Domestic Cisterns in Charleston, South Carolina: Public Health and Private Water in an Antebellum City

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DOMESTIC CISTERNS IN CHARLESTON, SOUTH CAROLINA: PUBLIC HEALTH AND PRIVATE WATER IN AN ANTEBELLUM CITY

A Thesis
Presented to
the Graduate Schools of
Clemson University and College of Charleston

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
Historic Preservation

by
Brittany T. McKee
May 2014

Accepted by:
Dr. Carter L. Hudgins, Committee Chair
Katherine Pemberton
Richard Marks, III
ABSTRACT

This study is the first comprehensive analysis of domestic cisterns in the antebellum United States. Cisterns, traditionally defined as catchment or storage facilities for rainwater collected by means of a drainage system, became a common domestic utility in Charleston, South Carolina during the nineteenth century. The earliest cisterns on the peninsula were constructed in the city’s more affluent properties. By 1870 they were a household feature in all areas of the city. Two primary factors motivated Charlestonians to install domestic water collection systems. First, the city urbanized with little to no sanitation policy. As a result the city experienced frequent outbreaks of water borne illnesses. Secondly, shallow wells that formerly provided adequate water supplies were contaminated and numerous campaigns to reach pure water by drilling of artesian wells failed. In response to this rising fear of disease, residents incorporated cisterns that provided a convenient and well-monitored source of potable water. Cistern technology evolved throughout the nineteenth century in response to developments in the field of bacteriology and sanitation reforms of the Progressive Era. The drive to provide potable water coupled with the standardization and development of new construction materials vastly altered cistern design and application. Surviving cisterns, trades catalogues, and city records identify physical variations and commonalities in cistern design and placement. The creation of the City of Charleston Water Works Company in 1879 obviated the need for private sources of clean water and by the early twentieth century city officials discouraged cistern use.
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Cisterns are traditionally defined as catchment or storage facilities for water (primarily rainwater). Cisterns in Charleston, South Carolina are supplied by interior and exterior drainage systems that collect water from the roof of a structure.\(^1\) The name of these receptacles derives from the Latin, *cisterna*, or *cista*, meaning “box or chest.”\(^2\) Cisterns have historically been constructed with various kinds of masonry such as brick and stone, and later, lead. Romans built early cisterns and water pipes with lead linings to service their early civilizations. Lead was shaped by being rolled into thick sheets around a wooden core to create pipes.\(^3\) Lead was later used to create ornamental pipes for gutters and cisterns in thirteenth-century England and France. In the twelfth century carpenters worked with lead to create cisterns and plumbing features, these first tradesmen were referred to as “leadworkers.” Plumbing was not officially recognized as a trade or profession until the foundation of The Plumber’s Company in London in the fourteenth century.\(^4\)

Cisterns can be viewed as a response to evolving human needs. The need for a supply of water for drinking, cleaning, growing crops, and fire protection was the impetus for the construction of early cisterns. This thesis evaluates these concerns in early Charleston, South Carolina and outlines how the cistern moved from a public water source to a feature of the average home.

\(^{1}\) Carl Lounsbury, *An Illustrated Glossary of Early Southern Architecture and Landscape* (Charlottesville: The University of Virginia Press, 1999), 88.
As issues with water collection evolved from a simple solution for scarcity of water to locating a source of uncontaminated water, cistern design improved to provide complex systems of filtration. By the eighteenth century, cisterns were a popular method of minimizing the spread of disease in both Europe and the Americas.

Little is currently known about the prevalence and role of domestic cisterns in Charleston, South Carolina. As with the development of any city, the need for a controlled source of potable water was of upmost importance in Charleston. The city’s 1886 Sanborn Fire Insurance Maps mark the locations of municipal water providers including fire wells, hydrants, and large private or industrial cisterns. This public identification of water sources was, in part, a response to fire concerns but these map symbols also signal the efforts to provide a safe water supply for drinking. Beyond the cistern for fire protection, numerous households in Charleston constructed cisterns most often in cellars, beneath dependencies, or in lined boxes attics. This shift leads to questions about the motivation behind Charlestonians to provide a controlled water source at their property.

This thesis explores the motivating factors behind Charlestonians efforts to control their source of water. The two factors identified were constant: first, the health epidemics born of poor sanitation that plagued nineteenth-century American cities, and second, urbanization without regard for sanitation policy.

The domestic cistern in Charleston is in many respects a result of urbanization. As was the case in most American cities, Charleston’s urbanization led to the development of sanitation issues. As cities became more dense the onslaught of human waste and

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6 For a full analysis of cisterns for fire protection including the location of fire cisterns and wells in Charleston see: Rebecca Moffat, *The Fire Houses of Charleston, South Carolina 1881-1943* (Master’s Thesis: Clemson University, 2011).
activity contributed to the breeding of illness and contaminated public wells. Devastating yellow fever outbreaks struck the city annually between 1790 and 1858. In 1849, nearly eighty percent of Charleston’s population, which was about twenty-four thousand, suffered from dysentery. Martin V. Melosi, author of Precious Commodity: Providing Water for America’s Cities, argues that, water supply in the nineteenth century assumed the imperative of “home-rule.” By this Melosi means that the private citizens took initiatives to provide a water collection to prevent the spread of disease.

The following chapters define and explore the origins of the domestic cistern in Charleston as well as provide a comprehensive study of cistern design and technology. Chapter Two traces Charleston’s physical development from a small walled city to a dense urban area that increasingly faced drainage and sanitation issues. The chapter explores the artesian well drilling campaigns that begin in 1823 and were unsuccessful until the 1870s. It was this failure that in part inspired Charlestonians to construct cisterns to supply water.

Chapter Three explores the history of public health in Charleston and the effects that epidemics born of poor sanitation had on the city. This chapter outlines the earliest sanitation efforts such as the creation of the Medical Society in 1789 and the creation of the Board of Health in 1808.

Chapter Four provides a comprehensive analysis of water infrastructure at fifty-six Charleston properties. Through an analysis of existing cisterns two patterns emerge concerning date of construction and location. Domestic cisterns in Charleston were first constructed at the turn of the nineteenth century when shallow wells were contaminated

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8 Melosi, Precious Commodity, 38.
and abandoned. By 1840 cisterns were built in cellars during the first phase of construction and beginning in the late 1850s they were connected to broader plumbing systems that serviced water closets, sinks, and baths.

Chapter five explores the failures and successes of these plumbing utilities in the 1870s along with strides in cistern development. In the late 1870s Charleston and the United States was struck by a second sanitary upheaval when epidemics borne from poorly constructed plumbing utilities swept the nation. This rise in concern led to the publication of various plumbing and drainage advice magazines including the *Plumber and Sanitary Engineer*. The *Plumber and Sanitary Engineer* included the latest developments in cistern technology and filtration methods both of which are explored in this chapter.

The cistern was a basic household utility that when studied provides insight into the lifestyle and concerns of early Charlestonians. They are physical remnants of human innovation and a response to environmental and social change. An analysis of existing cisterns in Charleston brings forth two patterns. One, cisterns are a private response to the nineteenth-century epidemics and the fear they inspired. Prior to the turn of the nineteenth century city residents relied on water pumped from public and private wells. As the peninsula urbanized and lots were divided to accommodate this growth, privies were constructed closer to wells than they had ever been. This fact coupled with increasing pools of stagnant water that were a result of the city’s climate and topography created a dismal sanitary environment. Shallow wells were contaminated by encroaching waste and the death toll rose consistently throughout the century. Multiple waves of yellow fever, typhoid fever, and other epidemics born of poor sanitation plagued the city. It was this rising death toll and fear of disease that inspired the city’s affluent property owners to construct private cisterns. In Charleston, the incorporation of cisterns was a rapid response to public alarm. Property owners constructed cisterns in work yards and under dependencees as early as
1801, seven years prior to the creation of the city’s Board of Health. Cisterns were part of Charlestonians efforts to avoid contributing to the city’s rising death toll. Property owners did not wait on public health and social reforms but instead reacted individually. There is a consistent rise in cistern construction throughout the nineteenth century as more and more property owners realized they needed to create an individual protected supply of water. Second, two trends arise concerning cistern construction and location on the property. Cisterns are constructed at three primary locations: the work yard, under dependencies, or under main houses either in the cellar or crawl-space. Their location is dependent on date of construction. Earlier cisterns were constructed in yards or under dependencies and by the late 1830s were constructed under the main house.

Like any historic city, Charleston bears physical evidence of years of technological advancement and change in its building stock. In Charleston’s case, cisterns are a reactionary aspect of the built environment. This thesis recognizes the domestic cistern as an integral aspect of the historic built environment of Charleston by outlining its evolution and defining its role in households of the city.

**Methodology**

This thesis identifies the relevant historic factors that led to the implementation of water catchment systems in Charleston homes and how these systems evolved. Through analysis of primary documents and physical examination of existing cisterns this thesis explains the use and development of cisterns and their implementation as a household feature. It is clear that in the earliest years of the city’s development, Charlestonians drew water from shallow wells. By the early nineteenth century, the first domestic cisterns were built in new houses. Throughout the mid to late nineteenth century, complex domestic
cisterns were added to homes, often in attics, under porches, or under dependencies. This study analyzes cisterns as an aspect of material culture and identifies cistern implementation as a response to social factors, health concerns, and technological developments. The answers to these questions can be achieved through a four-part analysis of domestic cisterns in Charleston, South Carolina.

The bulk of this analysis is rooted in understanding the cultural and physical make-up of early Charleston. The first step in this portion of the analysis was to review early maps and accounts that described the topography of the peninsula. To perform the second phase of this analysis, understanding public health and drainage issues in Charleston, a variety of primary sources were consulted including: The Charleston City Yearbooks, City Council minutes, and the Mayor’s Annual Reports. Intact City Council Ordinances are kept on microfilm at the South Carolina Room in the Charleston County Public Library.\(^1\) For this study, ordinances of the City Council of Charleston were reviewed based on an index search of relevant terms: water, cistern, well, drainage, and cellar. When ordinances were found, period newspapers were accessed that included the Mayor’s Annual Report of the year that particular ordinance was passed. This research illustrated the political climate surrounding the adoption of city ordinances relating to water, public health, and drainage.

The Charleston City Yearbooks were published annually from 1880 to 1951. Each book includes a snapshot of municipal life through published reports from the city’s boards and commissions. For this analysis the statements produced by the Board of Public Works and the Board of Health were review biannually between 1880 and 1907. These publications include the Mayor’s Annual Report every year after 1880 as well as exten-

\(^1\) *A Digest of Ordinances of the City Council of Charleston 1783-1844* (Charleston: Archibald E. Miller, 1818).
sive appendices describing events from Charleston’s history. The 1881 City Yearbook, for example, included a history section which presented an overview of Charleston’s water history and a detailed description of the artesian well campaigns that took place from the 1820s to the 1870s.²

A well supported explanation on the implementation of cisterns found throughout the related literature is that domestic cisterns were a response to the water-borne epidemics of the nineteenth century. Scholars state that the general acceptance of the Miasmatic Theory and, in later years, developments in the field of bacteriology, made urban residents become more aware of the connection between foul water and disease, and therefore more protective and aware of their water supply. This new awareness caused citizens to privatize and maintain their water supply in fear of disease. This is seen in Charleston by evaluating the effects of these diseases on the city’s population and the reactions of the city government through public health campaigns.

To create an understanding of the development of public health legislation in Charleston a number of secondary sources including Leon Banov M.D. and Public Health in Charleston by William Atmar Smith and A History of Medicine in South Carolina by John Waring were reviewed.³ This secondary analysis created an outline for an analysis of primary documentation. The most comprehensive documents reviewed were published by the Charleston Board of Health. This collection included reports given to the Board of Health concerning major health issues such as epidemics. Documents published during the years the city was plagued by water-borne epidemics were studied closely.⁴ The min-

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² Charleston City Yearbook Collection, South Carolina Room, Charleston Public Library, Charleston, South Carolina.
⁴ Yellow fever outbreaks were documented in Charleston in the following years:
utes of the Medical Society are another important source relating to public health policy in Charleston. The minutes of the Medical Society are available online provided by the Medical University of South Carolina. These minutes were keyword searched for the terms: cistern, well, water, draining, and epidemics. Each of these sources provides insight into the living conditions in Charleston and resident’s response to water and sanitation issues.

An important step in this research was the identification of cistern craftsmanship in Charleston. One of the indicators of cistern popularity and use is the presence of cistern makers, plumbers, or masons with skills related to cistern construction. This information was gleaned through an analysis of period newspapers and City Directories.

The real estate portion of three historic Charleston newspapers: *The South Carolina Gazette*, published from 1732 to 1775, *The Charleston Times*, published from 1800 to 1821, and *The Charleston Mercury*, published from 1822 to 1866 provided insight into the makeup of Charleston properties, including cistern size and location. Property advertisements were reviewed in each of these newspapers for three months of the year every ten years to identify trends in cistern placement.

The Charleston City Directories identify the work force active in Charleston. City Council created the City Directories to catalogue residents and businesses in the city and were published annually from 1782 to the present. Each directory includes advertisements for local businesses as well as an alphabetized list that identifies city residents by name, profession, address of residence, and address of place of work. After 1890 the volumes are indexed by street address. For this analysis, two months from every three years between 1800, 1802, 1804, 1817, 1820, 1821, 1824, 1827, 1828, 1838, 1839, 1849, 1852, 1854, 1856, 1858, 1864, 1871, and 1876. Dramatic Cholera outbreaks were documented in Charleston throughout the 1840s.
1782 to 1840 were reviewed to gain an understanding of trends in the number of craftsmen and laborers employed in the plumbing industry. The directories were keyword searched under the terms: plumber, leadworker, and cistern.

The bulk of this analysis relies on a physical investigation and documentation of existing domestic cisterns. One of the first steps in completing the physical analysis was to identify the location of existing cisterns in Charleston. Identifying the location of existing cisterns and determining when these cisterns were constructed formed a generalized date of cistern implementation in the city. Fifty-six properties on the Charleston peninsula were identified that had some sort of early water infrastructure. Properties were chosen based on access and knowledge of cistern or well location after consulting with local professionals and property owners. A database of cisterns was created that organized cisterns chronologically based on date of construction and noted the house name, street address, year of additions, roof type, and the presence of a well, subterranean cistern, attic cistern, or privy. If accessible, the dimensions, material conditions, exact location on the property, and drainage components were inspected and documented through sketches and photographs. Information about each of the properties was gathered from a number of sources including interviews with property owners and local professionals, Jonathan Poston’s *The Buildings of Charleston*, historic structures reports, archaeological reports, and newspaper articles.5

The final portion of this analysis focuses on cistern-related literature published after 1870. In the fourth quarter of the nineteenth century hazardous indoor plumbing utilities inspired the creation of the field of sanitary engineering. Similar to the turn of the nineteenth century, this era was plagued by disease including typhoid fever and cholera.

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The root of the spread of disease was attributed to poorly constructed indoor plumbing utilizes. As a response scientists and engineers set out to both create and publish solutions to the problem. One of these publications is the *Plumber and Sanitary Engineer*. The first issue was published in 1877 and included sketches of successful drainage systems, articles from professionals in the field, and an editorial section. For this analysis the publication was reviewed annually from 1877 to 1905. The publication was key word searched for the terms cistern and filtration. This publication added an additional layer to the analysis by portraying how cisterns evolved nationally and the filtration systems applied by cistern users who were either not reached by a municipal water supply or solely relied on cisterns for their water supply.

These methods of analysis identify the factors that motivated early Charleston residents to incorporate domestic cisterns. By studying a variation of primary documents, secondary accounts, and the existing materials, this thesis analyzes the evolution of the cistern as a response to the social and environmental conditions of the nineteenth century.
Figure 1.1: Cistern and well locations analyzed by author. (Map of Charleston in 1849, Source: www.carolana.com, accessed March 12, 2013).
CHAPTER II

URBAN GROWTH AND THE SEARCH FOR SAFE WATER, 1680-1905

Charleston, South Carolina has struggled with water management from its initial settlement on the peninsula in the 1680s to the present. Tidal drains, access to potable water, and sanitation were prominent topics in city legislation throughout the eighteenth and nineteenth centuries. Located on a peninsula and bounded by the Ashley and Cooper Rivers, Charleston historically benefited from its access to these rivers for commerce, but the marshland topography often interfered with resident’s search for potable water. By the turn of the nineteenth century, affluent property owners abandoned shallow wells and constructed cisterns to ensure a clean and moderated water supply. This chapter evaluates two aspects of Charleston’s early development that influenced the use of cisterns as a common domestic utility and that, later, led to the creation of a municipal water system. First, the topography of the peninsula directly affected development of the modern city. Over a period of two centuries the topography of the peninsula was altered by landfilling and infill development that negatively affected the sanitation of the city by blocking natural drainage. Second, the city’s rapid urbanization in late eighteenth century stressed the supplies. Charleston doubled in size between 1720 and 1740, and again grew substantially between 1740 and 1820. This abrupt development contributed to increased sanitation and drainage issues that precipitated crisis at the turn of the nineteenth century and inspired residents to seek a new source of water.

The landmass that is the Charleston peninsula was substantially created by infill. A topography that was once dotted by small creeks and marshlands was slowly filled with ballast, stones, trash, and other materials. Infill has received little scholarly attention with
substantial focus on twentieth century infill projects. Period accounts reveal the efforts of early city leaders to expand the landmass of the peninsula and the water issues that stemmed from this movement.

**Initial Foundation**

Charles Town was formally founded in 1670 by English colonists on the western bank of the Ashley River at Albemarle Point, about five miles upriver. This settlement was named Charles Town in honor of King Charles II. The initial settlement site, now Charles Towne Landing State Park, was chosen due to its location on high ground. Colonists aboard the ship *Carolina* followed the path of explorer, Robert Sandford to reach the colony.\(^1\) By 1670, much of North America had been colonized by the English, French and Spanish. Virginia had been settled in 1607 and Massachusetts in 1620. Although colonists in the Carolina Colony did not face the brutal winters and trials of early colonization that their northern counterparts did, they too contended with the elements and environmental concerns. One of the earliest challenges in the Carolina Colony was access to water. Water shaped decisions about the location of the early settlement and was needed both for drinking and as a protective boundary. Colonists chose to locate their settlement on high ground not only because it provided a solid foundation for construction but because it provided a view of the Ashley River where incoming ships and threats could be spotted. By 1672, the settlement included roughly thirty houses and two hundred people. During the early 1670s, colonists set out to discern if their current settlement was the most prosperous and desirable location. By February of 1672, they had elected to relocate from the current settlement at Albemarle Point to nearby Oyster Point, across the Ashley River.

\(^1\) Three ships left England in 1669, the *Carolina*, the *Port Royal*, and the *Albemarle*. The *Carolina* was the only ship to complete the voyage, the *Port Royal* and the *Albemarle* were damaged during the journey or lost in hurricanes but the passengers survived.
Colonists relocated to the peninsula of Oyster Point because this new location between the Ashley and the Cooper Rivers made for a defendable location, strengthened their opportunity for trade, and the high ground provided opportunities for a superior water supply. On December 17th, 1679, the Grand Council agreed that the settlement at Albemarle Point would be moved to Oyster Point. By 1682, one hundred houses had been constructed at the new site.

The settlement at Oyster Point rapidly grew both in population and physical land mass. The settlement was walled and bounded by modern Water, East Bay, Cumberland, and Meeting Streets. In his 1819 essay on the topography of Charleston, John L.E.W. Shecut described numerous creeks that meandered across the peninsula. In the historic core of Charleston, Shecut described up to ten “large creeks and several smaller ones” along with numerous ponds, marshland, and “broken ground.” It was this irregular topography, coupled with the need for a defensible position, that led settlers to occupy the high ground along the Cooper River. Within the first year of settlement, thirty houses, most constructed of wood, appeared within the town limits. Brick and earthen walls surrounded the early city with small wooden bridges eventually spanning the larger tributaries. The future site of the State House, at the corner of Broad and Meeting Streets, was initially a large pond dotted with pieces of broken land. Shecut attributed this to the natural lowness of the topography.


Figure 2.1: The Crisp Map of Charles Town 1711 (www.memory.loc.gov).

Figure 2.2: Iconography of Charleston, South Carolina, 1788 (London: E. Petrie, 1790, www.memory.loc.gov).
The Grand Modell, a 1680 plan for the city, shows an expanded settlement north to present day Beaufain Street. The plan included wide streets with deep and narrow lots and a central civic square at the intersection of Meeting and Broad Streets. In 1719, royal rule replaced the acting proprietary system of government. During this era, rice became the colony’s cash crop and the labor of enslaved Africans grew more and more essential to expand Carolina’s plantation economy. Throughout the eighteenth century, Charleston grew in economic consequence; with a per capita income that was highest in the colonies. By 1730, the south, west, and northern walls were demolished and the city had begun to expand to the south and west. By 1740 the city had doubled in size from its original eighty acre settlement. As the city grew so did the need for potable water.

From 1680 to about 1800, the best method of gathering water was to sink a well between twelve and fifteen feet in depth. At the time of settlement, the peninsula was composed of a layer of quartzose sand between eighteen and twenty feet thick. Below that on a lower bed, was a layer of blue thick clay that was impervious to water. The lower portion of the sand layer was usually saturated with water from rainfall, which averaged forty-three inches a year. The climate in Charleston was usually mild but with years of record heat and drought in 1728, 1738, and 1818. These droughts were described as causing pools of standing water to dry and rivers to become too shallow to navigate. The shortage of water killed animals and plants.

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7 Charleston City Yearbook 1881, Charleston City Yearbook Collection, South Carolina Room, Charleston Public Library, Charleston, South Carolina.
8 Charleston City Yearbook 1880, Charleston City Yearbook Collection, South Carolina Room, Charleston Public Library, Charleston, South Carolina: 315.
As the city grew, well water in dense urban areas became contaminated by nearby privies and stagnant drains and therefore dangerous to drink. Water issues constantly plagued the city, leading officials to suggest various solutions, among them obtaining water from springs on the Charleston Neck, an area north of the city, where there was less development, and therefore a more pristine supply. Officials suggested that this supply be collected and transported to the city through wooden pipes or carts. As the peninsula continued to urbanize, none of these suggestions were adopted. Wealthier citizens sought to meet their individual needs by collecting rainwater from their roofs and preserving it in “water-tight” cisterns, primarily located underground. This domestic water supply was used for cleaning and could be filtered for drinking. Cisterns gradually came into use for the middle classes and eventually were a commonality in all Charleston dwellings to fulfill the universal need for safe, clean water.\(^9\)

**Urban Growth and Municipal Improvements**

One of the earliest municipal landfilling campaigns took place in 1754 when State House Square and Vanderhorst’s Creek were filled to accommodate the city’s growing population. By 1765, there were 1,200 residential structures in the city and the marshland on the western edge of the peninsula (modern day Montagu and Wentworth Streets) had been improved for further construction.\(^10\) In 1764, City Council enacted an ordinance to prevent garbage from being disposed of in the streets, but it appears that this amendment was difficult to enforce as it was amended and attempted to be enforced various times.\(^11\)

\(^9\) The Charleston City Yearbook 1881, 259.  
\(^10\) L.E.W. Shecut, *Shecut’s Medical and Philosophical Essays* (Charleston: Printed for the author by A.E. Miller, 1819).  
\(^11\) Alston et al, Between the Tracks, 97.
In 1783, the city was incorporated and formally named Charleston. At this time the city boundary was moved four blocks north from its previous location at Beaufain Street to the aptly named Boundary Street (present day Calhoun Street). This expansion helped to accommodate Charleston’s growing population. Existing lots were divided, often doubling or tripling the number of buildings on each site. In 1806, city officials passed an ordinance that required a group of slaves to remove garbage from the streets every day except Sunday using carts or wheelbarrows. This group was also required to rake and level the streets and clear any debris from gutters or grates to keep the city drains free from obstruction.\textsuperscript{12} As the fear of disease caused by stagnant air or water increased, low areas of the peninsula were filled to eliminate standing water.\textsuperscript{13} In 1831, the original town settlement, south of Boundary Street, was divided into four wards. By 1849, the area above Boundary Street and below Line Street, commonly referred to as The Neck, was annexed and separated into what became known as the four “upper wards.”

The city followed this organization with a series of improvements to make the city more attractive commercially. As one of the first official steps, the City Council appointed a Commissioner of Streets and Lamps. In 1832, the city government placed and maintained 1,722 lamps.\textsuperscript{14} Fear of fire prompted the council to appoint a Board of Fire Masters that included an engineer, city employees, and volunteer groups to respond to threats of fire. A majority of the streets in antebellum Charleston consisted of dirt, creating dusty or muddy environments that slowed transportation and commercial endeavors. The solution was to pave some streets with granite Belgian block obtained from quarries in Winnsboro and Columbia, South Carolina. The first waves of this kind of improvement took place in the commercial districts and the residential areas of the wealthier lower

\textsuperscript{12} Alston et al, \textit{Between the Tracks}, 97. \\
\textsuperscript{13} This will be analyzed in greater detail in Chapter Three. \\
\textsuperscript{14} Ibid, 96.
wards. According to the City Receipts and Expenditures from 1850-1851, the streets as far north as Vanderhorst Street were paved with stone and the upper portion of King Street and side streets were covered with wooden planks. These municipal improvements helped to better sanitary conditions and created a higher standard of living in the city.

**Urban Specialization**

Charleston is often noted for its pre-industrial character. The early affluent town was made possible by the success of surrounding plantations that relied on slave labor. The city was managed mostly as a small town, and as the peninsula urbanized, sanitation issues emerged. Admittedly, the sanitation measures the city pursued illustrated a significant division between social classes. Wealthier residents had the means to construct cisterns, privies, and bricked drainage yards to deter disease, while poorer residents were left to rely on minimal municipal improvements. By the mid-nineteenth century, the city began to show the first sign of urban specialization with a more distinct separation of functions, creating commercial, industrial, and residential areas. The rapidly growing population and distinction of spaces resulted in commercial specialization and a call for municipal improvements to support a growing economy. The main focus on civic improvements included improving drainage, paving streets, building sidewalks, and adding lighting.

Charleston’s growth paralleled the mid-nineteenth century urban growth in the United States as a whole and as a result, significant municipal reform occurred. Between 1790 and 1870, the urban population in the United States grew from 202,000 to 15 million. By 1870, twenty-five cities boasted a population of more than 50,000; in 1790 no city had been that populated. Although Charleston was one of the nation’s smaller cities, 15


16 Ibid, 93.
it faced many of the same issues plaguing larger American cities: limited public transportation and a landmass that did not accommodate a growing population, as well as, significant sanitary and safety issues. Like most cities of the era, Charleston was densely populated in both its residential and commercial areas. Cities throughout the country, most notably port cities that relied on mercantile industries and trade were beginning to grow substantially throughout the nineteenth century. Financial prosperity and immigration were two of the main factors causing this rise in population. It was during this era that the Charleston City Council elected to monitor city growth through various systems of accountability including annual directories that numbered houses and organized areas of the city into wards. The city expanded around its port and commercial corridor beyond the main streets. Periphery streets grew mainly as private residential areas. This pattern of development resulted in a grid with subtle variations modified to the existing topography.

In these new neighborhoods, management of storm water was handled through tidal drains constructed as early as 1806. The oldest drains were made of wood and diverted substantial rainfall and sewage from the streets. Drains were often stagnant and collected waste since they relied on rainfall to provide a flow of water to keep them clean. The tidal drain system was adopted in the early nineteenth century by City Council members: Dr. William T. Wragg, Dr. William Hume, and Mr. James M. Eason. The system called for a series of mains to be laid about twenty inches above the low-water-mark on

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18 Alston et al, Between the Tracks, 93.
the longitudinal streets while lateral drains were then run perpendicular to accommodate the cross streets. All drains were designed to rest on a solid two-inch wood plank foundation. The drains were lined with cement and had a circular base with curved connections to easily direct the flow. Tidal changes flushed the system and excess water was kept in a reservoir on the western side of the city. Although this plan was put in place to relieve the city’s drainage issues, their poor design compounded the problem. According to the City Engineer in 1880, the drains were inadequately built on plank bottoms with open joints, omitting the curved brick foundation and cement lining. The constant rush of tidewater had washed sand from below the wood plank foundations causing settlement within the drains. In many places, drains were holding stagnant water about eighteen to twenty-four inches deep even after flushing. Large areas of built up silt and waste blocked numerous drains and at times leaked on to the streets. In some areas, drains had either settled or were constructed poorly resulting in a disjointed system that could not be thoroughly flushed. For example, the Franklin Street drain was set eighteen inches below the Broad Street drain that it was designed to release into. Furthermore, the system was built with no designated openings for inspection or cleaning. Residents in the vicinity of the drains often demanded cleaning and openings were forced in the arch of the drains with pickaxes to access stagnant material. Although well designed, the drain system was poorly implemented and constructed. By the late nineteenth century the system was also quite costly to maintain, costing the taxpayers $93,106.41 from 1865 to 1880 to clean.\textsuperscript{20} There was also a significant deficiency in yard drains. With no official guidance on size or depth, many private residential drains contributed to the cesspools that dotted city streets.

\textsuperscript{20} Charleston City Yearbook 1880, 37.
The drainage and water issues in Charleston were closely related to the issue of removing human waste. Throughout the colonial and antebellum periods, Charlestonians relied on privies and submerged vaults to collect waste material. The first ordinance that regulated the disposal of waste was passed in 1698. It required residents to empty and clean privy vaults on a regular schedule. Vaults often overflowed into the streets and in 1836 an ordinance was passed that required privies be constructed at least ten feet away from the street. This ordinance was expanded in 1851, when an ordinance was enacted that made it unlawful for a privy to empty in a city drain. Despite the efforts of city officials, insufficient waste management led to the most significant water issue. Since lots were often subdivided, they maintained double the amount of human activity. This division resulted in congested residential areas. Twice the human population on each lot also meant twice the waste and garbage. Shallow wells used to collect drinking water were contaminated as waste material was absorbed into the soil. This was one of the main factors motivating Charleston residents to construct cisterns to collect and store rainwater. As a secondary measure, residents constructed brick drainage systems to divert harmful materials from areas of water collection.\textsuperscript{21}

The contamination of existing groundwater and lack of potable drinking water was a common issue in nineteenth-century cities. Sanitary issues relating to insufficient water access led to the creation of private and municipal water systems throughout the country. Philadelphia was one of the earliest U.S. cities to develop a centralized water works. In 1801, Philadelphia began developing a water system after the report published by Benjamin Latrobe on the sanitary condition of the city. Philadelphia, like most river cities of the era, constructed a steam-driven water pump that drew water from nearby rivers. Other cities looked to reservoirs or watersheds for water. By 1860, the sixteen largest

\textsuperscript{21} Alston et al, \textit{Between the Tracks}, 102.
cities in the United States utilized municipally owned water systems. In many cities, these services were initially offered by private companies meaning that only the commercial and upper-class residential areas could afford the service. In most working class areas residents had to travel to public wells or pumps to collect their supply.22

Artesian Well Campaigns

By the 1820s, Charleston officials recognized the need for a more dependable water supply and organized sanitary measures. In 1823, the Charleston City Council appropriated a budget for sinking an artesian well to provide enough water to supply the city. The first recorded attempt to sink a well greater than fifteen feet had been three years earlier in 1820. According to the City Yearbook a property owner named Longstreet sought to provide water of a higher quality for his residence. Longstreet sank a circular well that was twenty feet deep to a layer of stiff clay. Longstreet experienced difficulty keeping water from the upper layers of sand around the well from seeping in and collapsing the walls. In the middle of the campaign, Longstreet altered his plan and sank an iron pipe through the clay to a depth of thirty-seven feet, resulting in a total depth of fifty-seven feet. At this depth, water freely filled the well bringing a supply within six feet of the surface. The total cost of Longstreet’s project was one thousand dollars. The 1881 Charleston City Yearbook denotes that this was “similar but purer than ordinary well water,” and was deemed potable. This well was probably located on the north side of Queen Street between King and Archdale streets and provided adequate water supply up to forty years after its installation.23

23 Charleston City Yearbook 1881.
The success of Longstreet’s campaign spawned a series of efforts known as the “sixty feet wells.” Citizens attempted to sink wells through the stiff blue clay to a layer of moist sand recorded to be sixty feet below the surface. Over a dozen wells were bored but no municipal water works was created and no private enterprise through the boring of wells would be financially viable.\(^{24}\)

By the mid 1820s, reports of successful artesian wells in London reached officials in Charleston. Descriptions of tools used and illustrations of the process were sent from London by Charlestonians touring Europe. These drawings and the news of this successful endeavor abroad gleaned the public attention. Drawings and descriptions of well drilling methods were placed on public exhibition. By 1823, the City Council was ready to undertake an artesian well for the public benefit and a committee was created and given the authority to act. The work took place in what was known as the Poorhouse Yard on Mazyck Street and was overseen by Dr. Philip Mosher and Mr. John Strohecker. This attempt was not successful. Unlike the London clay, the iron rods and tools were not suited for the sand layers and variation in Charleston strata. This first attempt took six months of labor, with significant difficulty removing sand to pass from a depth of sixty-one feet to sixty-seven. Dr. Mosher made a second attempt in 1825 at the State Arsenal Yard at the corner of Meeting and Broad Streets. Due to his previous failure, Mosher quickly lost his financial support and was forced to abandon the effort. In the race for water undertaken by private citizens, one of the most successful was Dr. Joseph Johnson. Johnson sought to drill an artesian well to provide water for tenements that he owned on Washington, Inspection and Boundary Streets (now Calhoun). Johnson was successful until his well
reached a depth of 109 feet where he encountered a small stream of water common in the layers of limestone marl. The well’s low position and stream caused water to flow over the surface, inhibiting the team from drilling deep enough to reach a pure source of water.

After numerous attempts there was a lull in water seeking, but Charlestonians would again be inspired by international success when an artesian well was bored in Paris. After eight years of work in Paris, workers reached a depth of 1,800 feet and created a well that provided a stream of 900,000 gallons of water every twenty-four hours. This, coupled with rapid strides in the field of geology inspired efforts, especially when it was discovered that the strata of the Southern Atlantic coast was similar to the strata of Paris and London. These studies were headed by the acting State Geological Surveyor, Micahel Tuomey, who hypothesized that since water was being reached at depths of 350 to 900 feet in western areas with less tools and machinery of those in Europe, it could be reached in Charleston. Governor James H. Hammond appointed Tuomey as the acting “State Geological Surveyor” in 1844. His research was heavily rooted in understanding the soils, minerals, and marl throughout the state to identify any economically prosperous mineral deposits.²⁵ Tuomey, hypothesized that water could be reached at depths between 400 and 500 feet in Charleston if engineers could overcome the mechanics.

Major Bowman, the engineer in charge of construction at Fort Sumter, reinstated drilling efforts in 1844. Bowman sought to drill an artesian well in the fort to secure an ample supply of water. Bowman utilized cast iron pipes, iron rods, boring augers, cylindrical buckets with valved bottoms, and other tools to complete this well. One year later, the City Council supported the drilling of a public artesian well at the corner of Meeting and Wentworth Streets under the supervision of engineer General A.H. Brisbane. Brisbane closely followed the plan executed by Bowman at Fort Sumter. The two wells were about

²⁵ Edgar, South Carolina Encyclopedia, 982.
four miles apart and were sunk at about the same time. The coincidental sinking of these two wells at similar times allowed the engineers to compare and better understand the strata of the region. The Fort Sumter well failed at a depth of 347 feet and shortly after, Brisbane’s well failed at 290 feet and work was suspended. By 1847, the City Council approved work to resume under the supervision of an engineer who had previous successes boring wells in Alabama, A.C. Melton. Melton employed unique methods including utilizing wooden rods with iron screws rather than iron rods. He often applied many of his own inventions when drilling the well and persevered for months to drill beyond the running sands and rock layers until he reached a depth of 1,260 feet. At this level water was found to rise to a level of twenty-four feet and ten inches delivering thirty gallons a minute. Study of the well showed that this quantity of water, which seemed small in relation to the amount of effort extended, was the amount that should be delivered by the well considering its depth. The friction of the column of water against the narrow pipe was the cause for the small quantity of water delivered; it was hypothesized that a larger diameter would yield a larger supply. These findings led the City Council to again authorize Melton to drill a well on the same sight in hopes of a higher yield. Melton was able to work more efficiently and economically on the second attempt. The first attempt cost 30,000 dollars but on the second attempt, this amount was reduced to about a third of the cost. A lost bucket and rods coupled with the financial impact of the Civil War suspended work in 1862. By 1867, the City Council allotted funds to remove any obstructions and continue drilling the well but due to old age and sickness, Melton could not complete the task.

In was not until 1876 that the efforts to drill a deep artesian well were revisited when a contract was made between the city and F. Spangler, a well-borer who had been successful in the Northwestern United States. Spangler applied a different method than that of his predecessors all of whom had used irons rods. The iron rods were an inch or
an inch and a half square and each of the rods were screwed together end to end to form a continuous iron bar that would reach the bottom of the well where an auger, which had been previously screwed to the lower rod took the brunt of the work. The weight of the rods was offset by a pulley above that was hand turned to allow the auger to gradually work away the rock or other strata. When a significant amount of debris had been produced, buckets with a valve bottom were lowered to gather and bring out debris that would interfere with the work of the tool. Melton had introduced wooden rods because they were lighter and more manageable than iron rods. Spangler abandoned the technique of the auger and hand boring and applied a system of water boring. To pass marle, clays, and hard rocks, Spangler relied on a heavy chisel of 1000 pounds; but like previous well borers faced the issue of alternating layers of hard and soft strata of the Charleston marle. Spangler credited his success to a unique chisel referred to as the “under cutter,” that enabled him to enlarge an opening to sufficiently allow passage for the boring tube. Spangler is credited with the first successful artesian well at the corner of Wentworth and Meeting. After his success, Spangler entered an agreement with the city and began a second well on George Street. He would continue to bore four major wells throughout the city that would later constitute the city’s public water supply.  

Fresh water was thoroughly tested when reached by drilling. The water from the 12,600 feet deep Wentworth Street well was compared to water from former campaigns and the results proved that water from deeper wells was far superior and contained less residue than the water from previous shallow wells. The water from artesian wells was deemed healthful. It was considered safe for all uses including laundry, baking, and cooking despite early fears that the water added a golden hue to starch based foods such as hominy and rice. This was later attributed to a reaction between the soda in the water and

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the starch in the food. The “soda” content was also an issue with laundry that was to be
starched; the review committee suggested washing articles of clothing with the water then
rinsing articles with cistern water to prevent action between soda and starch. An 1882
report on the healthfulness of the water from artesian wells stated that the deep wells did
not exceed a ratio of one to ten organic matter to pure water. This was attributed to the
excessive filtration of the water as it has passed through the layers of soil and rock and the
oxidation of organic matter in water.

Various studies were performed to compare the water flowing from artesian wells
to previous water supplies from cisterns and shallow wells. The 1881 Charleston City
Yearbook outlines theses studies by illustrating the cleanliness of collected rainwater. The
water from deep wells did not contain the quantities of free albuminoidal ammonia and
nitric and nitrous acids, that cisterns contained which changed yearly depending on rain-
fall, the locality, or the season of testing.

The public cisterns in 1881 were classified as:

Safe waters:
- Main Police Station Cistern
- St. Philip Church Cistern
- Medical College Cistern

Reasonably Safe Waters to Somewhat Suspicious Waters:
- Queen Street Cistern
- Holy Communion Parochial School Cistern
- Broad Street Cisterns, A and B
- Queen Street Cistern

Suspicious Waters
- Upper Station cistern
- St. Mary’s Church cistern

27 Charleston City Yearbook 1881, 279.
28 Charleston City Yearbook 1881, 293.
A complete water system was not functioning in city residences until 1905 and then it only serviced areas south of Broad Street. Even then, many residents relied on cisterns to provide water for household uses and drinking. Even though public water was available it was primarily used for fire prevention and cleaning drainage and sewage systems. In 1905, The Commissioner of the Board of Health published a list of suggestions for household cisterns; the main suggestion was that cisterns must be kept “clean and tight,” to provide the purest water.29

**Water Issues Continue**

In the 1880 City Yearbook, Charleston’s Mayor Courtenay addressed the operations of the past decades in reference to water. He stated that although,

..the operations of the Board have been extensive during the year, a very large amount of cleaning of drains and vaults, and filling low lots, has been done to the benefit of the city. Much has been left undone, not from any unwillingness on the part of the City Council but for want of present means, to fully carry out the view of the board. We have, however, reached a point in our municipal affairs when some comprehensive plan must be adopted for the sewerage and drainage of the whole city.. 30

Initially, the city looked to Memphis as a model and the improvements made by Colonel Waring who utilized a piping system to dispense waste and move clean water throughout the city. In 1880, the Memphis plan was presented to the Board of Health and the City Council to improve the sanitary condition of the city. In the 1880 City Yearbook,

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29 Alston et al, *Between the Tracks*, 105.
30 *Charleston City Yearbook 1888*, 30.
cess vaults or privy vaults were identified as the most pertinent sanitary measure to be addressed. Mayor Courtney stated that the problem “demands immediate solution.”[^31] He addressed the issue as:

> ...a daily discomfort to our existence, lowering the vital standard and every of the whole population by the putrid contamination of the air we breathe, and often the water thousands drink, originating a large class of maladies known as filth diseases, and perpetuating a high annual death rate by the operation of causes strictly preventable...[^32]

He identified population growth as the root of the problem. By 1880, 50,000 people lived on the 3,000 acre Charleston peninsula resulting in about 6,000 to 7,000 houses, each with a privy vault. This resulted in at least 100,000 pounds of human waste being deposited below ground every twenty-four hours.

In 1874, Boston created a commission of scientists to investigate the sanitary condition of their city. The resulting report identified the origin of diseases causing the highest mortality rate in the city as typhoid fever, cholera, and other diarrheal disease. These could all be attributed to “infection by filth.” Meanwhile other diseases spread rapidly because of the city’s poor sanitary condition such as, diphtheria, scarlet fever, pneumonia, and spinal meningitis. This awareness and sense of urgency demonstrated by city officials in Boston eventually trickled throughout the eastern United States.

Charleston recognized that its annual expenditures on disinfectants were wasted if attention was not paid to the drainage and water conditions of the city. The city thus shifted its focus from cleaning, to creating a successful sewerage and water system. In 1874, John Simon reported to the Government Board of London that, “there can be no effective sanitation for this City that does not take into account the complete abolition of the entire

[^31]: Charleston City Yearbook 1880, 30.
[^32]: Charleston City Yearbook 1880, 30.
system of cesspools and privy vaults located in the soil…The only proper way to deal with excrement is to carry it as fast and as far away from human dwellings as possible.” After reviewing the reports from other cities, Mayor Courtenay enforced a plan to monitor the city’s health conditions through paving streets and creating a city Board of Health.

**Map Study**

The Halsey Map of 1949 illustrates the peninsula’s growth by denoting the location of the historic high tide line, historic settlements and fortifications, and areas that have been filled since the city’s founding in 1680. Alfred O. Halsey, a resident of Charleston who owned a sawmill on the western edge of the peninsula, created the map by superimposing these notable early features on to a 1949 City Engineers map of the peninsula. Halsey noted that the oldest portions of the city were built on “virgin soil” but the peninsula was expanded through infill campaigns where low areas were filled with collected garbage and debris. The initial settlement of Charleston was dictated by the topography of the peninsula.

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33 *Charleston City Yearbook 1880*, 33.
Figure 2.3: The Halsey Map, 1949 (The Preservation Society of Charleston).
CHAPTER III

PUBLIC HEALTH AND DISEASE IN
NINETEENTH-CENTURY CHARLESTON

Carolina was in the spring a paradise, in the summer a hell, and in the autumn a hospital.¹

Communicable disease was a dreaded concern in Charleston throughout the eighteenth and nineteenth centuries. By 1800, Charleston had become a prominent maritime center, attracting numerous successful commercial ventures. Charleston also hosted numerous epidemics.² City Council frequently discussed how to deal with epidemics, and much of their energies were spent on creating boards to pinpoint the cause of these diseases. In time, these boards realized that the public was plagued by the spread of water-borne illness due to a lack of sanitation policy and public awareness. Devastating yellow fever outbreaks ravaged the city annually from 1790 to 1858.³ In 1849, nearly eighty percent of Charleston’s population, then about twenty-four thousand, suffered from dysentery. In the 1840s, contagious disease killed one of every four white children before their fifth birthday. These diseases even more drastically affected the city’s black residents. Fifty percent of all black infants born in the city died before their first birthday.⁴ The threat of

² William Atmar Smith, Leon Banov M.D. and Public Health in Charleston (Columbia: R.L. Bryan and Company, 1968): 14. For the purpose of this evaluation, epidemics are defined as diseases that exist at the same time or season and are rooted in a common cause.
³ Walter Edgar, South Carolina: A History (Columbia: The University of South Carolina, 1998), 220.
⁴ Edgar, South Carolina: A History, 220.
disease spawned constant fear in the entire population. Believing the spread of disease was due to bad air from the marshland climate, white citizens protected themselves by fleeing the city for more temperate climates.

Fear of bad air and water was part of the impetus for domestic cisterns. The theory that epidemics were caused by bad air, referred to as the Miasmatic Theory dates to the seventeenth century. The Miasmatic Theory is rooted in the belief that diseases including typhoid, cholera, and yellow fever, were caused by vapors emitted from decaying matter and stagnant water found in warm marshy regions. Although this theory obscured the true cause, the technological response, and sanitary reform that it spawned addressed the problem. Increased sanitation helped to contain the bacteria that spread these diseases. Newfound awareness spurred private and municipal efforts to better public health by removing hazardous materials and ensuring a healthful water supply.

The nineteenth century is known as “the Golden Century of Medicine” due to strides in the field of bacteriology and further refinement of the microscope. Because of these innovations, scientists now had the ability to trace the cause of diseases to specific germs. Germs responsible for cholera, tuberculosis, and leprosy were pinpointed and cities sought to abolish them.

Throughout the nineteenth century, cities across the United States focused not only on municipal improvements to tame epidemics but also private domestic features such as cisterns and yard drains. Most scientists attributed prominent diseases to an effluvia caused by decomposing vegetable and animal matter that was trapped in the streets because of poor drainage. In response to this belief, the Charleston City Council enforced

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strict sanitation policies. One of the first sanitation ordinances passed, required separation between privies and the water supply. This was a difficult task in Charleston, a city where a single lot could house two privies and two wells within a twenty-foot area.⁶

The response to water-borne illness further stratified Charleston’s population in respect to race and class. Wealthier citizens could afford to construct cisterns and brick drainage systems to stifle the spread of diseases in their homes. Residents of the city’s poorer boroughs and its back alleys suffered a greater risk of infection due to poor living conditions and the lack of sanitation left their water supply at a greater risk of contamination. All of Charleston’s residents faced the added layer of weather impacts on disease and overall health. The region’s warm and humid climate did not provide the freezing temperatures that would often kill bacteria, viruses, and insects that carried contagious diseases.⁷

Public Health

The oldest public health laws in Charleston date to the first decades of settlement on the peninsula. In 1698, The South Carolina Provincial Legislature passed a law that prohibited vessels from entering a one-mile radius of Sullivan’s Island without consent of the governor. This ordinance was put in place to ensure that no one on board the approaching vessel was infected with a contagious disease.⁸ Later in 1712, the legislature empowered an officer to serve as the first health official of South Carolina. His duties were to ensure that all people coming in to the city were free of symptoms of disease. Beyond port regulations, most of the earliest widespread health measures taken in the city were private initiatives. Some plantations had their own small hospitals to treat the enslaved

⁶ A Digest of the Ordinances of the City Council of Charleston 1783-1844 (Charleston: Archibald E. Miller, 1818), 54.
⁷ Melosi, Precious Commodity, 38.
⁸ Christian L. Larsen and Jeanette Searles, South Carolina State Board of Health (Columbia: Bureau of Public Administration, University of South Carolina: 1949).
populations and various private hospitals in the city provided care for the poor. Wealthy whites obtained individual medical care through personal doctors. The first official measures taken for the public were in 1749 when the Provincial Legislature passed an act that established a hospital for “all sick sailors and transient persons.” Following the founding of this hospital in the 1760s, the legislature appointed a body known as the Commissioners of Health. This board had a limited scope in regards to sanitation reform. The group was primarily charged with initiating small pox inoculations and monitoring the health of people coming in the port.

By the late eighteenth century, there was an increasing community interest in medicine. Various waves of yellow fever swept the city and scarlet fever devastated the state between 1787 and 1788. On Christmas Eve 1789, eleven medical practitioners in Charleston met to form the Medical Society of South Carolina, a group that was intended to represent the entire state but was primarily comprised of Charlestonians. This board would serve an active role in shaping policies related to public health in the city.

Prior to the creation of the Board of Health in 1808, Charleston had no formal legislative medical board beyond the Medical Society. The society’s main goals were to direct attention to garbage disposal, the unsanitary condition of waterfront areas, and improvement of the water supply. To commit policy to action, the society relied on correspondence between the Governor and the Intendant or Mayor of the city. Distance and bureaucracy often slowed progress, so the City Council sought to create a more active and internal plan. In 1795, the City Council requested that the Medical Society of Charleston create a set of recommendations to prevent contagious disease in the city. By 1796, offi-

cers of the Medical Society were official advisors to the City Council acting as a de facto Board of Health. The city slowly began to make public health improvements as a result of this consultation. In 1801, public baths were built on Queen Street to encourage cleanliness among residents. The Charleston Poor House created a specific ward for ill patients as a result of the board’s advice.

As the nineteenth century began, a wave of epidemics ravaged Charleston. Each one catapulted public health to the forefront of civic discussion. 1807 was an especially unhealthy year for the city. Yellow fever caused one hundred and seventy four deaths, fourteen thousand of the cities residents suffered from influenza, and three hundred and twenty eight deaths were accredited to “endemial causes.” In 1808, Charleston finally established a Board of Health with thirteen commissioners, each in charge of one of the thirteen city districts. Each of the commissioners was responsible for monitoring contagious disease and health nuisances in the city. This board suggested that the Medical Society appoint three members to create a board to prevent the spread of yellow fever specifically. A year after the commission created the yellow fever task force; several diseases ravaged the city, including yellow fever, which killed sixty-four Charlestonians. Consumption (tuberculosis) killed eighty-two residents. In a speech before the Medical Society, local physician David Ramsay identified, “privies, ponds, bad drains, intemperance, and the night air as serious hazards to health.” The society and commissioners supported a campaign of public cleanliness, encouraging Charleston residents to use the public baths and pay immediate attention to the cleanliness of private lots.

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12 Waring, A History of Medicine in South Carolina, 145.
13 Waring, A History of Medicine in South Carolina, 148.
City Council ratified an ordinance to create the second Board of Health on June 14, 1815. This Board of Health was created to write and enforce sanitary ordinances and distribute resources to the lower classes. Like the original council, this board was comprised of thirteen officials, but unlike the previous board, officials were appointed by City Council. The board met every week between the city’s most unhealthful months, May through September. This board was given the power to enter private property during epidemic season to inspect a lot or dwellings’ sanitary condition.

In the 1820s, the city was in desperate condition. City streets were poorly drained and most cellars were full of stagnant water. Even worse, the city lacked a source of potable water. In 1825, Stephen Elliot, the Chairman of the Board of Health, recommended that private cisterns be used to collect and protect water supply and deeper wells be sunk so the contaminated shallow wells could be abandoned. Charleston had been dealing with the issue of drainage since its founding but the advances in medical knowledge and fear of contagious disease drove city officials to enact legislation to aid drainage. In 1818, the City Council ratified an ordinance to compel owners of low lots to drain them or fill them to street level. They also encouraged property owners to drain or pump out privies and cellars where stagnant water, garbage, and waste had collected. Despite this encouragement, no penalties were enforced when citizens disobeyed or ignored the ordinances. As part of the effort to monitor the sanitary conditions of the city, the Medical Society created a group of “Medical Police” to study the spread of disease and epidemics. After

14 *A Digest of the Ordinances of the City Council of Charleston 1783-1844*, 22.
15 Smith, Leon Banov M.D. and *Public Health in Charleston*, 14.
17 *A Digest of the Ordinances of the City Council of Charleston 1783-1844*, 26.
a significant fire in 1838, the condition of portions of the city worsened as many cisterns and cellars were left exposed to collect water, waste, and debris. The Board of Health ordered that these receptacles and all low lots be filled to stifle the flow of bacteria.

By the late 1830s, the City Council worked with the Board of Health to create a more aggressive plan for the public health of the city. In August of 1836, City Council presented a resolution to amend the ordinances relating to public health. In 1837, the city was primarily concerned with the lowlands on the western edge of the peninsula, extending from the corner of Bull and Pitt Streets to Bennett’s Mill Pond. As a result of the 1836 resolution, a second wave of ordinances were passed that focused on the betterment of the city’s sanitary conditions. The section of the ordinance that created the Board of Health was amended to include a penalty on those who obstructed the city commissioners from entering private lots for inspections. Section One of the ordinance made it unlawful for any vault or privy to be built within ten feet of a street or alleyway and set a penalty of one thousand dollars. In addition to the other requirements, this adapted ordinance gave the city commissioners the power to order that lime be thrown in any drains or gutters that were becoming nuisances and were deemed as dangerous to the public health. On April 11th, 1837, City Council provided funds for the filling up and draining of low lots in the city. This ordinance also required that all private cellars and sinks be drained or cleaned. Section Two of this ordinance required that privies be built airtight, allowing no chance of overflow. In December 1839, the City Council completely eliminated the issue of improp-

18 Charleston City Council Ordinances 1783-1840. Charleston Public Library, South Carolina Room, Microfilm Reel.
19 A Digest of the Ordinances of the City Council of Charleston for the Year 1783 to October 1844 (Charleston: Walker and Burke, 1844), 27.
erly drained basements by mandating that no one within the city limits could dig a cellar if their property was within twenty miles of the ocean. Other subterranean excavations including wells, cisterns, icehouses, privies, and drains were allowed.\textsuperscript{20}

Despite the movements of the Board of Health in 1836, the health of the city was in decline. Acting mayor Robert Hayne commented on the conditions of the city from September 1836 to September 1837 in his annual report. Hayne stated that the city’s condition was a “pecuniary embarrassment,” when compared to the city’s former condition. He vigorously supported a re-evaluated plan for public improvements including adopting a course of action for supplying pure water and the creation of public salt-water baths and swimming places. The bulk of Hayne’s report focused on improving the “health, comfort, and ornament of the city.”\textsuperscript{21}

A little over fifteen years after its creation, the Board of Health was re-evaluated, with further involvement from the city’s General Board. The General Board was in charge of the general inspection of the city and brought annual attention to those areas that had health concerns. The new health department was arranged into three classes with different assignments given to members of the General Board. The first class was the Central Board of Health. This group consisted of the Mayor and four members of the commission’s General Board and it was required to inspect the bill of mortality published annually by the city. The Board of Health did not have a formal system of registering deaths in the

\textsuperscript{20}A Digest of Ordinances of the City Council of Charleston, 13.
\textsuperscript{21}Robert Hayne, “Report of the Proceedings of the City Authorities of Charleston during the Past Year Ending September 1\textsuperscript{st} 1837 for the Improvement of the City” (Charleston: Printed by A.E. Miller, 1837).
city until 1821.  

Prior to the passage of this ordinance, the Board of Health was often encouraged to suppress mortality records in fear that the knowledge would inhibit the city commercially.

The General Board also monitored meteorological observations and was required to inquire into all epidemic diseases that occurred in the city. The second committee was the Board of Inspection, also chaired by the Mayor and four other members of the General Board. The Board of Inspection oversaw the draining and leveling of low lots in the city. The third committee was the Commissioners of Streets and Lamps that was specifically created to level and grade the streets and create sidewalks. This committee was comprised of the Mayor and one member of the General Board from each ward. This reorganization and integration of public officials signaled that the issue of public health was foremost in the minds of city officials. Following the passage of this ordinance, the City Inspector became an executive officer of the Board of Health.

Disease

In the early nineteenth century the city was consistently ravaged by epidemics and contagious disease despite municipal emphasis on sanitation. In 1821, dysentery and consumption were the main causes of death in city. That year one hundred and fifty four people died of consumption and one hundred and twelve of dysentery. The most common diseases in the period between 1828 and 1845 were consumption; followed by yellow fever and gastrointestinal diseases such as dysentery and cholera, whose causes

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22 Larsen and Searles, *South Carolina State Board of Health*, 4.
24 Waring, *History of Medicine in South Carolina 1825-1900*, 60.
were directly related to the presence of bacteria in water that was easily spread in warm areas with poor sanitation practices. Cholera mostly affected children. Yellow fever was the most fearsome and most damaging to the population.

The most devastating diseases that effected Charleston were born of bad sanitation. Typhus fever was commonly reported in the city, most often imported from the Caribbean and Africa through the city’s port. Typhus is often referred to as jail or ship fever because it struck men who were confined to putrid environments. Typhoid Fever, a variation of typhus that involves the Salmonella bacteria, was listed as a common cause of death. Prior to 1837, there was no differentiation between these two diseases and they were often mistaken for the other as those struck by the diseases exhibited similar symptoms.

Like typhus and typhoid fever, cholera rapidly spread through water sources that had been contaminated by the waste of a cholera victims. Most cholera victims died a short twelve to forty-eight hours after being struck with symptoms. The disease was easily spread through urban areas as offhanded contact with a contaminated item such as clothing or bedding of a cholera victim could spread the disease.

25 Waring, History of Medicine in South Carolina 1825-1900, 63.
27 Pomerantz and Olsztynski, “Plagues and Epidemics,” 50-56. Cholera was a global disease in the nineteenth century. Cholera entered the United States mainly through immigrants from infected countries and bred in the dense urban areas. Dr. John Snow demonstrated the highly contagious nature of cholera in London in 1845 when he reported that 500 cases of cholera occurred in ten days within a 250 yard radius of London’s Broad Street. He attributed the spread of disease in this area to the use of a single water pipe that was infected by cholera and was then being used to service these areas. German Dr. Robert Koch discovered the bacillus of cholera in 1876. Koch noted that the bacteria can survive in excrement a “good while” after the initial attack of the disease.
The most notable event relating to Charleston’s city health was the reappearance of yellow fever in 1856. Yellow fever made its first appearance in Charleston in 1699 or 1700. At the time, it was referred to as the “infectious distemper” and it reoccurred in 1703 and 1728. One commonality among each of these occurrences was its appearance during warm summers. Yellow fever was a common problem in subtropical regions including Barbados and the Caribbean and the disease began to hit larger trading points in the United States including Boston and Philadelphia during the 1700s. Period physicians searched for the cause of yellow fever. They recognized a strong connection to warm climates and the disease but the main question was whether the disease was brought in through trade or created in warm unsanitary environments. The disease quickly became known as “Strangers Fever” in Charleston because visitors and children appeared to be more susceptible to the disease. This led physicians to believe the cause was environmental and long time residents had become immune. The disease plagued the city consistently through the 1730s with few cases in the 1750s. The city experienced a lull until 1792, when the fever again plagued the city.

Charleston physicians referred to the 1790s and early 1800s as “a new era of yellow fever.” Yellow fever was reported among citizens annually between 1795 and 1839, killing an average of about 149 people a year. The disease period extended from July to November but was at its worst in August and September. It is evident in city records that

28 Yellow fever plagued urban areas in the United States throughout the eighteenth and nineteenth centuries. One of the most noted epidemics of yellow fever took place in Philadelphia in 1793. Between August and November, five thousand people died in the city, most of yellow fever. At the time of the fever the population of the city was approximately fifty-five thousand. The source of the epidemic is attributed to the particularly hot and dry summer of 1793 which reduced water levels creating stagnant pools that served as a breeding ground for infected mosquitoes.


30 Simons, “A Report on the History and Causes of Strangers or Yellow Fever of
city officials and physicians believed the fever was in some way associated with moisture and heat. Many physicians accredited the decaying organic matter in poorly drained low lots or at the docks and wharves as the cause. Others blamed night air or the close proximity of cemeteries to healthy populations. In 1839 physician, Thomas Simons, wrote a report on the history and causes of the fever for the Board of Health that credited a variety of factors including, marsh-miasma, the mixing of salt and freshwater, and stagnant water. He suggested that the city focus on procuring a supply of pure water. In 1839, Simons stated that water from wells was not potable and the population was primarily dependent on water collected from cisterns. He suggested that either the city increase the number of city cisterns or encourage property owners to construct more private cisterns.  

The first case of yellow fever during this drastic wave was reported to the Chairman of the Committee in July of 1856. The first death was police officer John Abbott, who had been working his post on Market Street. He reported his illness on July 11th and died seven days later. The second reported case was a Spaniard, referred to as Garcini, who lived in the same house as John Abbott. A third case was reported shortly after when Abbott’s brother in-law reported the same symptoms. All three men lived in a residence on Tradd Street between King and Orange Streets and each had in some way been exposed to the steam ship *Catawba* that returned to Charleston after passage from Havana. These three cases raised numerous questions on the origin of the disease. While they could have each been exposed to the disease while in Havana, they also resided in the same house that was reported to be unsanitary. The Chairman of the Committee on Health, accompanied by a local physician, visited the men’s residence. Both men reported a “fearful odor” on the property. After further investigation, they found the contents from Charleston.”

a cellar or filled cistern piled six or seven feet high on the property. The contents were described as filth and neighbors reported that it had been exposed to the sun for several days. The commissioner deemed the lot “prejudicial to the health of the neighborhood.” All of the men’s belongings were removed from the property and burned after their death. Physicians accredited their proximity to the unsanitary material as the cause of their disease. In 1858, 773 city residents were diagnosed with yellow fever, most were adult white males during the month of September. The disease was not more likely to infect males, the white male population was just larger.

In an effort to calm the fears and better understand the disease, Dr. Robert Lebby, acting Chairman of the Board of Health, conducted a survey of Charleston physicians and distributed a questionnaire that included three questions:

“Do you consider the fever termed Yellow Fever, or formerly Stranger’s Fever, which has prevailed in this city since you have been in practice a contagious or imported disease?

Do you believe that a state of atmosphere can be produced, from local causes or otherwise, capable of rendering the disease epidemic in a city, the simple introduction of cases from abroad?

Do you believe the disease, as it prevailed in this city the past and former summers, to have exhibited in any degrees a contagious nature, or was it local of origin, dependent upon local causes?”

Most doctors said they thought the disease was a result of local conditions. Dr. Horatio Waring responded with a suggestion that the city strengthen its sanitation, citing the overflowing privies and undrained yards as the cause of the unhealthy atmosphere. Likewise, prominent Charleston physician, Elias Horlbeck, stated that he did not believe yellow fever was a contagious or imported disease. He believed that the disease that had ravaged the city in previous summers was a result of the poor execution and subpar materials used during the land reclamation projects. Dr. John Bellinger, responded to the survey, stating that he believed the idea that the disease was a product of local causes could easily be entertained.34

In 1858 the City Council supported two methods to remedy the health problem. One was to quarantine infected residents and to restrict the city’s port. The second was to reinforce rigid sanitary conditions throughout the city. The meeting resulted in the Council’s decision to create a new committee of five members that would evaluate the current Board of Health and quarantine ordinances in an effort to expand upon and make the existing ordinances more effective. The committee would also investigate the condition of city cemeteries and prohibit burials within the city. The third task of the committee was to create reports on Yellow Fever deaths between 1821 and 1858 and present to the City Registrar for further investigation.35

The actions at the 1858 meeting were successful in eliminating the disease. In November of 1861, Mayor Charles Macbeth reported on the health of the city in his annual address. During his address he emphasized the dramatic effects that the yellow fever epidemic had on the city between 1850 and 1858. But in contrast to years prior, Macbeth

34 “Report of the Committee of the City Council of Charleston Upon the Epidemic of Yellow Fever in 1858,” 27.
also reported on the success of the drainage campaigns. He attributed the newfound well-
ness in the city to cleanliness and to the thorough examinations performed by health offi-
cers. His speech reinforced the importance of sanitation policy in urban areas stating that,
“drainage and cleanliness contribute much to healthfulness in a Southern climate.” He recog-
ized that the risk of contagious disease had not been completely abated and that the
Board of Health and City Council were making positive efforts by monitoring lots.

Two years later, Macbeth, cheerfully reported that no epidemics had been reported
in the city since 1861. He attributed the eradication of yellow fever to the lack of com-
merce in the city since the beginning of the Civil War and the reemphasis on observations
on public health spearheaded by the Commissioners of the Board of Health. Macbeth
stated that the system of drainage had been improved and helped to remediate the bad air
in the city and in turn, eliminate yellow fever. Ten years later in the Mayor’s annual report
presented by mayor John A. Wagoner, the city had “enjoyed a better health during 1872
than at any similar period in its existence.” Wagoner remarked that the street departments
had thoroughly fulfilled their duties and carried out sanitary regulations. The mayor stated
that the city was probably one of the healthiest in the United States by this era. Although
similar cities throughout the southeast were ravaged by disease Charleston had somehow
“averted the pestilence.” Wagoner reported that funding the health department had been
a more expensive endeavor since the waves of yellow fever had hit the city. Most of the
funds had been allotted to applying disinfectants, monitoring garbage disposal, and moni-
toring properties during the summer months.

36 Charles Macbeth, “Mayor’s Annual Report,” The Daily Courier, November 9, 1861.
37 John A. Wagoner, “Mayor’s Annual Report,” Charleston Daily News, February 20th,
1873.
38 John A. Wagoner, “Mayor’s Annual Report,” The Charleston News and Courier,
November 17, 1873.
Public Health at the Turn of the Twentieth Century

The South Carolina State Board of Health was established when the Act of 1878 was passed by the state legislature that made the State Board of Health the body’s sole advisor. The state was divided into health districts and “subboards” of health were established in towns with no local boards. A third wave of yellow fever was the immediate cause of the creation of the State Board of Health. Between 1876 through 1877 numerous cases were recorded throughout the states. By 1877 Charleston fully supported a campaign to search for clean water, with numerous private and public well drilling campaigns. Despite the success of artesian wells, many Charlestonians were relying on water from household cisterns, as an effort to control their water intake. The creation of the State Board of Health inspired a second investigation into the link between the disease and the water supply. In 1885, the state passed a law that prohibited the sale of unfit food and drinks. In 1907 the State Board of Health passed a law that required all companies or municipalities operating a water supply to allow a chemist or bacteriologist approved by the State Board of Health to perform chemical and bacterial analysis. Despite the measures taken by private citizens and the City Council. During testing performed in 1898, a Charleston physician discovered colon bacilli in the water of numerous cisterns in the city. The consensus was, like the shallow wells that had been contaminated because of their proximity to privies, submerged cisterns were also being contaminated. Even though cisterns were a substantial improvement over wells, they were not free of contamination. In 1905, the commissioner of the Board of Health provided a number of tips to keep cisterns

39 Smith, Leon Banov, M.D. and Public Health in Charleston, 15.

40 Waring, History of Medicine in S.C., 1825-1900, 168.
41 Smith, Leon Banov M.D. and Public Health in Charleston, 15.
42 Ibid, 16.
in good order, suggesting that they be kept “clean and tight.”\textsuperscript{43} By 1926, Board of Health regulations required that regular samples be taken from all supplies of milk and water. Later that year the City Department of Health, that focused on the peninsula combined with the County Health Department to strengthen their jurisdiction and testing in the entire area.\textsuperscript{44}

By the end of the nineteenth century, Charleston was a more healthy and sanitary place. The drainage issues had been mediated but water quality and supply was still a common concern. There has always been a strong correlation between the health of the city and its water supply. Beginning in 1800, only ten years after the first dramatic wave of epidemics in the city, there was a rise in cistern construction. Cisterns were added in work yards or under additions in homes predating the turn of the nineteenth century. By 1840, cisterns were included as a domestic utility during the first phase of construction. Throughout the nineteenth century cisterns were commonly constructed in properties of the city’s more affluent residents. Although an ordinance to create a municipal water system was created in 1879, many Charleston residents relied on water from cisterns for drinking and household cleaning as the municipal system offered an insufficient supply. Cisterns were still constructed and utilized in homes until the turn of the twentieth century. The 1876 Mayor’s Annual Report published in the News and Courier, included a section entitled ‘Water for Charleston’ that stated that supplying the city with a pure water source was the Council’s main concern. Public health was no longer the city’s main issue but ensuring a plentiful and potable supply of water was a topic of debate.

\textsuperscript{43} Alston et al, \textit{Between the Tracks}, 105.
\textsuperscript{44} Smith, \textit{Leon Banov and Public Health in Charleston}, 28.
Figure 3.1 was created using data published in the 1858 Yellow Fever Pamphlet presented to the City Council of Charleston. After 1880, yearly deaths were published in the Charleston City Yearbooks. Prior to the publication of the city yearbooks death and disease tolls were addressed in the Mayor’s Annual Report that was published intermittently in the city newspapers.\textsuperscript{1} After 1821, the Board of Health published an Annual Bill of Mortality, this statement was more comprehensive and included causes of death, recorded deaths each month by age, race, and gender. City officials were hesitant to publish an Annual Bill of Mortality for fear that it would discourage people from visiting the city, thereby negatively effecting the city’s economy.

\textsuperscript{45} The publication location for the the Mayor’s Annual Report varied from year to year based on political affiliations.
This analysis presents the affect of water-borne contagions and diseases that plagued the city between 1821 and 1858. Since this report focused on yellow fever, it only accounts for fever related deaths. Since these deaths were born from poor sanitation in the city they are most relevant to this study.

The chart reports the toll of five to seven different types of fever depending on the year. Fevers identified were: Catarrhal, Bilious, Country, Remittent, Typhus, and in some years Yellow. Yellow fever was commonly called country fever in this era, both are listed as types of fever. Country Fever is listed in 1821 where yellow fever is not. This confusion between symptoms and disease shows that yellow fever was difficult to distinguish. By 1822 yellow fever is listed as a cause of death. Most of the causes of death listed are symptoms that were regarded as a disease. The list denotes all deaths from the broad umbrella “fever,” yellow and country fever are grouped with other more symptomatic causes such
as bilious. The list denotes nativity, gender, race, and age (adult or child). Figure 3.1 evaluates the city yearly and only list deaths during the summer months when disease was most common, April through November.

This graphic accounts for all deaths that were considered a result of a water-borne disease, which includes Yellow Fever, Country Fever, and Typhus. Since the other causes of death listed were primarily symptoms of these diseases they are also illustrated. The graphic does not differentiate between race, nativity, or gender. The only cause of death excluded for the creation of Figure 3.1 was “brace bone.”

As shown in Figure 3.2, cistern construction rose consistently throughout the nineteenth century. This graph was created based on the date of construction of cisterns identified for this study. When compared to the information presented in Figure 3.1 it is evident that as the death toll rose as did the number of cisterns constructed, with a significant rise in construction between 1810 and 1840. This coincides with the spike in deaths attributed to yellow fever from 1824 to 1838.
CHAPTER IV

CISTERN CONSTRUCTION AND LOCATION

An analysis of existing cisterns in Charleston identifies two patterns relating to water infrastructure and cistern construction. First, there is a consistent rise in cistern construction in Charleston households through the nineteenth century. Second, cisterns are constructed at three primary locations on Charleston properties: the work yard, under a dependency, or in the cellar. These factors correlate with the era’s societal consciousness concerning public health and sanitation. As waves of yellow fever, dysentery, and other diseases born of poor sanitation practices swept the city, residents responded by constructing cisterns that provided a potable water supply.

Various types of cisterns are found in households and work yards throughout the United States. Most are constructed of wood or masonry, later examples were made out of iron, concrete, or steel. Cisterns in Charleston can be can be divided into three categories: subterranean, semi-subterranean, and attic level. Few examples are located in yards above grade. The subterranean cisterns can be further divided in to two types: large rectangular masonry chambers with a cement or stucco lining and vertical bell-shaped masonry units. Beyond these categories, there is little diversity beyond size and capacity. Attic catchment basins were primarily large wooden boxes lined with lead. Most attic and basement cisterns were at some point connected through a system of pipes. Force pumps moved water between the two catchments. In all Charleston examples, cisterns collected rainwater. In most cases, an internal drainage system on the roof gathered rainwater and diverted it to the cistern. All rectangular units had an exterior access point covered by a stone or metal lid. It is difficult to discern if the access points served as a place to gather
water manually or existed primarily for cleaning and inspection. Evidence of piping connecting to force pumps is intact in a few Charleston examples. Intact filtration systems are rare in Charleston when compared to other areas of the county. This may be attributed to their date of construction. Most cisterns were constructed in relatively early additions that predate Charleston’s adoption of a public water system in 1879. By the early twentieth century, cistern use declined as many were contaminated by pollution and general sanitary issues stemming from rising population density.

**Cistern Construction**

Little is published on the craftsmanship and design of cisterns in early builders manuals and handbooks. Cisterns have been utilized since the earliest civilizations to provide a secure and consistent source of water for agriculture, cleaning, and drinking. *The Builder’s Dictionary: or Gentleman and Architect’s Companion*, published in the mid-eighteenth century, defines cisterns as “subterraneous Reservoir of Rain-Water, or a Vessel made to serve as a Receptacle for Rain or other Water, for the necessary Uses of a Family.”

The work suggests buildings materials for cisterns as well as the best location for construction. In residential structures, cisterns are to be kept under a house in a cellar. The work identifies bricks, stone, and terra cotta as the most common and successful building materials used for early cisterns. Each of these units would be joined with cement made of lime, linseed oil, and a fibrous material such as “Tow or Cotton-Wooll” as a binder. Multiple sources suggest that the bottom of masonry cisterns be covered with sand to “sweeten” the supply. *The Builder’s Dictionary* suggests that the walls be

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2. Multiple sources suggest the use of terras mortar or Parker’s Cement, also referred to as Roman cement. Developed in 1796, Parker’s Cement was used because it was impervious to water as soon as it cured.
well cemented to prevent water from seeping out and to keep the supply pure. Like the
cisterns in Charleston, the earliest descriptions from the mid-eighteenth century suggest
that cisterns be supplied with water collected from the roof. The water is directed to the
cistern through metal (usually lead or tin) pipes that divert the supply to the main cistern
or a trough that catches the initial rainfall from the roof, prior to directing it to the large
cistern. The Nicholson’s Dictionary of the Science and Practice of Architecture, Building,
and Carpentry, published in 1844, defines cisterns as, “an artificial reservoir or receptacle
for holding water, beer, or other liquor, as in domestic uses…” Like previous publica-
tions, this work suggests that cisterns be constructed of brick and lined with cement to
retain water. This work also suggests that cisterns be constructed in a cellar or basement
on a bed of well-tempered clay. The clay bed was often followed by a stone or brick floor,
and cemented with hydraulic or terras-mortar. When these components are not available, a
composition of “slacked lime sifted, linseed oil and tow or cotton” was often used. When
constructed in cellars, the sides of cisterns were often offset from foundation walls of the
house and the space was filled with clay to prevent any escaped water from damaging
the foundation of the house. Above ground cisterns were constructed of planks lined with
white lead, the entire unit supported by a row of brick, clay, or stone.

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3 Edward Lomax and Thomas Gunyon, eds. Nicholson’s Dictionary of the Science and
Practice of Architecture, Building, Carpentry, from the Earliest Ages to The Present
4 Lomax and Gunyon, Nicholson’s Dictionary, 166.
**Figure 4.1:** Typical front elevation of a Charleston semi-subterranean cistern (Drawing by author, not to scale).

**Image 4.2:** Typical side elevation of a Charleston semi-subterranean cistern (Drawing by author, not to scale).
Early Domestic Water Infrastructure in Charleston

Real estate advertisements in eighteenth and nineteenth-century Charleston illustrate the importance of domestic water access. Advertisements in three historic newspapers reveal the popularity of cisterns: the *South Carolina Gazette*, published from 1732 to 1775, *The Charleston Times*, published from 1800 to 1821, and *The Charleston Mercury*, published from 1822 to 1866. Charlestonians relied on wells throughout the eighteenth century until the water supply was contaminated through poor sanitation. At this point many turned to cisterns.

The earliest known property advertisement to mention a well appears in an October 22, 1764 supplement to the *South Carolina Gazette*. The advertisement describes an eight-room house with several dependencies including a washhouse, poultry house, chair-house, kitchen, and a small garden. The advertisement closes with the mention of “a well of exceeding good water.” Other ads reference wells and cisterns that coexist alongside kitchens and other work yard dependencies. The earliest reference to a cistern in a property advertisement appears in the *Charleston Times* in January 1801. The advertisement describes a “large and convenient house” for rent at 98 East Bay Street. Consisting of eleven rooms, a kitchen, stable, and a pantry with a large cistern below. Between, 1805 and 1861, cisterns are mentioned twenty times in the small sampling of newspapers. Some advertisements list properties that had both cisterns and “wells of good water” as late as 1861. The description of wells as containing “good water” reaffirms the difficulty that residents faced when acquiring and maintaining potable water. Having a well of good water, cistern, or access to both was something to advertise.

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5 Property advertisements in each of these newspapers were reviewed for three months of the year (January, July, and November) every ten years.
6 Property Advertisement, *Supplement to the South Carolina Gazette*, October 22, 1764.
After 1805, cisterns supplanted wells in popularity and newspaper advertisements include more information about cisterns. Most cisterns are described as being made of brick and usually located in a yard. They are often listed in tandem with other dependencies, most often kitchens and stables. For example, an 1832 advertisement from the *Charleston Mercury* described an “excellent cistern” on the premises of a house at the corner of Boundary and Washington Streets with a brick kitchen and washhouse.\(^8\)

Although property advertisements do not list specific purchase or rental prices, they do shed light on the form and value of cisterns. Most of these advertisements are for larger properties with eight rooms or more. All of the buildings advertising cisterns also listed various other dependencies and, at times, extensive gardens and paved yards. An analysis of these advertisements indicates that cisterns were constructed in more affluent properties, an intuitive finding due to the amount of time and resources cisterns required for their construction. An 1847 advertisement in the *Charleston Mercury* described a particularly comfortable property with a pantry, bathing room, “pleasant chambers,” and dressing rooms. The advertisement also listed a cistern capable of holding 5,000 gallons of water.\(^9\) An advertisement from 1852 describes a property on the corner of King and Tradd Streets that boasted both a well and a cistern as well as the recent introduction of gas in all rooms.\(^10\) Another advertisement describes the property at 2 Orange Street with a large cistern capable of holding 4,000 gallons of water, the property also contained numerous pantries, a kitchen, and a washroom.\(^11\) Based on these advertisements, it is evident that a large brick cistern was necessary domestic infrastructure, as essential as a kitchen house or stable.

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\(^8\) Property Advertisement, *Charleston Mercury*, January 1832.
\(^9\) Property Advertisement, *Charleston Mercury*, January 1847.
\(^10\) Property Advertisement, *Charleston Mercury*, August 1852.
Cisterns were also a common nineteenth-century addition to the work yards of many downtown lots. As plumbing technology developed, large cisterns were a more necessary addition to the home. Early indoor plumbing primarily consisted of the supply and service delivery of water for bathing. In the mid-nineteenth century, residents were still utilizing privies and brick privy vaults on their properties for the disposal of human waste. An 1847 advertisement, for example, described a large brick cistern located in the basement of a house at the corner of Thomas and Warren Streets. The advertisement describes a pump that led from the cistern in the basement to a dressing room with a bath. The advertisement also notes the location of out houses and a “well of good water” on the property.\(^\text{12}\)

This sampling of property advertisements indicates that brick cisterns were a common feature in affluent Charleston households by the 1850s. But who constructed these cisterns? City directories published between 1800 and 1850 indicate that in Charleston local masons and builders constructed cisterns. City Council created the Charleston City Directories to catalogue residents and businesses in the city. The directories were published from 1782 to the present and include advertisements from local businesses as well as an alphabetized list of city residents including name, profession, address of residence, and address of their place of work. Volumes published after 1890 were indexed by street address and the volumes published between 1905 and 1961 include residents’ race.\(^\text{13}\)

Within this search parameter, no one was defined as specifically constructing cisterns in

\(^{12}\) Property Advertisement, Charleston Mercury, January 1847.

Figure 4.3: Advertisement for 5 Water Street describing a brick cistern in the yard (Charleston Mercury, 1837).

Figure 4.4: Advertisement for a property at the corner of Thomas and Warren Streets with a brick cistern and pump in the basement (Charleston Mercury, 1847).
the city, but various masons and craftsman were found. Plumbing and lead working were regarded as prominent careers by the 1840s based on their numerous appearances in the city directories.

H. Horlbeck and Brothers were prominent builders working in the city during the mid-nineteenth century. Five brothers comprised the company. John Horlbeck Jr. and Henry Horlbeck were the primary owners and worked with the support of their other brothers, Daniel, Edward, and John. In addition to managing the construction business, the brothers operated a successful brick-making operation at Boone Hall Plantation, located east of the Cooper River. The Horlbecks worked on a variety of brick structures including numerous cisterns, wells, and yard drains. Their ledger books, include a record of project estimates, supplies and expenses, descriptions of projects, and the occasional sketch. The Horlbecks likely kept ledgers throughout their working lives, but only books from 1824 to 1860 survive. The Horlbeck brothers also kept a ‘daybook’ that chronologically lists properties on which they worked, the property owner, and work performed. They usually listed the number of workmen, identified by race, on each project as well as supplies used, and cost. The Horlbeck brothers worked on numerous Charleston municipal buildings including sections of the City Market, the Charleston Jail, numerous firehouses, and the Fireproof Building. They worked in tandem with the city on street improvement campaigns paving public roads with brick. They also worked at numerous private residences and at times listed the addresses where work was completed in their ledgers.¹⁴

¹⁴ Horlbeck Brothers Records, 1821-1860. (179.00) South Carolina Historical Society.
The Horlbecks worked on early subterranean water and plumbing infrastructure at various properties. There are numerous descriptions of brick privy vaults being constructed on Charleston properties where cisterns were also constructed. There are some mentions of wells throughout the ledgers illustrating that shallow wells and cisterns were being constructed at private residences during the same era.

A variety of conclusions can be drawn from an analysis of the Horlbeck Brother’s records: the size of cisterns built, materials used, method of filling, and location of the cisterns on the property. It is evident from their material lists that the cisterns built were most often subterranean, constructed from masonry and lined with cement. Their ‘cash-book’ used from 1842 to 1849 includes numerous descriptions of properties where cisterns were built. Each of these descriptions includes a list of materials used. The most common materials used were bricks, lead for pumps and tubes, and barrels of cement. In some cases gravel was included on the material list, possibly to serve as foundational aggregate at the bottom of the cistern or to be used as a method of filtration. The cisterns built by the Horlbeck Brothers’ company ranged in size from twenty-five by twelve feet to twenty feet by forty feet holding between 4,530 to 7,000 gallons of water. Most material lists also referenced metals used for gutters that direct water to the system or stones to cover manholes. One property, constructed in 1849, included the construction of a large cistern holding 4,530 gallons. The materials necessary for this project were 6,000 bricks, one carting charge of five dollars, eight barrels of cement at a cost of two dollars and fifty cents, one bath element for two coppers, and pump and lead tubes for twenty-three dollars. The accounting included installation of a system of gutters for seventy-five dollars and stone for the manhole. The pump and bath element included in the material list suggests that the large cistern was utilized not only to provide drinking water but to provide water for
water closets and bathing. Based on an analysis of the sketches in the Horlbeck daybooks, most of the cisterns constructed were rectangular masonry boxes with vaulted ceilings and a nine-inch central division wall for filtration.

The Horlbeck Brother’s records illustrate the nature of cisterns as a work yard and domestic utility. The book includes numerous descriptions of cisterns located in yards or under auxiliary buildings or additions. In two instances, cisterns were constructed under pantries. One sketch portrays a rough plan of a lot on Society Street dating to 1844. When the cistern is located in what appears to be a hyphen connecting the main dwelling to the kitchen. The connecting building is described as housing an “eating room, pantry, staircase, and cistern.” This central structure is slightly smaller in width than the main house, kitchen, and stables. It is reasonable to assume the cistern was the size of the addition or slightly smaller. The hyphen is fourteen feet wide and twenty-nine feet deep, which is congruent with the size of other cisterns on the peninsula. A second sketch of a property constructed in 1849 for a Mr. E. Calder, includes a sketched plan of a Charleston Single House. Represented in the sketch are a primary dwelling, a smaller auxiliary building with a side stair, and a detached outbuilding with two rooms and two fireplaces. Two privies are located at the rear of the property. A description below the sketch states that the cistern is under the pantry. Based on the price estimate for materials, located below the sketch, it appears the kitchen, privies, and cistern were being constructed, or at least altered, during this phase of construction. It appears that the other materials were necessary for repairs to the roof and piazza and the addition of gutters and a pump. In this instance, the cistern

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15 Horlbeck Brothers records, 1821-1860. (179.00) South Carolina Historical Society.
Figure 4.5: Sketch of a cistern with two arched chambers and a central filtration wall (Horlbeck Brothers Records, 1821-1860. (179.00) South Carolina Historical Society).

Figure 4.6: Sketch of a 1,402 gallon cistern (Horlbeck Brothers Records, 1821-1860. (179.00) South Carolina Historical Society).
Figure 4.7: Sketch of a property on Society Street with cistern noted under the hyphen (Horlbeck Brothers Records, 1821-1860. (179.00) South Carolina Historical Society).
was constructed at the same time as the dependency it is located beneath. This illustrates that residents were adding cisterns to their homes as auxiliary structures in the mid-nineteenth century.\textsuperscript{16}

\textbf{Case Studies}

Establishing a reliable chronology of well and cistern development is key in understanding overall water infrastructure. The Horlbeck ledgers reveal increased interest in cisterns as the nineteenth century progressed. As explored in previous chapters, a variety of sanitation concerns and minimal water supply motivated Charlestonians to build cisterns at the turn of the nineteenth century. The third step in the process is to evaluate the physical evidence in Charleston, including looking at the existing remains of cisterns and early water infrastructure. For this analysis fifty-six properties were evaluated that had some sort of existing early water infrastructure. Some early properties that did not have cisterns were considered to determine a start date for cistern construction. Properties were chosen based on access and knowledge of cistern or well location. Local preservation professionals and property owners provided valuable information. The locations of cisterns were noted as well as any wells or privies. Out of the data set of fifty-six properties, forty-nine existing cisterns were found, the exact location on the property is known for forty-four of these cisterns. Five of the properties had only wells. Two of the properties that were considered had neither cisterns nor wells. When possible, the author inspected the systems.

Based on the analysis of the data set, four types of cistern locations can be identified: subterranean cisterns under a hyphen or addition, the work yard, attic level, and under porches. Existing cisterns in Charleston are most often located under auxiliary buildings, particularly hyphens connecting a main dwelling space to a kitchen dependen-\textsuperscript{16}

\textsuperscript{16}Ibid.
Of the forty-four cisterns analyzed twenty-one were located under auxiliary buildings or additions. This location could be due to the time period in which cisterns were built. Cisterns were usually located under additions at properties with the earliest construction dates. After shallow wells failed to provide a sufficient supply of potable water, property owners turned to cisterns. Of the properties analyzed, six of them had known additions that dated between 1812 and 1880, most built between 1810 and 1830. Of the forty-nine cisterns, only six were not subterranean or slightly below grade. Two cisterns were constructed under a porch, twenty-one were located under dependencies or additions, eight were located in a work yard and were exposed, and one was hybrid of these two types. Nine were subterranean and constructed during the property’s first building campaign. Five properties had cisterns at the attic level but each of these attic cisterns was a part of a larger system that involved a subterranean masonry unit. In each of these five cases this masonry unit was constructed under a dependency or addition.

17 This number appears small, but the exact date of construction of dependencies was not known at most of the properties.

Figure 4.8: Chart of cistern locations (Created by author).
The oldest property in this analysis is the George Sommers House located at 43 East Bay Street. This house was constructed on lot number one of Charleston’s Grand Modell. The lot was conveyed to George Sommers from his father, Adam Daniel, in 1735. At the time of this conveyance, the lot and a “tenement” were reported on the site. The house was constructed circa 1755. The large molding profiles and paneling in the first floor rooms are in keeping with other houses constructed in the mid-eighteenth century. The house is a typical Charleston Single, one room wide and two rooms deep with a central hall staircase. A piazza was added in the early-nineteenth century with Federal style details.  

The cistern located at 43 East Bay is typical of early water collection practices but is in an unusual location. The cistern is a submerged rectangular masonry unit with an arched top. The property owner’s filled the cistern with dirt in the twentieth century to prevent injury or accident. Little of the physical evidence is extant but what is intact can be viewed from under the house. The cistern is located to the south of the hyphen. It is difficult to date when the cistern was added but it is safe to hypothesize that the cistern was not part of the original construction. The cistern was likely added when the hyphen or the kitchen house was constructed. As with many Charleston properties it is difficult to discern when secondary structures were added or modified. The contractors who worked on the property during a renovation noted that the mortar on the interior wall of the hyphen suggested that it was constructed in the 1850s. It is believed that the historic kitchen house pre-dates the hyphen. This information suggests that the cistern could have been constructed at the time of the kitchen house or in the 1850s at the time of the hyphen. The exposed access point in the yard of the property and the unusual placement suggests that

Figure 4.9: Stone lid covering cistern access at 43 East Bay Street (Photograph by author).

Figure 4.10: Exterior portion of the cistern at 43 East Bay Street and access point (Photograph by author).
it predates the hyphen. Most cisterns that were constructed under a hyphen were located directly beneath them. Early construction manuals suggest that cisterns should be inset from a structure's foundation walls to prevent water from seeping in to the foundation. The fact that this cistern is offset, and half of the unit is exposed in the yard suggests that it was likely built before the hyphen. No pipes or pumps exist to imply how water would have been accessed, but the location of the access point suggests that the water could have been removed manually. This cistern, as most early cisterns in Charleston, is more similar to wells in how they are accessed than the later systems that serviced multiple plumbing utilities. The access point is covered by a one foot eight inch by one foot six inch stone lid with a metal pull. Stone lids are typical of exterior access points in Charleston well and cisterns. The roof of the main house is hipped, which would have been suitable for diverting water into an interior or exterior draining system and to the cistern nearby.

Similar in era and construction to 43 East Bay Street, The Bull House, located at 35 Meeting Street was constructed in 1720. The house was altered in the 1790s and again in 1810. The main structure is three-and-a-half-stories, constructed of brick with a high basement.\(^{19}\) According to a 1959 Sanborn Map, the structure had two dependencies, one was a hyphen to connect the main structure to a kitchen building. At 35 Meeting Street the cistern was located beneath the 1790 rear addition (likely a kitchen or other form of auxiliary building). According to local contractors, the cistern was a large masonry structure with an arched top, similar to the other early examples. This cistern like all others that date to this era raises the interesting question of what came first the building or the cistern? The cistern could have been a submerged work yard utility or it could have been constructed in 1790 with the addition. When compared to other cisterns in the area it is likely this is one

\(^{19}\) Poston, *The Buildings of Charleston*, 92.
of the earliest cisterns built as part of an auxiliary structure. Since the cistern is located so far from the main structure it is unlikely that the cistern was fed by water collected from the roof of the 1730 structure. It is more likely that it was filled with water collected from the roof of the 1790s addition and was constructed at the same time to work in tandem.

The house constructed at 47 East Bay Street also exhibits this trend. 47 East Bay Street, known as the Anne Boone House, was constructed after 1740 and was renovated in the 1840s. The existing residence is believed to have been built within the footprint of an older house, utilizing the remains of a 1717 structure that was destroyed by the fire of 1740. The property changed hands numerous times between 1740 and 1936. The cistern at this property is located under the hyphen. The cistern is typical to Charleston, as it was constructed as a large masonry vault with an arched ceiling lined with stucco on the interior. The vaulted ceiling and access points are no longer intact. It is oriented east to west and measures thirteen feet by nine feet and is about three feet high. The cistern was added during the 1840s renovation when the hyphen was constructed.

Similarly, the cistern at the Capers-Motte House at 69 Church Street is located under an addition. This residence was constructed in 1750 and altered various times throughout the nineteenth century. Known as one of the largest pre-Revolutionary structures in the city, the Capers-Motte House is a three story double house with an excavated cellar. In the early 1800s, the house was converted to allow the addition of piazzas on the south side and by the 1820s and 30s the outbuildings were remodeled in the Gothic Revival Style. At this time, the work yard consisted of a stable, a privy, and a kitchen. The cistern at 69 Church Street is a subterranean masonry unit located behind the main structure under a square engaged addition. This square unit could have been added in the

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20 Poston, *The Buildings of Charleston*, 71
1800s when the piazza was added or was a later addition to accommodate modern conveniences. It is also difficult to discern whether or not the cistern predates the addition of the piazza. Property listings in Charleston published prior to 1800 usually list wells as a modern convenience. After 1800 cisterns appear as a feature worth noting. There is a gray period where properties often had both a well and a cistern but after the 1860s cisterns dominated water infrastructure in advertisements. This fact coupled with the sanitary concerns present in Charleston at the turn of the nineteenth century support the supposition that the cistern at 69 Church Street was added sometime in the early 1800s, when access to clean water was still a concern and shallow wells were often contaminated.

Through an analysis of cisterns in Charleston a variety of patterns emerge concerning location. The earliest cisterns were not constructed during the first phase of development on many lots. Houses constructed prior to 1800 would have depended on wells as their source of water but as these wells were contaminated, property owners constructed cisterns either in work yards, under porches, and under dependencies. Early cisterns were constructed in similar fashion to wells in that they were located underground and were accessed from the exterior.

The Miles Brewton House constructed at 27 King Street is exemplary of the work yard pattern. The Miles Brewton House is considered one of the most architecturally significant houses in Charleston. Constructed in 1769, the Brewton House is the quintessential Georgian Style double pile house. The house is one of the finest such dwellings in America and as such, is an example of not only the most fashionable decorative trends of its time but the most forward thinking infrastructure and utility practices. The house was occupied by Charleston’s elites between 1791 and 1830, a time period when sanitation practices and cistern building was beginning to evolve.\footnote{Martha Zierden, “The Urban Landscape, the Work Yard, and Archaeological Site}
House is supported by a myriad of outbuildings. The first phase of outbuildings included a kitchen, laundry, and carriage house all constructed in 1769. The earliest water source on the property was a well located in the northeast portion of the rear yard. The cistern is located under the southern arcade at the rear of the property. It is a subterranean unit that is no longer accessible but a force pump manufactured by Seneca Falls is intact. Water for this cistern was gathered on the roof and diverted into the cistern below where it was then pumped out for household uses. The cistern water would have been accessed from the exterior much like water from wells.

The work yard at the Miles Brewton House was paved suggesting that its owners were attempting to apply the best-known sanitation practices. At the break of the nineteenth century, sanitary knowledge was at the forefront of property owner’s minds, work yards were paved throughout the city and yard drains were installed and monitored. Yards paved with brick or tabby mortar are recorded throughout the city and cisterns, drainage systems, and dividing walls offer additional evidence of sanitary cognizance.23

A second, above grade cistern is located between the kitchen and stable dependencies north of the main house. At one time a force pump was connected to this cistern. This cistern is a more modern addition, constructed after 1902. During archaeological investigations at the house it was discovered that during this 1902 building campaign some of the earliest horse stalls on the property were removed. An older subterranean cistern was found under the foundation of the servant’s quarters. Artifact’s recovered during excavation suggests that the cistern was constructed in the early nineteenth century.24

23 Zierden, “The Urban Landscape,” 303.
24 Zierden, “The Urban Landscape,” 306.
Figure 4.11: Seneca Falls force pump at 27 King Street (Photograph by author).

Figure 4.12: Above grade cistern at 27 King Street. (Photograph by author).
The Nathaniel Russell House is another example of the work yard pattern. Now a museum house, the Russell House was constructed between 1806 and 1808 at 51 Meeting Street. The structure is unusually positioned on the lot, set back thirty feet from the street and fronted by a large garden. The property was originally comprised of the three-story, single pile central passage townhouse, a two-story brick building that housed the kitchen and laundry, and a second T-shaped masonry carriage house with stables, storage areas, slave quarters, and privies.²⁵ The cistern at the Nathaniel Russell House was uncovered under the hyphen in 1991 when a new HVAC system was installed after Hurricane Hugo. Later in October 2013 the Historic Charleston Foundation documented and excavated the area before adding an elevator.²⁶

According to the Historic Structures Report compiled in 1996, the Russell House cistern was most likely constructed between 1808 and 1810, shortly after the construction of the main house. The one story brick hyphen connecting the kitchen and main house was constructed around the 1820s. Prior to its construction, the area between the kitchen and main house would have been an open yard. It is plausible that the Russell Family maintained a paved work yard similar to that of the Miles Brewton House and the later constructed Aiken-Rhett House at 48 Elizabeth Street. A screening masonry wall with a Flemish bond was constructed between the main house and the kitchen shortly after the main house was constructed. Architectural historians, Orlando Ridout and Willie Graham hypothesize in the Historic Structures Report that the subterranean cistern was constructed

²⁶ Nicole Isenbarger and Andrew Agha, “Archaeological Mitigation for New HVAC System and Renovation at the Nathaniel Russell House,” Mitigation Draft Report, (Charleston: Prepared for Historic Charleston Foundation, 2013). For the installment of the elevator at the Nathaniel Russell House the cistern was dismantled but materials were kept and Archaeological Research Collective, Inc performed a full archaeological excavation.
Figure 4.13: Nathaniel Russell House with below grade cistern circa 1808-1832 (Drawing by Glenn Keyes, Architects).

Figure 4.14: Nathaniel Russell House after the construction of the hyphen circa 1840 (Drawing by Glenn Keyes, Architects).
at a similar time. It was built to the south of the wall and would have been a functioning part of the work yard with exterior access. The Flemish bond masonry screening wall extends from the northwest corner of the house to the northeast edge of the kitchen, separating the garden and driveway. The wall does not appear to have been bonded to the main structure or kitchen suggesting it was not an original feature but it is finished with the lime mortar and beak joints of the main house. This evidence suggests that it was likely an early modification to the work yard.27

The hyphen between the Russell House and kitchen was later constructed over the top of the cistern possibly incorporating parts of the masonry wall. The initial hyphen was one story, presumably with a pitched roof. In the 1840s the hyphen was raised to two stories and became functional living space, referred to as the nursery by occupant Sarah Dehon. Ridout and Graham hypothesize that plumbing was installed in the house by Sarah Dehon, the granddaughter of Alicia Russell who lived in the house from 1820 to the late 1850s. 28

When the cistern was initially inspected in 1991 by archaeologist Charles Andrus, it was still an intact and enclosed chamber that held water. It is a typical Charleston style rectangular masonry cistern, situated below grade. It runs twenty-one feet from north to west and nine and a half feet from north to south. A lead pipe with a five-inch diameter was found to the east of the cistern in 1991. This pipe presumably delivered the water that had been collected on the roof and channeled by the downspout into the cistern from the northwest corner of the house. The pipe was described as being imbedded in mortar

in a brick trough constructed of glazed and hand-made bricks. The cistern was utilized throughout the nineteenth century and was connected to an attic cistern. A force pump would have lifted water to this upper cistern where it was then delivered to baths and sinks in the northwest section of the house by gravity.\textsuperscript{29}

The attic cistern was located under the knee-walls in the northwest corner of the attic. The attic cistern consisted of a pine box created by planks laid horizontally and joined with wire nails. It was lined with sheet metal and measured three feet and three and a quarter inches wide and seven feet and three inches long. A small hole, measuring three and half inches at the diameter, was located on the north side of the unit that would have directed water into an overflow pipe that sent excess water on to the roof. One and a quarter inch holes were drilled in the wooden tank that would have been fitted with pipes to service the plumbing utilities on the lower floors.\textsuperscript{30} The wire nails that connect the metal lining to the wood suggest that the cistern was likely constructed in the 1870s. Wire nails were not produced and manufactured in the United States in large quantities until the 1870s and 1880s.\textsuperscript{31} Therefore this attic cistern was a later addition of indoor plumbing in Charleston, indoor plumbing was a common addition to homes in Charleston by the 1860s.\textsuperscript{32} Since a below grade cistern is present at the property, it is likely that some sort of basin would have predated this cistern to fulfill the home’s plumbing needs.

\textsuperscript{29} Ibid, 156.
\textsuperscript{30} Ibid, 164.
\textsuperscript{32} Graham and Ridout, \textit{Architectural and Historical Analysis of the Nathaniel Russell House}, 164.
Figure 4.15: Slate tiles recovered from the cistern floor at the Nathaniel Russell House (Photograph by author).

Figure 4.16: Brownstone lid that covered the access point of the cistern at the Nathaniel Russell House (Photograph by author).
In 2013, the subterranean cistern was partially destroyed to accommodate the addition of an elevator shaft. The site was excavated archaeologically and a portion of the cistern was disassembled. This excavation provided further insight into the materials used in the cistern. A circular brownstone cap that covered the access point was recovered as well as the slate tiles that covered the floor of the cistern. The top of the cistern was flat, created by two layers of stacked brick, unlike the other arched cisterns in the city. According to the archaeological report compiled during this excavation, the walls of the cistern were coated with a layer of coal and soot suggesting that the space was used for coal storage in later years.\(^{33}\)

As plumbing technology was developed throughout the nineteenth century, water infrastructure became more complex. One method of meeting these needs was to incorporate attic cisterns. Fewer attic cisterns were found in this analysis due to the nature of their construction. The most classic form of attic catchment basins across the United States are wooden boxes lined with metal, usually lead. Unlike subterranean cisterns, attic cisterns were easy to remove as the property was modified. Only five attic cisterns were found at the properties included in the data set. In some cases the physical evidence had been removed but their presence had been recorded in prior studies. Like subterranean units, these cisterns were filled by water collected from the roof. In many cases water was initially collected in a subterranean masonry cistern and was later force pumped up to an attic cistern. This prevented attic cisterns from overflowing and damaging the building materials below and around them. The water was then distributed to plumbing utilities on the lower floors through the force of gravity.

The attic cistern at the Aiken-Rhett House, at 48 Elizabeth Street, is a prime example of a system of water infrastructure that evolved through the years. John Robinson, a prominent merchant in the city, constructed the house circa 1820. The house was drastically altered in 1833 when it came into the possession of William Aiken Jr. and his wife Harriet Lowndes. They altered the overall floor plan of the existing structure and made significant additions throughout their ownership of the property. In the 1830s, the original central hallway was enclosed, the entrance re-oriented, and a double parlor was created. The Aiken’s also constructed a sizeable eastern wing that included a dining room on the first level with a ballroom above. The Aiken’s were not simply adding stylistic elements and expanding the structure for entertaining, they also improved the supporting structures, making additions to the slave quarters, kitchen, and carriage house/stable in the rear yard. They also added utilities to the home including gas lighting features and indoor plumbing. A second wave of improvements was made to the house in 1858 when the art gallery was built. At this time the building’s utilities were significantly upgraded including the addition of service bells and gas lighting, and improvements in plumbing.

There are four cisterns and a well on the property at the Aiken-Rhett House. Two of the cisterns are in the attic and the other two are subterranean. William Aiken was passionate about sanitation and applied the latest technology to his property. The work yard exemplifies this commitment, as the area is brick paved utilizing a complex drainage system that extended to the garden folly and privies. Archaeological investigations of the property also concluded that Aiken had his trash removed off-site, an unusual sanitary practice for nineteenth century.

34 Poston, The Buildings of Charleston, 605.
36 Martha Zierden, Aiken-Rhett House: Archaeological Research, Archaeological
The two attic cisterns are similar in construction, one is located in the original structure above the central stair hall and the second is located in the attic of the east wing. The cistern above the stair is likely the earliest, dating to 1858 when the Aiken’s built the art gallery addition and upgraded the home’s utilities. The second attic cistern in the east wing was likely added or at least adapted after a later campaign of plumbing was incorporated in the house in 1870. According to the Historic Structures Report, a lead pipe extends from the attic cistern in the east wing through a cornice dating to 1858. Since the cornice pre-dates the pipe it is likely that the attic cistern was added to accommodate the plumbing utilities in this addition in the 1870s. A small hole at the rim of the cistern would have easily fit a pipe that possibly served as an overflow release that allowed water to exit the cistern by returning to the roof or through a drain. Since the cistern sits higher than the gutter it was likely not filled by rainwater directly collected from the roof. Water was likely pumped from the subterranean cistern, but no surviving pipes exist to confirm this theory.

The attic cistern located above the stair hall, the oldest of the two, is a large wooden box that measures six feet and ten and three quarter inches east to west by fifteen feet and one inch north to south. The walls are one foot and eleven and one quarter inch in height. The cistern is constructed with six wooden planks joined with splines and dovetailed at the corners. Three wrought iron straps were utilized at the top to strengthen the cistern. At the time of the Historic Structures Report in 2003 the interior lining of the cistern had been removed but fragments of lead were noted. Theses fragments were fastened to the

Figure 4.17: Side wall of the attic cistern in the east wing of the Aiken-Rhett House (Photograph by author).

Figure 4.18: Side wall of the attic cistern above the stair hall at the Aiken-Rhett House (Photograph by author).
Figure 4.19: Remnants of the lining of the attic cistern above the stair hall at the Aiken-Rhett House (Photograph by author).

Figure 4.20: Dovetail joints on the attic cistern above the stair hall at the Aiken-Rhett House (Photograph by author).
unit with copper brads along the rim and a strip of lead existed under the one of the iron straps. Five rafters under the cistern were cut out to accommodate the frame of the cistern suggesting that it was built in place, but postdates the initial construction of the attic level. The later cistern, located in the attic of the east wing is a four foot three inch by eight foot three and a quarter inch wooden box that is rabbeted and nailed. The interior is lined with sheet copper that was soldered and crimped at the joints. The cistern has lead piping and a float valve that were likely later improvements.

All attic cisterns found in Charleston are connected to a wider service system that involved plumbing, piping, and usually a large subterranean cistern. The subterranean cisterns located at the Aiken-Rhett House correspond with the location of the attic cisterns. One is located just south of the east wing below the porch. The second is located below the art gallery addition. It is difficult to discern when these units were added but it is reasonable to believe they were constructed after the 1835 additions and definitely before the addition of the art gallery in 1858.39

The attic cisterns and contributing system of connectivity found at the Aiken-Rhett House is similar to others found in Charleston. Properties in the data set where cisterns are located and date to the 1850s, reflect the general pattern of plumbing utilities including baths and sink being added during the mid-nineteenth century, and later water closets. The William Gatewood House, at 21 Legare Street was constructed circa 1843. The structure is an impressive Greek Revival House with a brick façade, brownstone details, and marble belt course.40 A subterranean cistern is located under the rear portion of the main house. The cistern is brick and lined with stucco, typical of Charleston cisterns. There is a boxed

39 Ibid, III-165.
Figure 4.21: Exterior drainage servicing the cistern at 21 Legare Street (Photograph by author).

Figure 4.22: Well at 21 Legare Street (Photograph by author).
4.23: Force pumps at 67 Rutledge Avenue
(Photograph by author).
attic cistern three floors directly above the cistern below grade. Although it is not currently present, there was likely a system of connectivity between these two units. A brick well is also located under the hyphen.

A similar system is found at 67 Rutledge Avenue, the Colonel James Henry Taylor House constructed circa 1852. The house was constructed with the era’s latest technologies including gas lighting fixtures, a bell system, and interior plumbing. Many of these early features are still intact including a copper bathtub and an early water heater on the second floor. A large masonry cistern was constructed under the structure directly below the modern kitchen. There are two force pumps with spouts located beside the porch that are likely connected to the cistern. Without a thorough architectural investigation it is difficult to discern if additions were made to the house. The masonry cistern is located centrally under the house to the east of the cellar, but the house extends beyond its location toward the rear of the lot. There is a cupola at the rear of the structure that at one time held a lead lined tank that supplied water to the plumbing utilities. The tank originally held approximately 1,500 gallons of water that was pumped to the attic cistern from a well on the property. A newspaper article from 1956 states that the tank was part of the home’s original construction and was used until the late 1920s.

When analyzing the data on cisterns built during the first building campaign on a given property, many themes emerge. Charleston cisterns that were built during that first building campaign are similar in size, construction style, location, and the properties are in a particular area of the city. Of the fifty-two properties analyzed only ten cisterns were constructed at the same time as the main dwelling house on the property. All but one example are located in the western portion of the peninsula in Harleston Village. Harleston

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42 Isabella Leland, “’Villa In Persian Style’ House is Stately Marker to Past Era,” *Post and Courier*, November 29, 1956.
Village was one of Charleston’s earliest suburbs, subdivided into lots in 1770. Prior to the subdivision, the land was referred to as the Coming Tract. Few structures in this area were built before 1775 because the area was still dotted with marsh and tidal creeks that made building difficult. The area boomed in the 1840s and 1850s due to the success of the industrial mills on the western edge of the peninsula. Prominent industrialists constructed large impressive houses in the neighborhood during the 1840s and 1850s that demanded an equally large water supply.

The oldest properties where cisterns were built during the first phase of construction were built in the 1830s and 1840s. When residents were becoming more cognizant of the public health and sanitation issues. The cistern at 65 Rutledge Street was the oldest in the data set to be constructed during the first building campaign. This property, the James Henry Taylor House, was constructed circa 1830. The main dwelling is three and a half stories and is an example of a side-hall-plan built in the Greek Revival Style. The house was constructed by Taylor, a prominent merchant in the city who was one of the first to manufacture cotton goods in the state. The cistern is a rectangular subterranean unit located under the dining room. There is an access point located in the dining room that can be reached by lifting a hatch in the floor. The cistern is constructed of brick lined with stucco and is oriented north to south, parallel to Rutledge Avenue. Although the unit is simple, it would have held about 1,200 gallons. The cistern was significantly altered when modern conveniences were added. It currently houses piping related to the house’s HVAC unit, but the general size and most of the material is intact. The overflow point is located on the south end of the cistern and allowed water to flow out of the unit and under the porch in to the side yard if the cistern filled to capacity. Two pipes are still intact, one

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copper pipe that appears to empty into the cistern that presumably connects to the downspouts or internal drainage system. A lead pipe is located about five inches away from the copper pipe and is likely a remnant of a pumping system used to draw water from the cistern. There are two other features on the lot related to water management and sanitation infrastructure: a small shallow well and a brick vault in the rear yard. Neither of these features are currently exposed but according to an interview with the property owner, both are located in the rear yard near the auxiliary buildings. The shallow well was located near the kitchen building and the water was likely used to suppress mild kitchen fires. The brick vault found in the rear yard could have been a second cistern since it is located near the kitchen building where water could have been collected on the roof. It could also be a privy vault as the privy is located nearby and the brick vault is at the rear of the property away from the main structures where these vaults were commonly located.45

The Isaac Jenkins Mikell House built in 1853 at 94 Rutledge Avenue illustrates a similar case. The house is an impressive structure built in the Greek Revival Style with ornate details including a Minton-tiled portico.46 The cistern is located under the main dwelling, specifically under the library. It is an approximately twenty-four by thirty feet arched masonry unit. Like other subterranean masonry cisterns in Charleston the interior is stuccoed. The cistern is divided into three sections by two arched walls, each with three bays. The only remaining evidence of a piping system is an exposed section of galvanized pipe that extends into the central bay along the north exterior wall. This cistern form is similar to the one found at 179 Rutledge Avenue. Constructed twenty years later the Brown-Randolph House, utilizes a similar but more evolved cistern. The house is a three-story brick structure with double piazzas supported by Tuscan columns and a raised

46 Poston, The Buildings of Charleston, 556.
The cistern was constructed at the property during the first phase of construction. Most properties were built with cisterns by the 1870s in Charleston because of a heightened sense of sanitary awareness and need for a large supply of water to accommodate plumbing utilities. In 1876 the *Sanitary Drainage of Houses and Towns* was published steering national awareness toward adopting domestic sanitary measures. The cistern at 179 Rutledge Avenue is one of the largest in the data set. It is centrally located under the house with an access point at the northeast corner. The cistern could easily be accessed from the basement for cleaning or inspection. It is approximately sixteen by thirty-six feet, running from east to west, holding about 4,000 gallons. It was supplied by an internal drainage system that diverted water collected from the roof to the cistern through a series of cast iron pipes. The main part of the unit is a larger version of subterranean cisterns found throughout Charleston and is strikingly similar to the cistern found at 94 Rutledge Avenue. It is rectangular masonry box with an arched top and the interior is lined with stucco. The cistern is especially interesting because it reflects the plan of the main structure. The house is a side-hall plan with a central supporting wall that extends to the basement, dividing it into two main chambers. There are four fireplaces along this central wall and the supporting niches are exposed in the basement. This pattern is followed in the cistern. The main body is divided by this central supporting wall and is arched. There are four additional smaller chambers on the western end of the cistern. These chambers exhibit strides in cistern construction in the late nineteenth century and served to filter the water. Water would have been initially supplied by the cast iron pipes into the larger unit and would have slowly filtered through the masonry walls separating the large space from

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4.25: Exterior drainage servicing the cistern at 94 Rutledge Avenue (Photograph by author).
the four smaller units. At least one access point has been uncovered on the northwest small chamber. This is where water was likely gathered or lifted by a force pump for household use.48

By the late nineteenth and early twentieth centuries, cisterns were a common feature in Charleston properties. The Charleston Municipal Waterworks was formally created in 1879 by the City Council but the water supplied by artesian wells was minimal. Large cisterns were needed to provide drinking water as well as water for household cleaning. This insufficiency coupled with strides in plumbing technology kept cisterns relevant. Most houses in Charleston had indoor plumbing utilities that needed a large water supply. Even if properties were still utilizing outdoor privies, most had indoor baths that required an accessible water supply. 110 Ashley Avenue was constructed in 1881 with a 2,500 gallon raised masonry cistern at the basement level. The cistern is masonry lined with stucco with a barrel-vaulted top. This house was constructed with indoor plumbing and the cistern was likely constructed to provide an ample supply of water for water closets and baths. It was filled with water collected from the roof that was directed to a nearby drainage point by external gutters. There is one access point centered along the eastern edge for cleaning and inspection. Similarly, the E.M. Hacker Tenements were constructed in 1907 at 2-8 Bull Street. These four structures are identical two and a half story simplistic wooden houses exhibiting decorative details of the Queen Anne Style.49 Each of the houses was constructed with large subterranean masonry cisterns that can be accessed from the crawl space. One feature found at both the cisterns at the E.M. Hacker Tenements

48 Drawing by Evans and Schmidt Architect. At the time of this analysis, 179 Rutledge Avenue was an active construction site. Portions of the cistern were not exposed or available for full inspection.
49 Poston, The Buildings of Charleston, 495.
**Figure 4.26:** Exterior view of the cistern at 110 Ashley Avenue with masonry buttress supports (Photograph by author).

**Figure 4.27:** Overflow point at 110 Ashley Avenue (Photograph by author).
Figure 4.28: Exterior drainage servicing the cistern at 104 Ashley Avenue (Photograph by author).

Figure 4.29: Fill pipe for the cistern at 104 Ashley Avenue (Photograph by author).
and the cistern at 110 Ashley Avenue are the buttress supports. Each of these cisterns has a series of fin walls, similar to buttress supporting the portion of the arch and alls that are above grade.

Analysis of Charleston’s cisterns reveals little variation in cistern form in the city between 1800 and 1870. Other than the addition of pumps and systems of connectivity between sub-grade and attic units, little about the design or location changed. Of the fifty-six properties in the analysis, only one cistern was found that varied in size and form. The cistern at found at 2 Wragg Street at Aiken’s Row is an unusual example of a bell-shaped cistern. The cistern is centrally located in the work yard of the property. 2 Wragg Street was constructed in 1845 and is one of the seven identical properties that once formed Aiken’s Row. Only two of the seven properties stand today. William Aiken constructed these rental properties; each were two story Greek Revival Style houses with street facing double piazzas.\textsuperscript{50} Since this property had a cistern, it is likely that all the other properties defined as Aiken’s Row did since they were symmetrical. It is difficult to know whether these cisterns were original. In a master’s thesis on the landscape of Aiken’s Row, author, Patrick H. Morgan sites a rental advertisement for 2 Wragg dating to 1850 that does not mention the cistern. But in 1866, a second advertisement mentions a “large cistern.”\textsuperscript{51} It is possible that the cistern was simply omitted from the first advertisement or it could have been constructed during the sixteen years between. The most unusual features of the extant cistern is its shape and location. By 1845 it is unusual to find a cistern centrally located in a work yard. The cistern was likely not catching water from the roof unless there was a previous system of drainage present that directed water to it. The location in the work yard suggests that this water supply may not have been used as for domestic pur-

\textsuperscript{50} Poston, \textit{The Buildings of Charleston}, 615.
poses but for cleaning and supplying functions in the work yard. In the 1990s the waters from the cistern were used to irrigate the yard. The cistern is also not especially large and at first glance it appears to be a well. It is three feet in diameter and about nine feet deep widening into a bell curve at the bottom. The cistern likely had some sort of cap or covering since the opening would have been at ground level. A circular brick structure has been built over the cistern for protection.\(^{52}\)

Charleston’s existing cisterns reveal that after the turn of the nineteenth century property owners utilized cisterns as a common utility that moved from the work yard, beneath dependencies, to the cellar, and in some cases back to the work yard. Sanitary upheaval at the turn of the nineteenth century caused Charlestonians to incorporate cisterns, abandoning shallow wells, to maintain access to a potable water supply. Where cisterns are located on Charleston properties is heavily reliant on the property’s date of construction. At properties built before the turn of the nineteenth century (or shortly thereafter), cisterns are located in a work yard close enough to the main house to gather water from the roof or under a dependency. Water was likely gathered from work yard cisterns manually or through force pumps, much in the fashion that water was gathered from wells. Between the year 1810 and 1840 hyphens built to connect a main dwelling to a kitchen were constructed with cisterns below grade. And by the mid-nineteenth century, Charleston properties were constructed with cisterns located in the cellar. The interior drainage systems collected water from the roof and diverted it to the sub grade cistern, where it was kept cool and protected from debris. Property owners built cisterns in cellars for two reasons: access and timing. The houses built in the 1850s relied on the water supply kept in cisterns to service plumbing utilities. It was necessary that water be

\(^{52}\) Morgan, “To Rent: The Antebellum Landscape of Aiken’s Row, Charleston, South Carolina,” 45.
located near the house to be pumped up to this dependent system. Secondly, by the mid 1850s cisterns were a necessity in Charleston. The use of shallow wells had almost been completely abandoned and city officials were supervising an extensive artesian well drilling campaign. When constructed after 1830, a cistern was a requirement at a property to provide water. Therefore cisterns were safely and conveniently located a the cellar or crawl space.
By the 1870s indoor plumbing was a common feature in Charleston houses. Most houses in Charleston and throughout the United States boasted complex interior plumbing systems, most often supplied by cisterns. Indoor plumbing was a cutting edge convenience and was as highly regarded as artificial lighting. But these complex systems began to present a new set of issues to Charleston property owners. Similar to the sanitary upheaval that took place in the early nineteenth century, these complex plumbing systems, when poorly executed, brought water borne disease into the home. In 1878 sanitary engineer George E. Waring, Jr. published *The Sanitary Drainage of Houses and Towns*. This publication spurred a wave of municipal reform and sanitation legislation in the United States that inspired property owners to reevaluate their water supply and use of indoor plumbing.

Mary Stone argues in, “The Plumbing Paradox,” that indoor plumbing dramatically changed between 1880 and 1885. Stone examined “water service, drainage, and fixtures” in New York City during this five year period. During this half decade, plumbing systems drastically changed from being detrimental to health, to a moderately sanitary household system. Cistern development in Charleston mirrored this national trend. Cisterns evolved from a large source of water for drinking or cleaning to a source that was collected to supply indoor plumbing utilities. Various manufacturing catalogues and sanitary publications exemplify this change in focus from simply constructing a unit to provide water, to adapting systems to include filtration barriers that keep the unit clean.
In Charleston, evidence suggests there has always been a correlation between cisterns and disease control. First in the early nineteenth century when the population turned from shallow wells to cisterns for a healthful supply of drinking water, and again in the 1870s when the sanitation of indoor plumbing was nationally questioned. Two movements fueled the reemphasis on sanitation, the regularization and mass production of plumbing utilities and a national wave of sanitation legislation.

In the years immediately prior to the panic of the 1880s, cisterns were predominantly used when municipal water services were insufficient or at properties that were out of the utilities reach. 67 Rutledge Avenue, exemplifies this trend where the property owners relied on their attic basin when the supply provided by Charleston Waterworks was insufficient.\(^1\) As evidenced at the Aiken-Rhett House at 48 Elizabeth Street, large attic cisterns were constructed in homes during the 1850s to supply plumbing features on lower floors. Between 1860 and 1880, the number of plumbing and gas fitting supplies being manufactured by firms in the United States drastically jumped from 221 to 2,161. Plumbing utilities were widely available but were still relatively expensive because they were installed and produced by hand.\(^2\) Like subterranean masonry cisterns in the early nineteenth century, plumbing utilities and attic cisterns were found in affluent households.

Similar to the sanitary reform of the early nineteenth century, public health was ever evolving throughout the United States even in the 1870s. Louis Pasteur found that bacteria caused illness and disease in 1864, but it was not until about 1890 that the germ theory was widely accepted.\(^3\) Homeowners feared unseen “sewer gas” that allegedly

\(^1\) Isabella Leland, “'Villa In Persian Style' House is Stately Marker to Past Era,” *Post and Courier*, November 29, 1956.


escaped from faulty plumbing systems and spread disease. Although the gases were not the issue, the betterment of household drainage and securing plumbing utilities was the answer. The field of sanitary engineering was developed by a pool of engineers and scientists who utilized technology to create safe drainage methods for the betterment of the public health. George E. Waring Jr. was one of the United State’s most prominent sanitary engineers who published numerous works on how to best install indoor plumbing systems and construct adequate drainage in private homes and municipalities.

The developing field of sanitary engineering and general curiosity on best practices led to the development of publications geared toward the general public that discussed how to better plumbing and water infrastructure. One of these publications was the *Sanitary Engineer*. Previously known as the *Plumber and Sanitary Engineer*, the first edition was published in December 1877 and was composed of drainage diagrams, articles written by experts in the field, and an editorial question and answer section. The publication was the result of a casual dinner party conversation between founders Henry C. Meyer, a manufacturer of plumbing supplies, and a guest concerned about the health of her household. Meyer had recently made alterations to the plumbing system in his house because of a family member’s infliction with diphtheria. Meyer made a sketch of his design and spoke of the success of his alterations leading the woman to state, “…if someone were to start a high-class paper devoted to explaining these matters which would enlighten architects, plumbers and physicians on these questions, it would have a great future.”

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4 Ibid,189.
sation spawned the publication of the *Plumber and Sanitary Engineer*. Cisterns appear throughout the *Sanitary Engineer* from 1877 to 1885. The editorial section illustrates the general public’s sanitary awareness and desires to streamline their systems to service the latest plumbing utilities as well as adopt a sanitary system.

Based on an analysis of the publication, most cistern owners in the late nineteenth century were concerned with the quality of water their cisterns held. With the second wave of sanitary concerns sweeping the nation in the late 1870s, the water quality of cisterns was a primary concern. A substantial portion of the editorial section of the *Sanitary Engineer* was composed of questions about water quality and suggestions for filtration.

In the 1881-1882 volume of the *Sanitary Engineer* an article entitled “Plumbing Practice,” explores cistern use throughout the United States. This article identifies that by the 1880s cisterns were primarily used in areas where the public water supply was insufficient or inaccessible. Using the pen name “Sanitas,” the writer tackles the problem of cistern construction, stating that most cisterns were constructed improperly, in unsanitary locations without adequate covering. The article suggests that cisterns should always be lined with lead, tinned copper, or zinc. When iron cisterns are used they should be coated with boiled linseed oil before being painted or coated with Portland cement.\(^7\)

A major concern was the quality of water being brought in from the roof. Since water was collected from the roof, it had various places to be fouled. Rotting leaves, lead-dust, bits of shingles, and loose dirt were often cleaned out of cisterns. As property owners in the early nineteenth century were concerned with shallow wells being contaminated by infiltrating waste from privy vaults, property owners in the 1870s were concerned with contamination from the roof, especially in urban industrial areas where soot and pollution was more of a concern. *The Sanitary Engineer* suggested painting roofs where water was

collected with a small amount of oxide to ensure the metal roofs were clean. Or to let the first water of a rain be diverted away from a cistern. The first rain collects the most dirt and matter from the roof. In some cases this first run off was diverted to a second cistern and when this cistern was filled a cut-off would switch the pipe to the main cistern used for collecting usable water.  

According to the records kept by the Horlbeck Brothers, nineteenth-century cisterns employed masonry filtration walls, usually about one wythe of brick, that served to filter the water from the area where it enters the cisterns to the side where the water is accessed for use. A similar filtration system is found in the 1878 and 1880 edition of the *Plumber and Sanitary Engineer*. In this example, water undergoes a series of filtration levels before it enters the main storage space. Water would pass through a sieve placed at the end of an inlet pipe and would then seep through a porous brick diagonal masonry filtration wall that blocks off one corner of the cistern, allowing only the purest water to access the pump pipe. This cistern diagram is similar to the cisterns found in Charleston in size and material. Like earlier cisterns in Charleston the cistern is cement lined with the suggestion that the last coat of cement be used without and sand and floated upon the walls similar to a white finish coat on a plaster interior wall. This would create the smoothest possible surface and prevented the sand from contaminating the water supply.

In an 1880 edition of the *Sanitary Engineer*, a subscriber, again, raised the question of filtration systems. The response article stated that charcoal or bone black filters were the most efficient filter materials. Bone black was a material made from finely ground hard wood and served as the finest filtration level. A second filtration material suggested was cleaned and washed fine sand.

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8 “Automatic Cut-Offs,” *Plumber and Sanitary Engineer*, (June 1, 1880): 250.
Between 1800 and 1870 the lining of cisterns changed little; the publication suggests utilizing brick laid in hydraulic cement with an interior coating of plaster. By this time the magazine suggested that the plaster lining contain no lime but equal parts sand and cement smoothed to a finish. The floor was the last section to be laid after the walls were plastered so it could be kept clean. The floors were “dished” so settlement could gather in the middle and be easily removed.10

The filtration system suggested in this response is a more involved version of the filtration walls found in Charleston. The editor of the Sanitary Engineer suggests that a sloped filtration wall made of porous masonry be used to divide the cistern in to two chambers. Water is brought in to one larger chamber through a pipe and is filtered slowly through the wall. At the base of the filtration wall alternating bricks are removed from a course to accommodate a finer filtration system utilizing gravel and charcoal. On either side of the filtration wall charcoal is laid and topped with gravel (the gravel primarily serves as a weight to hold down the charcoal), two short brick walls are constructed on either side of the charcoal and gravel to contain the mix. This system allows water to enter under the filtration wall through the layers of charcoal and gravel and into the second chamber where it was then brought up through a force pump for use.11

The 1880-1881 edition of the Sanitary Engineer suggests a more technical system. Since plumbing technology was evolving, cistern form began to change as well. The 1880-1881 edition of the Sanitary Engineer includes instructions on how to create automatic cistern filters. The cistern described is similar in size, shape, and construction to Charleston cisterns, a sub-grade long square box but constructed with different but similar materials. The base and partition wall of the cistern were two pieces of flagstone.

10“Filtering Cisterns,” Plumber and Sanitary Engineer, 3 no. 10 (October 1880): 191.
11“Filtering Cisterns,” Plumber and Sanitary Engineer, 3 no. 41 (October 1880): 469.
Figure 5.1: Cistern filtration system using sand, gravel, and charcoal (The Plumber and Sanitary Engineer).
Figure 5.2: Plan and section cut of a cistern using masonry filtration wall (The Plumber and Sanitary Engineer).
The cistern walls were laid in cement, and like cisterns in Charleston, the interior walls were coated with a cement or stucco, in this case a smooth coating of Portland cement. The outlet and overflow pipes were made of vitrified and glazed stoneware. In this more complex system the bottom ground plane of the unit is sloped with a center wall (referred to as the trap) that divided the cistern in two parts. One side of the chamber is filled with water that travels through an inlet pipe directly from the roof. The second chamber (chamber B in Figure 5.3 and 5.4) would be filled with “clean-washed sand” as well as a layer of gravel. The central partition wall, (F) is lifted by an elbow joint at one end of the top of the cistern. Water enters into one chamber, the central partition wall is lifted about one inch from the floor of the cistern, and the water passes through the layers of gravel and sand to remove impurities. Loose dirt in the initial water supply would settle at the corner of the unit where the floor slopes and intersects with the cistern wall.¹²

Figure 5.3: Cistern diagram with a central filtration wall
(The Plumber and Sanitary Engineer).

Figure 5.4: Section cut of a cistern with a central filtration wall
(The Plumber and Sanitary Engineer).
Conclusion

Despite the emphasis on sanitation at the turn of the twentieth century, cisterns were considered hazardous to health in Charleston by the early 1900s. In the 1907 Charleston City Yearbook, Mayor Goodwyn Rhett identified clean water as “undoubtedly the greatest facet of health in a community.” He stated that the water supplied to the city by Charleston Waterworks from the Goose Creek reservoir contained “perfectly good water.” He also questioned how a “civilized community should prefer and insist upon drinking water from a cistern which is buried in the ground a few feet away from a dirty leaking privy vault of cesspool.”13 In the same 1907 yearbook, Charleston’s Health Officer reported that he tested 273 cisterns and condemned 68.14 Like shallow wells in the early nineteenth century, cisterns had fallen out of favor as a sanitary source of water by the early twentieth century. The City of Charleston purchased the Goose Creek Reservoir in 1907 which provided the first municipal source of public water to the city beyond the artesian wells.

A study of Charleston’s wells and cisterns reveals that water infrastructure in Charleston constantly evolved. As the peninsula grew, residents sought new ways to access potable water and when faced with epidemics borne of poor sanitation citizens and municipal boards reevaluated their efforts by mandating public health measures to protect the city’s supply of potable water and constructing household cisterns.

Cisterns are a physical remnant of the city’s struggle to maintain sources of safe water. By 1780 Charleston’s increasing urban density created unforeseen problems. City lots were divided often doubling the amount of waste on any particular site, exhausting and contaminating the supply of water drawn from shallow wells. Privy vaults overflowed

13 Charleston City Yearbook 1907, Charleston City Yearbook Collection, South Carolina Room, Charleston Public Library, Charleston, South Carolina, 158.
14 Charleston City Yearbook 1907, 165.
into the streets and later into public drains creating stagnant pools of water that provided an ideal breeding environment for disease. As early as 1754, low areas of the peninsula were filled to eliminate standing water. From 1790 on, devastating waves of water-borne and poor sanitation borne epidemics swept the city annually, driving residents and city officials to draft, enact, and enforce strict sanitary measures. This sanitary upheaval inspired residents turn to cisterns as a private water supply. Via exterior and interior drainage systems cisterns collected water from the roof of structures. This not only created a secure supply of potable water for residents but diverted water from the unhealthy public drains. It was no coincidence that between 1800 and 1830 cisterns became a common domestic utility in Charleston houses. The construction date of cisterns coincides with the increasing concern for public health.

An analysis of fifty-six properties in Charleston reveals several patterns concerning cistern placement and date of construction. First, in the early 1800s the fear of wide spread water-borne epidemics caused residents to abandon the use of shallow wells and begin to construct large subterranean masonry cisterns. These cisterns were constructed below dependencies or in the yard. The private nature of early cisterns reflected their adoption as the death toll from water-borne disease rose in the city. Cisterns were a private reaction to a public menace, an effort made by affluent residents to protect themselves from the disease. At first cisterns were constructed in work yards or below dependencies or hyphens. They relied on water collected from the roof of the main or supporting structure that was then diverted to the cistern through internal drainage system or gutters. Cisterns were treated much like wells during this era and water was accessed through force pumps. Second, by the 1840s cisterns were constructed in cellars during the first building campaign and were tied to wider water service features including baths, sinks, and water closets. By the late 1850s most affluent properties in the city had adopted some sort of
 indoor plumbing utilities. Charleston cisterns evolved to accommodate these new utilities but generally varied little in size and construction. In each era, Charleston cisterns were typically located partially below grade and were rectangular masonry units with arched tops, lined with cement to provide a clean and water-tight storage facility. They typically held between 1,000 and 4,000 gallons of water. Third, Charleston residents continued to rely on cisterns for water service into the early years of the twentieth century despite the availability of public water. In some instances property owners relied on cisterns when the public utilities were insufficient or did not reach the property. Throughout their years of use, cisterns were constructed by the city’s wealthy residents. Cisterns are a tangible reminder of the human response to epidemics and early sanitation concerns in Charleston.

Figure 5.5: Photograph of the cistern at 10 King Street repurposed for use as a wine cellar (Photograph by author).
Currently cisterns are often partially deconstructed to accommodate utilities that service modern conveniences such as HVAC units. At many historic properties, they have been repurposed for storage space since they are accessible from the home’s interior. In some cases cisterns have been adapted as usable space, on two occasions as wine cellars. Attic cisterns are less likely to be preserved as they are smaller and more easily removed.

Cisterns are an important part of historic infrastructure that serve to further educate architectural historians and interested property owners about the concerns, habits, and lives of eighteenth century Charlestonians, that when possible should be protected. When undergoing renovation or restoration projects it is important to consider cisterns, wells, and other domestic water utilities as a feature that may be encountered. In many cases throughout Charleston, large subterranean cisterns, wells, or privy vaults have been uncovered during work in back lots or under dependencies. These too should be protected as they provide valuable insight into the lives of Charleston’s eighteenth century residents and the issues they faced. Cisterns are a unique piece of Charleston’s architectural history that exemplify the panic caused by the epidemics of the nineteenth century.
Appendix A

CISTERN SURVEY
Appendix A
Charleston Cistern Survey

Street Address: 35 Meeting Street
House Name: Bull House
Date of Construction: 1730
Cistern Construction: circa 1790
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with a cement lining.
Size:
   Length: n/a
   Width: n/a
   Height: n/a

Street Address: 43 Meeting Street
House Name: James Mitchell House
Date of Construction: 1798
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with an arched top and cement lining.
Size:
   Length: 20’
   Width: 4’ 8”
   Height: 7’
Appendix A

Charleston Cistern Survey

Street Address: 51 Meeting Street
House Name: Nathaniel Russell House
Date of Construction: 1806-1808
Cistern Construction: circa 1810
Cistern Type: Subterranean
Material Description:
  Rectangular masonry unit with a flat top. The base of the cistern was covered with square slate tiles. A brownstone lid covered the access point. The cistern has been significantly altered to accommodate an elevator.
Size: n/a

Street Address: 38 Church Street
House Name: n/a
Date of Construction: 1740 with additions circa 1810 and 1840
Cistern Type: Subterranean
Material Description:
  Rectangular masonry vault cement lining.
Size: n/a
Appendix A

Charleston Cistern Survey

Street Address: 69 Church Street
House Name: Capers-Motte House
Date of Construction: 1812
Cistern Construction: circa 1840
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with a cement lining.
Size: n/a

Street Address: 39 Church Street
House Name: George Everleigh House
Date of Construction: 1742
Cistern Type: no cistern

1888 Sanborn Fire Insurance Map showing the property at 39 Church Street Approximate well location highlighted in green.

Street Address: 69 Church Street
House Name: Capers-Motte House
Date of Construction: 1812
Cistern Construction: circa 1840
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with a cement lining.
Size: n/a

1888 Sanborn Fire Insurance Map showing the property at 69 Church Street Approximate cistern location highlighted in red.
Appendix A
Charleston Cistern Survey

Street Address: 39 East Bay Street
House Name: George Chisolm House
Date of Construction: 1810 with additions in 1830
Cistern Type: Subterranean
Material Description:
Rectangular masonry vault with an arched top and cement lining.
Size: n/a

1888 Sanborn Fire Insurance Map showing the property at 39 East Bay Street. Approximate cistern location highlighted in red.

Street Address: 40 East Bay Street
House Name: James Misroon House
Date of Construction: 1806-1808
Cistern Type: Subterranean
Material Description:
Rectangular masonry vault with an arched top and cement lining. Cistern walls were partially destroyed after additions were made to the house.
Size:
Length: 11’8”
Width: 7’

1888 Sanborn Fire Insurance Map showing the property at 40 East Bay Street. Approximate cistern location highlighted in red.
Appendix A

Charleston Cistern Survey

Street Address: 43 East Bay Street
House Name: George Sommers House
Date of Construction: 1730 with 1790 additions
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with an arched top and cement lining. A stone cap covers the access point.
Size: n/a

1888 Sanborn Fire Insurance Map showing the property at 43 East Bay Street. Approximate cistern location highlighted in red.

Street Address: 47 East Bay Street
House Name: Anne Boone House
Date of Construction: circa 1740
Cistern Construction: 1840
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with an arched top and cement lining.
Size:
   Length: 13’
   Width: 9’9”

1888 Sanborn Fire Insurance Map showing the property at 47 East Bay Street. Approximate cistern location highlighted in red.
Appendix A

Charleston Cistern Survey

Street Address: 10 King Street
House Name: n/a
Date of Construction: 1790
Cistern Type: Subterranean
Material Description:
Rectangular masonry vault with an arched top and cement lining.
The current property owners have repurposed this cistern to house a wine cellar.
Size:
Length: 16’ 8”
Width: 7’ 8”
Height: 4’ 8”

Street Address: 27 King Street
House Name: Miles Brewton House
Date of Construction: 1769 alterations 1820 and 1840s
Cistern Type: Subterranean and above grade
Material Description:
There are two cisterns on the property at 27 King Street. One (cistern 1) unit located behind the house under the southern end of the arcade. This cistern was inaccessible but presumably made of brick with a brownstone lid over the access point. A force pump manufactured by Seneca Falls is located at the southeast corner of the cistern. Another cistern (cistern 2) is located in an arcade between the two dependencies to the north of the main house above grade. This cistern is a rectangular masonry box with a flat top.
Cistern 2 Size:
Length: approximately 20’
Width: approximately 10’
Height: approximately 4’
Appendix A
Charleston Cistern Survey

Street Address: 2 Ladson Street
House Name: John Drayton House
Date of Construction: circa 1760 with additions circa 1890
Cistern Type: Subterranean and attic
Material Description:
  Rectangular masonry vault with a cement lining.
Size: n/a

Street Address: 14 Legare Street
House Name: Simons-Edwards House
Date of Construction: 1802
Cistern Type: Subterranean
Material Description:
  Rectangular masonry vault with cement lining.
Size: n/a
Appendix A

Charleston Cistern Survey

Street Address: 15 Legare Street
House Name: John Fullerton House
Date of Construction: 1772
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with a cement lining.
Size: n/a

Street Address: 21 Legare Street
House Name: William Gatewood House
Date of Construction: 1844
Cistern Type: Subterranean and Attic
Material Description:
   Rectangular masonry vault with an arched top and cement lining. The attic cistern is a wooden box with a metal lining.
Size:
   Subterranean:
      Length: approximately 20’
      Width: approximately 10’
      Height: n/a
   Attic:
      Length:
      Width:
Appendix A

Charleston Cistern Survey

Street Address: 29 Legare Street
House Name: Rev. Paul Trapier Gervais House
Date of Construction: 1835
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with a cement lining.
Size: n/a

1888 Sanborn Fire Insurance Map showing the property at 29 Legare Street. Approximate cistern location highlighted in red.

Street Address: 32 Legare Street
House Name: Swordgate House
Date of Construction: 1810 additions circa 1840
Cistern Construction: circa 1812
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with a cement lining.
Size: n/a

1888 Sanborn Fire Insurance Map showing the property at 32 Legare Street. Approximate cistern location highlighted in red.
Appendix A
Charleston Cistern Survey

Street Address: 13 Pitt Street
House Name: Henry Gerdt’s House
Date of Construction: 1859-1869
Cistern Type: Subterranean
Material Description: Rectangular masonry vault with a cement lining.
Size: n/a

Street Address: 60 Montagu Street
House Name: Gailliard- Bennett House
Date of Construction: 1803
Cistern Type: Subterranean
Material Description: Rectangular masonry vault with a cement lining.
Size: n/a

1902 Sanborn Fire Insurance Map showing the property at 13 Pitt Street. Approximate cistern location highlighted in red and well location highlighted in green.

1902 Sanborn Fire Insurance Map showing the property at 60 Montagu Street. Approximate cistern location highlighted in red.
Street Address: 62 Montagu Street  
House Name: Keating L. Simons House  
Date of Construction: circa 1854-1860  
Cistern Type: Subterranean  
Material Description:  
Rectangular masonry vault with a cement lining.  
Size: n/a

1902 Sanborn Fire Insurance Map showing the property at 62 Montagu Street. Approximate cistern location highlighted in red.

Street Address: 31 Coming Street  
House Name: n/a  
Date of Construction: 1771  
Cistern Type: Subterranean  
Material Description:  
Rectangular masonry vault with a cement lining.  
Size:  
Length: approximately 12’  
Width: approximately 8’

1888 Sanborn Fire Insurance Map showing the property at 31 Coming Street. Approximate cistern location highlighted in red.
Appendix A

Charleston Cistern Survey

Street Address: 38 Coming Street
House Name: n/a
Date of Construction: 1798
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with a cement lining.
Size:
   Length: approximately 20’
   Width: approximately 12’

Street Address: 2-8 Bull Street
House Name: E.M. Hacker Tenements
Date of Construction: 1907
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with an arched top and cement lining.
Size:
   Length: approximately 20’
   Width: approximately 12’
Appendix A

Charleston Cistern Survey

Street Address: 107 Wentworth Street
House Name: William Johnson House
Date of Construction: circa 1858
Cistern Type: Subterranean
Material Description:
- Rectangular masonry vault with an arched top and cement lining.
- Masonry buttresses run along each side of the cistern.
Size:
  - Length: approximately 20’
  - Width: approximately 12”

Street Address: 104 Ashley Avenue
House Name:
Date of Construction: 1902
Cistern Type: Above grade
Material Description:
- Rectangular masonry vault with a flat top and cement lining. A cast iron lid covers the access point.
Size:
  - Length: approximately 15’
  - Width: approximately 8’
  - Height: approximately 4’
Appendix A
Charleston Cistern Survey

Street Address: 110 Ashley Avenue
House Name: Thayer-Lynah House
Date of Construction: circa 1881
Cistern Type: subterranean
Material Description:
Rectangular masonry vault with a vaulted top and cement lining.
Size:
Length: approximately 15’
Width: approximately 8’
Height: n/a

Street Address: 65 Rutledge Avenue
House Name: James Henry Taylor House
Date of Construction: 1830
Cistern Type: Subterranean
Material Description:
Rectangular masonry vault with an arched top and cement lining.
Size:
Length: approximately 18’
Width: approximately 6’
Height: n/a
Appendix A

Charleston Cistern Survey

Street Address: 67 Rutledge Avenue
House Name: Colonel Henry Taylor House
Date of Construction: 1852
Cistern Type: Subterranean and Attic
Material Description:
   Rectangular masonry vault with an arched top and lined with cement.
   An attic catchment basin was located in the back tower.
Size:
   Length: approximately 18’
   Width: approximately 6’
   Height: n/a

Street Address: 94 Rutledge Avenue
House Name: Isaac Jenkins Mikell House
Date of Construction: 1844
Cistern Type: Subterranean
Material Description:
   Rectangular masonry vault with an arched top and cement lining.
Size:
   Length: approximately 50’
   Width: approximately 30’
   Height: approximately 7’
Appendix A
Charleston Cistern Survey

1888 Sanborn Fire Insurance Map showing the property at 179 Rutledge Avenue. Approximate cistern location highlighted in red.

Street Address: 179 Rutledge Avenue
House Name: Brown Randolph House
Date of Construction: 1876
Cistern Type: Subterranean
Material Description:
Rectangular masonry vault with an arched top and cement lining. The vault is separated into four chambers with masonry filtration walls between each chamber.
Size:
Length: 36’
Width: 16”
Height: approximately 7’

1902 Sanborn Fire Insurance Map showing the property at 20 Thomas Street. Approximate cistern location highlighted in red.

Street Address: 20 Thomas Street
House Name: n/a
Date of Construction: 1885
Cistern Type: Subterranean
Material Description:
Rectangular masonry vault with an arched top and cement interior lining.
Size:
Length: n/a
Width: n/a
Height: n/a
Appendix A
Charleston Cistern Survey

Street Address: 12 Vanderhorst Street
House Name: Irish Volunteer Militia
Date of Construction: 1888
Cistern Type: Subterranean
Material Description:
    Rectangular masonry vault with a cement lining.
Size: n/a

Street Address: 350 Meeting Street
House Name: Joseph Manigault House
Date of Construction: 1803
Cistern Type: Subterranean
Material Description:
    Rectangular masonry vault with a flat top and cement lining.
Size:
    Length: n/a
    Width: n/a
    Height: n/a

1902 Sanborn Fire Insurance Map showing the property at 12 Vanderhorst Street. Approximate cistern location highlighted in red.

1902 Sanborn Fire Insurance Map showing the property at 350 Meeting Street. Approximate cistern location highlighted in red.
Street Address: 48 Elizabeth Street
House Name: Aiken-Rhett House
Date of Construction: 1830
Cistern Construction:
- Attic cistern 1: 1858
- Attic cistern 2: circa 1870
- Subterranean cistern 1: between 1835-1858
- Subterranean cistern 2: between 1835-1858
Cistern Type: Subterranean and Attic
Material Description:
There are four cisterns at the Aiken-Rhett House, two subterranean and two in the attic. The subterranean cisterns are masonry and the attic cisterns are wooden, lined boxes. Subterranean cistern 1 is located under the porch and subterranean cistern 2 is located under the art gallery addition. Attic cistern 1 is located above the stair hall and attic cistern 2 is located above the east wing.

Attic Cistern 1
Size:
- Length: 15’1”
- Width: 6’10”
- Height: 1’11”

Attic Cistern 2
Size:
- Length: 8’3”
- Width: 4’3”
- Height: 1’11”
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