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From Horse to Electric Power at the Metropolitan Railroad Company Site: Archaeology and the Narrative of Technological Change

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FROM HORSE TO ELECTRIC POWER AT THE METROPOLITAN RAILROAD COMPANY SITE: ARCHAEOLOGY AND THE NARRATIVE OF TECHNOLOGICAL CHANGE

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ABSTRACT

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The Metropolitan Railroad Company Site in Roxbury, Massachusetts, was first excavated in the late 1970s by staff of the Museum of Afro American History. Researchers recovered nearly 20,000 artifacts related to the site's phases as a horsecar street railway station and carriage manufactory from 1860 to 1891, its subsequent conversion into an electric street railway until around 1920, and finally its modern use as an automobile garage. Using the framework of behavioral archaeology, this project uses GIS-based spatial methods and newly collected documentary evidence to reexamine the site's assemblage of horse draught and carriage manufacturing byproducts study nuances in the space and materiality of technological change from horse draught to electric locomotion. Artifact distribution maps overlaid on detailed historic maps reveal that carriage manufacturing ceased with street railway electrification, but horse harness craftsmanship continued on in new capacities. Documents revealed that a hack livery and boarding stables and the road maintenance department of the electric street railway stored sleighs in the lot's carhouse, where the greatest concentration of horse accoutrements was recovered. The reuse of the materials of horse draught in different industries during a technological sea change in the street railway system highlights the importance of differential adoption and scales in archaeological narrative, and helps to connect the life histories of materials to historical actors involved with these transitions.

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CHAPTER 1

INTRODUCTION

The Metropolitan Railroad Company Site in Roxbury, Massachusetts, represents a unique opportunity to explore technology change in urban transportation through the example of streetcar railways in Boston. Its history as a transit hub began in 1860, when it was purchased by the Metropolitan Railroad Company (MRC) as the terminus of a horsecar line, and extends to the present day. Throughout the 19th and 20th centuries, this approximately 1.25 acre lot was controlled by two subsequent horsecar railroad companies, converted into an electric railway station, leased to a third company, and finally converted into an automobile garage at the end of the streetcar's domination of urban transportation around 1925. After a brief intermission as a vacant lot, Roxbury Crossing now functions once again as an electric transit hub along the Orange Line of Boston's subway controlled by the Massachusetts Bay Transit Authority.

The MRC complex at Roxbury Crossing was host to two major locomotive technologies during the heyday of streetcars in greater Boston. First, it functioned as a horsecar railway between 1860 and 1891. Horsecar railways were a system where 1-2 horses pulled passenger cars along rails set in streets. During the horsecar era, a great amount of activity occurred at Roxbury Crossing related to the care, housing, and feeding of hundreds of draught horses. The MRC also operated a car shop at Roxbury Crossing during this time that manufactured and repaired all of the cars and vehicles for the company's entire railway system. The West End Street Railway (WESR) merged with the MRC in 1887, and from that moment the Roxbury Crossing lot began its transition into an electric street railway system. From 1891 to 1893, nearly all of the Roxbury Crossing horses and horsecar railway materials were sold to the public. The great horse railway stables transitioned into a livery and boarding stables by 1895, and from then on the official documentary history of horses onsite ceases. The WESR was leased to a new company in 1898 known as the Boston Elevated Street Railway Company (BESRC), who continued to operate an electric streetcar railway line from the Roxbury Crossing lot until the 1920s.

Archaeological excavations of the Roxbury Crossing lot were undertaken in two phases in 1978 and 1979 by staff of the archaeology division of the Museum of Afro American History (MAAH) in advance of the planned construction of the Orange Line along a strip of vacant land cleared for a cancelled highway project called the Southwest Corridor. Their research goals included the discovery of structures related to the MRC and WESR's railways, as well as a better understanding of the structures and activities that supported urban transit in the 19^{th} and 20^{th} centuries (Bower et al. 1986).

The Phase III excavation report for the MRC Site was published in 1986 by Beth Anne Bower and other staff of the MAAH. The nature of the Phase III report is largely descriptive. It provides a solid foundation of documentary and material culture research upon which to ask further questions of the assemblage. One of the report's major goals as stated was to connect the archaeology of Roxbury Crossing to the archaeological study of the supportive industries of mass transit in the 19th century. It concludes that it has began to approach this topic, but a more in depth study of the collection's carriage and harness manufacturing related artifacts could produce even more questions and hypotheses.

The goal of this project is to pick up where the Phase III report left off and use modern methods to tie the rich artifact assemblage of the MRC site to the history of technological transition and the support industries of Boston's early mass transit systems. Given that the site was a space where a grand transition from horse to electric locomotion was incorporated, to what extent does the site reflect this transition? This project will seek patterns of change in both the layout of the site through time as well as the nature of supportive industries such as carriage and harness manufacturing onsite using an approach rooted in behavioral archaeology. When horses were largely replaced by electric traction, at what rate and to what extent was horse draught abandoned as a technology? Were any old specialized crafts or materials related to the horsecar railways still useful when the site was electrified? If old skill sets and materials persisted, was their use observably different during the primacy of the electric streetcar?

The exploration of these questions provides an entry point to a little understood section of industrial and historical archaeology. The history of urban mass transit has largely been left to historians, who have successfully employed the rich documentary record of the street railway era to reconstruct the life histories of the various famous metropolitan companies (see Cheape 1980, O'Connell 2013, Pinanski 1908, Warner 1962). Archaeology has not yet produced a considerable body of work on the supportive industries of early street railways in the United States. Archaeology has much to offer in the way of streetcar history, as well as the understanding of how urban mass transit developed in the United States. Most histories of how street railways, especially in Boston, transitioned from horse to electric power tend to portray the change as quick and uniform, with electrification an inevitability of the slower and more taxing days of horse draught. Archaeology offers the ability to focus on the dynamic time period between horse and electric locomotion with sophisticated and more subtle attention to the timeline and scale of technological transition. Even a cursory review of the assemblage from the MRC site in Roxbury Crossing reveals that artifacts related to horse locomotion are distributed in way that does not fit a clean and uncomplicated narrative of how technological transition is registered on a smaller scale.

The MRC site is, as far as this research has been able to discern, the only archaeological site where excavations have revealed the different support structures for both a horse and electric railway. The urban footprint of these streetcar railway systems was significant, both in terms of structures and materials. During both technological phases of the urban streetcar railway, the origin and terminus locations of car lines harbored structures and spaces where supportive tasks related to railway operation occurred. During the horsecar era, the Roxbury Crossing lot contained buildings such as stables, car houses, and shops that operated nearly 24 hours a day to keep horses and cars in good working order. The electric era required a smaller supportive footprint at street railway terminuses. Central power stations fed electricity to individual stations, and carhouses largely functioned as trolley storage and repair depots with commuter waiting stations often attached. The MRC site encompasses features and artifacts that relate to both of these major phases of the urban streetcar railways.

This project examines the MRC assemblage through a spatial and material lens, and compares its findings to the rich documentary record of the Roxbury Crossing lot to attempt to answer the research questions posited above relating to the rate and nature of technological change onsite. A great deal of historical sources that the 1986 Phase III report did not consult were analyzed over the course of this research, including detailed historical maps and atlases, aerial photography, contemporary industrial treatises and manuals on street railway operation, and official railway company reports and publications spanning the MRC, WESR, and BESRC eras. Chief in importance among these documents is the discovery of a comprehensive corporate inventory of the WESR published in 1898. It provides an unprecedented amount of detail about the appearance, layout, and equipment of every land holding in the WESR system through high-quality photography, parcel maps, and itemized materials lists. The inventory contains photography of the exterior of the entire Roxbury Crossing complex, depicts the interior arrangement of the carhouse, and lists every official item belonging to the WESR located there. Together, the WESR Inventory and the other documents collected for this project provide a more in-depth narrative of space and practice at the MRC site through time with incredible detail and clarity.

The amazing quantity and quality of the documentary materials invites reappraisal and contextualization of the MRC site's archaeological information. The analytic power of GIS (Geographic Information Systems) technology has developed significantly since the original analysis of the MRC site. Artifact distributions can now be mapped in horizontal space with ease. Additionally, historic maps and atlases can be related to the same physical space as excavation maps in a process known as georeferencing. For the first time, historic building footprints can be compared to spatial concentrations of different types of artifacts. The resulting graphical representations of the MRC site depict the different support activities such as blacksmithing, carriage manufacture, and leather harness craft in historical space throughout the different technological and corporate phases of the Roxbury Crossing lot.

The new documentary and spatial data also expands and clarifies our understanding of a particularly interesting feature at the MRC site known as the leather deposit. The leather deposit consists of a dense, 11-24 cm thick layer of leather materials related to different aspects of horse harness craft, including adjustment, repair, and production first encountered during the Phase II excavations of the MRC site. Initially, the leather deposit's full extent was unknown, and its discovery was one of the major reasons that researchers decided to pursue Phase III excavations at the MRC site (Bower et al. 1986: iv).

Figure 1. Plan view photograph of Test Trench 12. The partially unexcavated leather deposit lies above the signboard. The left side of the photograph shows the terminus of the cobblestone yard and the ruin of the northern carhouse's southern brick wall

Below the leather layer, the contexts exhibit a variety of activities from the street railway era of the MRC Site. Analyzed together, the new documentary evidence and GIS-based spatial analysis of the leather deposit largely answer the research questions that served as the impetus for this project. Finally, the application of a behavioral archaeology scheme to the evidence provides a well-rounded, logical narrative of technological transition onsite and its relationship to the human activities and material interactions of which it is composed.

Chapter 2 details the excavation and curation history of the site and its materials. It provides a general overview of the assemblage and how it has been re-examined using relational database software for this study. Chapter 3 serves as an outline of the development of Boston's urban transit system from its days of horse draught to its consolidation and electrification. It provides a detailed societal, economic, and technological context against which to discuss archaeology at the MRC site. Chapter 4 reviews Michael Schiffer's development of behavioral archaeology and its application to studies of technological change, arguing that it has the potential to provide an augmented and relatable narrative to the complex process at work at the Roxbury Crossing site. This chapter also reviews the spatial and material methods employed to analyze the assemblage. Chapter 6 establishes and describes the functional groups of artifacts related to carriage manufacturing and horse draught onsite, and then discusses the results of the spatial analysis that compares them to different detailed historic maps. Chapter 7 builds upon the material and spatial analyses to arrive at a holistic interpretation of the complicated nature that horsepower was replaced by and coexisted with electric power at the Roxbury Crossing lot It concludes by discussing the degree to which behavioral archaeology was applicable to this project, and suggests further avenues of research.

CHAPTER 2

BACKGROUND

The Southwest Corridor Project and the Metropolitan Railroad Company Site

In the late 1960s, a large swath of dense urban land extending from the Back Bay area of Boston southwestward to the Forest Hills Station of the Massachusetts Bay Transit Authority (MBTA) was cleared in advance of planned construction of an eight-lane highway that would connect Interstate 95 to Route 128 (see Appendix A, Map 1). Citizens within the affected area met the plan with great public protest, and popular pressure led Governor Francis Sargent to cancel the project in 1973 (Southwest Corridor Park Conservancy 2014).

The Southwest Corridor land had already been set aside for transportation purposes. The MBTA planned to use the land to run underground transit lines along its extent. From 1901, the Washington Avenue elevated railway had run along the path. The MBTA planned to close this line and replace it with the modern day Orange Line, which on May 4, 1987, first connected Forest Hills to Back Bay Station completely along a subterranean line. In advance of the Orange Line's construction, from July to October 1979, the Museum of Afro American History, Inc., (MAAH) conducted an archaeological survey of the Southwest Corridor Project for the MBTA.

After large-scale demolition, landscaping, and grading in advance of the cancelled interstate highway, the Southwest Corridor had been converted from a densely developed urban built environment to a completely cleared landscape. Though logistically advantageous for testing, the demolition also made subsurface features and structures completely invisible to walkover survey (Bower et al. 1984: 6-7). MAAH researchers discovered through documentary research that, at the corner of Tremont St and Columbus Ave tucked below the former Boston and Providence Railroad, there once sat a great complex of structures associated with the Metropolitan Railroad Company (MRC), a horsecar street railroad company that operated from 1856 to 1885.

Due to extensive disturbance in the recent past, backhoes first opened the MRC Site’s trenches, which were subsequently dug by hand after layers of heavy modern detritus were removed. The vertical extent of initial bulldozer and backhoe stripping on site reached 15 to 35 cm below surface. Excavation trenches were usually 1 to 2 meters wide, and ranged in length from 2-10 meter. When possible, trenches were dug in natural stratigraphic levels. All trenches were excavated to natural sterile subsoil, or as close as possible allowing for safety and reasonable conditions (Bower et al. 1986: 8-19).

Figure 2. Photograph of MAAH excavations onsite. An archaeologist reveals the footings of the west wall of the car shop.

The Artifact Assemblage

Initially, artifacts were cataloged at the laboratory of the Museum of Afro American History in Roxbury. In the late 1990s into the early 2000s, the Southwest Corridor Project artifact collection was transferred to the ownership of the Massachusetts Historical Commission (MHC). The artifacts were then catalogued in more detail and entered into an electronic database called the Massachusetts Artifact Tracking System (MATS). With the powerful search capabilities of Microsoft Access' relational database, new artifact reports with comprehensive attribute information were generated for different spatial and temporal units of the site.

A total of 18,718 artifacts were recovered combined from the Phase II and III excavations. The assemblage is dominated by two artifact material categories, historic glass and faunal materials, that together make up more than half of the collection's sum of artifacts. The historic glass category, which includes vessel, bottle, window, and other types of glass, contained 6,268 pieces, or 33.49% of the collection. Faunal materials, dominated by leather horse harness but also including items such as bone and shell, contained 7,034 pieces, or 37.58% of the collection.

Other artifact categories recovered include composite materials, or those objects composed of more than one material type such as light bulbs or horse harness with copper rivets, which contains 188 pieces or 1% of the collection. Floral materials, or those objects composed of plant materials such as paper, cloth, or wood, contains 183 pieces or 0.98% of the collection. The general material category, including miscellaneous objects such as slag, paint, and pencils, contains 526 pieces or 2.81% of the collection. The historic ceramic material category, which encompasses traditional archaeological categories such as refined and coarse earthenwares as well as sundry items such as porcelain insulators, contained 1,063 pieces, or 5.68% of the collection. Metal materials, including ferrous materials such as nails and other various objects of other metal types, contain 3,225 pieces, or 17.23% of the collection. The clay smoking pipe category, including the various portions of the pipes such as stem, heel, and bowl, contains 68 pieces, or 0.36% of the collection. Finally, the synthetic material category, including objects such as plastic hair combs and linoleum tile, contains 163 pieces, or 0.87% of the collection.

The artifact collection's functional categories were adopted from the MATS system. Broad categories employed by MATS include architecture, commerce, faunal, food/beverage, furniture/household equipment, heating/plumbing/electric, industry/manufacture/trades, lighting, medical/chemical, personal, recreation/leisure, storage, transportation, and writing. The transportation category, which includes objects related to the horse and electric street railroads but also sundry goods such as automobile and bicycle parts, contained the most pieces in the collection at 7,495 objects, or 40.05% of the collection. Architectural materials, which encompass a wide range of objects including hardware and building materials, represents the other major functional category, containing 6,148 pieces, or 32.85% of the collection. Food and beverage objects, including those objects related to consumption, storage, service, and preparation, contains 2,699 pieces, or 14.42% of the collection. The other functional categories were represented in significantly fewer numbers.

The heating, plumbing, and electric category, mostly piping and fuel, contains 653 pieces, or 3.49% of the collection. Personal items, such as clothing, fasteners, and items related to hygiene, contain s 226 pieces, or 1.21% of the collection. The recreation and leisure category, encompassing items related to gaming, music, toys, and especially smoking tobacco, contains 101 pieces, or 0.54% of the collection. Artifacts related to lighting, mostly devices like lamps, amount to 98 pieces, or 0.52% of the collection. The industry, manufacturing, and trades category, which broadly encompasses objects used and consumed by various professional activities and especially in this case smithing, contains 82 pieces, or 0.44% of the collection. Medical and chemical items contain 31 pieces, or 0.17% of the collection. Furniture related items contain 6 objects, or 0.03% of the collection. Commerce, including coins and seals, writing, and storage, together contain a scant 9 items, or combined only 0.05% of the collection.

Unfortunately, a good portion of the collection could not be organized based on functional categories due to their indeterminate historic use. Many of these largely unidentified items consisted of scraps of ferrous metal, or other ambiguous items of unknown composition that do not fit into any category.

Considering the urban industrial context of the site, taphonomy was a considerable factor when determining the possible date range for most contexts. Demolition of the West End Street Railway (WESR) buildings ca. 1926, while providing a definitive end date for railroad-related activities on the lot, at the same time proved disruptive to the accumulated stratigraphy of WESR and MRC activities. With some contexts, the cobblestone block layer provided a dating benchmark against which to determine if deposits occurred before or after its installation. The original Phase III excavation report estimates that the cobblestone yard was placed sometime around 1885, when the building that connected the stables and northern car house was enlarged and became the southern car house. Other historical documents and archaeological evidence supports this hypothesis, but its use as a temporal marker especially in the area of the leather deposit calls for other methods of corroboration.

A reliable method of determining the TPQ (terminus post quem) of the site's deposits derives from the earliest manufacturing date of the most recently manufactured objects within each context. Taken with the known or estimated date ranges for the buildings on the lot, the artifact-derived TPQ is an essential tool for dating the site's contexts. The site's overall TPQ, or that of all of its contexts combined, can be problematic to discern due to two facets of its original excavation. First, in some instances artifacts were only collected after mechanical excavation by backhoe had stripped a good deal of the most recent modern demolition and fill away. The field supervisors felt such stripping was necessary because the grand demolition and grading for the Southwest Corridor highway had left the surface rather impenetrable by other means (Bower pers. comm. 2014). Further, some architectural artifacts were sampled, rather than collected wholesale. Artifacts that were sampled include brick, shingles, linoleum, plaster, asbestos, concrete, mortar, and architectural wood (Bower et al. 1986: 76).

Nonetheless, some artifacts more or less contemporaneous with the date of the Phase II and Phase III excavations were discovered amongst contexts below the 1960s demolition and grading that suggest some deeper disturbance onsite. Test Trench 28 Level 3 contained many fragments of newspaper, none of which contained a date but one that mentions Rosalynn Carter as the First Lady of the United States. Seeing as she served as First Lady from 1977 to 1981, the newspaper must date from at least 1977, and thus provides a loose TPQ for the site. The excavations undertaken by the MAAH occurred practically at the same time, though, leading one to wonder about disturbance. A more firm TPQ comes from Test Trench 4. There, backhoe trenching revealed an atomizer bottle patented in 1955. Another artifact fairly well spread out amongst the bottle glass collection onsite is bottle glass with an Owens-Illinois Glass Company mark that firmly dates from at least 1954 (Lindsey 2010). Together, these artifact types confirm 1955 as a more conservative TPQ for the site's collection as a whole.

The lack of stratigraphic integrity for a great deal of the most diagnostic ceramics in the collection made establishing mean ceramic dates impossible for majority of the site's contexts. Many levels' artifacts were bagged together, lacked provenience, or simply lacked datable ceramics. Thus, MCDs were only calculated when warranted by possibility or necessity. A further caveat about MCDs involves their method of calculation. Historical archaeology has questioned the capacity of MCDs based on shard count to accurately depict a true mean for date of deposition, and researchers largely favor averages based on minimum numbers of vessels or individuals. Unfortunately, creating a minimum number of individuals for the MRC ceramic collection was outside of the scope of this project.

Conclusively, the Southwest Corridor Project resulted in the erasure of a significant portion of the Stony Brook area's historic fabric, yet the archaeology that was conducted in advance of the Orange Line was responsible for better understanding some of the vanished aspects of its industrial past. The extensive artifact collection recovered from the MRC site during Phase II and III excavations speak to a wide variety of activities onsite, ranging in time from the lot's use as a milldam pond up through its life as a vacant lot. In particular, the rich assemblage of artifacts related to horse draught and carriage manufacturing recovered from the MRC Site connect Roxbury Crossing to the history of urban mass transit and its development in Roxbury and metropolitan Boston.

CHAPTER 3

URBANIZATION AND MASS TRANSIT IN METROPOLITAN BOSTON

Industry and Urbanization in 19th century Roxbury

In 1820, Roxbury was a hinterland village. A small population clustered around the original main artery of Roxbury Street, but the surrounding country was largely agricultural (Drake 1878: 43). The center of the village around Elliot Square served as a market for Boston (Figure 3). Occupying the bottleneck of dry land at the Neck of Boston's downtown peninsula, goods and services were exchanged along the main thoroughfares of Roxbury, Tremont, and Centre Streets.

Figure 3. Detail of the 1832 Hale map of Roxbury. Elliot Square is represented by the cluster of buildings around Washington and Dudley Streets at the map's center.

Roxbury's path towards urbanization formed in conjunction with Boston's emergence as a city in the 19th century. Elliot Square remained the only real population cluster in the period before industrialization and annexation (Museum of Afro American History 1990: 5). The first notable population growth of the 19th century occurred between 1840 and 1850. During this time, Roxbury's citizens doubled in number from 9,000 to 18,000. The city was granted its charter in 1846 (Drake 1878: 43).

From 1850 to 1870 Roxbury experienced a building boom when industrialization spurred a growth of residential construction throughout Lower Roxbury (Warner 1962: 40). Nearly 60 percent of the new construction in Roxbury during these boom years served the needs of lower or middle class households (Warner 1962: 88). The population of the city again nearly doubled, from 18,373 in 1850 to 34,772 in 1870, and as the growing population blurred the boundaries between city and suburb, Boston annexed Roxbury in 1867 (Drake 1878: 43-52). By 1870, a postwar boom again helped make the growing population of Roxbury denser, and some distinct residential and commercial zones began to form. The establishment of the Metropolitan Railroad Company (MRC) in 1856 in the area allowed middle class families to reside in Roxbury and commute into Boston. The highlands south of Dudley St largely hosted grand residential estates, which sat above the lowland mixed residential and industrial area of Lower Roxbury along Stony Brook (Figure 4).

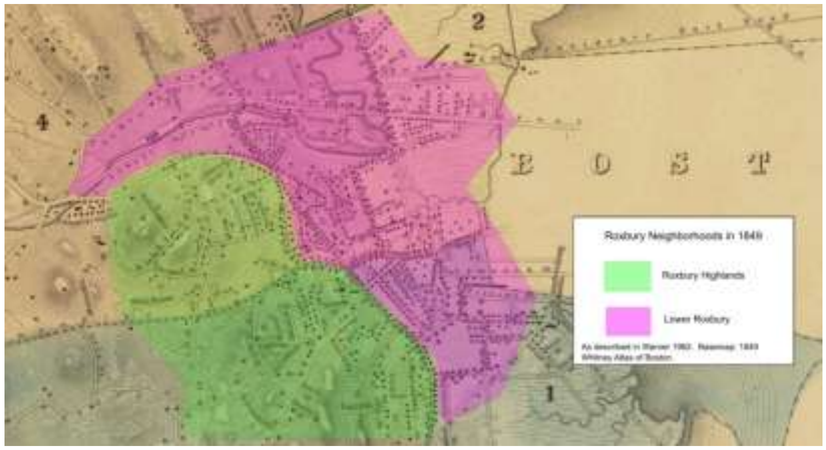


Figure 4. Detail of the 1849 Hale Map of Roxbury. The approximate boundaries of the city's neighborhoods are shaded.

The lower portion of Roxbury was a continuation of the South End and South Boston industrial complex (Warner 1962: 40). Water and power from Stony Brook and Back Bay and the docks of South Bay helped to grow Lower Roxbury into the industrial hub of Boston's hinterland. Diverse kinds of facilities, such as foundries, textile mills, rope walks, piano works, lumber and stone yards, and breweries, sprang up in the area.

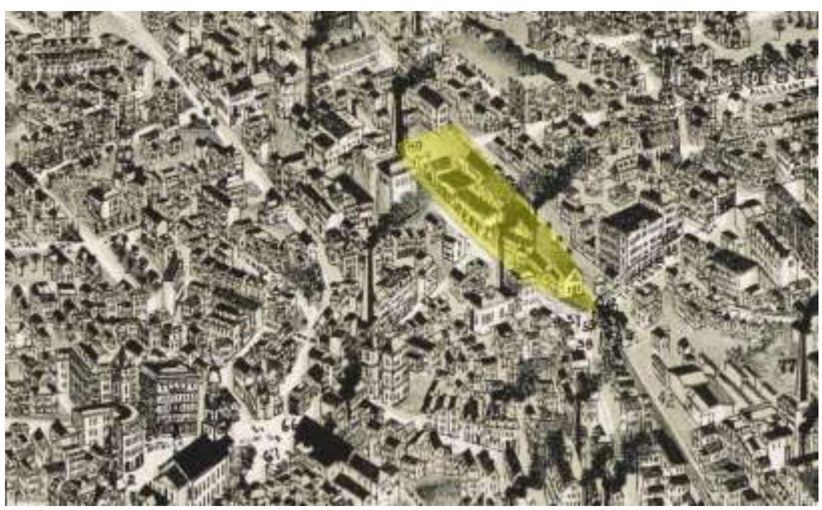


Figure 5. Bird's Eye Drawing of Lower Roxbury, 1888. The MRC Site lot is highlighted in yellow.

The electrification of streetcar lines starting in 1889 further bolstered suburban construction in the area (Warner 1962: 43, Museum of Afro American History 1990: 7). By 1900, the Lower Roxbury area was almost completely filled by factories, tenements, and facilities for supportive services (Figure 5). There was no room for established industries to expand or upgrade, and new industries often found more land and opportunity further outward from the Boston metropolis. Further, the remaining industries transitioned from skilled, higher wage labor to unskilled, lower wage labor. Overall, the built environment of the Lower Roxbury area was becoming a slum of sorts where inter-structural space had shrunk.

Roxbury's Infrastructure

Roxbury's approximately forty streets were only given official names as late as 1825, and the first street was paved in 1824 (Drake 1878: 50-51). Coaches first started running between Boston and Roxbury in 1826 on an hourly basis. Even after regular public conveyance of people and goods between the downtown and the hinterlands was established, many continued to walk to and from the Neck, carrying purchases or commuting to work (Drake 1878: 51).

Figure 6. Detail of the 1841 Dearborn Map of Boston, showing the recently expanded land connection between the Neck and Roxbury.

In 1850, the densely settled area of Boston was focused mostly on the area within a two-mile radius from the downtown peninsula where one could arrive by foot within 45 minutes (O'Connell 2013: 70). Portions of eastern Roxbury, mainly the lowlands along Tremont St bordering Boston's South End, were within the walking zone. Though stagecoach travel was ranked amongst the major methods of communication and transportation in and out of the Neck, walking still remained popular as the only cost-effective option for many metropolitan dwellers (Warner 1962: 15).

Marshes and ocean inlets inhibited the geographical opportunities for Boston's urban expansion. It was only by the 1830s that development had become so extensive that housing construction began beyond the Neck (Warner 1962: 18). By the 1840s and

1850s, the booms of population growth that occurred in Roxbury necessitated a novel method of transportation to and from the hinterland.

The Development of Horse-Powered Urban Transit

The organizers and promoters of mass transit in the early urban centers first attempted to power their lines with steam. Steam proved mechanically unsuitable, prone to explosion and derailment, and publically ill-perceived by the urban commuting populace (Greene 2008: 170, McShane and Tarr 2007). Instead, the industry turned to an organic draught machine. The domesticated animal found most suitable for industrial labor was the horse. The complicated, sensitive, and powerful natural characteristics of horses, including their non-territorial penchant for herding, easy reproductive capabilities, sociable behavior, and considerable but manageable size, placed horse labor at the center of many of the natural, social, and industrial urban spaces from which much of America's industrial production originated (Greene 2008: 14).

Stagecoaches, horse carts, and other equine powered vehicles are among the oldest, most common sights in western cities. Omnibus carts were among the first forms of mass public transportation. These large stagecoaches used horse draught to offer fixed schedules and predetermined routes with standardized stop locations typically at lower fares than private stagecoaches. The omnibus system's lack of smooth, efficient travel generated growing physical strain on its horses and the carriages themselves, both of which were often in need of repair. Passengers also often complained of irregularity in timing and frequency of stops (McShane and Tarr 2007: 58-89).

The key technological breakthrough came with the laying of steel rails on city streets, upon which larger carriages could run more quickly, smoothly, and safely, with less strain on draught horses. The busy line from downtown to Roxbury Crossing, the lot where the MRC site is located, was among the first horse-drawn streetcar railroad line in the area. Established in 1856, it soon replaced the area's omnibus service and supplanted pedestrian and carriage traffic (Warner 1962: 23).

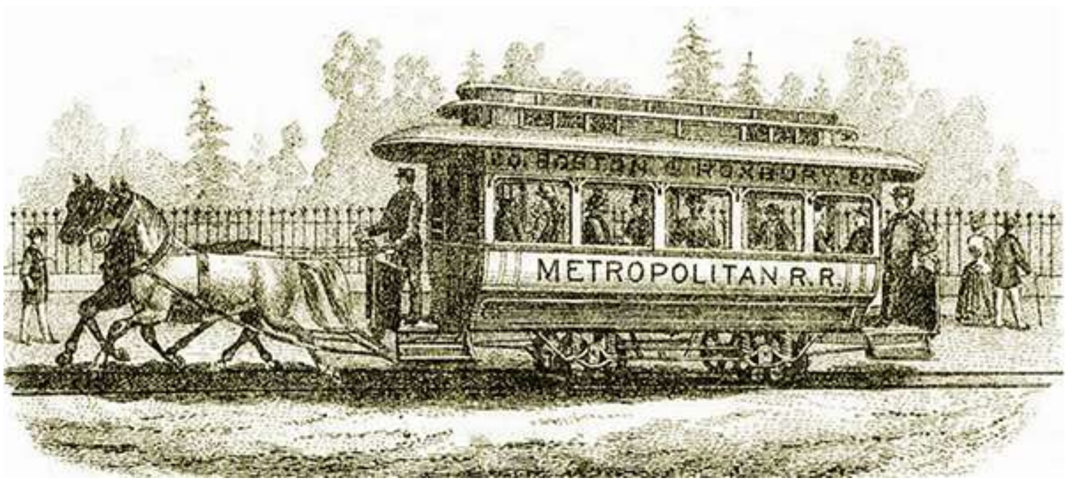


Figure 7. A Metropolitan Railroad Company horsecar from a contemporary illustration.

The Metropolitan Railroad Company and Roxbury Crossing

From 1856 to 1873, many franchises for streetcar lines were created and competed with each other, but in the end only two survived with service to Roxbury. The Metropolitan Railroad Company (MRC) was one of them. The charter for the MRC was granted in 1853 (Whitney 1892: 15). From its earliest days, the MRC strove to encapsulate as much of the labor and production of its industrial operation within the confines of its own business and capital. In its earliest annual financial reports, the MRC boasted of conducting all carriage repairs, horseshoeing, and harness making on its own premises, all labor paid on the company payroll. It also was reported that the company ran omnibuses, snowplows, and sleighs to account for variable thoroughfares and weather conditions (Bower et al. 1986: 12).

In 1859, the MRC bought two acres of land at the end of their Tremont Street line at what is now known as Roxbury Crossing, then "Waitt's Mills" or "Tremont Crossing." On this site the MRC built a complex to store and service the cars and horses that served the Tremont Street line. Its initial buildings consisted of a brick car house, 157' by 50', which held approximately 28 cars in its first story and numerous repair shops in its second. The building even had a steam engine to grind the horses' grain. To its rear, the MRC built a brick stable, 125' by 64.' By 1860, the MRC had added workshops to the complex (see Appendix A, Map 5) (Bower et al. 1986: 13). Typical street railway stables of this size housed anywhere from 100 to 300 horses (McShane and Tarr 2007: 109).

The next twenty years would see the construction of similar complexes in lots around Roxbury and Brookline to meet the ever-growing demand for supportive structures and services to aid in the smooth, stable, but costly running of the horsecar lines (Bower et al. 1986: 13-14). In 1866, the MRC reported that it had introduced steam power to its car shop at Roxbury Crossing: "Some improvements have been made at the car shop by which steam power has been substituted for manual labor, and we now have facilities for building cars, sleighs, &c, at less cost than they can be purchased" (Metropolitan Railroad Company 1866: 18).

By 1885, the Roxbury Crossing complex had grown exponentially in terms of the amount of horse- and carriage-related service and manufacturing undertaken on site. The lot's workshops had absorbed service and repair work not only for the Tremont Street line but also for much of the MRC's cars in general. Unfortunately, due to the afore-mentioned urban crowding that swept Lower Roxbury in waves during the late 1800s, there was no physical space for the Roxbury Crossing complex's lot to grow along with it. As lamented in the MRC Annual Report of 1884:

> "The constantly increasing business carried on in our car and repair shops has now made it almost impossible to longer transact it with either dispatch or anything like convenience. These shops are and for many years have been located at what is known as Tremont Crossing, over or in the upper part of the car-house and adjoining the large stable connected herewith. Danger from fire is and always has been imminent, and, with cars, horses, hay, wood and paint shops, blacksmith and machine shops and foundry—all huddled together in one heterogeneous mass—it is obvious that the necessity which has so long existed for the proper accommodation of this large department is now absolute and imperative…The Company owns about seven hundred cars, all of which need each season more or less repairs. This, taken in connection with the fact that we construct from the raw material all new cars placed upon the road (building every part thereof except the wheels and axles), it is evident

that our workshops have been the scene of some great activity during all recent years” (Bower et al. 1986: 14).

The MRC resolved to build large new workshops on land recently purchased on nearby Bartlett St (Bower et al. 1986: 14). In that same year, the workshops at the Roxbury Crossing complex created 57 new cars and repaired 66 (Bower et al. 1986: 14).

Horsecar Railway Operation at the Roxbury Crossing Lot

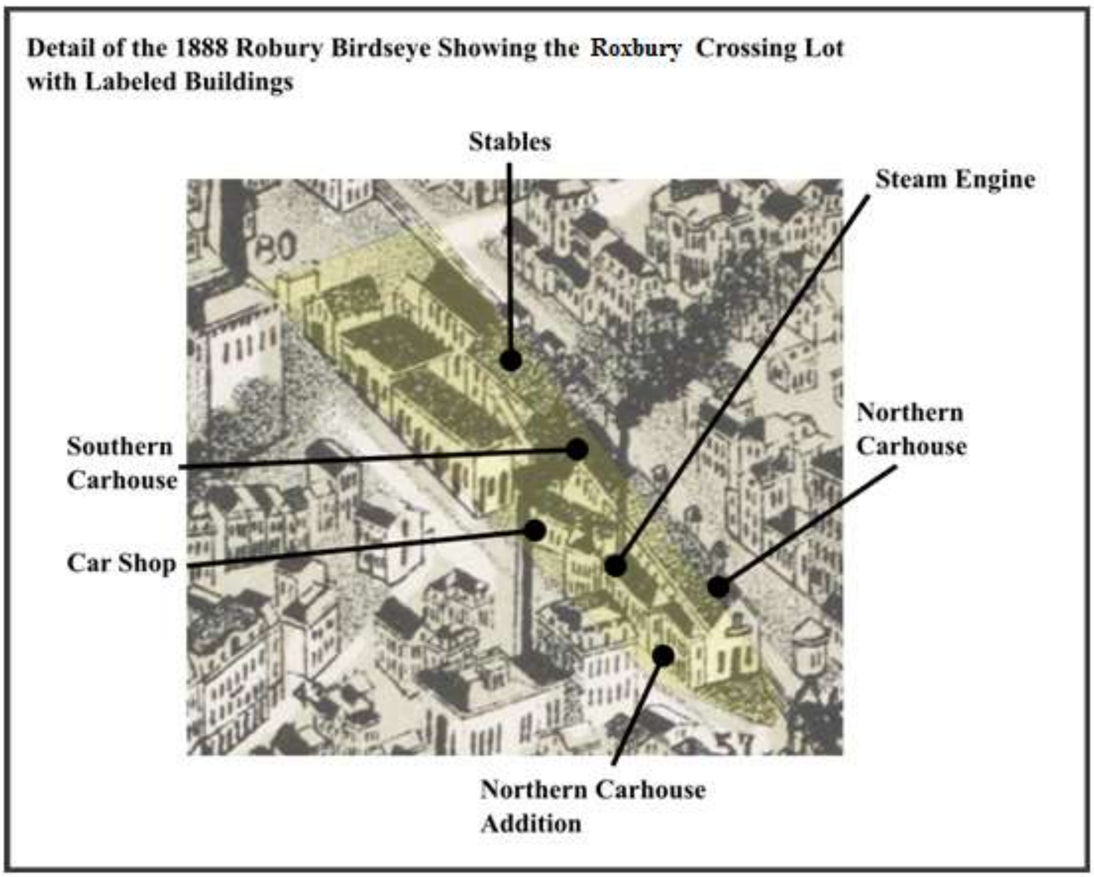


Figure 8. The Roxbury Crossing lot with labeled buildings, from the 1888 Bird’s Eye illustration

Individual buildings of the Roxbury Crossing lot dedicated to the component functions of the street railway enterprise contained compartmentalized use areas within themselves. Like the organs of a living being, these buildings' interior departments functioned in concert with one another in order to keep healthy the locomotive power of the draught horse and successfully couple it with clean carriages in good repair.

The compartmentalization of feeding departments above horse lodging areas allowed each individual horse to enjoy more spacious accommodations with proper ventilation. Good conditions for draught horses were often a cause for company pride. Not only did modern, well-kept stables keep horses in good working health, but they also ensured that, ostensibly, the horses *appeared* healthy. As they made their way through the major urban arteries of metropolitan Boston the outward appearance of the MRC and WESR horses was to their public and their customers the most obvious indicator of the company's integrity. Thus a healthy horse was also a vehicle for positive public relations at a time when large urban stables, with their smell and fire hazards, were not largely popular (McShane and Tarr 2007: 110).

The stable as a constructed space must have been able to accommodate the amount of feed necessary to fuel its draught population, while also being able to efficiently deliver the feed to its horses and provide for storage of surplus in case of emergencies (McShane and Tarr 2007: 127). There is good reason to believe that the feed department of the Roxbury Crossing MRC stable was arranged so that the work of preparing and mixing the grain in spaces was situated above the stabling areas for the horses.

Horses were almost always housed on the first and second floors of stables, which commonly employed an incline to move horses to the second floor (McShane and Tarr 2007: 109). The Sanborn maps and WESR photographs verify that such was the case at the Roxbury Crossing complex. Wright suggests that stables introduce as much light and air as possible in order to improve the health of the horses within (1888: 145-146). Sanborn Fire Insurance Maps and WESR photographs of the Roxbury Crossing lot show large exterior windows on all floor of stabling areas within the complex.

On average, streetcar horses spent 20 of the hours of a given day stabled. Their rural counterparts enjoyed grazing space and the open air of agricultural duties, and only spent 8 hours a day in stable. Thus, urban streetcar horses' stables were something of an all-encompassing environment and had to provide the sort of safety, shelter, nutrition, and healthiness that horses often found across multiple buildings or areas in agricultural or wild settings (Wright 1888).

The advent of the great metropolitan horsecar railways acted as a double-edged sword for the overall health of urban horses. Streetcar horses faced stable crowding and overall exposure to and interaction with large numbers of urban herds. Compounded with the pollution and microbial ecology of 19th century industrial centers, urban horses were more susceptible to disease. Further, the daily demand of draught work took a tool on streetcar horses. Exhaustion and injury were not uncommon, especially considering the treacherous urban surfaces their hoofs trod upon every day (McShane and Tarr 2007, Wright 1888).

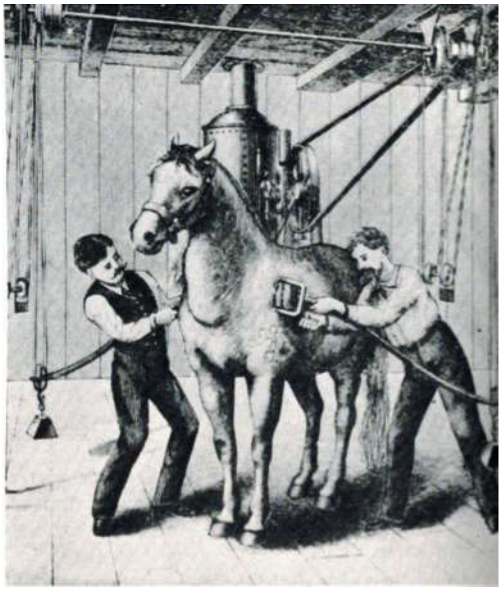


Figure 9. A mechanized horse-grooming machine as depicted in the 1884 *Street Railway Journal.* From Middleton 1967.

Urban streetcar companies faced with the fragility of their draught stock developed veterinary medicine commensurate with their need to keep their lines running. In the early days of the horsecar railroad at mid-century, blacksmiths and stable hands were often the repositories of traditional folk knowledge about horse healthcare. By the end of the century, manuals and treatises similar to those produced by streetcar engineers were being published by the leading horse experts to inform and instruct the established veterinary departments of great capital enterprises such as the MRC that held large draught stock (McShane and Tarr 2007: 157-164). Thus, the industrial mechanism that constructed an often unsanitary ecology for the urban horse was the same entity that developed a great deal of the first modern medical studies of its health.

Large stables such as those constructed by the MRC and other streetcar companies required veterinary facilities onsite located within the stables themselves. There is no definite evidence of the location of the veterinary facilities within the MRC stables, but no doubt they were located within the large stable area, most likely at its southern end far away from the noise of the car houses and the workshops.

Blacksmith shops were integral to the proper function of horsecar railways. They kept horses shod through their many trips back and forth along the lines, as well as producing ironwork for the cars, buildings, and the road itself. Some of the larger stables had facilities to shoe 200 horses daily (McShane and Tarr 2007: 120). Smiths employed in these shops were often independent craftsmen, but the MRC boasted that all of its workers, even the smiths, were on the company payroll (Bower et al. 1986: 30).

The dedicated function of a car house is as the starting and ending point of carriage routes. The MRC and WESR maintained car houses on the first floor of the northernmost building on the lot, and after 1885, in the building to its rear on the same story. The WESR Inventory provides a simplified layout of the car houses' interior (see Appendix A, Map 4). Four tracks ran the length of the north car house, with the easternmost three tracks extending into the southern car house. Attached to the eastern portion of the car house was a one-story brick and timber-frame structure that was partitioned into a small passenger waiting station, station offices, and a lounge for the complex's employees. Its southernmost brick portion housed a steam engine in the MRC days, and was the chief location of the leather deposit's materials. The waiting station portion of the car house was unique in that it hosted the commuting public, and sold to them tobacco, cigars, soda, and lunches (see Figure 10.) As opposed to the rest of the industrialized lot, its function was dedicated to leisure (West End Street Railway

Association 1898a: 128-131).

Figure 10. Photograph of the addition to the northern car house from the 1898 WESR Inventory. Note the signs advertising lunch, snacks, cigars, and tobacco, and the children loitering outside. From WESR 1898a.

Streetcar railways that manufactured their own carriages were firmly in the minority amongst the industrialized transit enterprises of the horsecar era, but the MRC operated a car shop on its Roxbury Crossing lot from 1860 up until its purchase by the WESR in 1885. There, it manufactured every part of its carriages except the wheels and axles for the majority of its entire streetcar railway system, not just the lines fed by Roxbury Crossing (Bower et al. 1986: 30). Wright's manual on streetcar railways devotes a whole chapter to the reasons why it does not make economic or managerial sense to maintain a carriage-manufacturing department. Although he argues against them, his thesis contains observations on their common arrangement: "The equipment of a street railway is comparatively limited, inasmuch as no single company need new cars enough to warrant an investment in buildings, with improved labor saving machinery, equal in extent to any of the large firms engaged in this business; and without this improved machinery, convenient and extensive shop room and arrangement, it cannot compete with the manufacture" (1888: 113).

Car shops required efficient and large spaces, and sophisticated technology. The MRC's 1866 annual report describes the addition of just such mechanical technology to its car shops to facilitate efficient car manufacturing: "Some improvements have been made at the car shop by which steam power has been substituted for manual labor, and we have now facilities for building cars, sleighs, &c., at less cost than they can be purchased" (Metropolitan Railroad Company 1866: 18). It was set back from the rest of the complex on its eastern edge, originally on the bank of Stony Brook and a steam engine was set at its northern edge. This is obvious from the 1888 Bailey bird's eye illustration's depiction of a smoke stack at this location (Figure 8), and is corroborated by the MRC's report of steam power. A noisy, hot, and potentially dangerous manufacturing center could not be located in or even be attached to the horse stables or even the car house, for reasons of fire safety, the physical and mental well-being of the horses, as well as the overall efficiency of labor divided by specialized task.

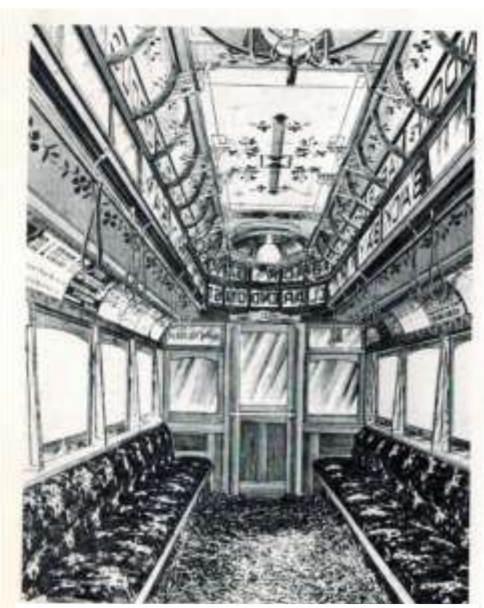


Figure 11. Illustration of the interior of an MRC trolley from *Street Railway Journal*. From Middleton 1967.

Other facts about the car shop were discovered during the original Phase II and Phase III excavations. As discussed in the Phase III excavation report, contemporary documentary sources such as Baillou's Pictorial and the Street Railway Journal describe the Roxbury Crossing cars in a variety of painted colors, with decorative tinted pressed glass windows. Archaeological correlates of these carriage decorations were discovered onsite, suggesting that painting and window installation occurred in the MRC and perhaps the WESR car shops, as is discussed later. Additionally, the car shop floor consisted of wooden planking set on sand fill (Bower et al. 1986).

Consolidation of the Streetcar Lines and Electrification

By the late 1880s, Boston's disparate private street railway lines were becoming so numerous and complicated that talk of consolidation entered corporate discussions. In 1887 a consolidated street railway firm was finally created, born out of the ambition of Henry Whitney, a steamship operator and speculator in Brookline real estate. He had formed a small streetcar syndicate named the West End Street Railway, and soon began obtaining stock in the other major operating lines in Boston, chief amongst them the MRC. The promise of rapid expansion, great profit, and the streamlining of service prompted stockholders in the other firms to acquiesce to Whitney, and in 1887 the "West End Bill" was passed by the Massachusetts legislature to allow the merger. Calvin A. Richards, then the head of the MRC, was the first to exchange his stock in his own company for that of the new West End Street Railway (Warner 1962: 25-27, Whitney 1892).

Immediately in 1889, the West End Street Railway (WESR) began experimenting with electric locomotion. It introduced its first electric car service in 1889, and began to phase out horsecars along its lines over the next twenty years. The economic superiority of electric draught was obvious from a managerial perspective. Electric streetcars could travel twice as fast as a horsecar, approximately thirteen to fifteen miles an hour, and carry three times the number of passengers per trip (Warner 1962: 28). Their maintenance and repair could be undertaken by skilled mechanics in centralized locations at fixed hours, rather than by a host of stable hands, blacksmiths, and veterinarians in charge of a living organism in need of attention 24 hours a day. Further, the locomotion of electric cars was pollution free, and buzzing without smell or sound along networks of wires, was looked upon favorably by a public who was sour over half a century of the urban horses' relatively noticeable droppings, sometimes dangerous behavior, and susceptibility to disease. The same half a century that saw the rise of the urban horse in mass transportation also witnessed unprecedented urban crowding and expansion, and electric locomotion promised to keep pace with the potential of the new modern era. The WESR's aggressive expansion of metropolitan Boston's urban rails and the greater speed and capacity of electric cars to travel along them soon carried Boston's zone of development six miles from the center of downtown, and nine miles into its suburbs (O'Connell 2013: 73).

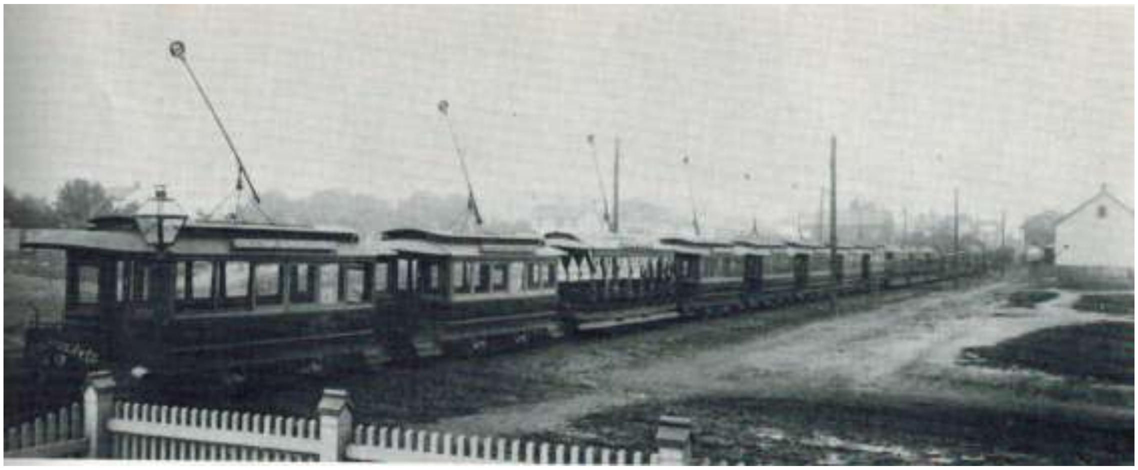


Figure 12. Photograph of the first electric cars ordered by Henry Whitney for the WESR. From Middleton 1967.

As part of the consolidation, the WESR had taken over control of the MRC's Roxbury Crossing lot in 1887, and introduced electric service to the station and the lines it fed in October 1891. Over the next three years, it began selling off its horses and most of the material apparatuses of the horsecar railroad operation (Bower et al. 1986). The WESR effectively transformed the Roxbury Crossing complex into a shell of its former self, leasing its stables to a hackney livery and horse boarding service and leaving empty the majority of the buildings formerly devoted to the care and upkeep of horses. No longer were carriages maintained or repaired anywhere on site. All the work of moving cars into, around, and out of the station was now performed by electric wiring, the power in which fed to the Roxbury Crossing complex by the WESR central power station located on premises in downtown Boston (West End Street Railway 1898a).

Despite the rise of electrification in the street railway industry, the 1890s witnessed the biggest increase in urban horse populations across the United Sates as horses continued to be relied upon for cheap and reliable draught across myriad industries. Many of the street railway horses were sold off to other businesses, and transitioned into hauling urban freight for a variety of industries such as construction and raw goods processing (Greene 2008: 176). Horses would continue to be as sources of draught across the industrial urban landscape in relatively large numbers well into the 20th century, only finally being replaced by the automobile and other vehicles powered by gasoline by around 1930.

The broader fate of the WESR followed much in the way that its component street railways had. Whitney retired from the WESR within a decade of its foundation due to "exhaustion," and in 1897, a rival group of capitalists formed the Boston Elevated Street Railway Company (BERSC). Under the supervision of the new state-created Boston Transit Authority, the BERSC leased the WESR in its entirety, and soon devised to continue its expansion of the metropolitan streetcar railway system to include elevated and underground lines. Ultimately, the BERSC would evolve into the MBTA of the present day (Warner 1962: 27-28).

The BERSC operated service at the Roxbury Crossing lot until 1919, when the old MRC facilities were finally vacated (Bower et al. 1986). The 1920s began the real end of the urban horse era in metropolitan Boston. At this time, streetcar ridership had hit its peak just before the first considerable adoption of automobiles (O'Connell 2013: 77). The Roxbury Crossing lot was taken over by a garage by 1926, where it would operate a filling station and repair facility until its demolition for the planned Southwest Corridor highway from 1969 to 1970. The final phase of Roxbury Crossing's life as a transportation hub began again in 1987 and persists to this day, as hundreds of electric railcars travel through it daily along the Orange Line that grew up in the space of the cancelled interstate highway.

Reconstructing Roxbury Crossing from Maps and Atlases

A variety of new sources were collected for this project that provides greater detail of the image and character of the Roxbury Crossing Complex lot in the street railway era. Various historic atlases of Boston, as well as maps produced by the Sanborn Fire Insurance Company, reconstruct the different use areas on site and how they changed over time. The maps are collected in Appendix A, starting at Map 3.

From at least 1843 through 1859, Roxbury Crossing was still largely under a millpond of Stony Brook. The first detailed map showing building footprints in the Roxbury Crossing lot was produced in 1873 by G.M. Hopkins & Co. for all of Suffolk County (Appendix A, Map 5). The Hopkins Map details the MRC "Station" or carhouse, its stables, and the blacksmith shop, and a square building of unknown use during the MRC period that would later be known as "Car House A" under the WESR. Since no subsurface testing occurred anywhere near the former location of this building, there is no way to determine whether the square building was also used as a carhouse when it was first constructed by the MRC.

Sanborn Fire Insurance Maps are first drawn for Roxbury in the 1880s. These detailed maps show the Roxbury Crossing lot contained a number of timber-frame structures attached to its main buildings, which served as inclines to higher stories, or as connectors between different buildings.   When the WESR took over the lot in 1885, the former car shop was rebranded as a “horse shed” (see Appendix A, Map 7).

The lot’s electrification in 1891 and the broadening of Columbus Avenue by 1893 had a great impact on the spatial arrangement of the complex, the horse shed, car houses “A” and “B,” and nearly all of the buildings of the former Roessle Brewery were demolished.. At this point, the only portion of the complex still housing horses was the former stable building, which is by 1895 is labeled as a livery (Appendix A, Map 8). Atlases through the 1920s depict the Boston Elevated Street Railway Company as the new owner of the lot.

By 1926, the northern carhouse had been expanded and repurposed as a garage operated by the Roxbury Crossing Service Station, Inc. The former stables and livery building was severely truncated. Additionally, a series of three outbuildings were installed in the former yard between the complex’s major structures. The interior of the garage was devoted to tire storage, sales, and automobile repairs. Aerial photography from 1938, 1955, and 1969 confirms these details. Later aerial photographs from 1971 and 1978 show the lot completely vacant after the grand urban demolition associated with the cancelled Southwest Corridor Highway, as it looked when excavated by the MAAH in 1978 and 1979.

From the first year of the MRC’s inception, the company’s president, board, and treasurer published annual reports that included profit details, ridership statistics, equipment and maintenance costs and credits, and a short description of the company’s activities. The WESR continued the practice of publishing detailed annual reports after its merger with the MRC. The WESR annual reports share the same structure and general contents of the MRC reports.

The annual reports are useful for a variety of reasons. Primarily, the reports' observations on ridership, profit, and expenditure read as a narrative of the company's growth and change. For example, from the MRC annual report of 1866: "A large building is much needed for sleighs and other vehicles on the vacant land owned by the Company, between Lowell street, and the brick stable near Waitt's Mills, so called, in Roxbury" (Metropolitan Railroad Company 1866: 17). Later on in the report, the president refers to the addition of steam power at the car shop.

These reports also speak to managerial concerns over efficient and safe management of space between and within use areas. As mentioned previously, the 1884 MRC annual report outlines the crowded and dangerous situation at the Roxbury Crossing lot's various workshops. The "huddled…heterogeneous mass" in the upper stories of the car house and stables caused much anxiety for the president and the board (Bower et al. 1986: 14).

In 1898, on the eve of its absorption into the Boston Elevated Street Railway Company, the WESR published an extensive, five volume inventory of all of its land, support structures, track, line and power equipment, cars and car equipment, tools, machinery, horses, harness, and materials. Of all the documents collected detailing the arrangement of the Roxbury Crossing lot, this is the most valuable. The first volume of the WESR Inventory details all of the parcels it owns, including building footprints and the interior arrangement of its car houses, as well as a written description of their use and photographs of their exterior. The Roxbury Crossing lot is described thusly:

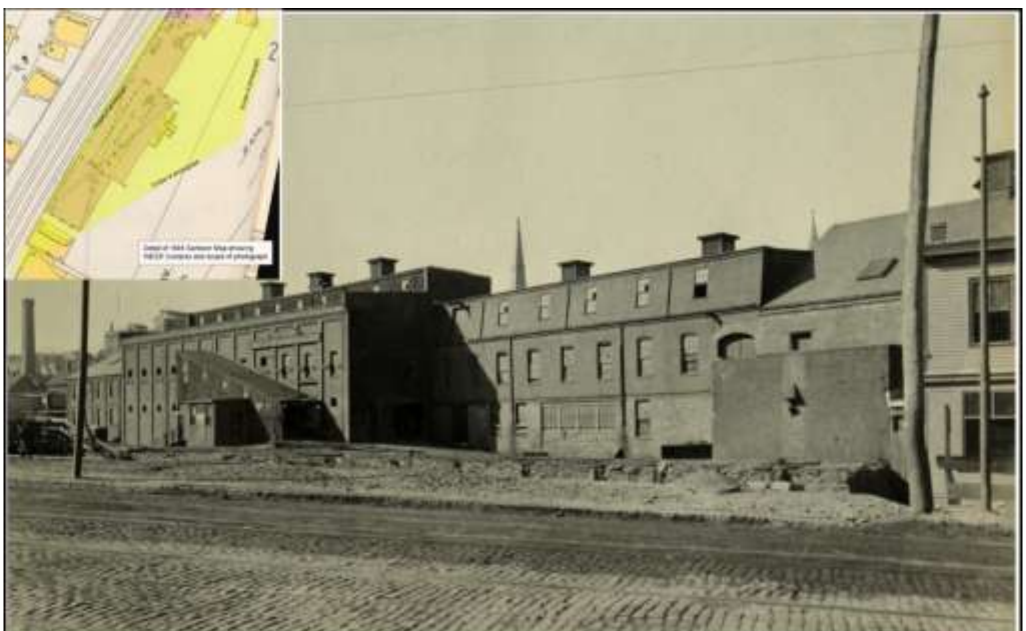
"About 54,378 square feet of land on which there are a number of old buildings formerly the property of the Metropolitan R.R. Co. Facing on Tremont St. There is a two and a half story brick, pitch roofed building, the ground floor of which is used for storing of electric cars, as is also the ground floor of the building immediately adjoining it in the rear. The second story of the first of these named buildings is now used for the storage of sleighs, and the second story of the other building has accommodations for fifty-five horses; both of these buildings have large vacant lofts. Adjoining the second building, in the rear, is a large stable with some dilapidated stalls on the first floor and stalls for eighty-two horses on the floor above with large hay and grain loft in third story. In the rear of this building is another brick stable in the same condition on the first floor, and with stalls for forty-eight horses above. This building has no loft. On the extreme end of the lot there is a frame building formerly used for a shop but now used for a carriage wash room for the stable. Adjoining the front car house is a small one story frame waiting room with a room in the rear used by the employees who run cars from this place. The interiors of all these buildings are in very bad shape and the buildings taken as a whole have very little value" (West End Street Railway 1878a: 128).

The accompanying parcel map of the lot (Appendix A, Map 11) verifies more or less what the 1895 Sanborn Fire Insurance Map depicts. It shows that in 1898, the car houses were still used for car storage, and the two buildings to the rear are stables. The interior detail map shows the layout of tracks in the car houses and identifies purpose of the one-story timber frame attachment to the eastern wall of the northern car house (see Appendix A, Map 4). The timber attachment was partitioned into rooms for stock, a lobby and offices, and oil storage.

Finally, the Inventory's two photographs (Figures 13 and 14) provide a rare panorama view of the lot's built environment soon after Roxbury Crossing transitioned to an electric street railway hub.

Photograph from 1898 WESR Inventory showing northern half of Roxbury Crossing lot, ca. 1897

Figure 13. Photograph of the northern half of the Roxbury Crossing lot with scope of photo on 1895 Sanborn Map shown.



Photograph from 1898 WESR Inventory showing southern half of Roxbury Crossing lot, ca. 1897

Figure 14. Photograph of the southern half of the Roxbury Crossing lot with scope of photo on 1895 Sanborn Map shown.

The date of the photography can be easily established. First, based on the date of the Inventory's publication in 1898, the photographs were taken no later than that date. Second, the photograph of the rear section of the lot (Figure 14), in essence the location of the cobblestone yard and the stables, shows that the MRC blacksmith shop and WESR horse shed building had already been demolished at the time of the photography. This demolition occurred during the widening of Columbus Avenue in 1895. The photograph depicts cobblestones and sidewalk blocks lined up along the unfinished sidewalks of Columbus Ave The Annual Report of the City Engineer of Boston from 1898, a review of work completed by that department in 1897, lists "measurement of edgestone, roadway, and sidewalk paving at Columbus Ave, Roxbury Crossing" among that year's projects (Office of City Engineer Boston 1898: 48). Thus, a firm date range for the photographs is 1895 to 1898, with the latter end of the range the likely date of photography.

Finally, other miscellaneous documentary sources contain detailed information regarding the temporal, financial, and logistical aspects of shifting from horse to electric locomotion. The Annual Report of the West End Street Railway for the year ending September 30, 1894, is the first to discuss the divestment of leather harness from the corporate inventory with the switch to electric traction. That year, $13,504.00 of harness equipment was either sold or destroyed (West End Street Railway 1894). The next year, the annual report discusses the difficult situation of converting its facilities' method of power: "This change from horse cars to electric, demands an entirely new equipment of cars and track. The horse cars are slow of sale, and if sold at all, it must be at a price which is insignificant compared with the cost of electric cars. The cost of such a change makes a large item of expense" (West End Street Railway 1895: 7). That year, the credit of unused harness is now lumped together with other tools, machinery, and vehicles used by the horsecars. A grand total of $174,726.10 was sold or destroyed (West End Street Railway 1895). The selloff of harness and horsecar goods finally slows down the next year in 1896, when $84,054.31 of credit was given for it (West End Street Railway 1896). Overall, the appealing potential of electric locomotion for higher profits and less costsspurred the WESR to eagerly divest itself of obsolete horse draught equipment.

The Lewiston Evening Journal on Mar 18, 1893, advertised "The last Grand Annual Sale of Car Horses by the West End Street Railway Company will take place at its Roxbury Crossing Stable, beginning March 20th, 1893, and continuing until May 2d. During that time, two thousand (2000) Horses, together with Harnesses, Collars, Blankets, Street Car Poles and Lead Bars will be on private sale, including a three days' sale of horses by public auction" (2). The advertisement, which was repeated in other newspapers around Boston, went on to say that "it will include not only horses of the class usually disposed of in the spring, but also a large number of horses of a better class which are being displaced by the introduction of electric cars…this Company has on sale most everything pertaining to the operation of a horse railway; horse cars at very low prices, and all the equipment necessary for stable use" (2).The WESR had been selling off the materials of the horsecar railway at Roxbury Crossing for years, starting in 1891. A photograph included in the Phase III Excavation report (Figure 15) corroborates this, showing the front of the Roxbury Crossing lot's northern car house with a sign above the entrance bays advertising horse harness for sale in the stables (Bower et al. 1986).

Figure 15. Photograph of the WESR northern carhouse exterior ca.1891. Note the sign above the car bays advertising harness for sale at the stables. From Bower et al. 1986.

In sum, the growth of Roxbury from a hinterland village in the early 19th century to a metropolitan urban neighborhood by the 1880s is directly linked to the growth of efficient, reliable, and expansive urban mass transportation in greater Boston. The rise of industries along Stony Brook, such as brewing and tanning, connected Lower Roxbury to the factories and businesses of downtown's Boston core. Along the thoroughfares of industry, residential and commercial areas grew up and were absorbed into the dense urban built environment of the urban sprawl. Street railways, the first form of mass transit, followed these paths of growth.

The Roxbury Crossing lot witnessed the rise and decline of Boston's street railways from the horsecar era up through the golden age of the electric trolley, and was host to its successors, the automobile and the subway. It contained a variety of structures related to the various iterations of urban transit, including horse stables, a blacksmith shop, a carriage manufacturing shop, various car houses, a waiting station, a livery, and ultimately, an automobile garage, within which many different historical actors performed countless activities under a handful of different institutions that kept animals, vehicles, and people moving. Their daily activities produced a rich material footprint bounded by the structural remains of the buildings that historically contained them, showing that the compartmentalized functions of the street railway system were separated but interconnected.

Though the cessation of horse draught as the primary mover of street railway cars ended around 1893 at the Roxbury Crossing lot, the documents and maps reviewed above suggest that horses continued to pull vehicles there into the 20th century, as the old MRC Stables were reused as a hack livery and boarding stables. The persistence of the horse past its traditional disappearance from urban transportation hubs around 1890 makes room for a closer examination of the contextual circumstances between 1890 and 1926 at

Roxbury Crossing, a time and place where both electric locomotion and horse draught technology artifacts attest to the multivalency and staggered adoption of technological change.

CHAPTER 4

METHODS

Behavioral Archaeology and the Narrative of Technological Change

This project seeks to employ a behavioral archaeology framework to study the technological change from horse to electric locomotion's effects on materials and space at the Metropolitan Railroad Company site and the Roxbury Crossing complex within which it is located. Archaeologist Michael Schiffer is the primary proponent of behavioral archaeology, and he has written at length on its application to archaeological studies of technological change. Technologies are often conceived of as ideas divorced from the fabric of their implementation. Behavioral archaeology frames technological change as a set of human behaviors and activities in transition.

Behavior archaeology uses the people-artifact interactions that make up technologically assisted activities as the primary analytic sites of technological change. Human interactions with materials are defined and characterized by a technology's performance characteristics and requirements, which are often in flux depending on a range factors. A technological and material life history framework contextualizes the different societal and economic processes that move technologies through different phases of creation, adoption, and discard (Schiffer 2011a: 40).

Schiffer has focused on applying his conceptual scheme to modern scenarios of technological change, such as the adoption of electric light in lighthouses (2005), the proliferation and senescence of pocket radios with subminiature tubes (1993, 1996), and the early competition of electric cars with their gasoline-powered counterparts (Schiffer et al. 1994). Schiffer's tendency towards the study of electricity as a power source and its application in various specific technologies makes his behavioral framework a good fit for the study of horse and electric locomotion at a street railway site.

The Roxbury Crossing lot hosted a variety of technological activities in a relatively short amount of time, including but not limited to horsecar manufacture and repair, horse harness maintenance and repair, horse draught for public and private transportation, and electric locomotion for public transportation. The archaeological study of technological change involves "identifying production locations and, given strong chronological evidence, inferring the beginning and ending dates of a product's manufacture span" (Schiffer 2011a: 121-122). The chronological and spatial controls that Schiffer requires are necessary because the narrative of a technology's life history is tied to specific time periods and geographical locations, which can range from broad or, in the case of the MRC Site, to relatively micro in scale. The various activities' chronological and spatial imprints often overlapped with one another onsite, resulting in the complex archaeological record that can only be read using horizontal and vertical controls.

To arrange an inclusive picture of the imprints of the different technological activities that occurred at the Roxbury Crossing lot, this paper explores the spatial and chronological extent of harness and carriage manufacture artifacts onsite. The spatial analysis section of this project employs Schiffer's scheme to help refine the dates of and contextual processes related to harness and carriage manufacturing onsite. By mapping the distribution of artifact types across the site relative to one another, and then comparing those distributions to historic and documentary evidence of building footprints and specialized craft activities' loci, it is possible to monitor changes and cessation in the production of certain technologies (Schiffer 136-137).

The marriage of artifact distributions to the known location of historic buildings and activity centers in both phases of the Roxbury Crossing lot's tenure ties manufacturing and technological transition to the built environment. As Rapoport (1990) has demonstrated, the internal and external arrangement and features of structures exhibit a sort of nonverbal communication to those that interact with the built environment. In the case of the Roxbury Crossing lot, the "language" of the horsecar street railway complex involved specialized structures, use areas, and interactions that, strung together, fulfilled their purpose of maintaining and harvesting the draught power of horses. Later in the site's history, the complex became a relatively quiet terminus for the electric railroad, where manufacturing and maintenance had been largely abandoned. New activities occupied old buildings designed for expressly different technologies, and thus a new lexicon inhabited an old set of defined spaces.

Analyzing artifact distributions against this interesting transition in the built environment helps provide a more holistic explanation of technological change. In the end, the different life cycles of horse and electric transportation technologies onsite can be woven into a general narrative that ties the adoption, refinement, and cessation of their respective activities to broader social, economic, and industrial processes.

A particularly important lens through which to view the process of technological change at the Roxbury Crossing lot involves the concepts of adoption, senescence, and reuse. Adoption involves the acquisition and use of new technologies by consumers, while senescence represents its falling off. These phases postdate the crucial first steps of invention and commercialization that occur in most technological narratives, including horse and electric locomotion in streetcar railways. By the time the Roxbury Crossing complex had adopted horse and electric locomotion, these technologies were already well-established in the technological landscape of the streetcar industry (Schiffer 2011a: 36-37).

Competing technologies often result in one supplanting the other, but the replaced technology's transition into senescence is hardly ever totalizing or immediate. The moment when one group reflects upon and records a technological transition can often occur when the materials perceived to have fallen into senescent obsolescence are still in use by a range of actors separated by characteristics such as class or geographic location (Schiffer 2011a: 162). Thus, material life histories do not necessarily end at perceived senescence.

Activities that result in the retention of materials that might otherwise have been discarded define reuse (Schiffer 2011a: 123). Re-adoption for secondary use, curation, and inheritance, are all activities that can possibly prevent, at least temporarily, materials from entering the historical and archaeological record. Technologies that have a low replacement rate and high adaptability are often the same ones that enter archaeological deposits some time after their adoption has slowed or ceased. For example, the inorganic materials of horsecar draught technology, such as harness systems and streetcars designed specifically to be pulled by horses, had relatively little need of complete replacement during the height of the horsecar era. Frequent daily trips did result in significant wear and tear, but specialized craftsmen maintained them and ensured their working life was long. Street railway horses themselves, on the other hand, had a relatively high replacement rate, even though skilled stable hands, blacksmiths, and veterinarians regularly cared for them. As mentioned before, the average streetcar horse was only employed for 4 or 5 years before being sold into other work. The relatively high replacement rate of the individual components of horse draught technology drove railway organizers to search for a steadier source of locomotion, which eventually led to the switch to electricity.

Even after the switch to electricity, the horse still remained at the Roxbury Crossing lot at the hack livery and boarding stables set up in the former MRC stables. The leather harnesses that had connected horse draught to various street railway vehicles persisted and were refitted to pull new types of vehicles such as sleds during the winter riding seasons. The process of material reuse during a period of perceived senescence plays a large part in the discussion of how the Roxbury Crossing lot transitioned from horse to electric power.

This project employs Schiffer’s framework due to its integration of holistic perspectives on technological change. The behavioral approach does not divorce the societal context, the built environment, different human interactions, varying schemes of adoption, or the importance of materials from narratives of technological change. If the behavioral framework is applied successfully to this project, Schiffer's argument will serve to augment the already-established archaeological analysis of the Roxbury Crossing lot.

Spatial Analysis

The main function of spatial analysis at the Roxbury Crossing lot is to compare the distribution of streetcar railway artifacts with the different industrial use areas represented on and in the historic maps, atlases, photography, company reports and inventories, and industrial treatises.

With the aid of archived field notes, sketched maps, and the recorded locations of the different excavation trenches in relation to observed subsurface foundations and remnants of different railway buildings, it was possible to reconstruct nearly the full extent of past archaeological investigations onsite (Appendix A, Map 2). The official Phase II and Phase III site maps were scanned, georeferenced using the Helmert transformation, and arranged on an interactive GIS map that uses the NAD83 Massachusetts Mainland State Plane projection system. It was also possible to digitize the location and extent of some of the different observed features, such as the footprint of a timber frame structure attached to the west wall of the carriage shop, which aided in better understanding the uses of and former extent of some auxiliary structures onsite. Unfortunately, three trenches that did contain cataloged artifacts were excluded from the spatial analysis simply because no records existed among the project's field notes that show their actual location. Perhaps in the future some record of their placement in space will be found. For now, though, these excavation trenches cannot be provenienced and thus did not figure into the spatial analyses of this project.

Once the comprehensive excavation map was constructed, the next step was to link its units to quantified tabulations of artifacts related to horse draught and electric locomotion. Specifically, the goal of the spatial analysis was to track the material correlates of blacksmithing, carriage manufacture, and horse draught onsite throughout the lot over time. The MRC Site's artifact collection had been previously grouped according to function in the MATS archaeological database when it was processed by staff of the MHC. The artifact collection's functional categories were adopted from the MATS system into broad categories including industry/manufacture/trades and transportation. Within the broader categories, artifacts were grouped into subcategories related to more specific functions, such as "smithing" or "clothing." The broader transportation category, for example, includes objects related to both the horse and electric street railroads. One of the subcategories of "transportation" is "horse accoutrements," which for the most part consist of leather harness materials..

By grouping the various artifacts related to functions of horse draught into one functional category, "horse accoutrements," it was possible to differentiate the materials generated and disposed of during and after the performance of activities related to this technology. The same artifact group tabulation was performed for artifacts of activities related to carriage manufacturing and maintenance, and blacksmithing. When the quantified functional artifact groups were joined to the geo-located excavation maps, it was possible to generate a variety of distribution maps that showed the various artifacts associated with carriage manufacturing and repair, blacksmithing, and horse draught.

Finally, the last step of spatial analysis involved geo-referencing Sanborn Fire Insurance Maps and historical atlases that show the Roxbury Crossing lot in various levels of detail. These raster-based high quality scans of maps were georeferenced in the same manner as the site's excavation maps, except that their georeferenced anchor points consisted of corners of some of the few mapped buildings that had not been demolished in the late 1960s or the center point of some road intersections that likewise had not been altered in the past 150 years, rather than the corners of excavation units or subsurface foundations. The end result is that the various Phase II and Phase III excavation units and their constituent carriage manufacturing and repair, blacksmithing, and horse draught artifact distributions can be compared to the highly documented specialized use areas and structural footprints of the Roxbury Crossing lot during its different iterations as a transportation hub.

Altogether, the methods of this project rely on two novel approaches to the artifact assemblage of the MRC Site. Behavioral archaeology provides a viable lens through which to gain new perspectives on the persistence of horse draught at Roxbury Crossing. The framework of behavioral archaeology has been used by researchers to better understand technological transitions, notably in modern examples where electricity has supplanted previous mechanisms, by putting materials and the human interactions associated with them at the center of analyses. The material products and byproducts of horse draught and carriage manufacture recovered at the MRC site are compelling, and suggest connections to broader processes of technological change that can be gleamed on a small scale.

To better understand the relationship between different categories of support industry artifacts to one another and their connection to the process of technological transition, it is necessary to develop a refined picture of their horizontal extent onsite. GIS-based spatial analysis establishes connections between time, technology, and place. Taken altogether with the documentary history of the Roxbury Crossing lot and interpreted in the context of behavioral archaeology, the MRC site's assemblage testifies to the ability of archaeological materials to enrich traditional historical narratives of technological change.

CHAPTER 5

ANALYSIS

Horse Accoutrements and the Leather Deposit

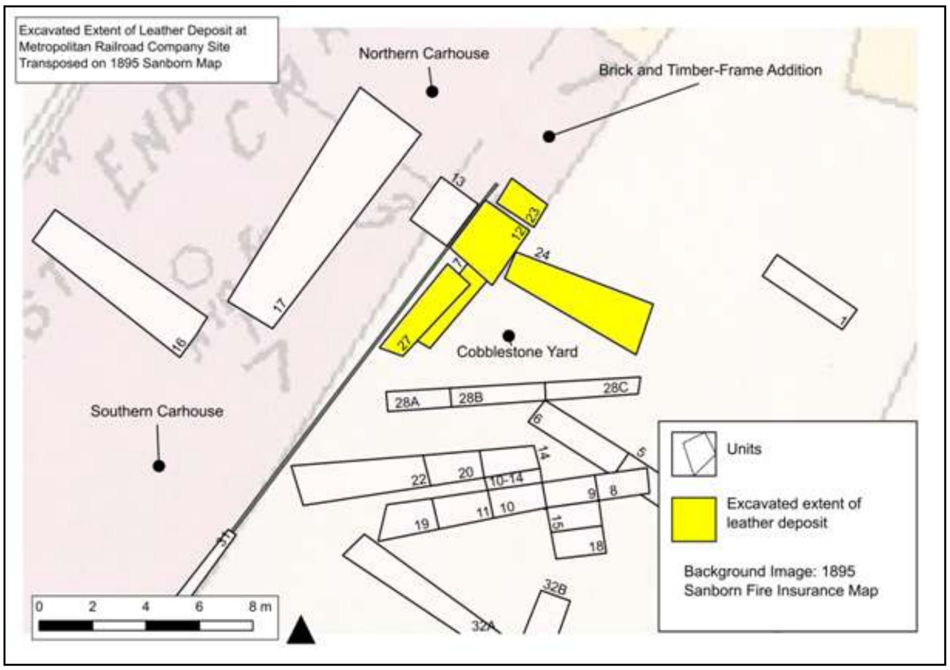


Figure 16. Map of the excavated extent of the leather deposit, with 1895 Sanborn Map in background for comparison.

The most unique stratigraphic context encountered at the MRC site is known in the Phase III report as "the leather deposit." It consists of an 11-24 cm thick, rather homogenous layer of leather materials including horse harness straps, offcuts, hardware, and other horse-harness related artifacts mixed with a small amount of brown sooty soil and other artifacts. It is chiefly concentrated within the ruins of the northern carhouse in Test Trench 23. The thickness of the leather layer decreases as it spreads south and eastward into Test Trenches 7, 12, 27, and 24 (Figure 16).

The deposition of the leather layer was associated with the demolition of the northern carhouse sometime between 1920 and 1926, when an automobile garage was built on the lot. The deposited debris of the northern carhouse lied on top of the leather deposit, and the spatial analysis conducted for this project revealed that its main horizontal concentration was framed within a one story brick and timber-frame addition to the northern carhouse. After an exhaustive review of original excavation notes and sketches, this project produced a rudimentary diagram that shows the stratigraphic relationships of the different test trenches and their levels to one another in the yard and carhouse areas where the leather deposit is located (Figure 17). This diagram contextualizes the leather layer in vertical and horizontal space, and helps frame the bulk of the leather deposit within the northern carhouse

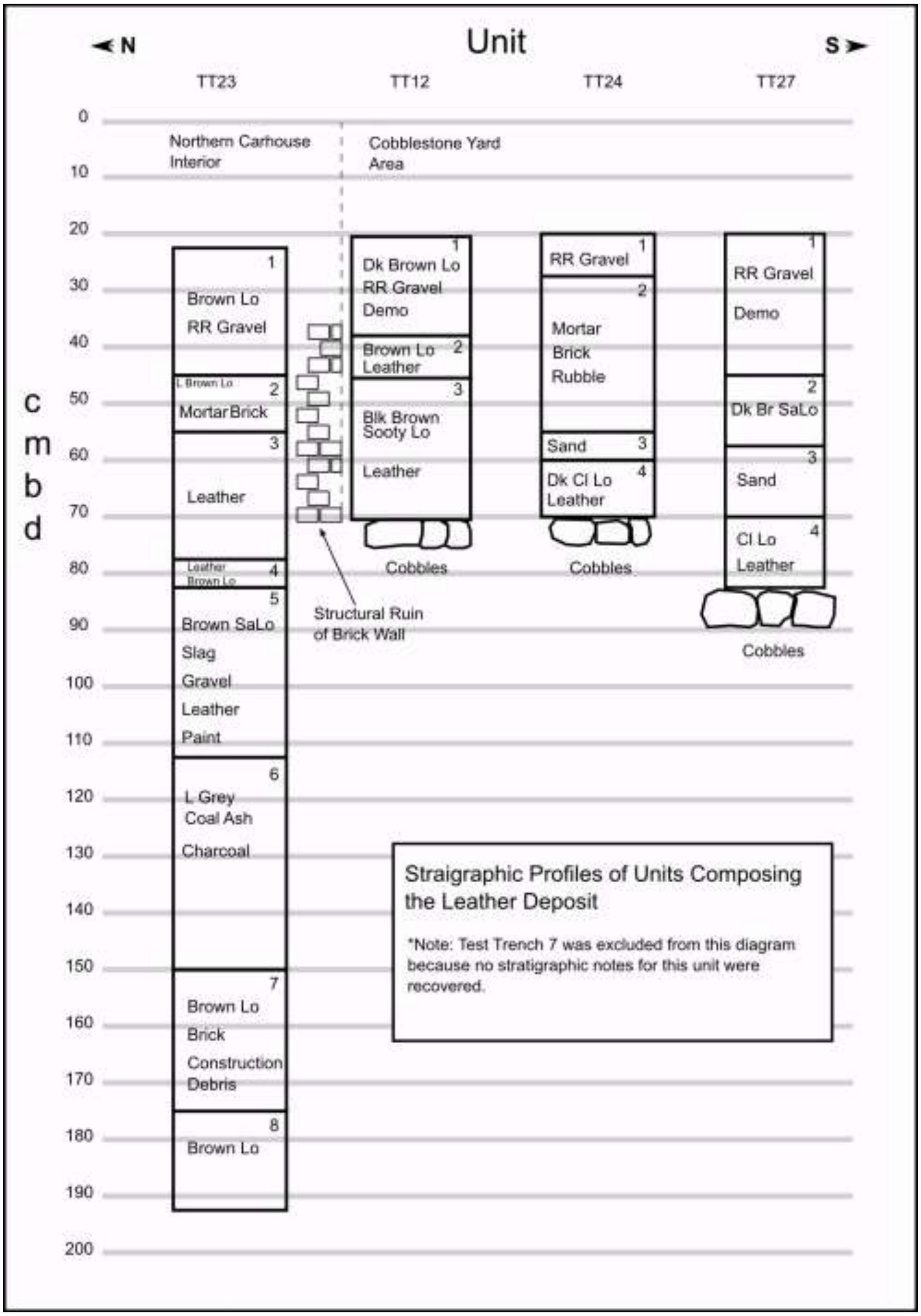
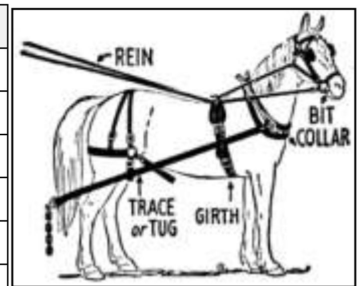


Figure 17. Diagram of the stratigraphic position of different excavation units comprising the leather deposit.

Table 1. Tabulation of Horse Accoutrement Artifact Categories

Object Category	Quantity	Percentage
Harness Straps	4089	59.82%
Offcuts and Scraps	1714	25.07%
Misc Strap Fragments	691	10.11%
Misc Harness Hardware	109	1.59%
Unidentified Leather	80	1.17%
Collar Fragments	41	0.60%
Buckles	23	0.34%
Cloth and Matted Horse Hair	21	0.31%
Harness Rings	17	0.25%
Trace Hooks	9	0.13%
Poultice Boots	9	0.13%
Circular Cutouts	8	0.12%
Blinders	6	0.09%
Horseshoes	6	0.09%
Chain Links	4	0.06%
Leather Lacing	4	0.06%
Metal Rivets	3	0.04%
Hame	1	0.01%
Rectangular Blocker	1	0.01%
Total	6836	100.00%



The leather deposit is responsible for nearly all of the artifacts grouped into the functional category "horse accoutrements," which refers to artifacts representative of or related to horse harness production, repair, and adjustment. The deposit hosts artifacts from all parts of a typical horse harness system, including straps, buckles, traces, and collars, some with various signs of distress and wear. Harness craft byproducts were also present in the leather deposit, including snippings, offcuts, punched out leather circles, and miscellaneous portions of tanned and un-tanned hide (Table 1). The leather deposit is firmly attributable to the WESR due to a teardrop-shaped piece of leather with the words "WEST END ST ROAD DEP," (Figure 18) which refers to the road maintenance department of the WESR (West End Street Railway Company 1898b).

Figure 18. Photograph of a piece of leather stamped by the road department of the WESR from Test Trench 23

Leather horse harness serves as the chief material related to harvesting the draught power of horses. As a technology, horse locomotion relies on a sturdy connection to a vehicle in order for it to be productive to transit. It has a relatively low replacement rate in that it can be modified or maintained with ease by skilled craftsmen such as leather harness makers. Horse harness in itself is a system of straps, traces, connectors, and fasteners that work to comfortably transfer a horse's kinetic energy to an otherwise stationary object. If one part of the system is malfunctioning or has become damaged, it can be replaced by a skilled craftsman who can take the raw material of leather and integrate it into the functional whole.

Figure 19. Photograph of a sample of unstitched and modified strapping from the leather deposit.

The majority of the horse accoutrement artifacts recovered from the leather deposit includes miscellaneous strapping from a typical horse harness system (Table 1, Figure 19.) The strapping exhibits a variety of stitching, incorporated fasteners, and various signs of use and adjustment. Some of the strapping is stitched, while others are unstitched, or show signs of having their stitching removed. Harness craftsmen typically used stitching to join together smaller straps, to reinforce portions of harness that suffered great wear and tear, or to join together functional portions of the harness system (Hasluck 1904).

Figure 20. Photograph of a sample of riveted strapping from the leather deposit.

Rivets and fasteners served to adjust harness systems to fit different horses, or accommodate different vehicles. Brass rivets were recovered within strapping and without, after being removed due to intentional repair or adjustment, or perhaps taphonomic factors (Figure 20.) A number of straps exhibited holes leftover from former riveting. Rivets represent the cohesion of functional portions of the harness system.

Figure 21. Photograph of a sample of offcuts and modified leather fragments from the leather deposit.

Offcuts and snippings are represented in the leather deposit in considerable numbers and varieties (Table 1, Figure 21.) Long, thin offcuts speak to the crafting and adjustment of straps, where standardized widths and thicknesses of leather hides were used for different horses and tasks, such as streetcar pulling (Hasluck 1904). More abstract shapes of refused leather speak to the trimming of larger fragments of tanned hide that were divided into strips to be converted into strapping. Small ovular punch-outs of leather are indicative of the harness craftsman's accommodation of rivets and fastener holes in strapping. The collection of offcuts accumulated from active harness craftsmanship.

Figure 22. Photograph of a sample of horse collar fragments from the leather deposit.

Collar and blinder fragments recovered from the leather deposit are attributable to specific portions of the horse harness system. The harness collar was responsible for stabilizing the bulk of the harness system on the body of the horse, as well as ensuring that the harness did not slip and choke the horse during the course of work (Figure 22.) Collars were constructed from long, thick strips of leather that were folded in on themselves, stuffed with horsehair or other insulating materials, and stitched together for strengthening and reinforcement (McShane and Tarr 2007).

Figure 23. Photograph of parts of a horse blinder from the leather deposit.

Blinders are reinforced pieces of leather attached to the headgear of the harness system (Figure 23.) This crucial part of the harness system helps calm nervous horses by blocking their peripheral vision of their surroundings and thus making horses less aware of the various noises and stimulants of the busy urban environment, leaving them to focus on the track ahead and lessening the frequency of accidents.

Figure 24. Photograph of a poultice boot from the leather deposit. Bottom (left) and top (right).

Poultice boots consisted of a reinforced leather pouch filled with medicine that was attached to the foot or ankle of an injured horse (Figure 24.)   Veterinarians employed by horsecar railways applied poultices to horses that suffered sprains while pulling cars along the course of their routes. Poultices helped speed recovery, and allowed horses to continue to work after a sprain (McShane and Tarr 2007). Poultice boots are a component of the assemblage of horse accoutrements most intimately connected to the daily work of horse draught.

Carriage Manufacturing Artifacts

From 1860 to 1884, the MRC manufactured and repaired all of its streetcars at Roxbury Crossing in a dedicated shop. Painting and window furnishing activities produced a distinct assemblage of artifacts that were recovered in the locus of the shop, including etched, tinted, and frosted decorative glass and clumps of paint chips. These paint chips and glass fragments came in a variety of colors, mostly a mixture of white and straw hues, and featured different designs such as starbursts or geometric etching (Figure 25.)

Figure 25. Photograph of paint spattered and painted glass (left) and etched/frosted glass (right) from the car shop area.

Detailed depictions of MRC and WESR streetcars corroborate the identity of paint chips and decorative glass as the byproducts of carriage manufacture. According to contemporary descriptions, during the MRC era, the streetcars for Roxbury were painted a straw color, and “the convex panels, dashers, letterboards, and bulkheads of closed cars were painted the division color, the concave panels and the trim around the doors and windows being white or cream” (Bower et al 1986: 85). During the WESR era, pale yellow and buff were the main colors of the streetcars. Photographs of streetcar interiors in the 1898 WESR Inventory show that decorative glass and painting was also incorporated into interior spaces, especially in the paneling above the windows and in the roof (Figure 26.)

Figure 26. Two photographs of the interior of WESR streetcars taken from the 1898 WESR Inventory.

Etched, frosted, painted, and paint spattered glass fragments are byproducts of carriage assemblage and maintenance activities, such as painting, furnishing, and window fitting that occurred at the car workshops. Taken together, the byproducts make up the functional category called “carriage items,” the distribution of which can be compared to the georeferenced historic maps collected for this project.

Artifact Distribution Maps

Artifacts related to carriage manufacturing, mainly paint chips and fragments of tinted, pressed flat glass were recovered in a relatively great concentration in Test Trench 28C, Level 3. A minor concentration of paint chips was also discovered in Test Trench 23, Level 5. Compared with the 1885 Sanborn Fire Insurance Map (Appendix A, Map

12), the highest concentration of carriage manufacturing byproducts were clustered around the MRC car shop.

The 1895 (Appendix A, Map 13) and 1919 (Appendix A, Map 14) Sanborn Fire Insurance Maps show the highest concentration of manufacturing byproducts is no longer associated with a structure. The now vacant yard hosts the great concentration of paint chips and pressed glass.

Horse accoutrements cluster at the core of the leather deposit located inside the southern brick wall of the northern carhouse addition. Compared with the 1885 Sanborn Fire Insurance Map (Appendix A, Map 15), it is clear that the major portion of the leather deposit was located in the former northern car house's eastern addition that functioned as a waiting station and, only under the MRC, as a steam engine room. The second highest concentration occurs in Test Trench 12 immediately south of it and outside the brick carhouse wall. The 1895 (Appendix A, Map 16) and 1919 (Appendix A, Map 17) Sanborn Fire Insurance Maps reveal the same pattern.

Although the leather deposit is most intensely clustered inside of the northern carhouse in Test Trench 23, the original Phase III excavation report inaccurately suggests that the majority of it was deposited south of it in Test Trenches 7, 12, 24, and 27, on the exterior cobblestone yard. Contrary to this, the three distribution maps that compare horse accoutrements to historic structural footprints show that the great majority of leather was actually discovered within the former northern carhouse's timber-frame and brick one-story addition. The addition's south wall separates the Test Trench 23 leather from other units that compose the deposit. Excavators discovered of the ruin of this brick wall in a bulk between the northern wall of Test Trench 12 and the southern wall of Test Trench 23 (Figure 27 and Appendix A, Map 4). It splits the most intense cluster of horse accoutrements from the exterior of the building, where less amounts of horse accoutrements were recovered.

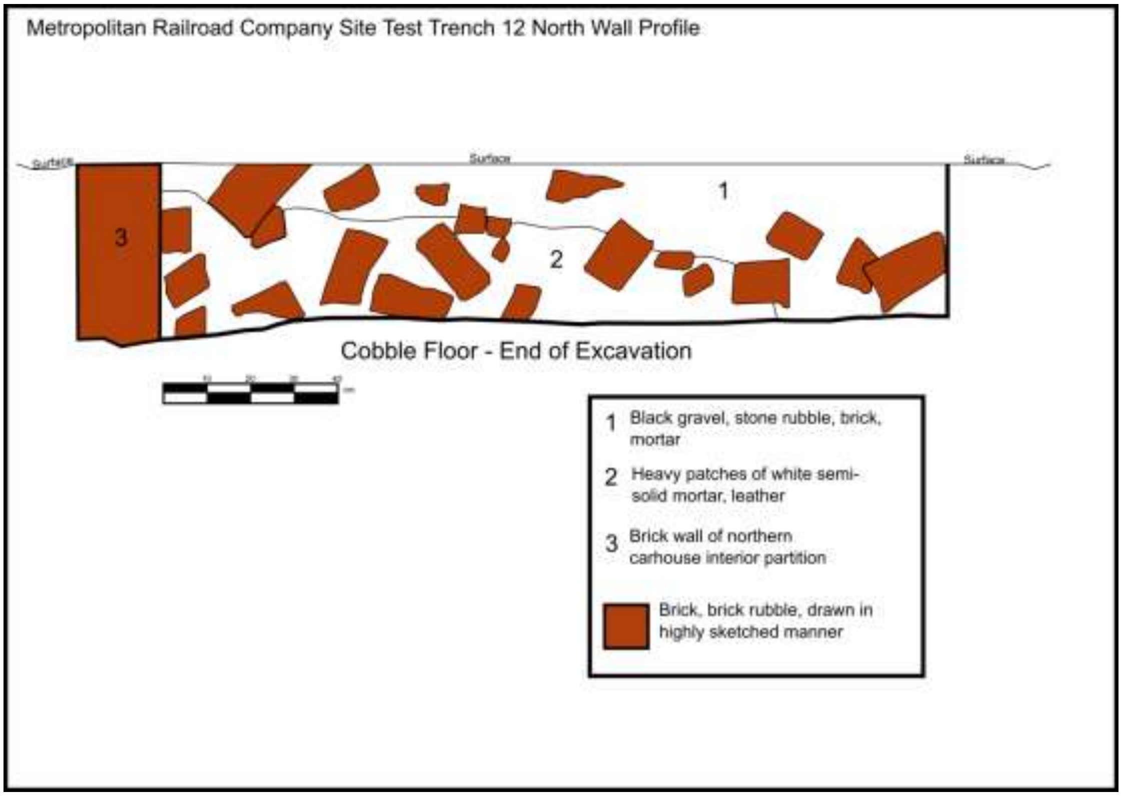


Figure 27. Profile of the north wall of Test Trench 12. This cross section of a bulk between Test Trench 12 and 23 shows the structural remains of the Northern Carhouse Addition's southern brick wall.

Unfortunately, there was little material evidence of horse harness maintenance in the southern area of the complex formerly occupied by the stables. The original Phase III excavation report suggests that taphonomic processes associated with the various 20th century demolitions and reconstructions onsite most likely obliterated any material record of the stable's use under the RC, or its later use under the WESR and BERSC as a hackney livery and private boarding stables.

Artifacts discovered below the leather layer in Test Trench 23 speak to different activities during the street railway eras onsite. Only two MCDs could be established for the contexts below the leather deposit. Test Trench 23 Level 6 had an MCD of 1878. Level 7 of the same unit had an MCD of 1882. The latter date is not as well established, since the context only had 4 shards. On the other hand, Level 6 contained 17 shards from a spectrum of late 19th century ceramics, including a child's plate that is firmly datable from 1882 to 1892. The plate's theme is the nursery rhyme "Hey diddle diddle," and features an illustration of the cow jumping over the moon and other characters from the tune. Around its edge is printed the alphabet (Figure 28). The artifact's well-established date range and relationship with children onsite makes it a valuable interpretive member of the below-leather assemblage. The artifact correlates of children onsite during this time period is further bolstered by the recovery of a porcelain

Detail of a child's nursery rhyme plate made by the Bronwhills Pottert Co, Staffordshire, England, ca. 1880. A fragment of this plate was discovered in Level 6, TT23.

Figure 28. Detail of print on a children's plate of the same type discovered in TT23, Level 6

doll limb in the same context. Such personal finds help underline the human element of technological manufacturing and transition.

Overall, the patterns discerned in the horizontal distribution of different functional artifact groups provide an entry point to an analysis of their broader technological context over time. The availability of highly detailed historic maps from the 1880s through the 1920s provides temporal context against which to compare the materials of horse draught and carriage manufacturing. The documentary record provides the location of buildings and activity areas, and where they moved with new iterations of the street railway. Taken together, it becomes clear that the different technological phases of the Roxbury Crossing lot influenced their archaeological correlates. The connection between spatial patterns and the body of documentary evidence collected for this project reveal that on different scales, horse draught persisted and was adaptively reused during a time of the technology's senescence.

CHAPTER 6

THE NARRATIVE OF TECHNOLOGICAL CHANGE AT ROXBURY CROSSING

From Horse to Horse and Electric at Roxbury Crossing

From its construction in 1860 until its conversion to a horse shed around 1884, the MRC's car shop served as the major locus of streetcar production for the whole MRC system. Carriage manufacture and maintenance produced two major byproducts recovered during the excavations, those being paint chips and decorative flat glass. Their patterned distribution onsite confirms that these specialized activities occurred in and around the structure identified as the car shop in the horsecar era (see "Shop" on 1873 Bromley Atlas, Appendix A, Map 5).

The car shop was situated on the eastern edge of the lot, at first along the bank of Stony Brook and later on, after the waterway was diverted underground, at the edge of Pynchon Street. Together with the unexcavated car houses "A" and "B" (see 1885 Sanborn Map, Appendix A, Map 7), it effectively enclosed the lot and yard from the rest of the urban streetscape, creating a working courtyard within the space that was paved with cobbles probably around 1885. The 1888 Bailey and Company birds' eye illustration (Figure 8) shows just how central the carriage manufacturing space was within the Roxbury Crossing lot, complete with its smokestack shooting soot from production at the foundries into the Roxbury sky. Set at an angle to the carhouse block and the stables to the west and open to the traffic of Pynchon St to the east, the car shop was poised to service the Roxbury Crossing lot's horses and carriages, as well as receive and transmit goods and materials to the greater urban landscape.

The car shop or horse shed was destroyed in 1895, when Columbus Avenue was extended and widened along what used to be called Pynchon St. It seems as if by this time, the WESR had already ceased carriage manufacture for a few years, and what was left of the MRC's carriage business had already been moved offsite to Bartlett St (Bower et al. 1986). After this important event, the former carriage manufacturing location sat in a vacant portion of the lot (see Figure 14). There is no activity there, and since the WESR was now ordering electric carriages and maintaining them elsewhere at shops along Bartlett St, no reason to re-establish the paved yard as a useful space.

The high concentration of horse accoutrements within the northern car house speaks to harness maintenance and manufacture onsite. The 1895 Sanborn Fire Insurance Map of Roxbury and the WESR's 1898 Inventory, discussed in further detail in the next chapter, reveal that the former MRC stables functioned as a hackney livery at least through the 1900s, and that horse-drawn sleighs were stored in the upper story of the northern car house. The proximity of the leather deposit to a working horse population and sleighs, which were used seasonally as recreational vehicles well into the 20th century, tethers the life history of the horse accoutrements past the era of street railway electrification at Roxbury Crossing into a phase of reuse for a different mode of transportation from which it originated.

After the Roxbury Crossing lot was electrified in October of 1891 and nearly all of its horses were sold off two years later, Volume 4 of the 1898 Inventory of the West End Street Railway Company officially lists no working horses in the company's ownership at Roxbury Crossing. The WESR still employed 487 horses at this time scattered around its lines, most at their Huntington Ave stables in Boston, but none resided in the former MRC stables at Roxbury Crossing (West End Street Railway 1898b: 201-209). Further, Volume 4 also inventoried the kinds and number of harness the WESR owned throughout its entire system, down to each bell, harness, breeching, collar, or strap. Like the horses, there is no official record of any WESR-owned horse harness at all at the Roxbury Crossing lot in 1898, even though other harness materials are inventoried at other locations such as West Lenox St. in the Roxbury division (West End Street Railway 1898b: 197). According to Inventory Volume 1, which reviews the company's real estate, a large three story stable formerly of the MRC bordering Camden St, Tremont St, and Columbus Ave in Boston "contains a harness room, a shop where all harness owned by the company is repaired" (West End Street Railway 1898a: 29). The WESR had centralized all of its carriage and harness maintenance at downtown facilities. It seems that according to the official WESR literature, there was absolutely no harness maintenance and manufacturing that was occurring on the Roxbury Crossing lot by 1898.

Despite the testimony of the 1898 Inventory, the fact still remains that until the late 1970s, there were 6,836 horse-related items at the Roxbury Crossing lot in a relatively small cluster in he northern carhouse, and among the collection is a decorative circle of harness with the words "WEST END ST ROAD DEP" stamped on it, which definitely links the harness deposit to the time of the WESR. This begs the question of why the harness products and byproducts are present at all and in such great number onsite, even though the official company literature seems to suggest they were not.

The 1895 and 1919 Sanborn Fire Insurance Maps verify that the former MRC stables had been converted into a hackney livery. The photograph of the rear end of the Roxbury Crossing lot in Volume 1 of the WESR 1898 Inventory verifies this (Figure 29). There, the former stables have a sign reading “Hack Livery & Boarding Stable” attached to the second story above the incline shed. Horses were indeed present on the Roxbury Crossing lot after electrification, even if they were not officially the property of the WESR. This building is verified as a livery and boarding stable at least through 1919, when the Sanborn Map still strikes it through with a bold “X” denoting its use as horse housing.

Detail of the 1898 WESR Inventory's photograph of the southern half of the Roxbury Crossing lot showing the Hack Livery and Boarding Stable that occupied the former MRC Stables after 1891-1893.

Figure 29. Detail of a photograph of the southern half of the Roxbury Crossing lot. Note the sign above the incline advertising the Hack Livery. From WESR 1898a.

Livery and boarding stables were smaller scale operations than streetcar railways. Their function was to rent, board, and sell horses on consignment. In late 19th century Boston, livery and boarding stables were popular, rising in number from 71 in 1870 to 175 in 1900. Business at livery stables fluctuated. The need for rental was not always steady but the need to house and care for the horses was an ever-present expense. Thus, some urban liveries and boarding stables gained a bad reputation for their poor conditions and their reliance on credit in lean times to keep horses fed and cared for. Debts were usually paid when business picked up in winter months, when snow covered the streets of Boston and horses were rented for the popular pastime of sleigh riding (McShane and Tarr 2007: 112-115). Sleigh riding was enjoyed especially by the upper class, where sleighs were the site of courtship of mates or races between rivals. Sleighs were also used by a variety of other groups, such as butchers and grocers for delivery of stock, or by the lower class on communal sleigh rides for those who could not afford their own horses (McShane and Tarr 2007: 90-91).

Volume 1 of the 1898 WESR Inventory describes sleighs at the northern carhouse of the Roxbury Crossing lot: "The second story of the first of these named buildings is now used for the storage of sleighs" (West End Street Railway 1898a: 128). This provides a link between the livery stables and the northern car house of the WESR. Although the hack livery and boarding stables were centered at the old MRC stables at the southern end of the complex, they could have stored sleighs for the winter seasons in the second story of the northern car house. Though no official record of it exists in the 1898 Inventory related to the Roxbury Crossing lot, the WESR did maintain a road department that was in charge of keeping its various street railway lines in good working order (West End Street Railway 1898a: 127). Perhaps some of the livery stable horses assisted in this function as well, providing draught for repair vehicles. Horses rented for sleigh riding or leased for road maintenance would have been fitted with harness in the northern carhouse, where the vehicles were located. It is possible that occasionally harness repairmen or craftsmen operated in this space during busy times such as the height of the winter sleigh season, when there would most likely be a need to keep the sleigh harness in good repair.

The northern carhouse horse harness finally fell out of use sometime after 1918, when the Roxbury Crossing lot was decommissioned and other businesses rented out the old MRC buildings before their conversion to a garage in 1926 (Bower et al. 1986). Given the distribution of horse-related artifacts in such a tight cluster within the northern carhouse, their deposition was most likely related to the garage's construction. The leather deposit is situated below a deposit of mortar and brick in Test Trenches 23 and 12, a layer interpreted by the original researchers as the demolition of the northern carhouse itself. In this way, the leather deposit truly marks the absolute end of the horse's tenure at the Roxbury Crossing lot, and the terminus of horse locomotion as a technology in this location.

The contrast between the horse and electric eras at Roxbury Crossing was highly visible in the built environment. When the MRC owned the Roxbury Crossing lot and operated a carriage manufactory there from 1860 to around 1884, the vacant area between the various street railway structures was full of activity. The needs of the horses, carriages, and schedules of the railway demanded workers onsite nearly 24 hours a day, especially in the case of stable hands and groomsmen. The MRC thus invested a great deal of capital and labor into the Roxbury Crossing lot. It served as the maintenance and manufacturing center for its entire railway system, and before the adoption of electric locomotion different tasks encapsulated in different structures cooperated in order to produce the impressive product of well-functioning, stable, and reliable urban mass transit.

On the other hand, after the WESR conglomerated the MRC and electrified Roxbury Crossing and sold its horses into livery, the lot was a ghost of its former self. The narrative description of the lot in Volume 1 of the 1898 WESR Inventory relays this most effectively, especially when it describes the functions of most of its structures in the past tense. There are vacant lofts once used for feed, accommodations for a great number of horses but none stabled at present. Of the structures themselves, “The interiors of all these buildings are in very bad shape and buildings taken as a whole have very little value” (West End Street Railway 1898a: 128). The accompanying photographs bolster this sentiment, showing the rear of the lot in general disrepair with no activity occurring in or around it (Figures 13 and 14).

Maintenance and manufacture onsite at that time was relegated to a very minor role, situated probably in the second story of the northern car house. There was most likely a very minimal number of skilled laborers onsite, perhaps just occasionally a harness maker and a hand to keep the livery’s sleighs or the WESR’s road department vehicles in working order. The bulk of the work was now being done elsewhere in the

WESR system. Electric carriages required repair and maintenance, but that was done elsewhere. Further, their draught was supplied by electric lines fed from a central power station also located far offsite. In essence, the Roxbury Crossing lot now served mostly as a waiting station, and perhaps the selling of cigars, soda, and lunch was the most intensive activity that occurred there. The transition from horsepower, with all of its onerous material, personnel, and auxiliary structures and artifacts, to electric, which was clean, cheap, and quick, transformed the MRC complex in turn from a bustling hub to a relatively quiet space probably better known for its sleigh livery when the city was covered in snow.

This is most likely the scene at the Roxbury Crossing lot up until the early 1920s, when the automobile garage took over the former street railway lot and largely demolished its built environment to suit the needs of mechanical repairs and maintenance of the new popular vehicle of transportation in Boston. The time period of the automobile's supremacy at Roxbury Crossing did not form much of an imprint on the archaeological record, and was most likely erased with the grand demolitions related to the Southwest Corridor highway. The subsequent life of the lot as a vacant patch of land between 1970 and 1987, when the Orange Line station was opened there, represents the only period of time between 1859 and the present when Roxbury Crossing was not associated with transportation in one way or another.

Revising Traditional Technological Narratives

The majority of academic and popular narratives that detail the conversion from horse to electric power in the streetcar railway system tend towards a quasi-evolutionary approach. The coming of electric traction is heralded from the start of the omnibus and horsecar eras as a superior technology that was destined to replace its clumsy organic counterparts. Researchers have tended to group street railway history along a gradient where there is everything before electric locomotion, and then everything after. Very few give proper attention to the subtleties of the technological transition from horse draught to electric draught, or the rich history of horse locomotion itself as it developed from bumpy stagecoach to smooth inlaid rails.

Folk narratives are easy to find amongst the traditional histories of Boston's urban mass transit system. Schiffer warns against the personification of development narratives, but time after time Henry Whitney is sketched as the avatar of the electric railway in Boston (see Warner 1962). His consolidation of Boston's various streetcar railways was indeed a catalyzing event that cascaded throughout the city's arteries, affecting not only the organization of transit but eventually the technology that drove it. Keeping that in mind, the street railway system of greater Boston functioned as a collection of many different stations and terminals that operated in concert with one another to move people to and from the heart of downtown. Within each complex, a variety of different social, economic, and technological process were playing out, and to a certain extent, the transition from horse to electric locomotion could even occur at different rates within the same site.

Henry Whitney retired from the WESR within a few years of the electrification of Boston's street railways, but long after he was gone, urban horses continued to labor along its lines. When the BESRC bought the WESR in 1898, 487 horses were still pulling cars throughout its system. At that time, the WESR still had a dedicated workshop just for horse harness repair located downtown, and a road department that used horses regular to maintain track and clean snow from its lines. Most likely, a given Bostonian commuter could travel on both electric and horsecar rails over the course of his metropolitan travels into the 20th century.

The major difficulty of applying Schiffer's behavioral framework for technological change at one site involves its scale. When street railways replaced horses with electric lines, a great number of locations were affected in concert with one another as an aggregated transition occurred from a broad perspective. On the micro scale, sites along the streetcar arteries were affected and reacted in a variety of ways.

The best way to monitor the more subtle differential adoptions of technological change that Schiffer promotes is to analyze the material culture of the manufactured materials correlate to the technologies involved in the transition. When compared to changes in the structure and arrangement of the built environment that fostered and supported the street railway, narratives can link the artifacts of technological transition to urban landscapes in the society they served.

The behavioral approach to technological change employs heuristics that allow for the semi-anomalous horse harness artifact class to be integrated into a generalized narrative. The official company inventory of the WESR suggested that the Roxbury

Crossing lot had no harness or horses in 1898, but other documentary sources and the archaeological evidence itself suggested that horse and harness were still maintained and employed onsite until sometime in the early 20th century. A careful cross examination of the materials and the documents revealed that, after a great sale of horses and the materials of the horsecar railway from 1891 to 1893, horse locomotion took on a different role at the Roxbury Crossing lot. Instead of power mass transit, it served as draught in consignment, rental, or infrastructural maintenance. Instead of moving the masses, horses now probably served as a power source for the exciting leisure activity of sleigh riding, or for the ongoing task of track upkeep and repair. It is interesting and perhaps a bit ironic to note how horse draught continued on at the Roxbury Crossing lot in large part to ensure that its technological successor, electric cars, could continue to ride the rails in bad weather.

Figure 30. Photograph of a horse-drawn carriage operated by the BESRC to fix lines and conduits. From the 1989 WESR Inventory.

The material culture study of manufacturing allows for a more subtle narrative of carriage manufacture at the Roxbury Crossing lot. A simple evolutionary approach that treated Henry Whitney's consolidation of the MRC into the WESR as one and the same as wholesale street railway electrification would lose the interesting facets of technological transition onsite. There would be no reason to suggest that horse draught still had productive capacity, as it was no longer the objectively optimal method of locomotion. Instead, a holistic narrative of technological change shows how the WESR clerk selling cigars and soda at the waiting station, the children sitting idly around the lot on piles of cobbles in the vacant yard where cars were once painted and fit, or the horse groom at the hack livery that hopes winter brings a good amount of snow and a popular sleighing season were all tied up in the process of technological change, and their life histories interacted with the life histories of the materials of the street railways.

Schiffer's behavior approach in the end seems to have lived up to its potential to augment a traditional narrative of technological change that has previously enjoyed little attention to its complicated implementation, especially on the micro scale. Perhaps this is the ultimate strength of the behavioral approach. It seeks out as many possible explanations and differential outcomes to a process that is often seen in hindsight to have been rather simple but in practice was all but. Likewise, the narrative inherent in the archaeological record of the Roxbury Crossing lot is rather complicated, both in terms of the materials it juxtaposes and the subsequent taphonomic events imposed upon it throughout the mid to late 20th century. When research allows for surprises and unexpected outcomes, for example, a richly detailed five-volume inventory of a company's materials officially listing not one of the nearly 7,000 pieces of horse furniture recovered onsite, the result is not generalization but rich diversification of the historical narrative. The human element of technological progress becomes the focus, and material transitions transform into the end result of many individual decisions aggregated along a temporal gradient.

Another major benefit of Schiffer's behavioral approach is that it recognizes the eccentricities in the technological scope of the site's trajectory even after archaeology has shifted its gaze. By recognizing different scales of technological change both in time and space, the present iteration of the Roxbury Crossing lot as a transportation hub along the

Orange Line long after the days of the WESR and the BESRC shows that technological change is never as straight-forward or linear as it is perceived to be.

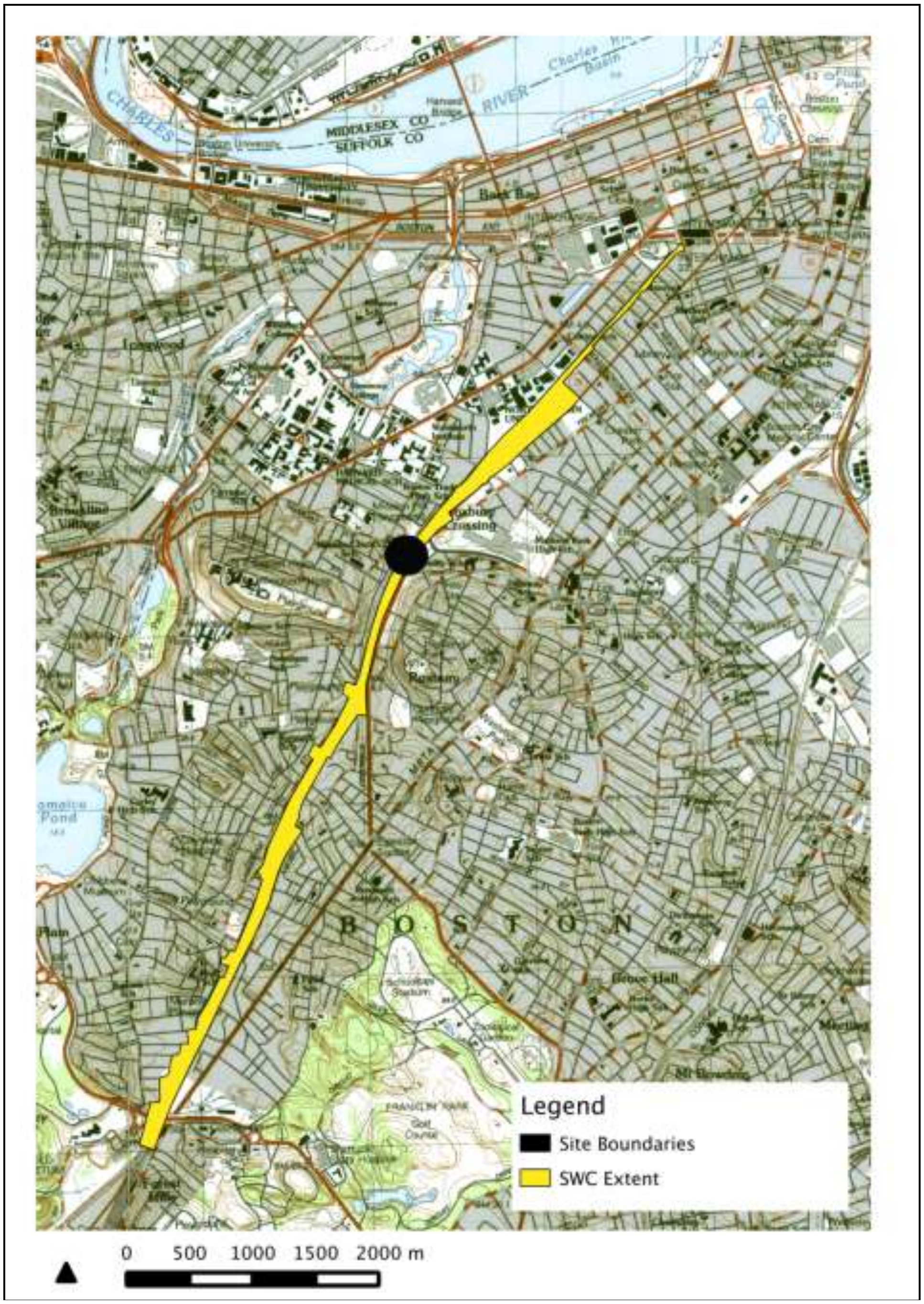
Future research

It would be interesting to compare the MRC site to other archaeological examples of stables to more helpfully integrate the artifacts of carriage manufacture and harness making with what must be a rich variety of materials related to the industrial management of a great numbers of draught horses. The history of horse labor, especially in urban settings, is an area of anthropological interest that is beginning to blossom amongst researchers in various fields, including history, archaeology, and biology. Their nearly ubiquitous presence amongst complex Western societies only ended within the last century, and their absence invites a better understanding of what humans have devised to replace them and how their legacy continues to affect our present.

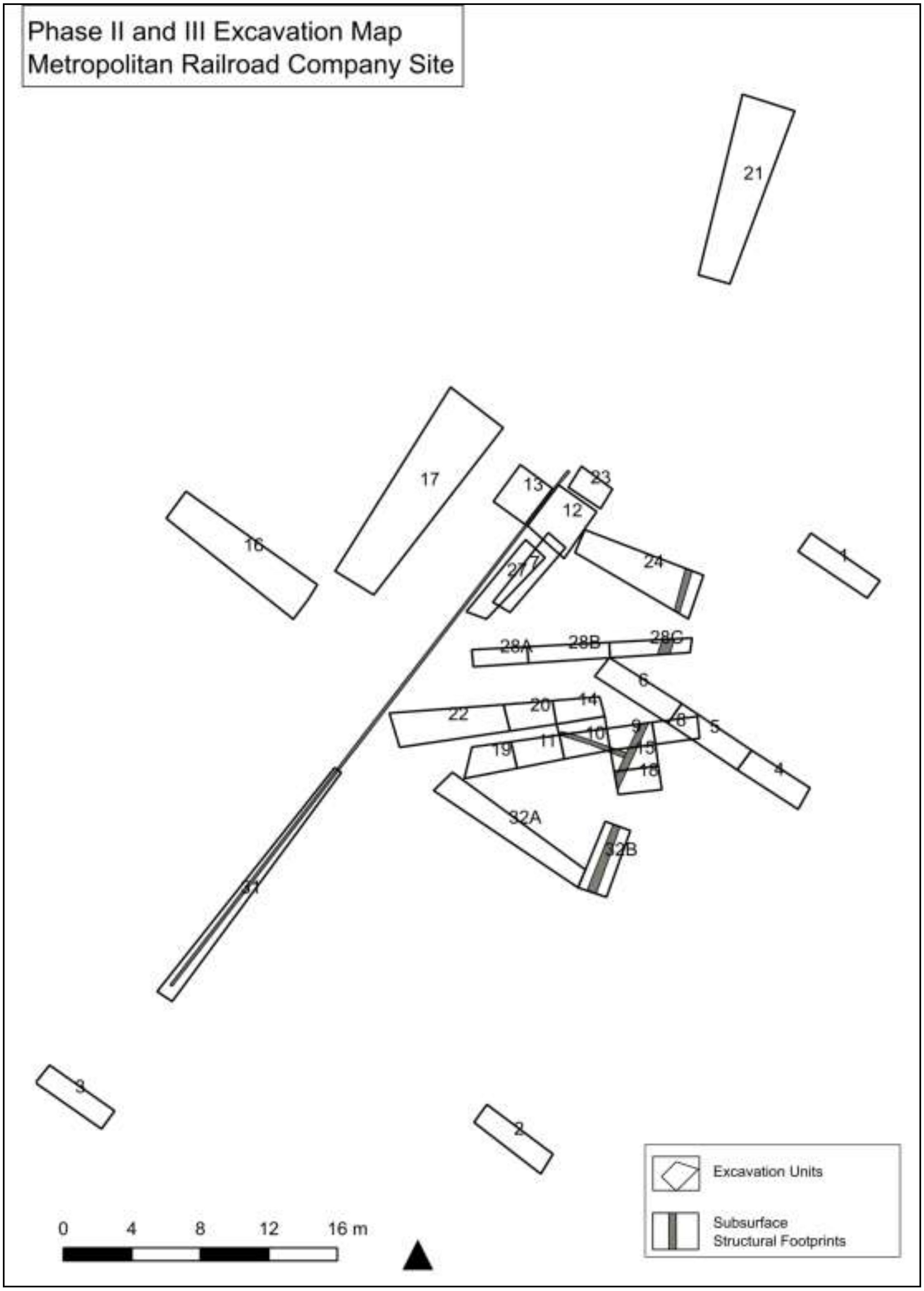
The ultimate goal of this research is to help establish the study of infrastructural support complexes as viable and interesting units of archaeological research. The original researchers shared this goal, and one of the aims of rekindling interest in the MRC Site was to bring their aspirations into a new era of archaeological practice. All too often, studies of transportation lines focus on the tracks and rails that carried vehicles, while the people that maintain and manufacture at their terminals are relegated to footnotes. Mass transit, it seems, is always a work in progress, and those that ride upon it hardly ever witness the army of workers who ensure that it runs smoothly. Perhaps through archaeological investigation, the poorly understood human, animal, and technological components of urban transit can contribute to a robust and flexible understanding of the processes that drive them and the complex ways that they change our society.

APPENDIX A

MAPS

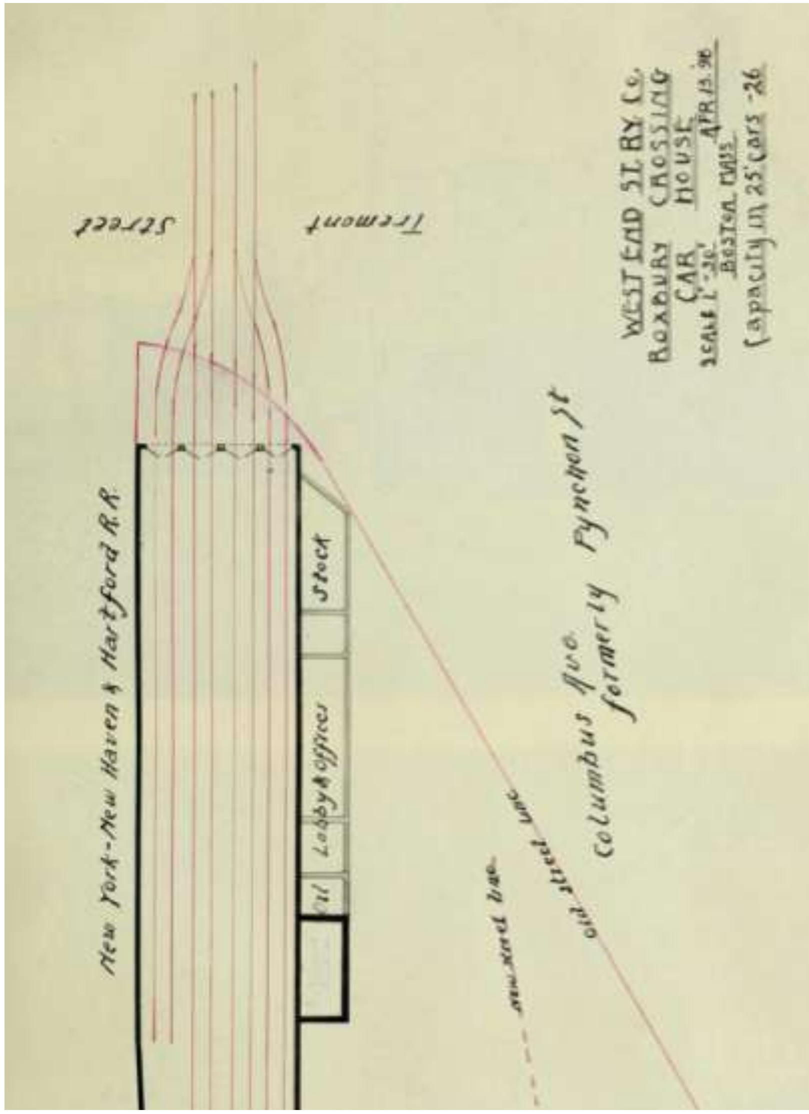


Map 1. The Southwest Corridor Project area, with the MRC Site's location.



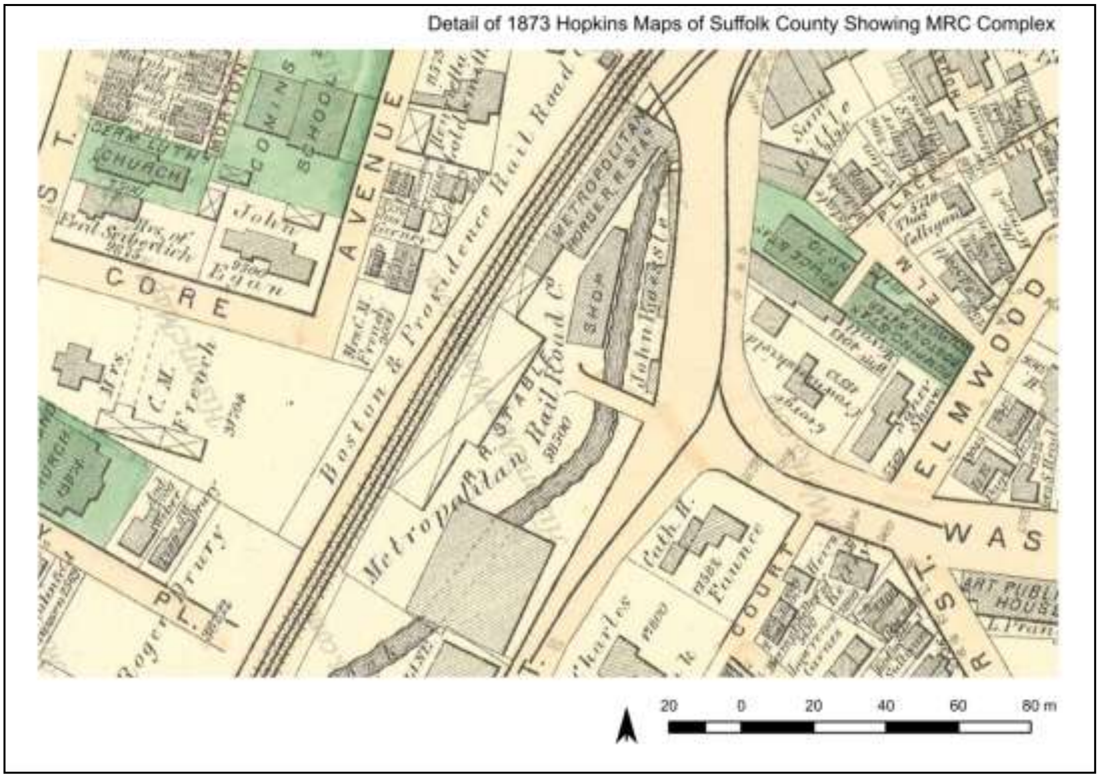
Map 2 Combined Phase II and Phase III Excavation Map of the MRC Site.

Map 3 Detail of the 1852 McIntyre Atlas of Boston showing the Roxbury Crossing lot on the eve of the filling of the millpond. Note the buildings of the Roessle Brewery.

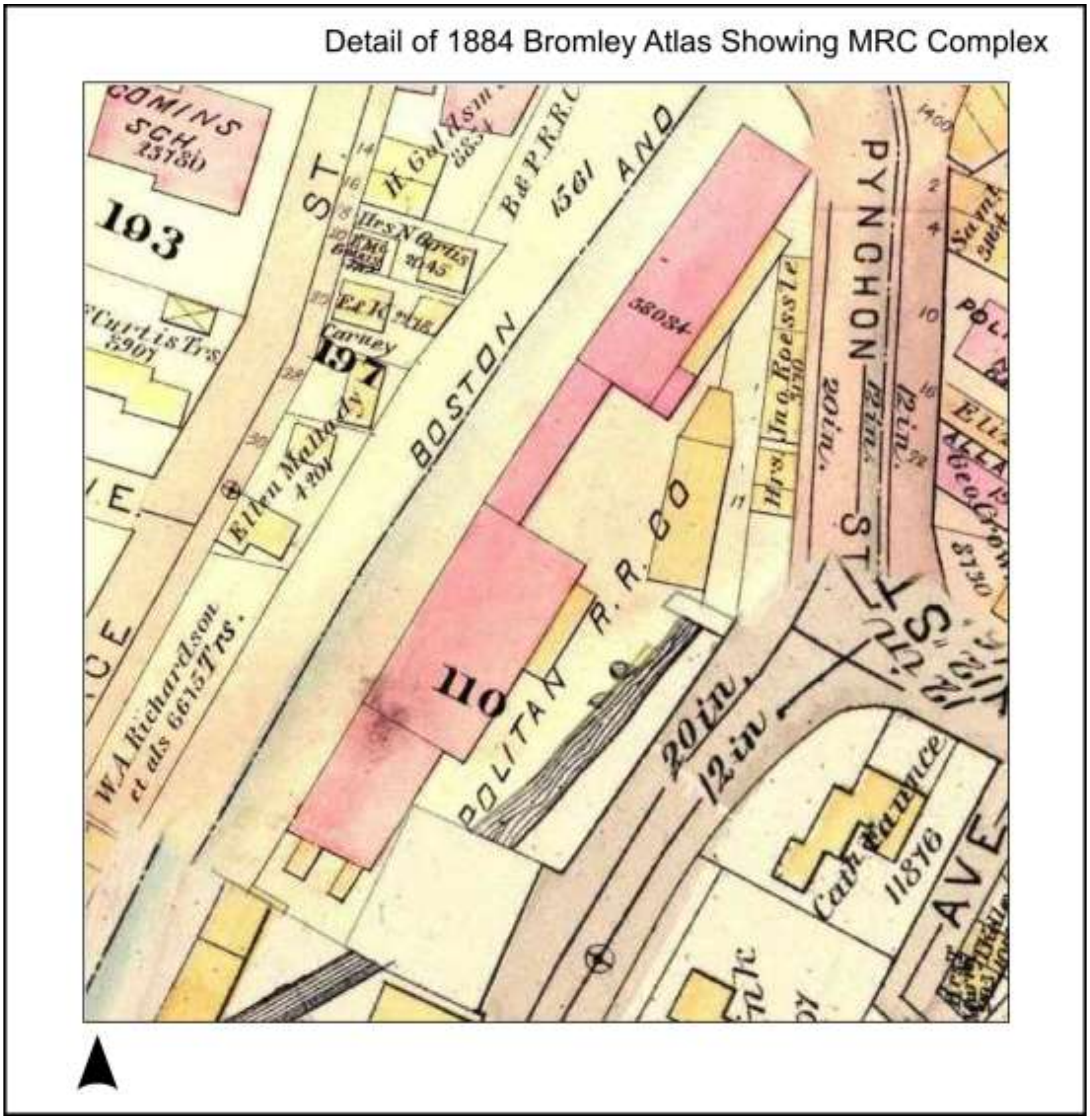


Map 4. A plan of the northern carhouse of the Roxbury Crossing lot drawn for the 1898 Inventory of the WESR.

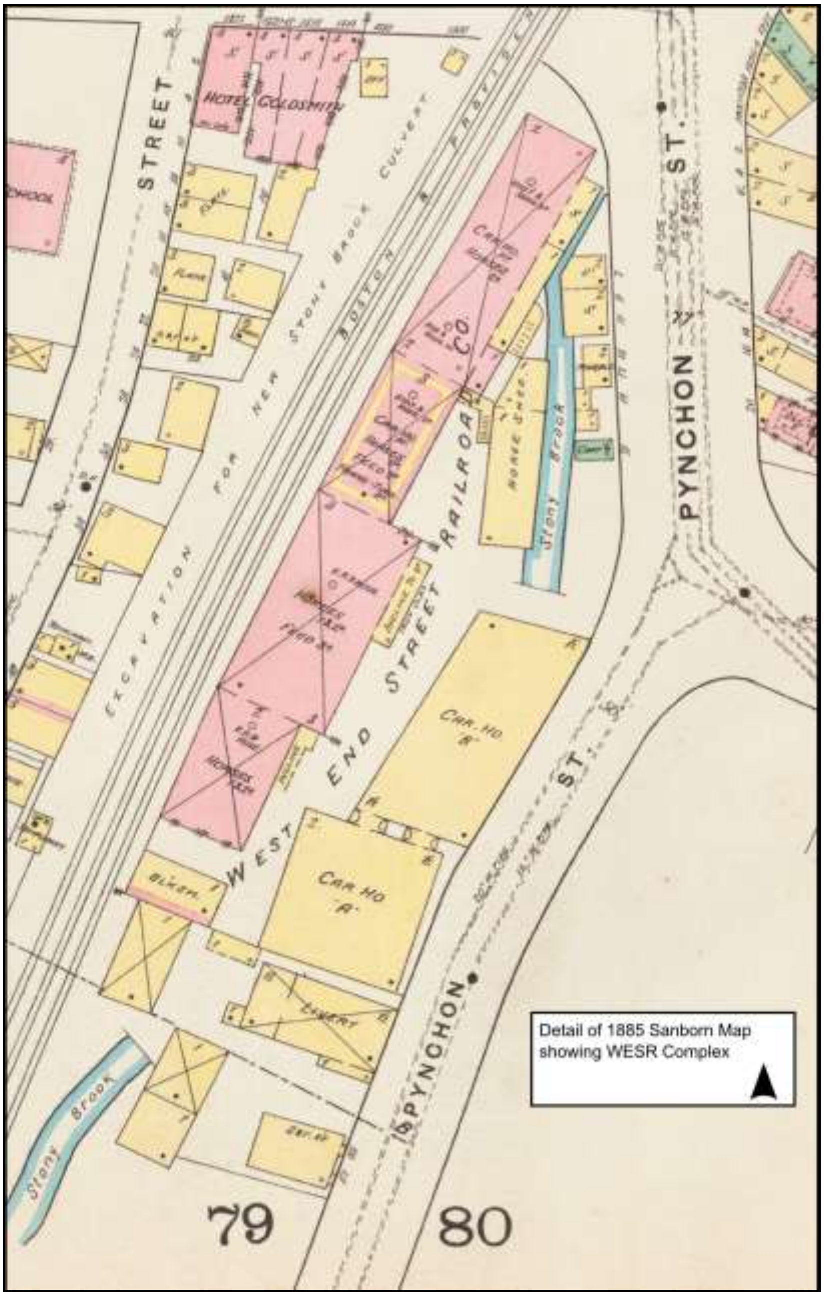
Red lines represent trolley tracks. Solid black lines represent brick walls. Hollow black lines represent timber frame walls. The brick and timber-frame addition includes rooms for "stock," where passengers waited and goods were sold, the "lobby & offices," where employees could lounge, and "oil," the use of which was probably for storage of lubricating oil. The leather deposit was discovered within the southernmost partition of the addition, which used to house a steam engine in the MRC days and whose use is unclear in the WESR and BERSC eras.



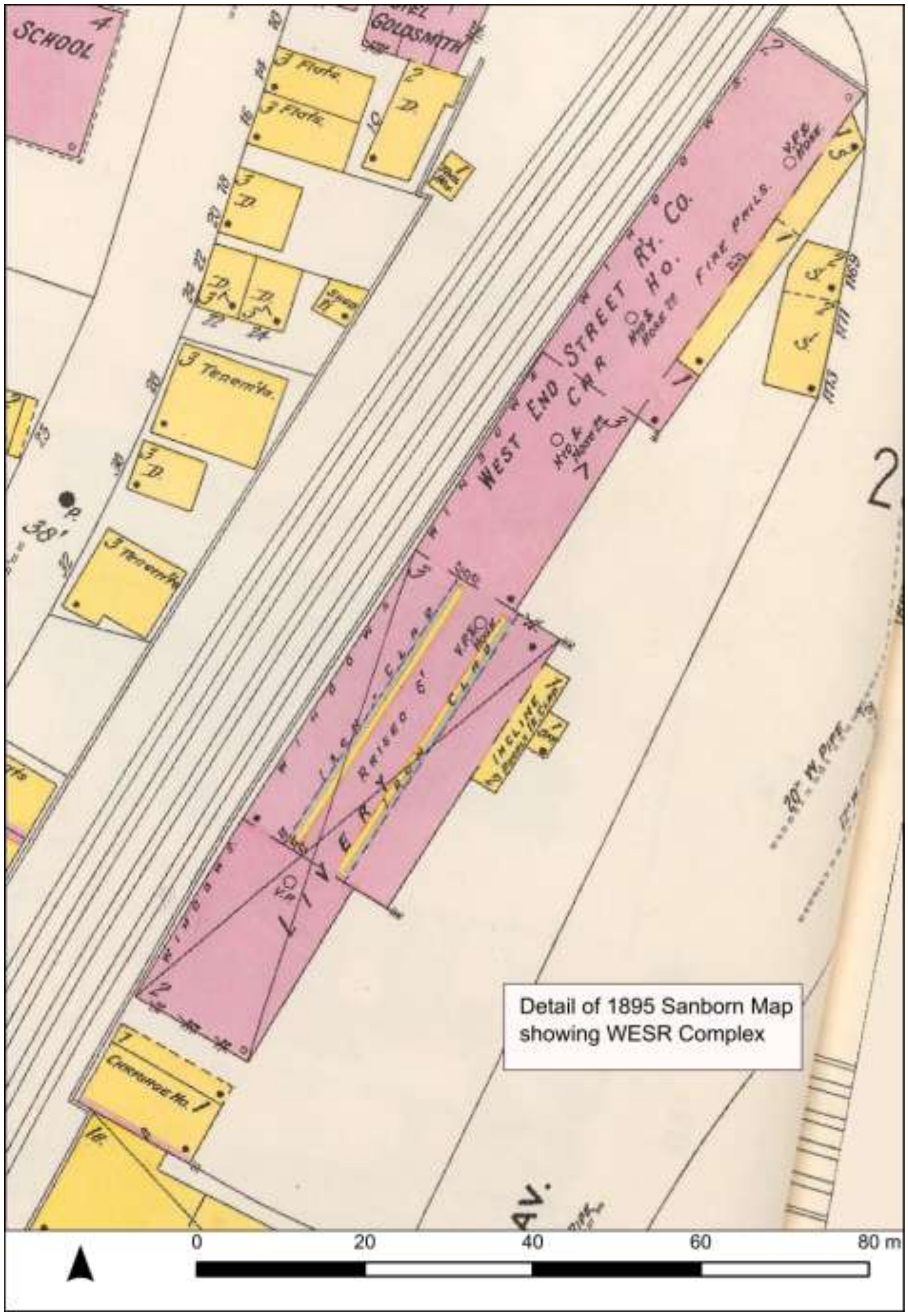
Map 5. Detail of 1873 Hopkins Map showing the MRC Complex.



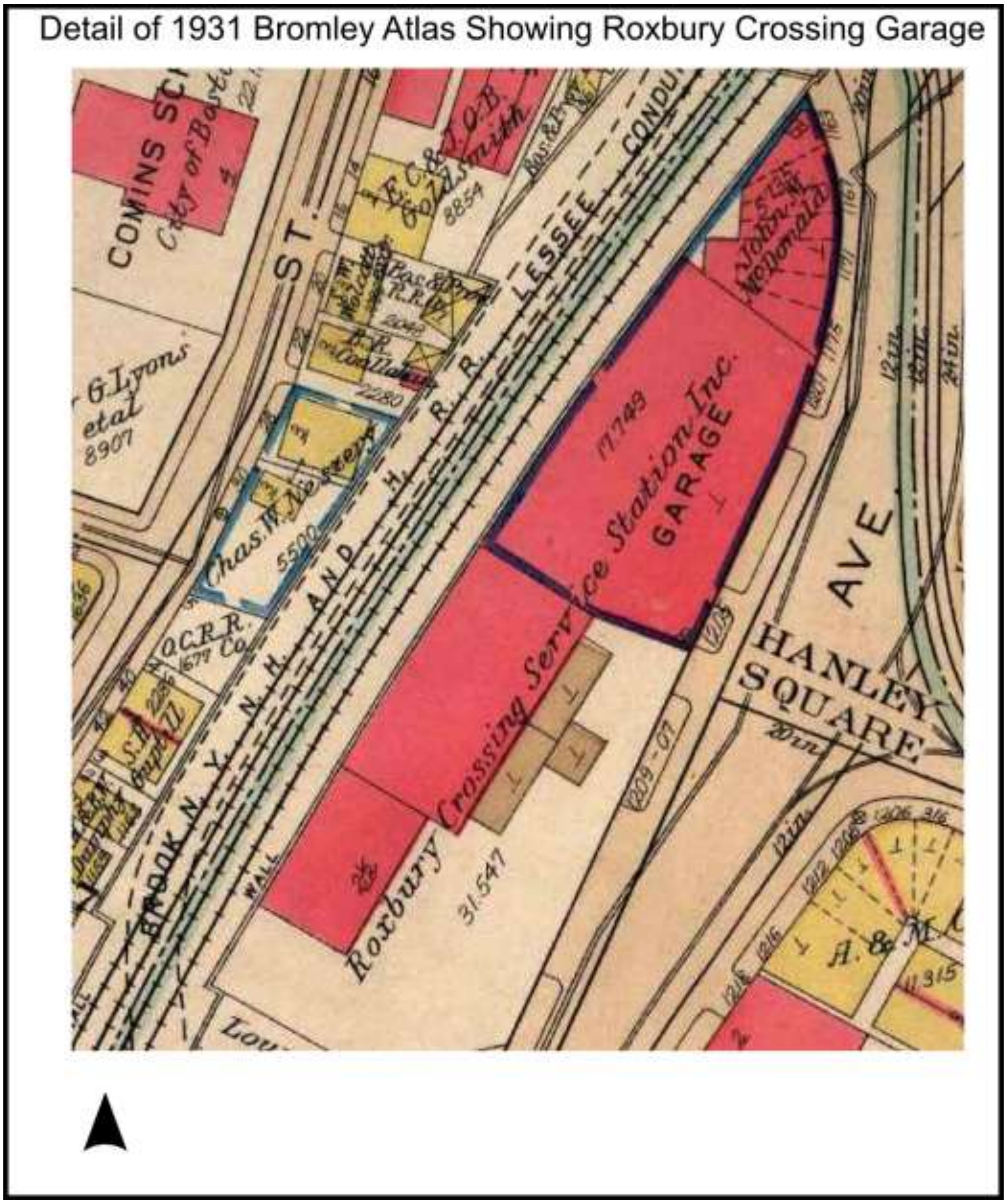
Map 6. Detail of the 1884 Bromley Atlas of Boston showing the MRC Complex. Note the slim pink structure that would later be expanded as the southern carhouse. In 1884, it is merely a connecting shed between the northern carhouse and the stables. Also noteworthy is the depiction of the car shop, the yellow structure just north of where stony Brook goes underground, with an interior partition. This map shows that the car shop was a timber-frame structure.



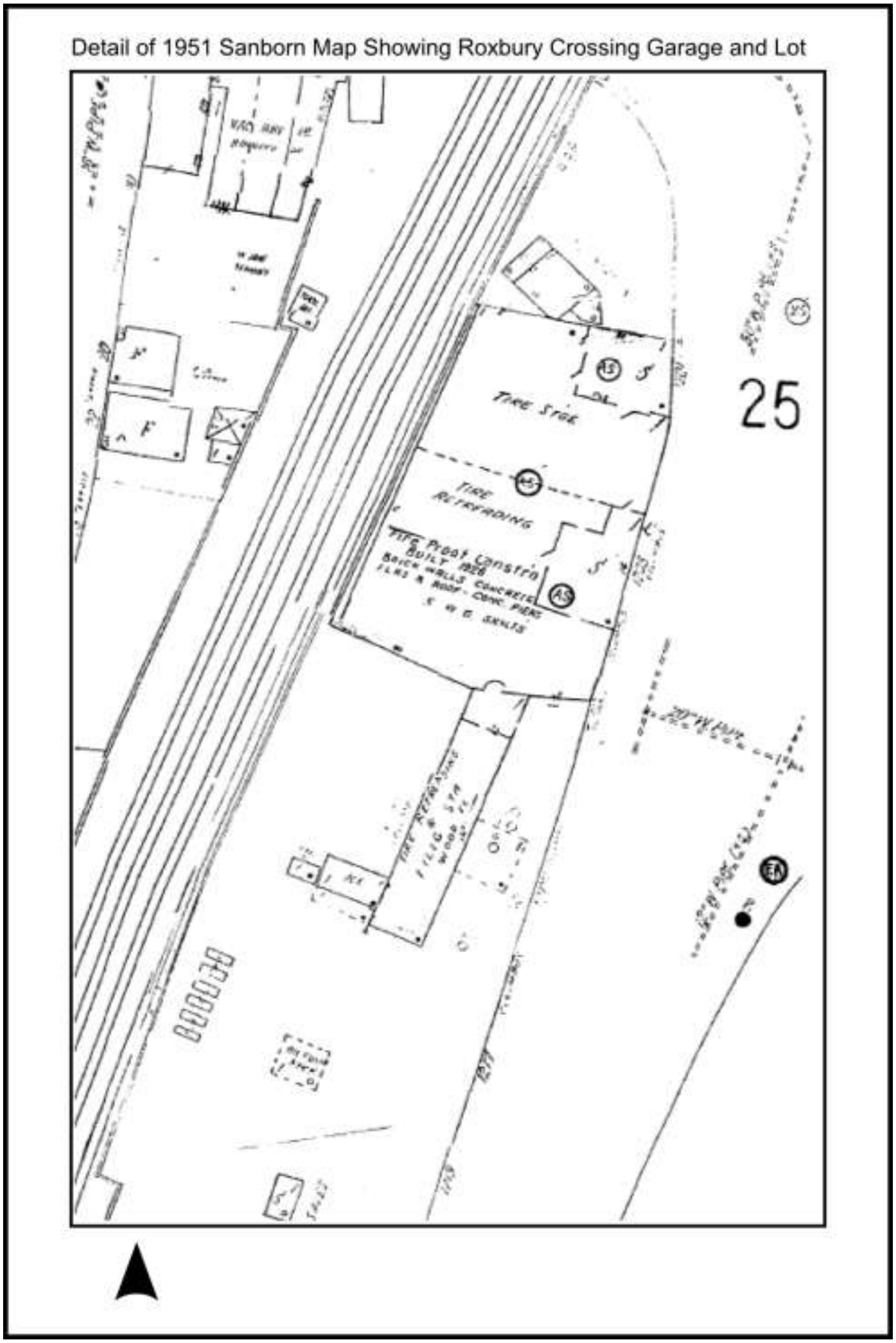
Map 7. Detail of 1885 Sanborn Map showing WESR Complex. The southern carhouse has now been expanded to the width of the northern carhouse. Also note the unexcavated "Car House A" and "Car House B," and the blacksmith shop at the lot's southern extreme. The former car shop is now the "Horse Shed," and there are a number of timber-frame buildings serving as inclines or connecting sheds between different areas.



Map 8. Detail of 1895 Sanborn Map showing WESR Complex. Note the former MRC Stables, which are now labeled as a Livery.

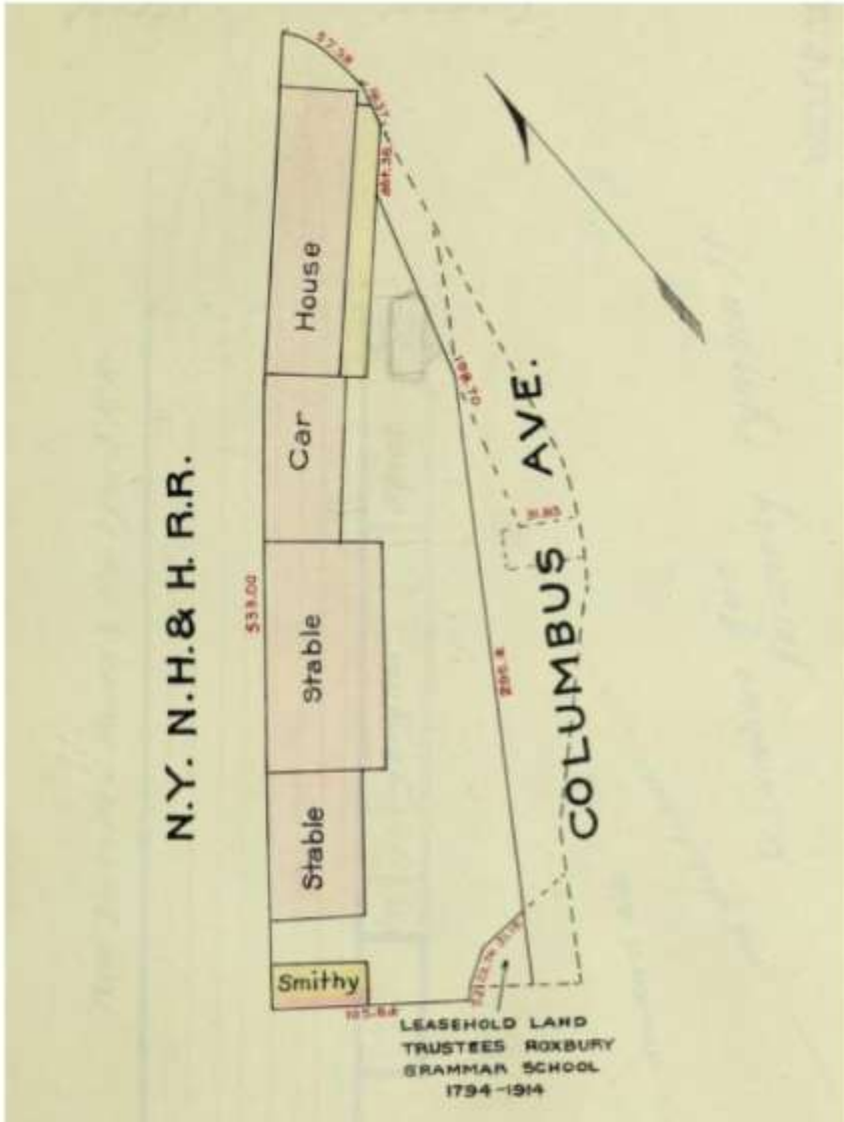


Map 9. Detail of 1931 Bromley Atlas showing the Roxbury Crossing Garage that now occupied the lot.

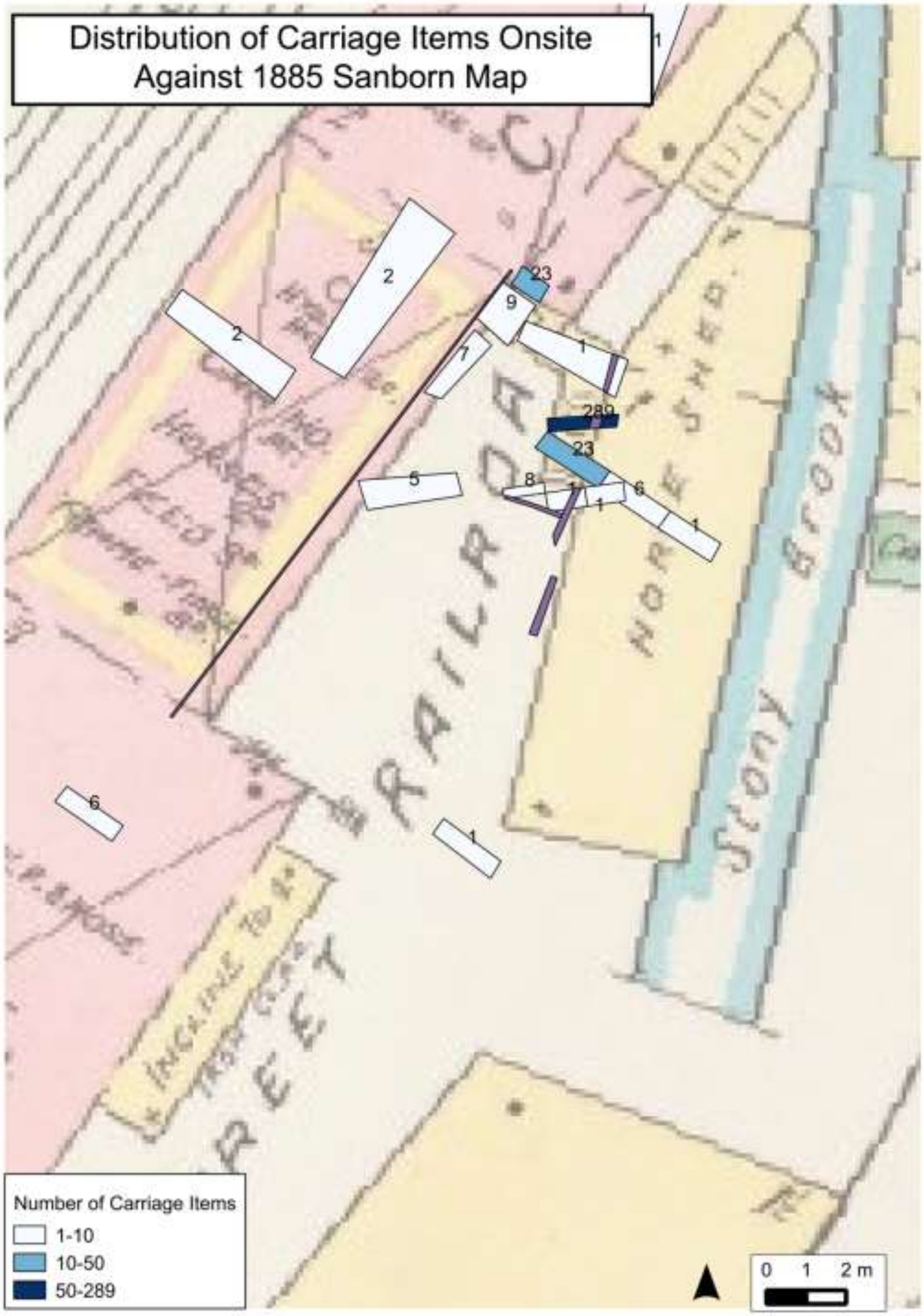


Map 10. Detail of 1951 Sanborn Map showing Roxbury Crossing Garage, with different interior use areas labeled.

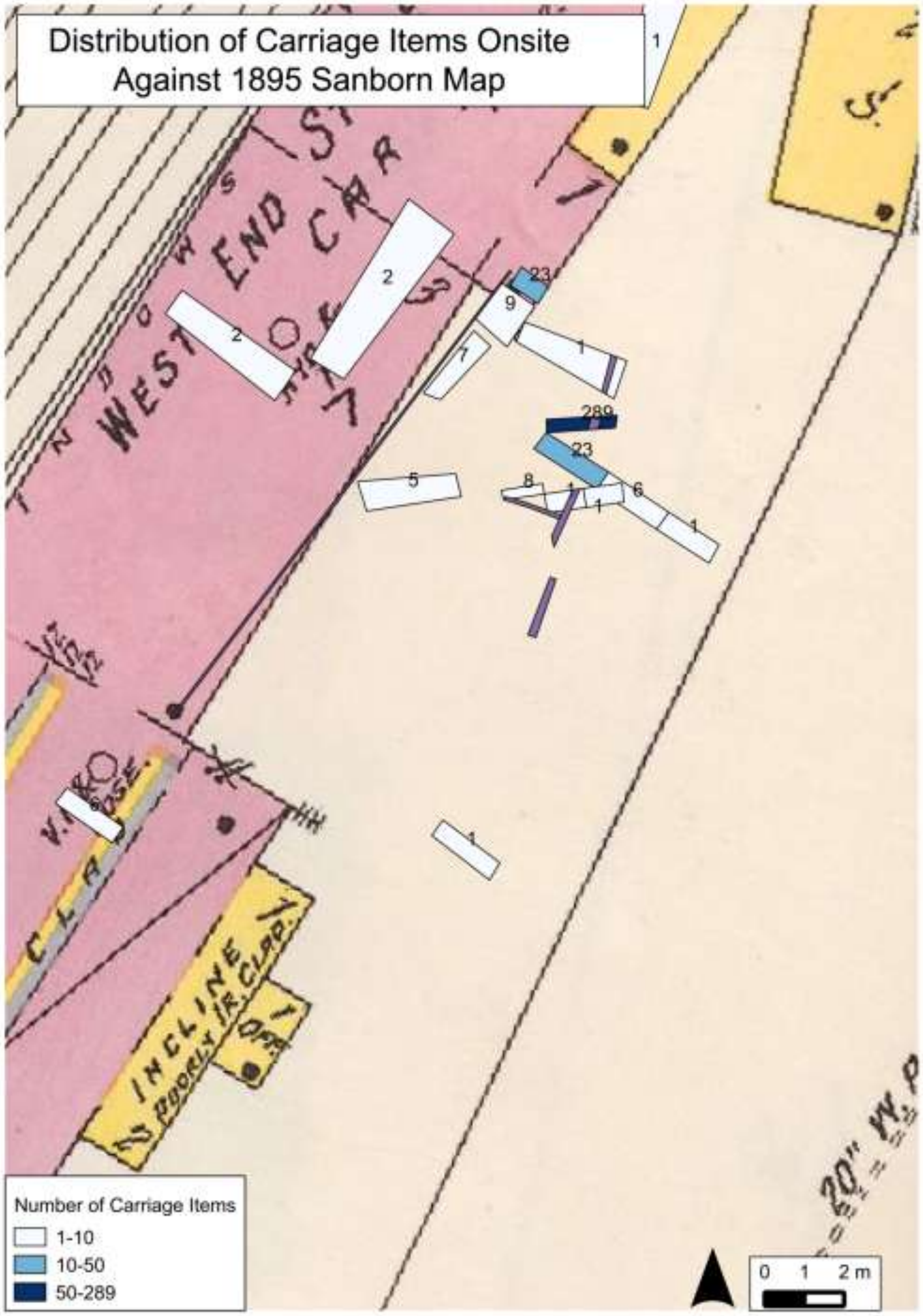
Detail of 1898 WESR Inventory showing Roxbury Crossing parcel and different use areas



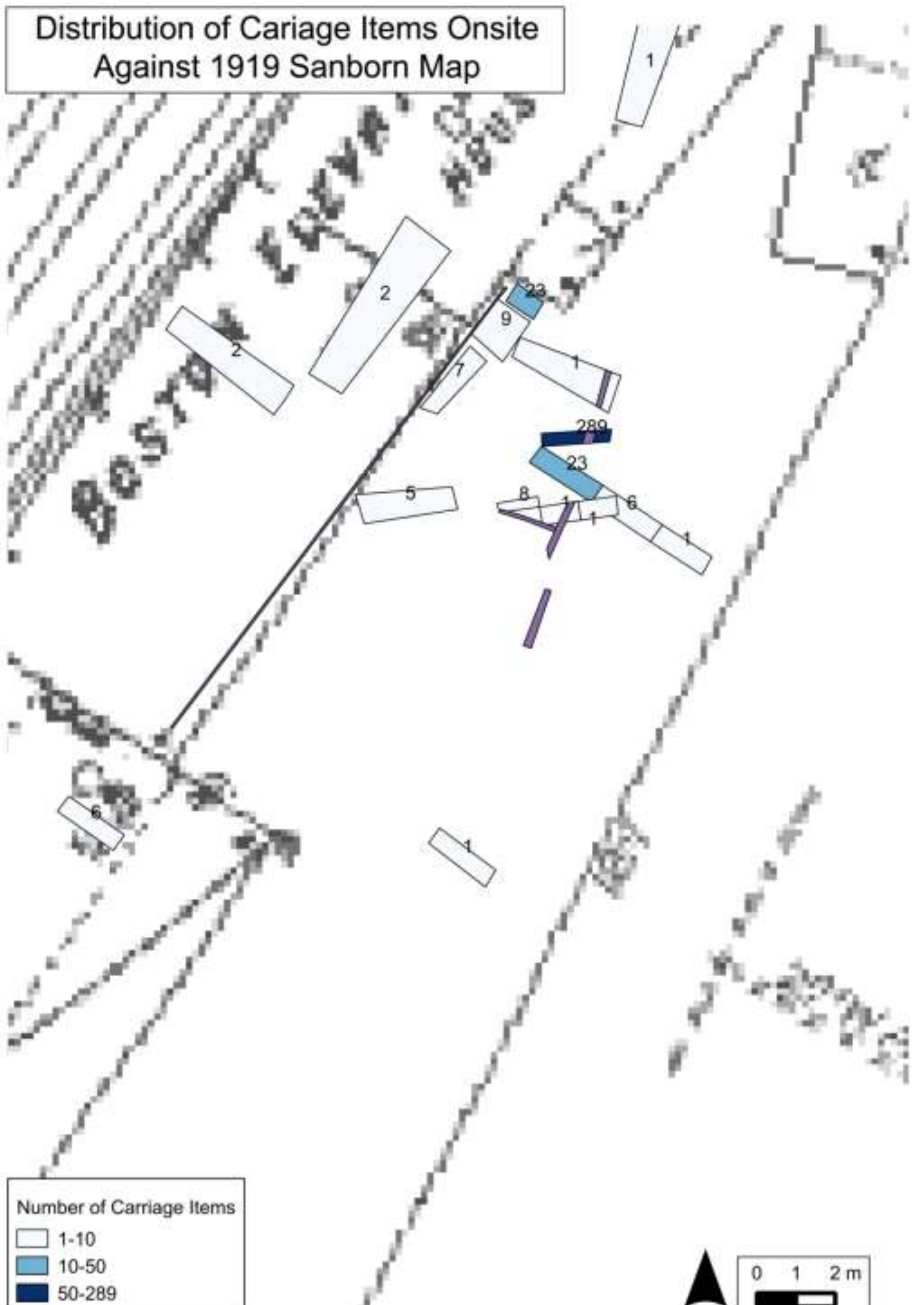
Map 11. Detail of the 1898 WESR Inventory showing the Roxbury Crossing parcel and its buildings' use areas.



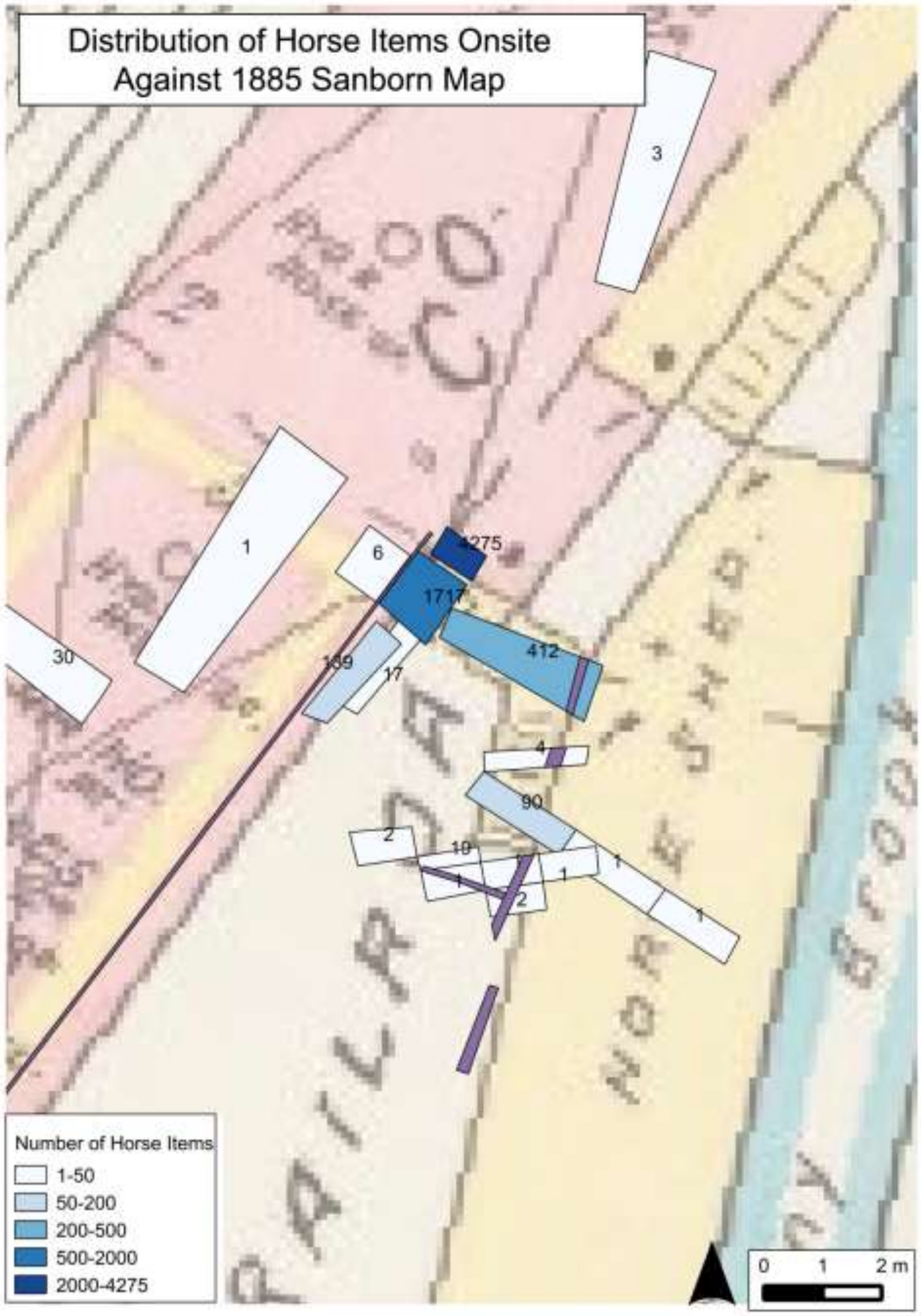
Map 12. Distribution of carriage manufacturing related artifacts onsite compared to the 1885 Sanborn Map.



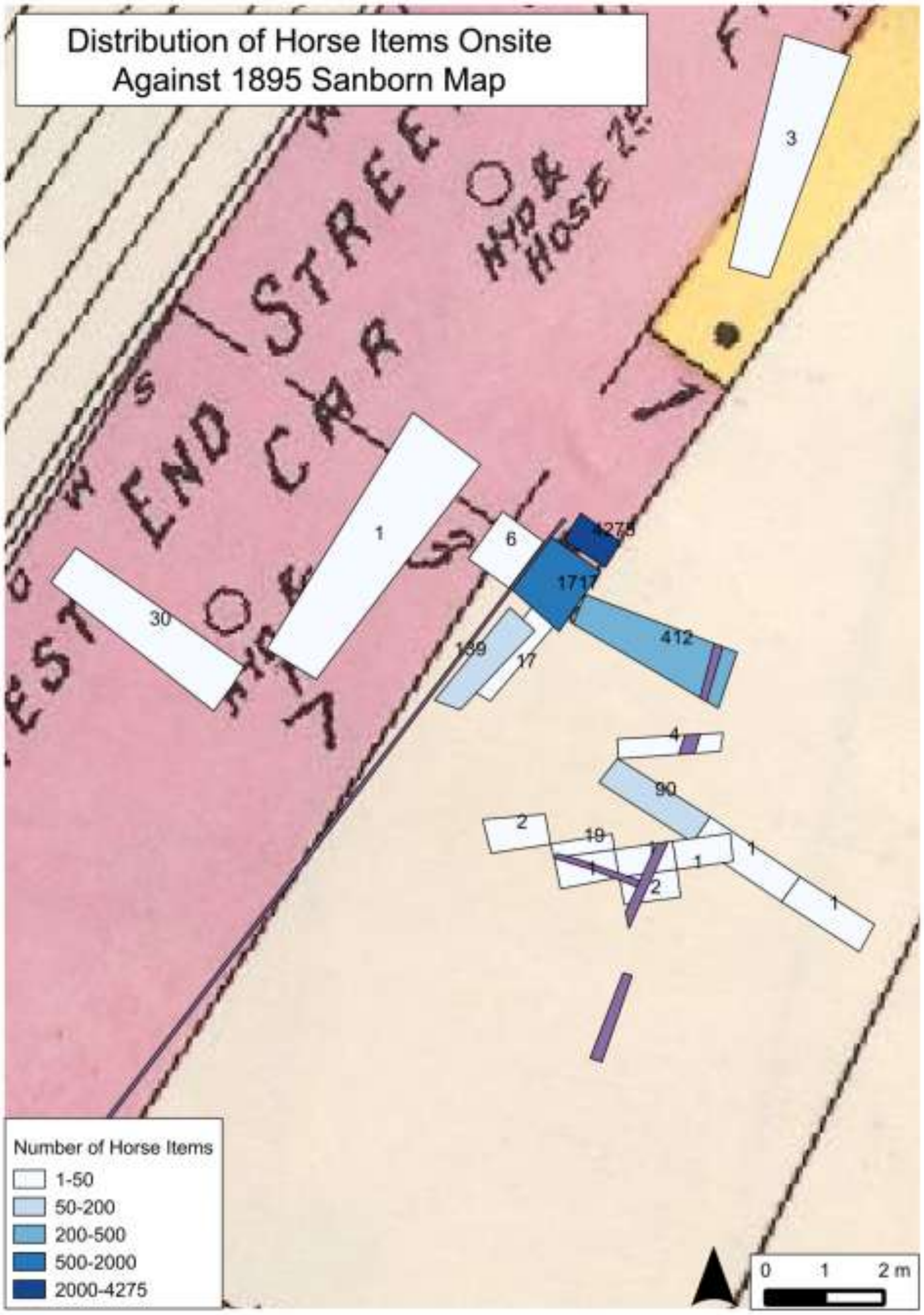
Map 13. Distribution of carriage manufacturing related artifacts onsite compared to the 1895 Sanborn Map.



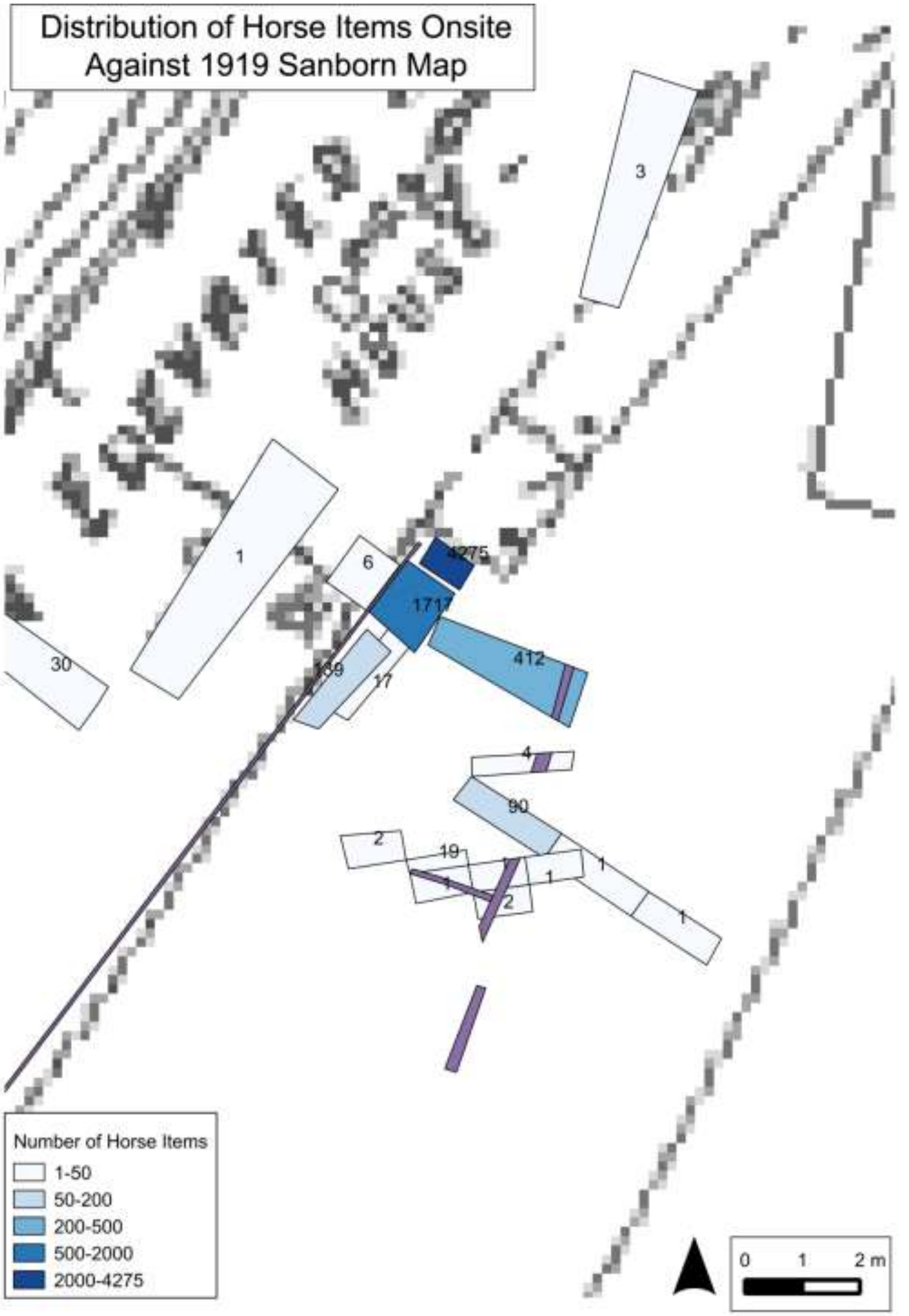
Map 14. Distribution of carriage manufacturing related artifacts onsite compared to the 1919 Sanborn Map.



Map 15 Distribution of horse-related artifacts onsite compared to the 1885 Sanborn Map.



Map 16 Distribution of horse-related artifacts onsite compared to the 1895 Sanborn Map.



Map 17 Distribution of horse-related artifacts onsite compared to the 1919 Sanborn Map.

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