modern Machine		1830+
61.33	Feature 3	A2	2	Common Nail	Complete		Modern Machine		1830+
62.01	Feature 3	A2	1	Common Nail	Head		Modern Machine		1830+
62.02	Feature 3	A2	1	Common Nail	Shank		Modern Machine		1830+
62.03	EU18	A2	1	Stoneware	Handle	Light Green	Strapped		
62.04	EU18	A2	1	Stoneware	Handle	Green	Strapped		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
62.05	EU18	A2	1	Stoneware	Spout	Green			
62.06	EU18	A2	11	Stoneware	Body	Light Green			
62.07	EU18	A2	3	Stoneware	Body	Green			
62.08	EU18	A2	6	Stoneware	Body	Green	Glaze Running		
63.01	EU18	A2	5	Stoneware	Body	Brown			
63.02	EU18	A2		Stoneware	Body	Bits			
63.03	EU17	A2	1	Stoneware	Rim	Green			
63.04	EU17	A2	1	Stoneware	Rim	Dark Green			
63.05	EU17	A2	1	Stoneware	Spout	Green			
63.06	EU17	A2	20	Stoneware	Body	Light Green	Glaze Running		
63.07	EU17	A2	19	Stoneware	Body	Green			
63.08	EU17	A2	2	Stoneware	Body	Dark Green			
63.09	EU17	A2	1	Stoneware	Body	Dark Green	Glaze Running		
63.10	EU17	A2	12	Stoneware	Body	Burnt			
63.11	EU17	A2	8	Stoneware	Body	Burnt			
63.12	EU17	A2	5	Stoneware	Body	Orange			
63.13	EU17	A2	3	Stoneware	Body	Burnt			
63.14	EU17	A2	7	Stoneware	Body	Brown			
63.15	EU17	A2		Stoneware	Body	Bits			
63.16	EU17	A2	1	Stoneware	pipe	Orange			
63.17	EU17	A2	1	Stoneware	pipe	Dark Brown			
63.18	EU17	A2	1	metal	button			4 hole	
63.19	EU17	A2	1	Metal	Block				
64.01	EU17	A2	3	Common Nail	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
65.01	EU17	A2	1	Finished Nail	Complete		Modern Machine		1830+
65.02	Feature 2	B3	13	Stoneware	Body	Burnt			
65.03	EU17	A3	1	Stoneware	Rim	Green			
65.04	EU17	A3	1	Stoneware	Rim	Green			
65.05	EU17	A3	1	Stoneware	Rim	Green			
65.06	EU17	A3	1	Stoneware	Rim	Burnt			
65.07	EU17	A3	1	Stoneware	Spout	Burnt			
65.08	EU17	A3	1	Stoneware	Handle	Burnt		Strap	
65.09	EU17	A3	1	Stoneware	Base	Burnt			
65.10	EU17	A3	1	Stoneware	Base	Burnt			
65.11	EU17	A3	2	Stoneware	Body	Green			
65.12	EU17	A3	39	Stoneware	Body	Light Green			
65.13	EU17	A3	7	Stoneware	Body	Light Brown			
65.14	EU17	A3	4	Stoneware	Body	Dark Green	Glaze Running		
65.15	EU17	A3	49	Stoneware	Body	Burnt			
65.16	EU17	A3	3	Stoneware	Body	Brown			
65.17	EU17	A3	1	Stoneware	pipe	Tan			
65.18	EU17	A3	1	Stoneware	pipe	Orange			
65.19	EU17	A3	5	Glass	Body	Clear			
65.20	EU17	A3	1	Glass	Base	Lime			
65.21	EU17	A3	1	White Ware	Body	Blue		Hand Painted	
65.22	EU17	A3	1	Metal			UNK		
67.01	EU17	A3	1	metal			UNK		
67.02	EU17	A3	3	Nail	Shank		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
67.03	Feature 3	A3	1	Stoneware	Spout	Burnt		W/ Handle	
67.04	Feature 3	A3	1	Stoneware	Spout	Green		Strap	
67.05	Feature 3	A3	1	Stoneware	Handle	Green		Strap	
67.06	Feature 3	A3	1	Stoneware	Handle	Green		Strap	
67.07	Feature 3	A3	1	Stoneware	Handle	Green			
67.08	Feature 3	A3	1	Stoneware	Base	White			
67.09	Feature 3	A3	10	Stoneware	Base	Light Brown			
67.10	Feature 3	A3	1	Stoneware	Base	Light Green	Graze Runs		
67.11	Feature 3	A3	4	Stoneware	Base	Burnt			
67.12	Feature 3	A3	1	Stoneware	Base	Orange			
67.13	Feature 3	A3	32	Stoneware	Body	Green			
67.14	Feature 3	A3	16	Stoneware	Body	Green			
67.15	Feature 3	A3	2	Stoneware	Body	Light Green			
67.16	Feature 3	A3	4	Stoneware	Body	Dark Green	Graze Runs		
67.17	Feature 3	A3	1	Stoneware	Lid	Light Green		button	
67.18	Feature 3	A3	1	Stoneware	Base	Light Brown		2.5 cm	
67.19	Feature 3	A3	1	Clay					
67.20	Feature 3	A3	1	Common Nail	Complete		Modern Machine		1830+
67.21	Feature 3	A3	5	Common Nail	Complete		Modern Machine		1830+
68.01	Feature 3	A3	2	Finished Nail	Complete		Modern Machine		1830+
68.02	Feature 3	A3	1	Common Nail	Complete		Modern Machine		1830+
68.03	Feature 3	A3	1	Common Nail	Complete		Modern Machine		1830+
68.04	Feature 3	A3	1	Common Nail	Complete		Modern Machine		1830+
69.01	Feature 3	A3	1	Common Nail	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
69.02	Feature 2	B2C	10	Stoneware	Body	Burnt			
69.03	Feature 3	B1	1	Stoneware	Rim	Green			
69.04	Feature 3	B1	1	Stoneware	Handle	Green		Strap	
69.05	Feature 3	B1	1	Stoneware	Spout	Green			
69.06	Feature 3	B1	1	Stoneware	Base	Light Green			
69.07	Feature 3	B1	2	Stoneware	Body	Light Green			
69.08	Feature 3	B1	17	Stoneware	Body	Light Green			
69.09	Feature 3	B1	3	Stoneware	Body	Green			
69.10	Feature 3	B1	13	Stoneware	Body	Dark Green			
69.11	Feature 3	B1	5	Stoneware	Body	Tan			
69.12	Feature 3	B1	2	White Ware	Rim	Plum	Floral	Transfer Print	
69.13	Feature 3	B1	1	White Ware	Body	Red		Transfer Print	
69.14	Feature 3	B1	3	Sprigs and Brads	Complete		Modern Machine		1810+
69.15	Feature 3	B1	1	Common Nail	Complete		Modern Machine		1830+
69.16	Feature 3	B1	1	Common Nail	Complete		Modern Machine		1830+
70.01	Feature 3	B1	1	Common Nail	Shank		Modern Machine		1830+
70.02	Feature 3	B1	2	Finished Nail	Shank		Modern Machine		1830+
70.03	Feature 2	B3C	1	Bone					
70.04	Feature 2	B3C	1	Stoneware	Spout	Burnt			
70.05	Feature 2	B3C	1	Stoneware	Base	Light Brown			
70.06	Feature 2	B3C	1	Stoneware	Base	Green			
70.07	Feature 2	B3C	2	Stoneware	Body	Green			
70.08	Feature 2	B3C	2	Stoneware	Body	Light Green			
71.01	Feature 2	B3C	8	Stoneware	Body	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
71.02	Feature 2	B3C	1	Stoneware	pipe	Orange			
71.03	Feature 2	B4	1	Stoneware	Handle	Burnt			
71.04	Feature 2	B4	1	Stoneware	Rim	Green			
71.05	Feature 2	B4	1	Stoneware	Rim	Burnt			
71.06	Feature 2	B4	2	Stoneware	Body	Green			
72.01	Feature 2	B4	10	Stoneware	Body	Light Green			
72.02	Feature 2	B4	18	Stoneware	Body	Burnt			
72.03	EU19	A2	1	Stoneware	Rim	Tan			
72.03	Feature 2	B4	1	Common Nail	Complete		Early Modern		1790-1810
72.04	EU19	A2	1	Stoneware	Rim	Light Green			
72.05	EU19	A2	1	Stoneware	Rim	Light Green			
72.06	EU19	A2	1	Stoneware	Rim	Light Green			
72.07	EU19	A2	1	Stoneware	Rim	Light Green			
72.08	EU19	A2	1	Stoneware	Rim	Green			
72.09	EU19	A2	1	Stoneware	Rim	Green			
72.10	EU19	A2	1	Stoneware	Rim	Green			
72.11	EU19	A2	1	Stoneware	Rim	Green			
72.12	EU19	A2	1	Stoneware	Rim	Dark Green	Glaze Running		
72.13	EU19	A2	1	Stoneware	Rim	Dark Green	Glaze Running		
72.14	EU19	A2	1	Stoneware	Rim	Burnt			
72.15	EU19	A2	1	Stoneware	Spout	Light Green			
72.16	EU19	A2	1	Stoneware	Base	Light Green			
72.17	EU19	A2	1	Stoneware	Base	Light Green			
72.18	EU19	A2	1	Stoneware	Base	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
72.19	EU19	A2	1	Stoneware	Base	Green			
72.20	EU19	A2	1	Stoneware	Base	Light Green			
72.21	EU19	A2	1	Stoneware	Handle	Light Green		Strap	
72.22	EU19	A2	2	Stoneware	Handle	Light Green		Strap	
72.23	EU19	A2	1	Stoneware	Handle	Light Green		Strap	
72.24	EU19	A2	1	Stoneware	Handle	Light Green		Strap	
72.25	EU19	A2	1	Stoneware	Handle	Light Green		Strap	
72.26	EU19	A2	1	Stoneware	Handle	Light Green		Strap	
72.27	EU19	A2	1	Stoneware	Handle	Light Green		Strap	
72.28	EU19	A2	1	Stoneware	Handle	Green		Strap	
72.29	EU19	A2	1	Stoneware	Handle	Green		Strap	
72.30	EU19	A2	1	Stoneware	Handle	Green		Strap	
72.31	EU19	A2	1	Stoneware	Handle	Orange		Strap	
72.32	EU19	A2	1	Stoneware	Handle	Brown		Strap	
72.33	EU19	A2	2	Stoneware	Handle	Burnt		Strap	
72.34	EU19	A2	1	Stoneware	Handle	Burnt		Strap	
72.35	EU19	A2	1	Stoneware	Handle	Burnt		Strap	
72.36	EU19	A2	114	Stoneware	Body	Burnt			
72.37	EU19	A2	28	Stoneware	Body	Green			
72.38	EU19	A2	17	Stoneware	Body	Light Green			
72.39	EU19	A2	19	Stoneware	Body	Light Brown			
72.40	EU19	A2	10	Stoneware	Body	Light Green			
72.41	EU19	A2	16	Stoneware	Body	Green			
72.42	EU19	A2	10	Stoneware	Body	Dark Green	Glaze Running		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
72.43	EU19	A2		Stoneware	Body	Bits			
72.44	EU19	A2		Stoneware	EXP				
72.45	EU19	A2	2	Stoneware	pipe	Orange			
72.46	EU19	A2	1	Stoneware	pipe	Orange			
72.47	EU19	A2	1	Stoneware	pipe	Orange			
72.48	EU19	A2	1	metal	ball			rifle	
72.49	EU19	A2	1	Glass	Base	Blue Green			
72.50	EU19	A2	2	Glass	Body	Lime			
72.51	EU19	A2	11	Glass	Body	Clear			
72.52	EU19	A2	10	Glass	Body	Clear			
72.53	EU19	A2	1	Glass	Body	Lime			
72.54	EU19	A2	1	White Ware	Body	Blue	Molded	Hand Painted	
72.55	EU19	A2	1	White Ware	Rim	Blue	Floral	Transfer Print	
72.56	EU19	A2	1	White Ware	Body	Blue	Floral	Transfer Print	
72.57	EU19	A2	1	White Ware	Body	Blue	Dots	Transfer Print	
72.58	EU19	A2	1	White Ware	Body	Blue	Floral	Transfer Print	
72.59	EU19	A2	1	White Ware	Body	Mulberry	Curves	Hand Painted	
72.60	EU19	A2	1	White Ware	Rim	Mulberry	Angles	Transfer Print	
72.61	EU19	A2	2	White Ware	Body	Brown	Curves	Hand Painted	
72.62	EU19	A2	6	Common Nail	Complete		UNK		
72.63	EU19	A2	1	Spike Nail	Complete		Modern Machine		1830+
72.64	EU19	A2	5	Common Nail	Shank		Modern Machine		1830+
72.65	EU19	A2	8	Common Nail	Shank		Modern Machine		1830+
72.66	EU19	A2	3	Common Nail	Head		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
72.43	EU19	A2		Stoneware	Body	Bits			
72.44	EU19	A2		Stoneware	EXP				
72.45	EU19	A2	2	Stoneware	pipe	Orange			
72.46	EU19	A2	1	Stoneware	pipe	Orange			
72.47	EU19	A2	1	Stoneware	pipe	Orange			
72.48	EU19	A2	1	metal	ball			rifle	
72.49	EU19	A2	1	Glass	Base	Blue Green			
72.50	EU19	A2	2	Glass	Body	Lime			
72.51	EU19	A2	11	Glass	Body	Clear			
72.52	EU19	A2	10	Glass	Body	Clear			
72.53	EU19	A2	1	Glass	Body	Lime			
72.54	EU19	A2	1	White Ware	Body	Blue	Molded	Hand Painted	
72.55	EU19	A2	1	White Ware	Rim	Blue	Floral	Transfer Print	
72.56	EU19	A2	1	White Ware	Body	Blue	Floral	Transfer Print	
72.57	EU19	A2	1	White Ware	Body	Blue	Dots	Transfer Print	
72.58	EU19	A2	1	White Ware	Body	Blue	Floral	Transfer Print	
72.59	EU19	A2	1	White Ware	Body	Mulberry	Curves	Hand Painted	
72.60	EU19	A2	1	White Ware	Rim	Mulberry	Angles	Transfer Print	
72.61	EU19	A2	2	White Ware	Body	Brown	Curves	Hand Painted	
72.62	EU19	A2	6	Common Nail	Complete		UNK		
72.63	EU19	A2	1	Spike Nail	Complete		Modern Machine		1830+
72.64	EU19	A2	5	Common Nail	Shank		Modern Machine		1830+
72.65	EU19	A2	8	Common Nail	Shank		Modern Machine		1830+
72.66	EU19	A2	3	Common Nail	Head		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
72.67	EU19	A2	6	Finished Nail	Complete		Early/Modern Machine		1815-1830
72.68	EU19	A2	12	Common Nail	Complete		Modern Machine		1830+
72.69	EU19	A2	6	Common Nail	Complete		Modern Machine		1830+
72.70	EU19	A2	1	Spike Nail	Shank		Modern Machine		1830+
73.01	EU19	A2	1	Screw	Shank		Molded		
73.02	EU19	A2	3	Metal			UNK		
73.03	Feature 3	B2	1	Stoneware	Rim	Light Green			
73.04	Feature 3	B2	1	Stoneware	Rim	Light Green			
73.05	Feature 3	B2	1	Stoneware	Handle	Tan		Strap	
73.06	Feature 3	B2	1	Stoneware	Base	Light Brown			
73.07	Feature 3	B2	1	Stoneware	Spout	Dark Green			
73.08	Feature 3	B2	30	Stoneware	Body	Green			
73.09	Feature 3	B2	6	Stoneware	Body	Green			
73.10	Feature 3	B2	8	Stoneware	Body	Light Green			
73.11	Feature 3	B2	1	Stoneware	Body	Tan			
73.12	Feature 3	B2	1	Stoneware	Body	Orange			
73.13	Feature 3	B2	6	Stoneware	Body	Burnt			
73.14	Feature 3	B2	2	Common Nail	Complete		Modern Machine		1830+
74.01	Feature 3	B2	2	Common Nail	Shank		Modern Machine		1830+
74.02	Feature 3	B2	1	Finished Nail	Complete		Modern Machine		1830+
74.03	Feature 3	Clean Up	1	Stoneware	Rim	Light Brown			
74.04	Feature 3	Clean Up	1	Stoneware	Rim	Light Green			
74.05	Feature 3	Clean Up	1	Stoneware	Rim	Light Green			
74.06	Feature 3	Clean Up	1	Stoneware	Handle	Dark Green		Strap	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
74.07	Feature 3	Clean Up	1	Stoneware	Handle	Green		Strap	
74.08	Feature 3	Clean Up	1	Stoneware	Handle	Light Green		Strap	
74.09	Feature 3	Clean Up	1	Stoneware	Handle	Light Green		Strap	
74.10	Feature 3	Clean Up	1	Stoneware	Handle	Orange		Lug	
74.11	Feature 3	Clean Up	1	Stoneware	Handle	Dark Green		Lug	
74.12	Feature 3	Clean Up	2	Stoneware	Handle	Dark Green		Lug	
74.13	Feature 3	Clean Up	1	Stoneware	Spout	Green			
74.14	Feature 3	Clean Up	1	Stoneware	Spout	Green			
74.15	Feature 3	Clean Up	1	Stoneware	Spout	Green			
74.16	Feature 3	Clean Up	1	Stoneware	Spout	Green			
74.17	Feature 3	Clean Up	1	Stoneware	Base	Dark Green			
74.18	Feature 3	Clean Up	2	Stoneware	Base	Green			
74.19	Feature 3	Clean Up	2	Stoneware	Base	Light Brown			
74.20	Feature 3	Clean Up	1	Stoneware	Base	Burnt			
74.21	Feature 3	Clean Up	1	Stoneware	Base				
74.22	Feature 3	Clean Up	10	Stoneware	Body	Dark Brown			
74.23	Feature 3	Clean Up	4	Stoneware	Body	Brown			
74.24	Feature 3	Clean Up	6	Stoneware	Body	Orange			
74.25	Feature 3	Clean Up	45	Stoneware	Body	Dark Green	Graze Runs		
74.26	Feature 3	Clean Up	2	Stoneware	Body	Dark Green			
74.27	Feature 3	Clean Up	3	Stoneware	Body	Green			
74.28	Feature 3	Clean Up	16	Stoneware	Body	Light Green			
74.29	Feature 3	Clean Up	4	Stoneware	Body	Light Green			
74.30	Feature 3	Clean Up	2	Stoneware	Body	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
74.31	Feature 3	Clean Up	18	Stoneware	Body	Burnt			
74.32	Feature 3	Clean Up	2	Stoneware	Body	Burnt			
74.33	Feature 3	Clean Up	1	Stoneware	body	Light Green	slash		
75.01	Feature 3	Clean Up	1	Metal			UNK		
75.02	Feature 3	Clean Up	1	Metal			UNK		
75.03	Feature 4	A1	4	Stoneware	Bowls	Dark Green	Glaze Running		
75.04	Feature 4	A1	1	Stoneware	Bowls	Dark Green	Glaze Running	Mending	
75.05	Feature 4	A1	1	Stoneware	Bowls	Dark Green	Glaze Running		
75.06	Feature 4	A1	1	Stoneware	Bowls	Dark Green	Glaze Running	Mended	
75.07	Feature 4	A1	3	Stoneware	Bowls	Dark Green	Glaze Running		
75.08	Feature 4	A1	3	Stoneware	Bowls	Dark Green	Glaze Running		
75.09	Feature 4	A1	7	Stoneware	Bowls	Dark Green	Glaze Running		
75.10	Feature 4	A1	2	Stoneware	Bowls	Dark Green	Glaze Running		
75.100	Feature 4	A1		Stoneware					
75.11	Feature 4	A1	1	Stoneware	Bowls	Green		Mended	
75.12	Feature 4	A1		Stoneware	Base	Dark Green	Glaze Running		
75.13	Feature 4	A1	1	Stoneware	Rim	Dark Green	Glaze Running	Mended	
75.14	Feature 4	A1	1	Stoneware	Rim	Dark Green	Glaze Running	Mended	
75.15	Feature 4	A1	250	Stoneware	Body	Dark Green	Glaze Running		
75.16	Feature 4	A1	38	Stoneware	Body	Dark Green	Glaze Running		
75.17	Feature 4	A1	77	Stoneware	Body	Dark Green	Glaze Running		
75.18	Feature 4	A1	28	Stoneware	Body	Dark Green	Glaze Running		
75.19	Feature 4	A1	26	Stoneware	Body	Green	Glaze Running		
75.20	Feature 4	A1	21	Stoneware	Body	Green	Glaze Running		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
75.21	Feature 4	A1	17	Stoneware	Body	Light Green	Glaze Running		
75.22	Feature 4	A1	50	Stoneware	Body	Dark Green	Glaze Running		
75.23	Feature 4	A1	1	Stoneware	Bowls	Green	Glaze Running		
75.24	Feature 4	A1	1	Stoneware	Bowls	Dark Green	Glaze Running		
75.25	Feature 4	A1	1	Stoneware	Bowls	Dark Green	Glaze Running		
75.26	Feature 4	A1	1	Stoneware	Bowls	Dark Green	Glaze Running		
75.27	Feature 4	A1	1	Stoneware	Bowls	Dark Green	Glaze Running		
75.28	Feature 4	A1	1	Stoneware	Bowls	Dark Green	Glaze Running		
75.29	Feature 4	A1	52	Stoneware	Base	Dark Green	Glaze Running		
75.30	Feature 4	A1	15	Stoneware	Body	Dark Green	Glaze Running		
75.31	Feature 4	A1	1	Stoneware	Body	Dark Green	Glaze Running		
75.32	Feature 4	A1	3	Stoneware	Rim	Dark Green	Glaze Running		
75.33	Feature 4	A1	6	Stoneware	Rim	Dark Green	Glaze Running		
75.34	Feature 4	A1	2	Stoneware	Rim	Dark Green	Glaze Running		
75.35	Feature 4	A1	6	Stoneware	Handle	Dark Green	Glaze Running	Lugs	
75.36	Feature 4	A1	1	Stoneware	Handle	Dark Green	Glaze Running	Strap Handle	
75.37	Feature 4	A1	1	Stoneware	Handle	Dark Green	Glaze Running	Strap Handle	
75.38	Feature 4	A1	33	Stoneware	Rim	Dark Green	Glaze Running	Double	
75.39	Feature 4	A1	3	Stoneware	Base	Dark Green	Glaze Running		
75.40	Feature 4	A1	1	Stoneware	Base	Dark Green	Glaze Running		
75.41	Feature 4	A1	9	Stoneware	Base	Dark Green	Glaze Running		
75.42	Feature 4	A1	1	Stoneware	Base	Dark Green	Glaze Running		
75.43	Feature 4	A1	1	Stoneware	Base	Dark Green	Glaze Running		
75.44	Feature 4	A1	1	Stoneware	Base	Dark Green	Glaze Running		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
75.45	Feature 4	A1	1	Stoneware	Base	Dark Green	Glaze Running		
75.46	Feature 4	A1	3	Stoneware	Base	Dark Green	Glaze Running		
75.47	Feature 4	A1	2	Stoneware	Base	Dark Green	Glaze Running		
75.48	Feature 4	A1	1	Stoneware	Base	Dark Green	Glaze Running		
75.49	Feature 4	A1	1	Stoneware	Base	Dark Green	Glaze Running		
75.50	Feature 4	A1	1	Stoneware	Body	Dark Green	Glaze Running		
75.51	Feature 4	A1	13	Stoneware	Rim	Dark Green	Glaze Running		
75.52	Feature 4	A1	3	Stoneware	Rim	Dark Green	Glaze Running		
75.53	Feature 4	A1	1	Stoneware	Rim	Dark Green	Glaze Running		
75.54	Feature 4	A1	1	Stoneware	Rim	Dark Green	Glaze Running		
75.55	Feature 4	A1	3	Stoneware	Rim	Dark Green	Glaze Running		
75.56	Feature 4	A1	5	Stoneware	Rim	Dark Green	Glaze Running		
75.57	Feature 4	A1	3	Stoneware	Rim	Dark Green	Glaze Running		
75.58	Feature 4	A1	8	Stoneware	Rim	Dark Green	Glaze Running		
75.59	Feature 4	A1	1	Stoneware	Spout	Dark Green	Glaze Running		
75.60	Feature 4	A1	1	Stoneware	Spout	Dark Green	Glaze Running		
75.61	Feature 4	A1	103	Stoneware	body	Burnt			
75.62	Feature 4	A1	24	Stoneware	body	Burnt			
75.63	Feature 4	A1	6	Stoneware	Base	Burnt		10cm	
75.64	Feature 4	A1	1	Stoneware	Base	Burnt		8cm	
75.65	Feature 4	A1	1	Stoneware	Base	Burnt			
75.66	Feature 4	A1	1	Stoneware	Base	Burnt		8cm	
75.67	Feature 4	A1	1	Stoneware	Base	Burnt		6.5cm	
75.68	Feature 4	A1	1	Stoneware	Base	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
75.69	Feature 4	A1	1	Stoneware	Base	Burnt			
75.70	Feature 4	A1	1	Stoneware	Base	Burnt		8cm	
75.71	Feature 4	A1	1	Stoneware	Base	Burnt		6cm	
75.72	Feature 4	A1	1	Stoneware	Base	Burnt		8cm	
75.73	Feature 4	A1	1	Stoneware	Base	Burnt		8cm	
75.74	Feature 4	A1	1	Stoneware	Base	Burnt		9cm	
75.75	Feature 4	A1	2	Stoneware	Base	Burnt		9cm	
75.76	Feature 4	A1	2	Stoneware	Base	Burnt		6cm	
75.77	Feature 4	A1	1	Stoneware	Base	Light Green		11cm	
75.78	Feature 4	A1	1	Stoneware	Base	Burnt			
75.79	Feature 4	A1	1	Stoneware	Rim	Burnt		13cm	
75.80	Feature 4	A1	1	Stoneware	Rim	Burnt		17cm	
75.81	Feature 4	A1	1	Stoneware	Rim	Burnt		13cm	
75.82	Feature 4	A1	2	Stoneware	Rim	Burnt		8cm	
75.83	Feature 4	A1	1	Stoneware	Rim	Burnt		8cm	
75.84	Feature 4	A1	1	Stoneware	Rim	Burnt			
75.85	Feature 4	A1	1	Stoneware	Handle	Burnt		lug	
75.86	Feature 4	A1	1	Stoneware	Handle	Burnt		lug	
75.87	Feature 4	A1	1	Stoneware	Handle	Burnt		lug	
75.88	Feature 4	A1	2	Stoneware	Handle	Burnt		strap	
75.89	Feature 4	A1	1	Stoneware	Handle	Burnt		strap	
75.90	Feature 4	A1	2	Stoneware	Spout	Burnt		Double collar	
75.91	Feature 4	A1	1	Stoneware	Spout	Burnt		Double collar	
75.92	Feature 4	A1	1	Stoneware	Spout	Burnt		Single Collar	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
75.93	Feature 4	A1	1	Stoneware	Spout	Burnt		Single Collar	
75.94	Feature 4	A1	1	Stoneware	Spout	Burnt		Single Collar	
75.95	Feature 4	A1		Stoneware		Burnt			
75.96	Feature 4	A1		Stoneware					
75.97	Feature 4	A1		Stoneware					
75.98	Feature 4	A1		Stoneware					
75.99	Feature 4	A1		Stoneware					
76.01	Feature 4	A1		Stoneware					
76.02	Feature 4	A1	14	Common Nail	Complete		Modern Machine		1830+
76.03	EU20-21	A1	1	Stoneware	Rim	Light Green			
76.04	EU20-21	A1	1	Stoneware	Rim	Light Green			
76.05	EU20-21	A1	2	Stoneware	Rim	Light Green			
76.06	EU20-21	A1	1	Stoneware	Rim	Light Green			
76.07	EU20-21	A1	1	Stoneware	Rim	Light Green	Glaze Running		
76.08	EU20-21	A1	1	Stoneware	Rim	Brown			
76.09	EU20-21	A1	1	Stoneware	Handle	Light Green		Strap	
76.10	EU20-21	A1	1	Stoneware	Handle	Light Brown			
76.11	EU20-21	A1	1	Stoneware	Handle	Green		Lug	
76.12	EU20-21	A1	1	Stoneware	Spout	Light Green			
76.13	EU20-21	A1	1	Stoneware	Base	Light Green	Glaze Running		
76.14	EU20-21	A1	1	Stoneware	Base	Dark Brown			
76.15	EU20-21	A1	1	Stoneware	Base	Light Green			
76.16	EU20-21	A1	23	Stoneware	Body	Light Green			
76.17	EU20-21	A1	21	Stoneware	Body	Light Green	Glaze Running		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
76.18	EU20-21	A1	3	Stoneware	Body	Dark Green			
76.19	EU20-21	A1	3	Stoneware	Body	Light Brown	Glaze Running		
76.20	EU20-21	A1	17	Stoneware	Body	Light Brown			
76.21	EU20-21	A1	12	Stoneware	Body	Brown			
76.22	EU20-21	A1	3	Stoneware	Body	Dark Brown			
76.23	EU20-21	A1	1	Stoneware	Body	Orange			
76.24	EU20-21	A1	3	Stoneware	Body	Orange			
76.25	EU20-21	A1	1	White Ware	Body				
76.26	EU20-21	A1	1	White Ware	Rim				
78.01	EU20-21	A1	1	Metal			UNK		
78.02	EU20-21	A1	1	Lath Nail	Head		Hurley Machine		1790-1810
78.03	Feature 4	A2	3	Stoneware	Lids	Burnt			
78.04	Feature 4	A2	1	Stoneware	Spout	Burnt			
78.05	Feature 4	A2	1	Stoneware	Spout	Burnt			
78.06	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.07	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.08	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.09	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.10	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.11	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.12	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.13	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.14	Feature 4	A2	1	Stoneware	Rim	Burnt			
78.15	Feature 4	A2	1	Stoneware	Rim	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
78.16	Feature 4	A2	1	Stoneware	Base	Burnt			
78.17	Feature 4	A2	1	Stoneware	Base	Burnt			
78.18	Feature 4	A2	3	Stoneware	Base	Burnt			
78.19	Feature 4	A2	112	Stoneware	Body	Burnt			
78.20	Feature 4	A2	16	Stoneware	Body	Dark Green			
78.21	Feature 4	A2	4	Stoneware	pipes	Burnt			
78.22	Feature 4	A2	1	White Ware	Body	White			
78.23	Feature 4	A2	1	Metal	Boot Spur				
79.01	Feature 4	A2	1	Common Nail	Complete		Modern Machine		1830+
79.02	Feature 4	A2	1	Common Nail	Head		Modern Machine		1830+
79.03	EU11	B1	2	Stoneware	furniture				
79.04	EU11	B1	1	Stoneware	Rim	Dark Green			
79.05	EU11	B1	1	Stoneware	Base	Dark Green			
79.06	EU11	B1	1	Stoneware	Base	Dark Green			
79.07	EU11	B1	1	Stoneware	Base	Dark Green			
79.08	EU11	B1	2	Stoneware	Body	Burnt			
79.09	EU11	B1	5	Stoneware	Body	Dark Green			
80.01	EU11	B1	5	Stoneware	Body	Green			
80.02	EU11	B1	1	Stoneware	Body	Burnt			
80.04	EU20	A2	1	Stoneware	Rim	Brown			
80.18	EU20	A2	1	Stoneware	body	Dark Brown	roulette		
80.19	EU20	A2	2	glass	body	Clear			
80.20	EU20	A2	1	glass	Spout	Dark Green			
80.21	EU20	A2	2	White Ware	Body	Blue		hand painted	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
80.22	EU20	A2	1	Sprig and Brad	Complete		Early Machine		1790-1805
80.23	EU20	A2	3	Common Nail	Complete		Early Machine		1815-1830
80.24	EU20	A2	1	Common Nail	Complete		Modern Machine		1830+
80.25	EU20	A2	1	Common Nail	Complete		Early Machine		1815-1830
80.26	EU20	A2	1	Finished Nail	Head		Modern Machine		1830+
80.27	EU20	A2	5	Common Nail	Shank		Modern Machine		1830+
81.01	EU20	A2	4	Common Nail	Head		Early Machine		1815-1830
81.02	EU20	A2	1	Common Nail	Head		Modern Machine		1830+
81.03	Feature 4	A3	1	Stoneware	Base	Burnt			
81.04	Feature 4	A3	1	Stoneware	Base	Dark Green			
81.05	Feature 4	A3	1	Stoneware	Base				
81.06	Feature 4	A3	1	Stoneware	Base	Burnt			
81.07	Feature 4	A3	1	Stoneware	Rim	Burnt			
81.08	Feature 4	A3	1	Stoneware	Rim	Burnt			
81.09	Feature 4	A3	1	Stoneware	Rim	Burnt			
81.10	Feature 4	A3	1	Stoneware	Rim	Burnt			
81.11	Feature 4	A3	1	Stoneware	Rim	Burnt			
81.12	Feature 4	A3	2	Stoneware	Rim	Burnt			
81.13	Feature 4	A3	1	Stoneware	Handle	Burnt			
81.14	Feature 4	A3	12	Stoneware	Body	Dark Green	Glaze Runs		
81.15	Feature 4	A3	8	Stoneware	Body	Green			
81.16	Feature 4	A3	1	Stoneware	Body	Green			
81.17	Feature 4	A3	59	Stoneware	Body	Burnt			
81.18	Feature 4	A3	1	Stoneware	Base	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
81.19	Feature 4	A3	2	Stoneware	Base	Burnt		2 cm	
81.20	Feature 4	A3	1	Stoneware	pipe	Burnt			
81.21	Feature 4	A3	1	Stoneware	furniture				
81.22	Feature 4	A3	1	Common Nail	Head		Early Machine		1815-1830
81.23	Feature 4	A3	2	Common Nail	Head		Modern Machine		1830+
81.24	Feature 4	A3	1	Finished Nail	Complete		Modern Machine		1830+
81.25	Feature 4	A3	3	Common Nail	Shank		Modern Machine		1830+
82.01	Feature 4	A3	2	Nail	Complete		UNK		
82.02	Feature 4	A3	1	metal			UNK		
82.03	EU20	B1	1	Stoneware	Rim	Light Green			
82.04	EU20	B1	1	Stoneware	Handle	Burnt		Strap	
82.05	EU20	B1	1	Stoneware	Handle	Burnt		Strap	
82.06	EU20	B1	1	Stoneware	Handle	Burnt		Strap	
82.07	EU20	B1	1	Stoneware	Handle	Burnt		Strap	
82.08	EU20	B1	1	Stoneware	Spout	Green			
82.09	EU20	B1	1	Stoneware	Base	Burnt			
82.10	EU20	B1	1	Stoneware	Base	Burnt			
82.11	EU20	B1	1	Stoneware	Base	Burnt			
82.12	EU20	B1	1	Stoneware	Base	Burnt			
82.13	EU20	B1	1	Stoneware	Base	Burnt			
82.14	EU20	B1	1	Stoneware	Body	Brown			
82.15	EU20	B1	3	Stoneware	Body	Dark Green			
82.16	EU20	B1	3	Stoneware	Body	Green			
82.17	EU20	B1	1	Stoneware	Body	Light Brown			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
82.18	EU20	B1	10	Stoneware	Body	Light Green			
82.19	EU20	B1	55	Stoneware	Body	Burnt			
82.20	EU20	B1	1	Stoneware	pipe	orange			
82.21	EU20	B1	1	metal	dime				1825
82.22	EU20	B1	6	glass	body	Clear			
82.23	EU20	B1	2	glass	body	lime			
82.24	EU20	B1	1	White Ware	body	Blue	Floral	Transfer Print	
82.25	EU20	B1	1	White Ware	Body	Black	Molded	hand painted	
82.26	EU20	B1	1	Metal			UNK		
83.01	EU20	B1	4	Nail			UNK		
83.02	EU20	B1	3	Common Nail	Complete		Modern Machine		1830+
83.03	EU21	A2	1	Stoneware	Rim	Tan			
83.04	EU21	A2	1	Stoneware	Rim	Light Green			
83.05	EU21	A2	2	Stoneware	Rim	Brown			
83.06	EU21	A2	1	Stoneware	Spout	Green	Glaze Running		
83.07	EU21	A2	2	Stoneware	Spout	Green	Glaze Running		
83.08	EU21	A2	2	Stoneware	Spout	Light Green			
83.09	EU21	A2	1	Stoneware	Spout	Light Brown			
83.10	EU21	A2	2	Stoneware	Spout	Brown			
83.11	EU21	A2	1	Stoneware	Spout	Brown			
83.12	EU21	A2	1	Stoneware	Spout	Brown			
83.13	EU21	A2	1	Stoneware	Spout	Brown			
83.14	EU21	A2	1	Stoneware	Spout	Brown			
83.15	EU21	A2	1	Stoneware	Handle	Light Green		Strap	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
83.16	EU21	A2	1	Stoneware	Handle	Light Green	Glaze Running	Strap	
83.17	EU21	A2	1	Stoneware	Handle	Light Green		Strap	
83.18	EU21	A2	1	Stoneware	Handle	Green		Strap	
83.19	EU21	A2	1	Stoneware	Handle	Green		Strap	
83.20	EU21	A2	1	Stoneware	Handle	Green		Strap	
83.21	EU21	A2	1	Stoneware	Handle	Green		Strap	
83.22	EU21	A2	1	Stoneware	Handle	Burnt		Strap	
83.23	EU21	A2	2	Stoneware	Base	Light Brown			
83.24	EU21	A2	3	Stoneware	Base	Light Brown			
83.25	EU21	A2	2	Stoneware	Base	Brown			
83.26	EU21	A2	1	Stoneware	Base	Light Green	Glaze Running		
83.27	EU21	A2	1	Stoneware	Base	Light Green			
83.28	EU21	A2	2	Stoneware	Base	Light Green			
83.29	EU21	A2	2	Stoneware	Base	Burnt			
83.30	EU21	A2	103	Stoneware	Body	Light Green	Glaze Running		
83.31	EU21	A2	31	Stoneware	Body	Green			
83.32	EU21	A2	3	Stoneware	Body	Light Brown			
83.33	EU21	A2	45	Stoneware	Body	Brown			
83.34	EU21	A2	29	Stoneware	Body	Dark Brown			
83.35	EU21	A2	6	Stoneware	Body	Dark Brown			
83.36	EU21	A2	40	Stoneware	Body	Light Brown			
83.37	EU21	A2	9	Stoneware	Body	Orange			
83.38	EU21	A2		Stoneware	Body	Bits			
83.39	EU21	A2	1	Stoneware	Base	Light Brown		marked	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
83.40	EU21	A2	1	Stoneware	pipe	Dark Brown	Glaze Running		
83.41	EU21	A2	1	glass	body	Clear			
83.42	EU21	A2	1	glass	body	lime			
83.43	EU21	A2	2	White Ware	Rim	Dark Blue	Floral	Transfer Print	
83.44	EU21	A2	1	White Ware	Body	Burnt	Banded		
84.01	EU21	A2	13	Common Nail	Complete		Modern Machine		1830+
84.02	EU21	A2	1	Metal	Rod				
84.03	Feature 4	A4		Charcoal					
84.04	Feature 4	A4	3	Shell					
84.05	Feature 4	A4	1	Metal					
84.06	Feature 4	A4	5	Stoneware	Spout	Burnt			
84.07	Feature 4	A4	1	Stoneware	Spout	Burnt		Double Collar	
84.08	Feature 4	A4	1	Stoneware	Spout	Burnt		Double Collar	
84.09	Feature 4	A4	3	Stoneware	Spout	Burnt		Double Collar	
84.10	Feature 4	A4	1	Stoneware	Spout	Burnt		Double Collar	
84.100	Feature 4	A4	2	White Ware	Body	Light Blue	Molded	Washed	
84.101	Feature 4	A4	2	White Ware	Rim	Light Blue	Feather edged	hand painted	
84.102	Feature 4	A4	1	Mocha	Body	Brown			
84.103	Feature 4	A4	3	White Ware	Body	Burnt			
84.104	Feature 4	A4	1	White Ware	Body	Light Blue	Floral	Transfer Print	
84.105	Feature 4	A4	1	Glass	Body	Solarized			
84.106	Feature 4	A4	3	Common Nail	Shank		Modern Machine		1830+
84.107	Feature 4	A4	6	Common Nail	Complete		Modern Machine		1830+
84.108	Feature 4	A4	13	Common Nail	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
84.109	Feature 4	A4	31	Common Nail	Complete		Modern Machine		1830+
84.11	Feature 4	A4	1	Stoneware	Spout	Dark Brown		Double Collar	
84.110	Feature 4	A4	8	Common Nail	Complete		Modern Machine		1830+
84.111	Feature 4	A4	18	Common Nail	Complete		Modern Machine		1830+
84.112	Feature 4	A4	2	Common Nail	Heads		Modern Machine		1830+
84.113	Feature 4	A4	1	Spike Nail	Heads		Modern Machine		1830+
84.114	Feature 4	A4	28	Common Nail	Heads		Modern Machine		1830+
84.115	Feature 4	A4	24	Common Nail	Heads		Early Machine		1815-1830
84.116	Feature 4	A4	20	Common Nail	Shank		Modern Machine		1830+
84.117	Feature 4	A4	13	Common Nail	Shank		Modern Machine		1830+
84.118	Feature 4	A4	34	Common Nail	Shank		Modern Machine		1830+
84.119	Feature 4	A4	13	Common Nail	Shank		UNK		
84.120	Feature 4	A4	5	Common Nail	Complete		Early Machine		1815-1830
84.12	Feature 4	A4	1	Stoneware	Spout	Olive Green		Double Collar	
84.121	Feature 4	A4	2	Finish	Complete		Modern Machine		1830+
84.122	Feature 4	A4	2	Sprigs and Brads	Complete		Early Machine		1790-1805
84.123	Feature 4	A4	1	Sprigs and Brads	Shank		Early Machine		1790-1805
84.124	Feature 4	A4	1	Rose Head	Complete		Hand Wrought		
84.125	Feature 4	A4	1	Bolt	Complete		UNK		
84.13	Feature 4	A4	2	Stoneware	Spout	Burnt			
84.14	Feature 4	A4	1	Stoneware	Spout	Burnt		Single Collar	
84.15	Feature 4	A4	1	Stoneware	Spout	Burnt		Single Collar	
84.16	Feature 4	A4	1	Stoneware	Spout	Burnt		Single Collar	
84.17	Feature 4	A4	1	Stoneware	Spout	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
84.18	Feature 4	A4	2	Stoneware	Handle	Tan		Strap	
84.19	Feature 4	A4	1	Stoneware	Handle	Tan		Strap	
84.20	Feature 4	A4	1	Stoneware	Handle	Light Brown		Strap	
84.21	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.22	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.23	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.24	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.25	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.26	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.27	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.28	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.29	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.30	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.31	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.32	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.33	Feature 4	A4	1	Stoneware	Handle	Burnt		Strap	
84.34	Feature 4	A4	2	Stoneware	Rim	Burnt			
84.35	Feature 4	A4	1	Stoneware	Rim	Burnt			
84.36	Feature 4	A4	1	Stoneware	Rim	Burnt			
84.37	Feature 4	A4	1	Stoneware	Rim	Burnt		10.3cm	
84.38	Feature 4	A4	1	Stoneware	Rim	Gray			
84.39	Feature 4	A4	1	Stoneware	Rim	Tan		7.7cm	
84.40	Feature 4	A4	1	Stoneware	Rim	Burnt			
84.41	Feature 4	A4	1	Stoneware	Rim	Burnt			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
84.42	Feature 4	A4	1	Stoneware	Rim	Burnt			
84.43	Feature 4	A4	1	Stoneware	Rim	Burnt			
84.44	Feature 4	A4	1	Stoneware	Rim	Burnt		6.3cm	
84.45	Feature 4	A4	1	Stoneware	Rim	Burnt		15.6cm	
84.46	Feature 4	A4	1	Stoneware	Rim	Tan		9cm	
84.47	Feature 4	A4	1	Stoneware	Rim	Dark Green		9cm	
84.48	Feature 4	A4	1	Stoneware	Rim	Brown		9cm	
84.49	Feature 4	A4	1	Stoneware	Rim	Light Green		9cm	
84.50	Feature 4	A4	1	Stoneware	Rim	Green	Glaze Running	9cm	
84.51	Feature 4	A4	3	Stoneware	Rim	Burnt			
84.52	Feature 4	A4	7	Stoneware	Rim	Burnt			
84.53	Feature 4	A4	3	Stoneware	Rim	Burnt			
84.54	Feature 4	A4	1	Stoneware	Rim	Burnt			
84.55	Feature 4	A4	1	Stoneware	Rim	Burnt			
84.56	Feature 4	A4	1	Stoneware	Lid	Burnt			
84.57	Feature 4	A4	1	Stoneware	Base	Burnt			
84.58	Feature 4	A4	1	Stoneware	Base	Burnt			
84.59	Feature 4	A4	1	Stoneware	Base	Burnt			
84.60	Feature 4	A4	2	Stoneware	Base	Burnt		9cm	
84.61	Feature 4	A4	1	Stoneware	Base	Burnt		9cm	
84.62	Feature 4	A4	4	Stoneware	Base	Burnt		8.3cm	
84.63	Feature 4	A4	3	Stoneware	Base	Burnt		7.7cm	
84.64	Feature 4	A4	2	Stoneware	Base	Burnt		7.7cm	
84.65	Feature 4	A4	1	Stoneware	Base	Burnt		7.7cm	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
84.66	Feature 4	A4	1	Stoneware	Base	Burnt		7.7cm	
84.67	Feature 4	A4	4	Stoneware	Base	Burnt		7.1cm	
84.68	Feature 4	A4	6	Stoneware	Base	Burnt		7.1cm	
84.69	Feature 4	A4	1	Stoneware	Base	Burnt		7.1cm	
84.70	Feature 4	A4	1	Stoneware	Base	Burnt		7.1cm	
84.71	Feature 4	A4	1	Stoneware	Base	Burnt		7.1cm	
84.72	Feature 4	A4	1	Stoneware	Base	Burnt		7.1cm	
84.73	Feature 4	A4	3	Stoneware	Base	Burnt		6.3cm	
84.74	Feature 4	A4	2	Stoneware	Base	Burnt		6.3cm	
84.75	Feature 4	A4	2	Stoneware	Base	Burnt		6.3cm	
84.76	Feature 4	A4	2	Stoneware	Base	Orange		6.3cm	
84.77	Feature 4	A4	6	Stoneware	Base	Burnt		5.8cm	
84.78	Feature 4	A4	23	Stoneware	Body	Green			
84.79	Feature 4	A4	6	Stoneware	Body	Green			
84.80	Feature 4	A4	22	Stoneware	Body	Green			
84.81	Feature 4	A4	17	Stoneware	Body	Light Green			
84.82	Feature 4	A4	38	Stoneware	Body	Light Green			
84.83	Feature 4	A4	37	Stoneware	Body	Dark Green			
84.84	Feature 4	A4	11	Stoneware	Body	Dark Green	Glaze Running		
84.85	Feature 4	A4	59	Stoneware	Body	Orange			
84.86	Feature 4	A4	24	Stoneware	Body	Burnt			
84.87	Feature 4	A4	585	Stoneware	Body	Burnt			
84.88	Feature 4	A4	1	Stoneware	Body	Dark Green	Slashes		
84.89	Feature 4	A4	1	Stoneware	Body		Furniture		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
84.90	Feature 4	A4	1	Metal	Axe				
84.91	Feature 4	A4	4	Brick					
84.92	Feature 4	A4	1	Stoneware	Body	Burnt	marked		
84.93	Feature 4	A4	1	Stoneware	pipe	Burnt			
84.94	Feature 4	A4	6	Glass	Body	Solarized			
84.95	Feature 4	A4	1	Glass	Body	Clear			
84.96	Feature 4	A4	1	Glass	Body	Lime			
84.97	Feature 4	A4	1	Glass	Spour	Lime			
84.98	Feature 4	A4	6	White Ware	Body	Burnt			
84.99	Feature 4	A4	8	White Ware	Body	White			
85.01	Feature 4	A4	1	Metal	UNK		UNK		
85.02	Feature 4	A4	1	Screw	Complete		UNK		
85.03	Feature 3	A1	1	Stoneware	Rim	Light Green			
85.04	Feature 3	A1	1	Stoneware	Base	Dark Green	Graze Runs		
85.05	Feature 3	A1	1	Stoneware	Base	Green			
85.06	Feature 3	A1	1	Stoneware	Base	Green	Graze Runs		
85.07	Feature 3	A1	12	Stoneware	Body	Green	Graze Runs		
85.08	Feature 3	A1	4	Stoneware	Body	Light Green			
85.09	Feature 3	A1	1	Stoneware	Body	Light Green			
86.01	Feature 3	A1	4	Stoneware	Body	Light Green	Graze Runs		
86.02	Feature 3	A1	8	Stoneware	Body	Dark Green			
86.03	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.04	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.05	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
86.06	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.07	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.08	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.09	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.10	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.14	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.15	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.16	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.17	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.18	Feature 4	B1	3	Stoneware	Handles	Light Green		Strap	
86.19	Feature 4	B1	1	Stoneware	Spout	Light Green		Single Collar	
86.20	Feature 4	B1	1	Stoneware	Spout	Light Green	Slashes	Double Collar	
86.21	Feature 4	B1	1	Stoneware	Spout	Light Green	Slashes	Double Collar	
86.22	Feature 4	B1	1	Stoneware	Spout	Light Green		Double Collar	
86.23	Feature 4	B1	1	Stoneware	Spout	Light Green		Double Collar	
86.24	Feature 4	B1	1	Stoneware	Spout	Light Green		Double Collar	
86.25	Feature 4	B1	1	Stoneware	Spout	Light Green		Double Collar	
86.26	Feature 4	B1	1	Stoneware	Spout	Light Green		Double Collar	
86.27	Feature 4	B1	2	Stoneware	Spout	Light Green		Double Collar	
86.28	Feature 4	B1	2	Stoneware	Spout	Light Green		Double Collar	
86.29	Feature 4	B1	3	Stoneware	Spout	Light Green		Double Collar	
86.30	Feature 4	B1	3	Stoneware	Spout	Light Green		Double Collar	
86.31	Feature 4	B1	1	Stoneware	Spout	Light Green		Double Collar	
86.32	Feature 4	B1	1	Stoneware	Rim	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
86.33	Feature 4	B1	1	Stoneware	Rim	Light Green			
86.34	Feature 4	B1	1	Stoneware	Rim	Light Green			
86.35	Feature 4	B1	1	Stoneware	Rim	Light Green			
86.36	Feature 4	B1	2	Stoneware	Rim	Light Green			
86.37	Feature 4	B1	1	Stoneware	Rim	Light Green			
86.38	Feature 4	B1	1	Stoneware	Handle	Light Green		Lug	
86.40	Feature 4	B1	1	Stoneware	Handle	Light Green		Lug	
86.41	Feature 4	B1	1	Stoneware	Handle	Light Green		Lug	
86.42	Feature 4	B1	1	Stoneware	Spout	Light Green	Slashes		
86.43	Feature 4	B1	1	Stoneware	Body	Light Green	Slashes		
86.44	Feature 4	B1	230	Stoneware	Body	Light Green			
86.45	Feature 4	B1	1	Stoneware	Base	Orange	7		
86.46	Feature 4	B1	1	Stoneware	Base	Orange	7		
86.47	Feature 4	B1	7	Stoneware	Base	Orange	7		
86.48	Feature 4	B1	10	Stoneware	Base	Orange	7		
86.49	Feature 4	B1	1	Stoneware	Base	Orange	7		
86.50	Feature 4	B1	1	Stoneware	Base	Orange	7		
86.51	Feature 4	B1	1	Stoneware	Base	Orange	7		
86.52	Feature 4	B1	1	Stoneware	Base	Orange	7.5		
86.53	Feature 4	B1	1	Stoneware	Base	Orange	7.5		
86.54	Feature 4	B1	1	Stoneware	Base	Orange	7.5		
86.55	Feature 4	B1	1	Stoneware	Base	Orange	7.5		
86.56	Feature 4	B1	1	Stoneware	Base	Orange	8		
86.57	Feature 4	B1	1	Stoneware	Base	Orange	8		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
86.58	Feature 4	B1	1	Stoneware	Base	Orange	8		
86.59	Feature 4	B1	13	Stoneware	Base	Orange			
86.60	Feature 4	B1	1	Stoneware	Base	Orange	8		
86.61	Feature 4	B1	94	Stoneware	Base	Orange			
86.62	Feature 4	B1	1	Stoneware	Base	Orange	8		
86.63	Feature 4	B1	1	Stoneware	Base	Orange	8		
86.64	Feature 4	B1	1	Stoneware	Lid	Orange			
86.65	Feature 4	B1	1	Stoneware	Spout	Orange			
86.66	Feature 4	B1	1	Stoneware	Spout	Orange			
86.67	Feature 4	B1	1	Stoneware	Spout	Orange			
86.68	Feature 4	B1	1	Stoneware	Spout	Orange			
86.69	Feature 4	B1	1	Stoneware	Spout	Orange			
86.70	Feature 4	B1	1	Stoneware	Spout	Orange			
86.71	Feature 4	B1	1	Stoneware	Spout	Orange			
86.72	Feature 4	B1	1	Stoneware	Spout	Orange			
86.73	Feature 4	B1	4	Stoneware	Handle	Orange		Strap	
86.74	Feature 4	B1	2	Stoneware	Handle	Orange		Strap	
86.75	Feature 4	B1	1	Stoneware	Handle	Orange		Strap	
86.76	Feature 4	B1	4	Stoneware	Handle	Orange		Strap	
86.77	Feature 4	B1	2	Stoneware	Handle	Orange		Strap	
86.78	Feature 4	B1	2	Stoneware	Handle	Orange		Strap	
86.79	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.80	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.81	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
86.82	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.83	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.84	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.85	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.86	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.87	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.88	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.89	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.90	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.91	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.92	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.93	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.94	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.95	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.96	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.97	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.98	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.99	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.100	Feature 4	B1	1	Stoneware	Handle	Orange		Lug	
86.101	Feature 4	B1	5	Stoneware	Rim	Orange	10.1cm		
86.102	Feature 4	B1	2	Stoneware	Rim	Orange	8.4cm		
86.103	Feature 4	B1	5	Stoneware	Rim	Orange	8.8cm		
86.104	Feature 4	B1	22	Stoneware	Rim	Orange	7.7cm		
86.105	Feature 4	B1	2	Stoneware	Rim	Orange	8cm		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
86.106	Feature 4	B1	35	Stoneware	Rim	Orange	9cm		
86.107	Feature 4	B1	1645	Stoneware	Body	Orange			
86.108	Feature 4	B1	14	Stoneware	Base	Orange	14 cm		
86.109	Feature 4	B1		Stoneware	Base	Orange	8		
86.11	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.110	Feature 4	B1		Stoneware	Base	Orange	10		
86.111	Feature 4	B1	5	Stoneware	Base	Orange	6		
86.112	Feature 4	B1	5	Stoneware	Base	Orange	7		
86.113	Feature 4	B1	10	Stoneware	Base	Orange	7.5		
86.114	Feature 4	B1	6	Stoneware	Base	Orange	8		
86.115	Feature 4	B1	4	Stoneware	Base	Orange	8		
86.116	Feature 4	B1	1	Stoneware	Base	Orange	7	Storage	
86.117	Feature 4	B1	1	Stoneware	Base	Orange	7	Storage	
86.118	Feature 4	B1	4	Stoneware	Base	Orange	8	Storage	
86.119	Feature 4	B1	2	Stoneware	Base	Orange	8	Storage	
86.12	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.120	Feature 4	B1	2	Stoneware	Base	Orange	8	Storage	
86.121	Feature 4	B1	4	Stoneware	Base	Orange	8	Storage	
86.122	Feature 4	B1	4	Stoneware	Base	Orange	8	Storage	
86.123	Feature 4	B1	7	Stoneware	Base	Orange	8	Storage	
86.124	Feature 4	B1	4	Stoneware	Base	Orange	8	Storage	
86.125	Feature 4	B1	7	Stoneware	Base	Orange	8	Storage	
86.126	Feature 4	B1	1	Stoneware	Base	Orange	9	Storage	
86.127	Feature 4	B1	1	Stoneware	Base	Orange	9	Storage	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
86.128	Feature 4	B1	2	Stoneware	Base	Orange	9	Storage	
86.129	Feature 4	B1	6	Stoneware	Base	Orange	10	Storage	
86.13	Feature 4	B1	1	Stoneware	Handles	Light Green		Strap	
86.130	Feature 4	B1	6	Stoneware	Base	Orange	10	Storage	
86.131	Feature 4	B1	2	Stoneware	Base	Orange	10	Storage	
86.132	Feature 4	B1	4	Stoneware	Base	Orange	10	Storage	
86.133	Feature 4	B1	3	Stoneware	Base	Orange		Storage	
86.134	Feature 4	B1	10	Stoneware	Base	Orange	8	Storage	
86.135	Feature 4	B1	1	Stoneware	Spout	Light Green	Slashes		
87.01	Feature 4	B1	8	Stoneware	Rim	yellow		bowl	
87.02	Feature 4	B1	1	White Ware	Body	Green	Floral	hand painted	
87.03	EU22	A2	1	Stoneware	Rim	Green			
87.04	EU22	A2	2	Stoneware	Rim	Green			
87.05	EU22	A2	1	Stoneware	Rim	Green			
87.06	EU22	A2	1	Stoneware	Rim	Light Green			
87.07	EU22	A2	1	Stoneware	Rim	Light Green			
87.08	EU22	A2	2	Stoneware	Spout	Light Brown			
87.09	EU22	A2	1	Stoneware	Spout	Light Brown			
87.10	EU22	A2	4	Stoneware	Spout	Light Green			
87.11	EU22	A2	1	Stoneware	Spout	Green			
87.12	EU22	A2	1	Stoneware	Spout	Green			
87.13	EU22	A2	1	Stoneware	Spout	Light Brown			
87.14	EU22	A2	1	Stoneware	Spout	Burnt			
87.15	EU22	A2	1	Stoneware	Handle	Orange		Strap	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
87.16	EU22	A2	1	Stoneware	Handle	Light Green		Strap	
87.17	EU22	A2	1	Stoneware	Handle	Light Green	Glaze Running	Strap	
87.18	EU22	A2	1	Stoneware	Handle	Dark Green	Glaze Running	Strap	
87.19	EU22	A2	1	Stoneware	Base	Light Green			
87.20	EU22	A2	1	Stoneware	Base	Light Green			
87.21	EU22	A2	1	Stoneware	Base	Light Green			
87.22	EU22	A2	1	Stoneware	Base	Light Green			
87.23	EU22	A2	1	Stoneware	Base	Dark Green			
87.24	EU22	A2	37	Stoneware	Body	Light Green			
87.25	EU22	A2	10	Stoneware	Body	Light Green	Glaze Running		
87.26	EU22	A2	24	Stoneware	Body	Light Green	Glaze Running		
87.27	EU22	A2	35	Stoneware	Body	Light Green	Glaze Running		
87.28	EU22	A2	6	Stoneware	Body	Green			
87.29	EU22	A2	44	Stoneware	Body	Light Brown			
87.30	EU22	A2	19	Stoneware	Body	Dark Brown			
87.31	EU22	A2	34	Stoneware	Body	Burnt			
87.32	EU22	A2		Stoneware	Body	Bits			
87.39	EU22	A2	1	Stoneware	unk	Orange			
87.40	EU22	A2	3	Stoneware	body	Light Brown	roulette		
87.42	EU22	A2	1	glass	Rim	Green			
87.43	EU22	A2	2	glass	screw top	Clear			
87.44	EU22	A2	1	glass	body	lime			
87.45	EU22	A2	2	glass	body	Dark Green			
87.46	EU22	A2	1	White Ware	Body	White			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
87.47	EU22	A2	1	White Ware	Body	Blue	Lines	hand painted	
87.48	EU22	A2	1	White Ware	Rim	Blue	Molded	Transfer Print	
87.49	EU22	A2	2	Common Nail	Complete		Modern Machine		1830+
87.50	EU22	A2	2	Common Nail	Complete		Modern Machine		1830+
88.01	EU22	A2	1	Bolt	Head		UNK		
88.02	EU22	A2	1	Metal			UNK		
88.03	Feature 3	A2	1	Stoneware	Spout	Green			
88.04	Feature 3	A2	1	Stoneware	Base	Brown			
88.05	Feature 3	A2	1	Stoneware	Body	Dark Green			
88.06	Feature 3	A2	8	Stoneware	Body	Green	Graze Runs		
88.07	Feature 3	A2	3	Stoneware	Body	Light Green			
88.08	Feature 3	A2	6	Stoneware	Body	Burnt			
89.01	Feature 3	A2	4	Stoneware	Body	Burnt	Graze Runs		
89.02	Feature 3	A2	1	Stoneware	Base	Tan			
89.03	Feature 3	B3		Stoneware			marked		
89.04	Feature 3	B3	1	Stoneware	Rim	Light Green			
89.05	Feature 3	B3	1	Stoneware	Rim	Light Green			
89.06	Feature 3	B3	1	Stoneware	Rim	Tan			
89.07	Feature 3	B3	1	Stoneware	Rim	Tan			
89.08	Feature 3	B3	1	Stoneware	Body	Light Brown			
89.09	Feature 3	B3	14	Stoneware	Body	Tan			
89.10	Feature 3	B3	2	Stoneware	Body	Light Green			
89.11	Feature 3	B3	6	Stoneware	Body	Green			
89.12	Feature 3	B3	10	Stoneware	Body	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
89.13	Feature 3	B3	4	Stoneware	Body	Light Green			
89.14	Feature 3	B3	3	Stoneware	Body	Burnt			
89.15	Feature 3	B3	2	Spike Nail	Complete		Modern Machine		1830+
89.16	Feature 3	B3	1	Common Nail	Complete		Modern Machine		1830+
89.17	Feature 3	B3	1	Sprigs and Brads	Complete		Modern Machine		1810+
89.18	Feature 3	B3	3	Common Nail	Head		Modern Machine		1830+
89.19	Feature 3	B3	1	Common Nail	Head		Modern Machine		1830+
89.20	Feature 3	B3	1	Finish	Head		Modern Machine		1830+
90.01	Feature 3	B3	1	Common Nail	Shank		Modern Machine		1830+
90.02	Feature 3	B3	1	Common Nail	Shank		Modern Machine		1830+
90.03	EU20	B2		Stoneware	Ball				
90.04	EU20	B2		Stoneware	Furniture				
90.05	EU20	B2	1	Stoneware	Rim	Green			
90.06	EU20	B2	1	Stoneware	Rim	Green			
90.07	EU20	B2	1	Stoneware	Rim	Green			
90.08	EU20	B2	1	Stoneware	Rim	Green			
90.09	EU20	B2	1	Stoneware	Rim	Burnt	Glaze Running		
90.10	EU20	B2	1	Stoneware	Spout	Tan			
90.11	EU20	B2	1	Stoneware	Handle	Burnt			
90.12	EU20	B2	1	Stoneware	Handle	Burnt		Strap	
90.13	EU20	B2	1	Stoneware	Handle	Burnt		Strap	
90.14	EU20	B2	1	Stoneware	Handle	Light Green		Strap	
90.15	EU20	B2	1	Stoneware	Handle	Green		Strap	
90.16	EU20	B2	1	Stoneware	Handle	Light Green		Strap	

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
90.17	EU20	B2	1	Stoneware	Handle	Burnt		Strap	
90.18	EU20	B2	1	Stoneware	Base	Burnt		Lug	
90.19	EU20	B2	1	Stoneware	Base	Burnt			
90.20	EU20	B2	1	Stoneware	Base	Burnt			
90.21	EU20	B2	1	Stoneware	Base	Burnt			
90.22	EU20	B2	1	Stoneware	Base	Burnt			
90.23	EU20	B2	1	Stoneware	Base	Burnt			
90.24	EU20	B2	1	Stoneware	Base	Burnt			
90.25	EU20	B2	8	Stoneware	Body	Light Green		Small Bowl	
90.26	EU20	B2	9	Stoneware	Body	Light Green			
90.27	EU20	B2	11	Stoneware	Body	Green			
90.28	EU20	B2	3	Stoneware	Body	Green			
90.29	EU20	B2	6	Stoneware	Body	Light Green			
90.30	EU20	B2	4	Stoneware	Body	Green			
90.31	EU20	B2	3	Stoneware	Body	Green			
90.32	EU20	B2	10	Stoneware	Body	Light Brown			
90.33	EU20	B2	17	Stoneware	Body	Orange	Glaze Running		
90.34	EU20	B2	6	Stoneware	Body	Burnt			
90.35	EU20	B2	51	Stoneware	Body	Burnt			
90.36	EU20	B2	1	Stoneware	pipe	Burnt			
90.37	EU20	B2	1	Stoneware		Burnt			
90.38	EU20	B2	1	glass	body	Clear			
90.39	EU20	B2	1	glass	body	Clear			
90.40	EU20	B2	1	Common Nail	Complete		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
90.41	EU20	B2	3	Common Nail	Head		Modern Machine		1830+
90.42	EU20	B2	5	Common Nail	Shank		Modern Machine		1830+
91.01	EU20	B2	1	Common Nail	Complete		Early Machine		1790-1820
91.02	EU20	B2	7	Common Nail	Shank		Modern Machine		1830+
91.03	Feature 4	B2		Charcoal			pipe mold		
91.04	Feature 4	B2	1	Stoneware	Handle	Green			
91.05	Feature 4	B2	1	Stoneware	Handle	Green			
91.06	Feature 4	B2	1	Stoneware	Rim	Light Green			
91.07	Feature 4	B2	1	Stoneware	Rim	Green			
91.08	Feature 4	B2	1	Stoneware	Spout	Green			
91.09	Feature 4	B2	1	Stoneware	Base	Green			
91.10	Feature 4	B2	1	Stoneware	Base	Orange	Glaze Runs		
91.11	Feature 4	B2	12	Stoneware	Body	Burnt			
91.12	Feature 4	B2	41	Stoneware	Body	Tan			
91.13	Feature 4	B2	20	Stoneware	Body	Green			
91.14	Feature 4	B2	3	Stoneware	Body	Green	Glaze Runs		
91.15	Feature 4	B2	18	Stoneware	Body	Light Green			
91.16	Feature 4	B2	1	Stoneware	Body	Dark Green			
91.17	Feature 4	B2	1	Stoneware	Body	Orange			
91.18	Feature 4	B2	6	Common Nail	Head		Early/Modern		1815-1830
91.19	Feature 4	B2	20	Common Nail	Complete		Early/Modern		1815-1830
91.20	Feature 4	B2	5	Common Nail	Complete		Modern Machine		1830+
91.21	Feature 4	B2	6	Common Nail	Head		Early/Modern		1815-1830
91.22	Feature 4	B2	8	Common Nail	Head		Modern Machine		1830+

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
91.23	Feature 4	B2	10	Common Nail	Head		Modern Machine		1830+
91.24	Feature 4	B2	11	Common Nail	Head		Modern Machine		1830+
91.25	Feature 4	B2	3	Sprigs and Brads	Complete		Machine Cut		1810+
91.26	Feature 4	B2	25	Common Nail	Shank		Modern Machine		1830+
91.27	Feature 4	B2	2	Common Nail	Shank		Modern Machine		1830+
91.28	Feature 4	B2	3	Sprigs and Brads	Complete		Hand Wrought		
92.01	Feature 4	B2	1	Sprigs and Brads	Head		Machine Cut		1810+
92.02	Feature 4	B2	1	Rose	Head		Hand Wrought		
92.03	Feature 5	A1	1	Stoneware	Rim	Light Brown	marked		
92.04	Feature 5	A1	1	Stoneware	Rim	Burnt			
92.05	Feature 5	A1	1	Stoneware	Rim	Burnt			
92.06	Feature 5	A1	1	Stoneware	Handle	Burnt			
92.07	Feature 5	A1	5	Stoneware	Base	Light Green		Lug	
92.08	Feature 5	A1	1	Stoneware	Base	Green			
92.09	Feature 5	A1	2	Stoneware	Body	Dark Brown	Glaze Running		
92.10	Feature 5	A1	38	Stoneware	Body	Brown			
92.11	Feature 5	A1	10	Stoneware	Body	Light Green			
93.01	Feature 5	A1	2	Stoneware	Body	Light Brown			
93.02	Feature 5	A1	19	Stoneware	Body	Burnt			
93.03	Feature 5	A2	1	Stoneware	Rim	Dark Green			
94.01	Feature 5	A2	7	Stoneware	Body	Light Green			
94.02	Feature 5	A2	16	Stoneware	Body	Brown			
94.03	Feature 5	Clean up	1	Stoneware	Rim	Brown			
94.04	Feature 5	Clean up	1	Stoneware	Rim	Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
94.05	Feature 5	Clean up	1	Stoneware	Handle	Tan			
94.06	Feature 5	Clean up	1	Stoneware	Handle	Green		Strap	
94.07	Feature 5	Clean up	1	Stoneware	Spout	Tan		Strap	
94.08	Feature 5	Clean up	1	Stoneware	Base	Green			
94.09	Feature 5	Clean up	1	Stoneware	Base	Light Green			
94.10	Feature 5	Clean up	1	Stoneware	Base	Burnt			
94.11	Feature 5	Clean up	1	Stoneware	Base	Burnt			
94.12	Feature 5	Clean up	1	Stoneware	Base	Burnt			
94.13	Feature 5	Clean up	1	Stoneware	Body	Light Green			
94.14	Feature 5	Clean up	1	Stoneware	Body	Light Green	Glaze Running		
94.15	Feature 5	Clean up	1	Stoneware	Body	Light Green			
94.16	Feature 5	Clean up	4	Stoneware	Body	Green			
94.17	Feature 5	Clean up	1	Stoneware	Body	Green			
94.18	Feature 5	Clean up	1	Stoneware	Body	Dark Green	Glaze Running		
94.19	Feature 5	Clean up	2	Stoneware	Body	Light Brown			
94.20	Feature 5	Clean up	18	Stoneware	Body	Burnt			
94.21	Feature 5	Clean up	5	Stoneware	Body	Orange			
95.01	Feature 5	clean up	4	Stoneware	body	white			
95.02	Feature 5	Clean up	3	Common Nail	Head		Modern Machine		1830+
95.03	Feature 5	Clean up	1	Stoneware	Rim	Light Green		slip	
95.04	Feature 5	Clean up	1	Stoneware	Rim	Light Green			
95.05	Feature 5	Clean up	1	Stoneware	Body	Burnt			
95.06	Feature 5	Clean up	1	Stoneware	Body	Light Green			
95.07	Feature 5	Clean up	3	Stoneware	Body	Green	Glaze Running		

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
95.08	Feature 5	Clean up	2	Stoneware	Body	Burnt			
95.09	Feature 5	Clean up	4	Stoneware	Body	Brown			
95.10	Feature 5	Clean up	4	Stoneware	Body	Dark Brown			
95.11	Feature 5	Clean up		Stoneware	Body	Bits			
96.01	Feature 5	clean up	1	Stoneware	unk				
96.02	Feature 5	Clean up	1	White Ware	Body	White			
96.03	Feature 5	Clean up	1	Stoneware	Base	Dark Green	Glaze Running		
96.04	Feature 5	Clean up	1	Stoneware	Base	Burnt			
96.05	Feature 5	Clean up	3	Stoneware	Body	Light Green			
97.01	Feature 5	Clean up	7	Stoneware	Body	Dark Brown	Glaze Running		
97.02	EU21	Clean up	1	glass	body	Clear			
97.03	EU24	A1	1	Stoneware	Rim	Dark Green			
97.04	EU24	A1	1	Stoneware	Spout	Light Green			
97.05	EU24	A1	1	Stoneware	Handle	Light Green			
97.06	EU24	A1	1	Stoneware	Handle	Green		Strap	
97.07	EU24	A1	1	Stoneware	Handle	Dark Green		Strap	
97.08	EU24	A1	1	Stoneware	Handle	Burnt		Strap	
97.09	EU24	A1	1	Stoneware	Base	Dark Brown		Strap	
97.10	EU24	A1	1	Stoneware	Base	Light Green			
97.11	EU24	A1	1	Stoneware	Base	Light Green			
97.12	EU24	A1	1	Stoneware	Base	Light Brown			
97.13	EU24	A1	1	Stoneware	Base	Light Brown			
97.14	EU24	A1	4	Stoneware	Body	Light Green			
97.15	EU24	A1	2	Stoneware	Body	Light Green			

Bag#	Unit#	Stratum	Quantity	Material Type	Form	Color	Design	Decoration	Date Range
97.16	EU24	A1	1	Stoneware	Body	Light Green			
97.17	EU24	A1	14	Stoneware	Body	Light Green	Glaze Running		
97.18	EU24	A1	7	Stoneware	Body	Green			
97.19	EU24	A1	1	Stoneware	Body	Dark Green			
97.20	EU24	A1	8	Stoneware	Body	Green			
97.21	EU24	A1	3	Stoneware	Body	Orange			
97.22	EU24	A1	2	Stoneware	Body	Light Brown			
97.23	EU24	A1	4	Stoneware	Body	Brown			
97.24	EU24	A1	2	Stoneware	Body	Dark Brown			
97.25	EU24	A1	1	Stoneware	Body	Brown			
	EU24	A1	1	Metal	Axe				
	EU24	A1	1	Metal	Rod				