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Archaeological Overview & Assessment
PULLMAN NATIONAL HISTORICAL MONUMENT
Town of Pullman, Chicago, Illinois

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and
Dr. Steven A. Walton

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Available

Making the report available meets the criteria of 43CFR Part 7, Subpart A, Section 7.18 (a) (1).

ARCHAEOLOGICAL OVERVIEW & ASSESSMENT

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Management Summary

The Archaeological Overview and Assessment (Archaeological O&A, or simply O&A) is a Baseline Research Report within the National Park Service's Cultural Resource Management system. This report presents basic research results intended to help support planning regarding and management of park cultural resources, as well as supporting interpretive programming. The National Park Service defines an Archaeological O&A as a report which "describes and assesses the known and potential archeological resources in a park area. The overview reviews and summarizes existing archeological data; the assessment evaluates the data. The report assesses past work and helps determine the need for and design of future studies" (U.S. Department of the Interior: 25).

As an industrial factory site with associated community, the archaeological resources of Pullman National Monument are evaluated here within the overlapping frameworks of Industrial Archaeology and Industrial Heritage. The federally owned and managed property within this monument is a single building within one part of the factory complex. The NPS is establishing collaborative relationships with other landowners within the monument's boundaries, including the State of Illinois, The Historic Pullman Foundation, and many private residents. This study is accordingly focused on the Palace Car works at Pullman, essentially the portion of the larger factory that included the majority of the works concerned with producing Pullman's famous sleeper cars. While the study points to how archaeological research and management at the works can connect to the larger community within the Monument, this theme will be expanded in the forthcoming Historic Resources Study and other publications and project reports.

This report includes a short introduction to the history of the Pullman Palace Car Company, then turns to a summary of the geological and environmental setting of the monument with focus on the Monument's potential to yield sites or artifacts related to ancient land use. Since the work process is the core of analysis in Industrial Archaeology, the third chapter includes an analysis of the establishment of the works and town at Pullman with a focus on the design and construction of infrastructure for production at the palace car shops. Working from existing primary sources, the document examines what is known about the design and evolution of the work process at the factory. Until researchers can undertake more detailed analyses of the Tenneco Papers collection or new archaeological fieldwork, this report includes the most detailed examination of the factory's work process and its interrelated activity areas.

The report then reviews archaeological resources, including a chapter reviewing previous archaeological work within the monument's boundaries and the research potential of known archaeological resources within the factory site (buildings #1-#8). The final section makes recommendations for research and management of the monument's archaeological, historical, archival, and architectural resources, leading toward the *Historic Resources Study* that is the third phase of the collaborative interaction between the National Park Service's MWAC, Pullman National Monument, and MTU's Industrial Heritage and Archaeology program.

Michigan Technological University and the National Park Service initiated this work in November of 2016 as part of the project entitled “Cooperative Agreement for Work with Pullman National Monument” (Michigan Technological University Proposal #1609078, Task Agreement #P17AC00005). The agreement was established within the Cooperative and Joint Venture Agreement of the Great Lakes-Northern Forest Cooperative Ecosystems Studies Unit (NPS # P12AC31164, MTU Master Cooperative Agreement #P12AC31164). This agreement will culminate in the production of a *Historic Resources Study*, to be published on September 1st, 2019.

Contents

List of Figures

Abbreviations

- CA&StL Chicago, Alton, & St. Louis railroad
- CB&Q Chicago, Burlington & Quincy railroad
- IC Illinois Central railroad
- MC Michigan Central railroad
- NHL National Historic Landmark
- NPS National Park Service
- NRHP National Register of Historic Places
- NYC New York Central railroad
- PNM Pullman National Monument
- PPCCo Pullman Palace Car Company
- PRR Pennsylvania Railroad
- DC&MW Detroit Car & Manufacturing Works
- RRCo. Robinson, Russell, and Company

Preface and Acknowledgements

We would like to extend our thanks for assistance on this project to numerous people in the Chicago area and well as at Michigan Technological University:

To begin, we wish to extend our most grateful thanks to two persons: Timothy Schilling and Nathaniel Parks. Timothy Schilling has been our lead contact at the National Park Service's Midwest Archeology Center office. Dr. Schilling has been patient with work delays and responsive to all our questions, through with his comments and suggestions, and a reliably collegial partner. As a community volunteer, Nathanial Parks acted as a *pro tem* archivist of the Tenneco Papers in the care of the State of Illinois Department of the Interior and dedicated eight intensive hours on a Saturday to help us unstack and restack more than 178 boxes of documents. This allowed us to assess the materials identified in the preliminary inventory and bring just a bit of that amazing collection into this report. This collection is truly a gold mine of information about the Pullman factory operations, filing the historical holes in source material at the Newberry Library and other archives and we are grateful for Mr. Parks' assistance. Once the collection is eventually fully catalogued, these papers will be invaluable to the future history of the Pullman factory complex. We hope the organizations will eventually realize their vision to create an industrial heritage archive for the Lake Calumet region.

Several professional staff from the National Park Service provided assistance and support throughout the project. Pullman National Monument's Kathleen Schneider, Superintendent, and Sue Bennett, Chief of Visitor Services and Community Outreach, both supported our efforts and we look forward to future collaborations. Archaeologist Timothy Schilling served as our primary contact and collaborator on the Archaeological O&A. Dr. Schilling and the staff at the NPS Midwest Archeology Center (MWAC) were a constant source of assistance and support during the research. Many individuals in NPS provided administrative and research support: Dawn Bringelson, Archaeologist and Agreements Technical

Representative; Bob Bryson, Associate Regional Director of Cultural Resources and former Center Manager, MWAC; Tim Townsend, Historian, Lincoln Home National Historic Site; and Elizabeth Dean, Administrative Support Assistant, MWAC. Paul Labovitz, Superintendent of Indiana Dunes National Lakeshore, served as acting superintendent while we got the project started.

We thank the Pullman Museum and the Pullman State Historic Site and Industrial Heritage Archives. David Schultz provided access to buildings and enabled access to the Tenneco Paper Collections. Mr. Schultz is the Site Supervisor for both the Pullman and Douglas Tomb State Historic Sites, Illinois Department of Natural Resources. The professional staff in the Illinois State Historic Preservation Office provided comments at various points during this process. We are grateful for their assistance, including: Rachel Leibowitz, Deputy State Historic Preservation Officer and Division Manager of Historic Preservation; Joe Phillippe, Staff Archaeologist; and Ryan Prehn, Illinois Department of Environmental Quality; During the project, these professionals struggled with the State of Illinois budgetary issues and the reorganization/relocation of their agency to the Illinois Department of Natural Resources. A number of people helped us access the Illinois Inventory of Archaeological Sites (at IDNR) and the related Illinois State Archaeological Survey records (at the University of Illinois Urbana Champlain and the Illinois State Museum): Michael Farkas, GIS and Database Coordinator, Illinois State Archaeological Survey; Jason Kuhlman of the Department of Natural Resources, Office of Mines and Minerals; Erich Schroeder, Associate Curator of the Technology Learning Center, and Michael Wiant, interim Director, both of the Illinois State Museum. We appreciate everyone's efforts to keep the project on track during difficult times in the state.

During the preparation of this document, we were pleased to have the interest and support of many Pullman community organizations. We look forward to closer collaborations with these individuals and organizations during the Historic Resources Study. We must offer particular thanks to some of these individuals, including Mike Shymanski of the Historic Pullman Foundation; Dr. Lyn Hughes and David Petersen of the National A. Philip Randolf Pullman Porter Museum; and Paul Petraitis, historian and Pullman resident, "co-curator" of the Pullman History Facebook Group (with Andrew Bullen). We are also grateful to the Historic Pullman Foundation and the Pullman Community Organization.

Here at Michigan Tech, we owe a debt of gratitude to Don Lafrenier at the Geospatial Research Core Facility and his graduate class in GIS for building the Pullman Geospatial Infrastructure, which has served as the backbone of our mapping for the site. Gerard Spikeberg worked as a lab assistant, building much of the HGIS infrastructure. We also thank Cooper Sheldon for his work as a research assistant and our EndNote archivist, as well as Michael Bleddynn and Alice Margerum, who each accompanied us to the archives to explore what we had to work with, we owe a great debt for their forbearance in the face of our unknown knowns as we so rapidly dove into the huge amount of material preserved on Pullman.

Our university's Sponsored Programs staff have been essential in facilitating our NPS collaborations and handling the accounting processes. We are indebted to Kim Codere, Manager of Grants and Contracts. In addition, we thank the efforts of Tracy LaPlante, Grants Accounting; Mary Yeo, Manager of Auxiliary Accounting and Banking Operations; Bobbie Dalquist, Manager of Financial Information Systems, and Leslie Turnquist, Billing Coordinator.

Several archaeological colleagues assisted us with research support and/or advice. Jane Baxter has shared all of her previous work at Pullman, along with thoughtful advice and insight. We are in her debt. Christopher Fennell of the Department of Anthropology at UIUC assisted with site file research before we'd been granted access to the ISAS servers.

The professional staff at several archives and libraries were helpful in our work, including Glenn Humphreys, Special Collections Librarian, Librarian Roslyn Mabry, and other staff of the Chicago Public Library. Staff at the Chicago Historical Society Archive Smithsonian Institution, the Library of Congress, and Harvard University's Baker Library all provided assistance. We thank Reneé Blackburn and Tyler Allen for their research assistance. Dr. Blackburn reviewed the Pullman materials in the R.G. Dun & Co. / Dun & Bradstreet Collections in the Baker Library of the Harvard Business School. Mr. Allen visited the Smithsonian and the Library of Congress on our behalf.

Several archivists and librarians deserve special mention for their invaluable help. The Sanborn and Rascher images that we georeferenced into our HGIS were provided courtesy of the Map and Geography Library, Special Collections, University Library, University of Illinois at Urbana-Champlain. Several individuals were tremendous help in this effort, including Jenny Marie Johnson, Associate Professor of Library Administration and Map and Geography Librarian; Krista L. Gray, Archival Operations Reference Specialist, Illinois History and Lincoln Collections; and Rimkus Kyle, Assistant Professor and Preservation Librarian.

Several staff from the Newberry Library were of tremendous help with their collections of archival material. Martha Briggs, Lloyd Lewis Curator of Modern Manuscripts was our initial contact and tremendous help throughout our effort. We also wish to thank Alison Hinderliter, Archives and Manuscripts Librarian in the Modern Manuscripts section; John Powell, Digital Imaging Services Manager; Patrick Morris, Map Catalog Librarian; and JoEllen McKillop Dickie, Reference Librarian.

At the Art Institute of Chicago, we were assisted by several people who helped us access documents, images, and maps. Nathaniel Parks, Tigerman McCurry Art and Architecture Archivist of the Ryerson and Burnham Libraries, advised us on the research. We were also assisted by Autumn L. Mather, Head of Reader Services; Joe Tallarico, Digital Imaging Photographer; and Stephanie Fletcher, E-Resources/Reference Librarian. Although our contact was too late to be included in the present study, Lori H. Boyer, Exhibitions and Collections Manager at the Art Institute of Chicago, provided assistance tracking down loose ends in the collections of the AIC.

At Michigan Technological University's J. Robert Van Pelt and John and Ruanne Opie Library, we thank Erin Mattas, Research Support Librarian, and both Stephanie Reed and Kari Bellin-Sloat, Assistant Librarians on the Resource Sharing Team. They helped us with database access and interlibrary loans that were (and continue to be) essential the historical background work that contextualizes the archival study with primary documents.

We are indebted to the volunteer staff of the Illinois State Railway Museum's Pullman Library in Union, Illinois. They spent time with us during which we explored their collection. They are volunteers doing a wonderful job caring for the tremendous collection of Pullman drawings, photographs, and documents

transferred from Bombardier. The cataloged and uncatalogued documents at IRM's Pullman Library have great research potential. We thank Ted Anderson, Steve Hile, Nick Kallas, Bob Webber, and others in their organization for both their time and their overall preservation efforts.

Daniel Liedtke, Curator of Collections at the National Railroad Museum in Green Bay. Conley opened the museum's private research library to us and our graduate students, a facility which will be invaluable in Historic Resource Study. It was there that, as a research team, we had our first "up close and personal" interaction with an excellent Pullman car exhibit about the car technology as well as the Pullman Porters. Prof. John 'Jack' Brown from the University of Virginia kindly fielded questions about whether anybody had ever studied or written about car erecting shops (he is the author of a recent important work on the Baldwin locomotive works) He suggested a number of avenues of study that we will take up in the next phase of this project.

1 Introduction

In answering a demographic questionnaire, the city supervisor replied to a question, "How many public parks belong to the city?" by stating "The whole city is a park, but half a dozen open spaces are elevated to parks."[1]

The name "Pullman" was synonymous with luxury rail travel for over a century in America and around the world, and even today, when rail travel is for most a distant memory, the name still conjures an image of a sleeping car with porters to care for the travelers. More historically aware people may attach the name to the idyllic planned town by the same name that was to be a workers' paradise in the age of rapid industrialization; or to the famous strike of 1894 and its catalyst for the national recognition of Labor Day later that same year; or perhaps to the famous African-American Pullman Porters and their historic role in race and labor in America. Pullman—the man, the town, the rail cars—are all of this and more, and the creation of the Pullman National Monument in 2015 recognized their individual and collective place in American history. It is also worth being explicit that the Pullman story is one of the history of technology, the history of urban planning, the history of labor and management, the history of material culture, and the history of identities (not least of all race but also, class, skilled/unskilled, and place-based identity still today).

The 1850s saw a modest revolution in the development of cars: taking their inspiration from barbers' reclining chairs and trying to compete in luxury with steamship travel, rail car builders turned regular day coaches into relatively luxurious sleeping cars. In 1858 the Galena Railroad added a sleeper on its Chicago–Dubuque line, and in the same year the Chicago & Alton (*i.e.*, St. Louis) line hired George Mortimer Pullman and the Field brothers, Noman J. and Benjamin, cabinetmakers of Albion, NY, to refit old passenger cars for long-distance travel. For 50¢, a traveler could pay to have his or her plush seat converted into a more horizontal bed for the 6-8 hour journey (Pierce 1937a:61) (Figure 1-1). What we take for granted today on airplanes, trains, coach busses, and even in our own living rooms was the new and luxurious feature for increasingly long distance train travel, which to that point could be backbreaking, uncomfortable, and quite literally nerve-wracking (Porter 1987). Pullman initially built the chairs himself and soon graduated to constructing entire "palace" cars by 1863, which he then operated for various railroads in the upper Midwest, starting with the Chicago, Alton & St. Louis railroad. Pullman and his brother and business partner, Albert Pullman, realized that it was to their financial advantage to not sell the cars to various railroads, but rather to operate the cars themselves, paying the railroad to haul the cars from station to station, but then charge the passengers directly for their use. By 1868 the business had grown so successfully that Pullman incorporated the Pullman Palace Car Company, though he still at this time had the cars constructed in various other firms' rail car erecting shops. The PPCCo. took control of their own shops by buying a car plant in Detroit in 1869 and by the middle of the next decade Pullman began contemplating building a whole manufacturing facility for the obviously successful business from scratch. Thus was born the idea of the Town of Pullman on the prairie (well, really marsh, but the prairie has always been more evocative of American progress (Smith 1994).

[1] Chicago Public Library, Historic Pullman Collection, box 8, folder 7, "Demographic Questionnaire" (1885), p. 11.

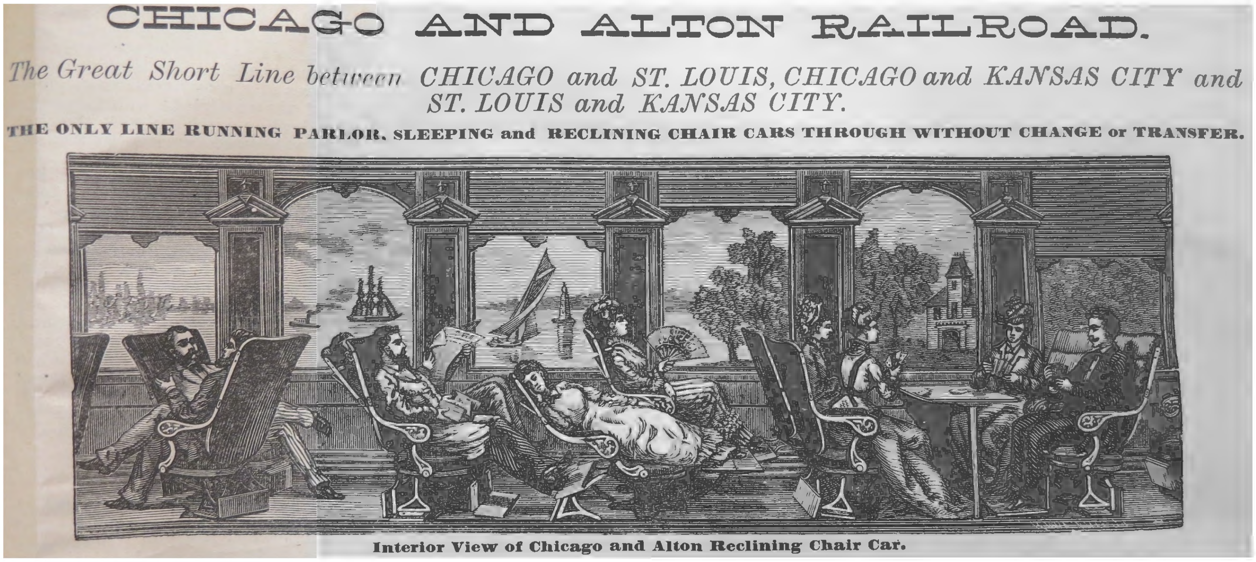

Figure 1-1: The first Pullman reclining chairs. From the Joliet News Historical Edition*, 1884 (reprinted in (Anon. 1897b: 47).*

By the 1860s (and even during the Civil War), the demand for more and more luxurious accommodations for riding, sleeping, and dining spread throughout the rail industry. Seeing the possibilities, in 1867 Pullman founded his own company for this now booming business of luxury rail travel, the Pullman Palace Car Company (PPCCO). Sleeping cars with spring mattresses appeared by mid-decade, and in 1868, Pullman took over three dozen guests—and not just any guests, for Pullman knew the right people to impress: railway managers, paper editors, merchants and bankers—for an excursion in his newest dining car, the "Delmonico". The car cost $20,000 to build at the Chicago, Burlington, and Quincy works in Aurora, IL (Pullman at this time was still subcontracting the construction of his cars) and seated guests at black walnut four-top dining tables along the windows, with six each in the dining rooms at either end of the car, with the kitchen in the middle. The goal was to effect a first-class hotel dining room on rails, and by all accounts, it was a complete success. The bill of fare—printed in loving detail by the papers—was sumptuous, and the car so well engineered that apparently not a drop was spilled on the 45-mile run at 50mph. This Michigan Central put Pullman dining cars into service straightaway, and by 1870 they were on virtually every major line in the country (Anon. 1868; Pierce 1937a:62).

This report concentrates on the features of the *manufacturing and production facility* at the core of the Town of Pullman, a subject which has not been explored at any significant depth in the published literature, and only superficially even by the Historic American Engineering Record (Historic American Engineering Record 1976). Numerous studies have delved into the life of George Pullman,[2] into the

[2] Surprisingly there is only one book-length scholarly biography of Pullman: (Leyendecker 1992)

town,[3] and especially the cars he built.[4] It is also important to mention that much information on the Pullman cars may be found in a pair of germinal reference works on railway rolling stock in general (White 1988, 1993). This study examines primary evidence in the form of documents and photographs, along with a survey of past archaeological work within and around Pullman National Monument, to enable planners and designers to anticipate the archaeological resources that may be present under and above ground at the factory site. The document also identifies research themes that will allow cultural resource managers to make recommendations on assessing the significance of buried features and artifacts and designing recordation strategies when archaeological materials are to be disturbed.

1.1 Origins of the Company Town of Pullman, IL

By the later 1860s, Pullman's business had grown steadily and he needed more cars, suggesting clearly to him that he needed to have his own production facilities. In 1870 he bought a car-building shop in Detroit, MI, but within a decade, its capacity was too limited for the expansion that Pullman could see coming, for even in 1880, the 600 men employed at the Detroit shops could only produce 114 cars per year (Buder and Kulash 1967). Although people in Detroit expected those shops to expand, expansion into the Chicago area was an obvious choice, with the city expanding rapidly after the Great Fire of 1872 and already the well-established hub of the Midwestern train network (Gutter 1872; Young 2005). The question was in what manner Pullman might build the new shops, given the options available. Simple business sense suggested that he build a moderate way outside of town for the purpose of economy. But such considerations were not at all the only concern for Pullman. Suitable land and rail connections would have been available closer in to the city of Chicago than was eventually chosen, though Pullman realized that any sizable purchases of land that could be connected to him would set off waves of speculation, thereby driving up the cost of adjacent land he wished to obtain at the time or in the near future. In the end, he quietly purchased much of the land through a third party to head off that rampant speculation, though it did materialize as soon as the news of Pullman's grand scheme became public.

The Town of Pullman stands as an important exemplar in the nearly 2,500 company town experiments in America in the later nineteenth and early twentieth century. Coming on the heels of the great Chicago fire of 1872 and the both necessary and boundless opportunities in rebuilding the city, Pullman conceived of a new start on a clean slate of the open land to the south of the city. While planned communities centered on a factory have a long history in America (Garner 1992), only a few rise to being truly *industrial* planned communities (Doughty 1986; Tone 1997). That Pullman stands both as one of the earliest where the town specifically was built *ex nihilo* to serve the factory and only the one factory,

[3] (Buder and Kulash 1967) and see (Buder 1967; Lillibridge 1953; Reiff 1997) and especially (Baxter 2012; Morgan 1954)

[4] (Barger 1988; Maiken 1992; Morel 1983; Welsh, et al. 2015). In these limited citations, we are omitting numerous books and articles published by the Pullman Company itself. While informative, they serve more as promotional material than analytical works; see (Reiff and Hirsch 1989) There is also an extensive literature in the train aficionado community detailing individual cars or the rolling stock of individual railroads (from the continental such as the PRR, NYC, or Milwaukee Road to the purely local), and even the paint schemes of Pullman cars (Dubin 1997), that need not be considered here.

and a town where the company controlled all the housing and amenities.[5] Pullman is also notable for the design consistency and architectural planning that went into the town, as well as the integrated utilities—especially sanitation and water—that connected factory and town. Other experiments of company towns, whether utopian or not, typically had an existing town into which a dominant factory (*e.g.*, Roebling, NJ) or factories (*e.g.*, Lowell, MA) were inserted. The counterexample, though not often discussed in the same category as a the urban or peri-urban[6] city might be mining towns, but as they are extractive industries, parallels with the manufacturing at Pullman would be limited at best, even if the socio-politics of company towns in both industries might bear comparison.

It should not be underestimated how deeply the Great Railroad Strike of 1877 seems to have shaken Pullman's confidence in the possibility of a happy marriage between labor, capital, and industry (Pullman Incorporated 1970; Buder and Kulash 1967: 33-40). Along with other prominent businessmen like Cyrus McCormack, Marshall Field, and Phillip Armour, Pullman himself became a member of the daily committee of the Chicago Citizen's Alliance, originally intended as a mutual fire protection aid society, which by the 1870s offered its services to the police to make citizen's arrests of any dissenters, rabble rousers, and especially red-flag waiving agitators (Pierce 1937a:61). It became imperative to him to develop an industrial community that would mitigate against the forces of unrest in his workers. At the heart of it was the factory, though at this date the elements of welfare capitalism (*i.e.*, industrial paternalism) that would shape the town seems to have had little impact on the development of the manufacturing complex itself.

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[5] In this case, that was never strictly true (Allen 1966; Crawford 1995; Dinius and Vergara 2011; N. White 2012).

[6] *I.e.*, Industrial "satellite cities" (Taylor 1915).

The PPCCO had an initial capitalization of $1,000,000 (over $14B today). By 1870, with headquarters in Detroit, Pullman had capital assets of $8M, cars running over 15,000 miles of track, and 3,000 men at work building cars at a rapid rate; between 1883 and 1893, the capital of the company increased by 250%, dividends paying 6-8%, and growth at 18% over the year previous in 1890. Similarly, the growth of passenger-miles exploded between 1885 and the end of the century (Pierce 1937b:112-115, 113-158). Specialty diversification was Pullman's main success: there were the sleeping cars, of course, but then also gender-segregated toilet facilities, smoking cars, drawing-room cars, buffet-cars all of course equipped with electric light and steam heating. By the 1920s, Pullman had achieved a truly global empire, with cars in service across north and south America, Europe, Russia, and Japan. It had 11 manufacturing facilities and 6 repair shops in the U.S., as well car plants in France and one in Brazil (Figure 1-2). The company was strikingly profitable from the very beginning, returning a steadily increasing dividend even in poor years, and the company assets grew steadily until the Depression. (Figure 1-3). Between 1867 and 1884, the Pullman Palace Car Company paid out 71 dividends to its shareholders, ranging from just under $30,000 to over $1.26 million per year, totaling in all for those 18 years a cumulative total dividend of just over $10 million, representing an annual return of between 3% and 19% in various years, with an average rate of over 11%.[7]

Figure 1-2: The Pullman manufacturing and repair empire at its height (from Annual Report 1929, 2)

[7] "Memorandum Showing Cash Dividends Paid from Nov. 15, 1867 to Nov. 15, 1884, Inclusive," (Chicago Historical Society, Pullman Miller Collection, box 5, folder 1.)

At the same time, it was *manufacturing* thousands of cars a year, roughly in the proportion of 1 sleeper for every 20 passenger cars, for every 300-800 freight cars (Figure 1-4); this should be contrasted with their *operations* division, which operated thousands of sleepers on the rails in the first half of the twentieth century, but only a few hundred parlor cars and a handful of dining or other cars (Figure 1-5). And to put this all into perspectives, Pullman-operated cars were only ever a very small fraction of all the passenger cars of any type in operation on American rails during the lifetime of their operation (Figure 1-6). In other words, Pullman realized that in manufacturing, it was turning out the thousands of freight cars that was fastest and most profitable, as building passenger cars, and especially opulent sleepers, was slow and expensive. But on the other hand, he (and the managers after his death in 1897, of course) also realized that it was operating the *sleepers* where the profits were to be had.

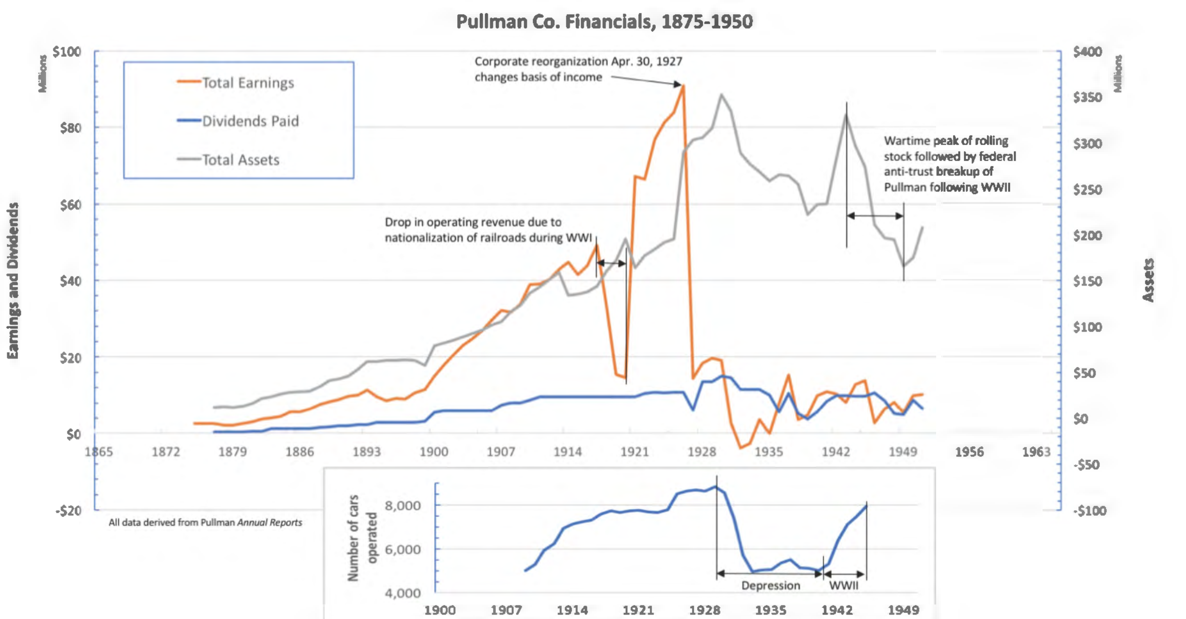

Figure 1-3: Annual Earnings, Dividends, and Assets for Pullman Co., 1880-1972 (Annual Reports)

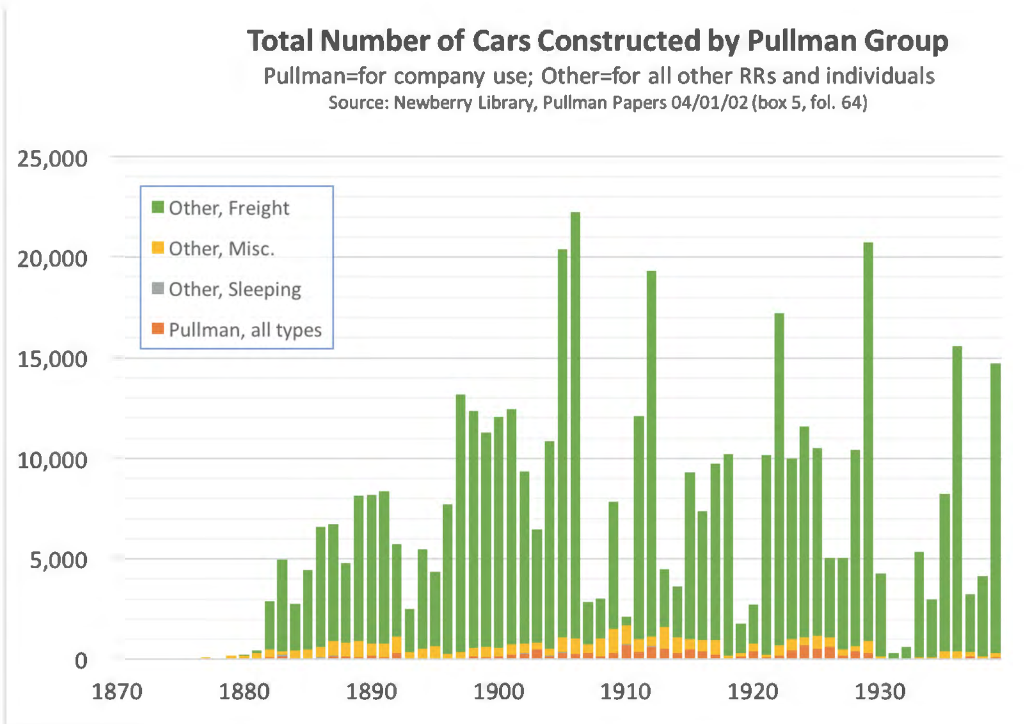

Figure 1-4: Total Number of Cars Constructed by Pullman, 1871-1940

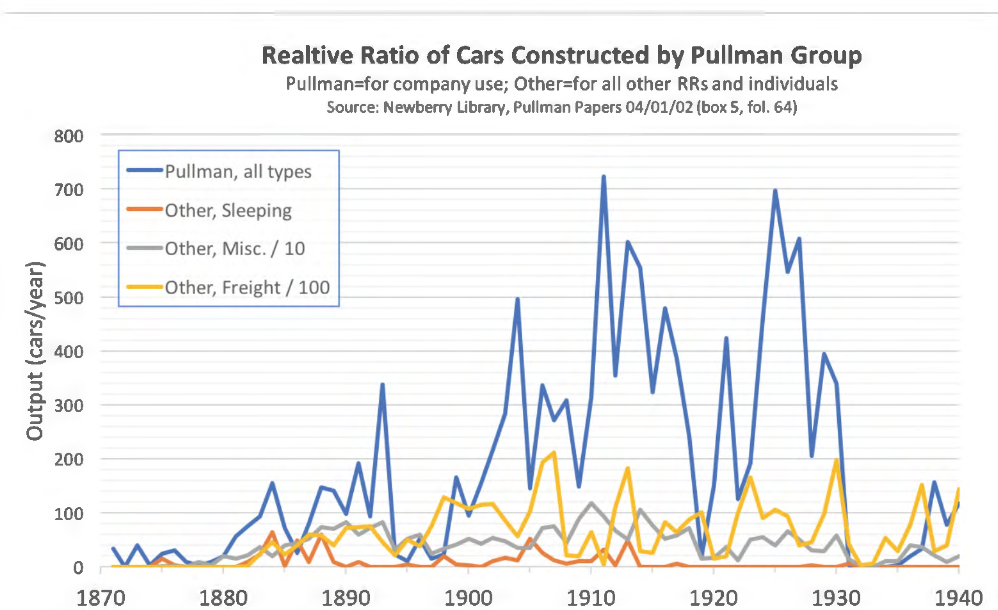

Figure 1-5: Relative Ratio of Cars Constructed by Pullman Group

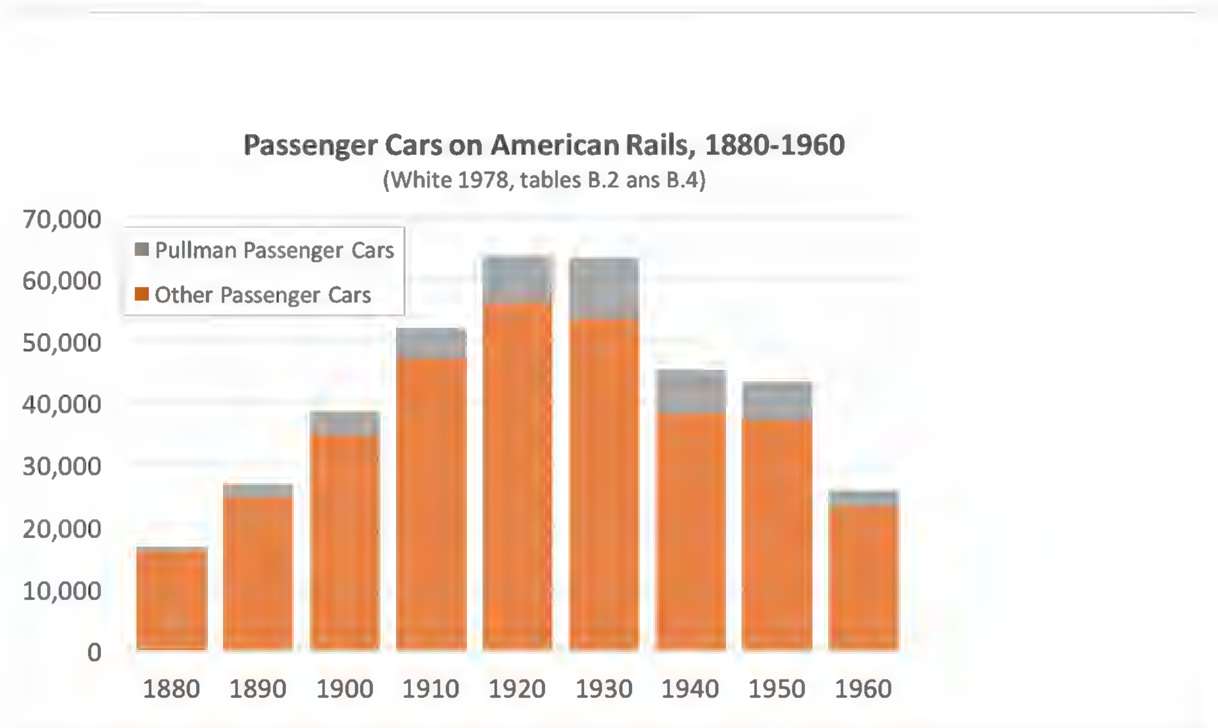

Figure 1-6: Passenger Cars on American Rails, 1880-1960

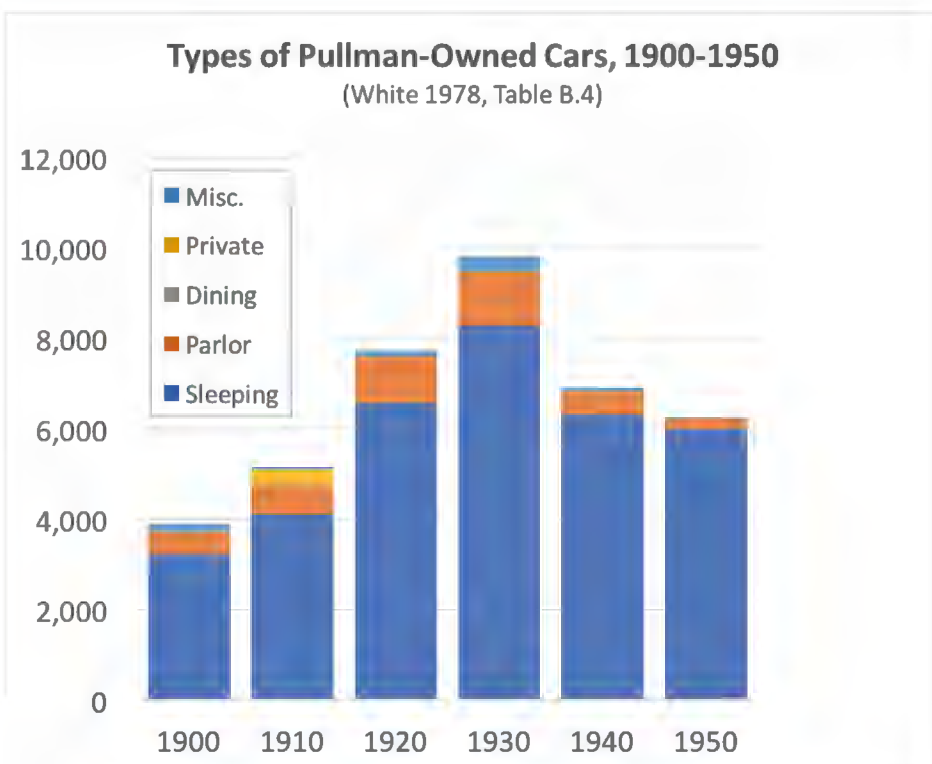

Figure 1-7: Types of Pullman-Owned Cars, 1900-1950

1.2 The Town of Pullman and its overlapping designations

The factory complex at the heart of the Town of Pullman, IL, is subject to multiple overlapping historical designations at the city, state, and federal level. All of these overlapping agencies have varying and limited degrees of jurisdiction or types of involvement in Pullman (Figure 1-8).

The town of Pullman is a wholly incorporated subdivision of the City of Chicago since 1889, extending from 103rd St. on the north to 115th St. on the south, and existing between Cottage Grove Avenue (and the Illinois Central railroad right of way) on the west to Interstate-94 and Lake Calumet on the east.

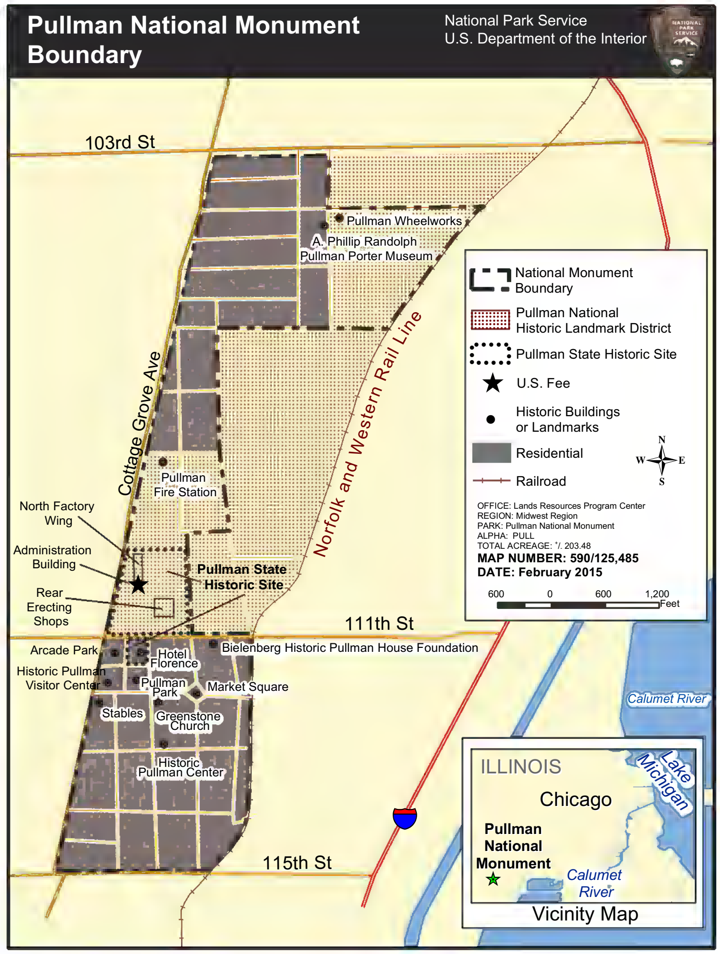

Figure 1-8: Overlapping boundaries of Pullman historical districts (courtesy PNM)

Residents of Pullman have been fierce promoters of their community's heritage. In 1960, a group formed the Pullman Civic Organization to advocate for the community and their efforts inspired a long series of recognitions. A number of heritage agencies have listed the Pullman historic site, declaring its significance. Following a survey by the Historic American Building Survey in 1967 (Historic American Engineering Record 1976), the State of Illinois designated the town as a State Historic District in 1968 and the town was placed on the National Register of Historic Places in 1969.

At the end of 1970, the Secretary of the Interior named Pullman a National Historic Landmark District, which it then expanded in 1972. The NHL program is administered by the National Park Service as a stand-alone program. That same year, the City of Chicago designated South Pullman residential area as a Landmark District, adding North Pullman's residential area in 1993. This listing recognizes the suite of features in a district—buildings, other structures, and landscape elements—that together add up to a historically significant area worth preservation and recognition. Structures within a NHL may be privately or publically owned, and although there must be a preponderance of so-called "contributing" buildings to make the NHL designation viable, the district may contain "non-contributing" structures so long as they have not too strongly marred or altered the qualities for which the district is being recognized.

NHLs can be single structures or districts, and have been established to recognize sites where nationally historic significant events occurred, prominent persons lived, or that more abstractly characterize a way of life or iconic ideals important to our national identity. NHLs can also recognize exceptional examples of design, construction, or archaeological significance. In the case of Pullman NHL, the site was noted for its relation to industrialism, urban planning, civil rights, and the historically pivotal strike of 1894.

Most recently, President Barak Obama designated Pullman National Monument on February 19, 2015, giving the National Park Service an active preservation and education role in the community, though it should be noted that the NPS owns only the Administration Building (the "clock tower") at the core of the remaining factory complex. The State of Illinois retained ownership of the rest of the factory site and the Hotel Florence immediately to the south, while the rest of the town remains privately owned. The NPS and the State of Illinois work to reach agreement on the management of their respective portions of the factory property. Private properties within the rest of the Monument are not regulated by NPS law, policy, or rules.

The Monument was given the following mission statement in his proclamation:

> Pullman National Monument fulfills the following purposes for the benefit of present and future generations: to preserve the historic resources; to interpret the industrial history and labor struggles and achievements associated with the Pullman Company, including the rise of and the role of the Brotherhood of Sleeping Car Porters; and to interpret the history of urban planning and design of which the planned company town of Pullman is a nationally significant example. (Obama 2015)

The proclamation went on to highlight how the town was an "evocative testament to the evolution of American industry, the rise of unions and the labor movement, the lasting strength of good urban design, and the remarkable journey of the Pullman porters toward the civil rights movement of the 20th century." As such, the Monument now has a multifaceted interpretation mandate, and the NPS, the State of Illinois, local museums and preservations groups, and the residents of Pullman will work to make that a reality.

1.2.1 The Factory Complex

As the National Park Service took possession of the Administration Building at Pullman (Building #1), they initiated a conversation with Michigan Technological University. That yielded this collaborative effort to update what was known of the history of the building and the entire core of the Palace Car factory complex, the rest of which is owned and managed by the State of Illinois. The Historic American Building Survey had documented the Administration Building and Erecting Shops in 1967 (Historic American Buildings Survey 1967). When a team from the Historic American Engineering Record arrived nine years later (HAER IL-5), they captured 15 photos, seven drawings, and 183 pages of data about the area's historical and current conditions. While other publications have outlined the history of buildings, they were derived from these sources and supplemented by research in other resources, such as newspaper articles, and published academic histories. This survey complements and extends those studies due to the added benefit of 50 additional years of cataloging of collections, but also the loss of original architectural fabric in the factory. While all of the archives we visited had updated finding aids and catalog information over those decades, the essential core documents in which people recorded details about manufacturing were still not found in any archive.

This changed in the Spring of 2017 after the Chicago Area Archivists held a service day activity to a create box-level inventory and condition reports of the 150 boxes in the Tenneco Company Collection papers in the care of the Pullman State Historic Site. This collection includes many of the original company documents about manufacturing. Working from that catalog, we were able to spend a single day looking through the surviving records of Pullman Company's manufacturing unit. These papers, which will eventually be available to researchers and the public through the Industrial Heritage Archives of Chicago's Calumet Region, helped to extend our analysis of work at the factory. Our examination of the Tenneco papers was rushed and nowhere near complete, so we still could not find several key document types. As an example, the Newberry Library holds a remarkable collection of oversized and bound volumes of maps and blueprints documenting change over time at the Calumet Shops. While similar volumes existed for the manufacturing core, including the erecting shops, the blacksmith shop, the wood machine shop, etc., these have still not been found.

2 The Geological and Environmental Setting

People exploited the resources of Lake Calumet and the Pullman area for millennia. The Chicago Lake Plain had distinctive riparian and aquatic environments, with extensive marshland long known to have very high net primary productivity and edible productivity that people utilized throughout time (Craig 1988). Given the transformation of the landscape at the Pullman factory site detailed in this report, it is highly improbable that any undisturbed cultural resources remain sealed underneath the 1880 landfilling on NPS or State of Illinois property within or surrounding the sleeping car shops. We summarize the geological and environmental history below, however, along with notes on the cultural phases of land use because ancient peoples used this land extensively although no human settlements are known to be located within the town boundaries.

Considering the larger context of the town's landscape upon the lake plain, however, Monument staff should note that people used the nearby Tolleston Ridge as a travel route thousands of years and Lake Calumet would have offered many useful and attractive resources. Nearby landforms around Lake Calumet may have attracted people, such as the smaller beach ridges with gravel and sand deposits that were still visible as recently as the 1930s just north and south of the factory site. This chapter provides a background to interpret the Monument's geological history to visitors, explain different periods of land use, and to point toward long-term landscape history of the site.

In 1988, Joseph Craig undertook a literature review of sites recorded by the Illinois Archaeological Survey in the nearby Cook County Forest Preserve District lands. His subsequent settlement pattern analysis indicated that alluvial bottomland locations without dense forest cover were the most utilized environment on the lake plain, followed by the dune and beach ridge features with savanna forest. These sites are generally close to useful marshland but are higher and drier. Conversely, the upland prairie environments seem to have been least attractive to residents of the lake plain, and people used locations in that zone for brief stays collecting special resources. The people of the Archaic (10,000 BP-2,000 BP) concentrated on exploiting productive marshland habitats, preferring to locate on beach ridges clear of forest. Woodland sites (2,000 BP-400 BP) showed more generalized use of different geographic zones. The Mississippian-era settlers (900 CE-1400 CE) favored the river and stream valleys for settlement in order to exploit the bottomlands more intensively (Craig 1988). These general findings have held up to subsequent work (Lovis and O'Gorman 2006; Lurie 2009; Markman 1991).

We do not yet know the vegetative history or soil types in Pullman. Both the landforms and soils of the Pullman area were shaped by the scouring force of glaciers and the changing levels of water in the lakes they produced. As the glaciers advanced and retreated and lake levels fluctuated from high to low levels, Pullman was alternately inundated and exposed for varying lengths of time as these processes created the landforms and major sediment layers summarized below. In each case, as the water receded to a lower level, soils would generate from the clayey material as it mixed with aeolian sediment and that moved by surface runoff (Calsyn, et al. 2012: 13, 16-18). To be clear, the patterns related below are very generalized and the site will have spent long periods underwater, as seasonal marsh, and as forested bottomland sheltered between relict dunes to the east and west. Wetland environments like this also shifted from wet-to-dry seasonally, annually, and over the decades.

Most of the City of Chicago, including the Lake Calumet area, is on Lake Plain topography that initially formed under glacial Lake Chicago. Layers of grayish brown or gray clayey silt settled out from the lake water, forming what became a broad and nearly level surface that sloped gently toward Lake Michigan. The sediments around Lake Calumet are described as lacustrine silty clay (Thompson 1989) or "quiet-water lake sediments dominated by well bedded silt that is locally laminated and contains thin beds of clay. Also, local lenses of sand and gravel are not uncommon" (Sinars 1999: 2-7). The color derives primarily from the oxidation state of iron compounds, and in low-lying and marshy areas where water fills pore spaces within the soil all year. The lack of oxygen in these saturated sediments reduces the iron in the clay and gives the sediment a grayish character. Where soils are better drained and oxygen circulates, the clayey sediment tends to be brown. The low relief on the lake plain influences runoff and water infiltration, particularly in areas where clayey soil collects, such as in depressions or flat areas (Calsyn, et al. 2012: 16-18). Archaeological studies in Pullman have generally found that 20cm-60cm of anthropogenic topsoils overlay clayey lake deposits, often described as gray in color (Martinez, 2016; Baxter, 2011a-c). Sediment borings conducted for architectural assessment in the Office building revealed about 3 feet of rubble and fill, but these borings did not distinguish modern rubble and fill, historic fill, or buried paleosol (Knight and Pfingsten 2001).

Questions of water flow and oxygenation in the paleosols and sediment deposits are important because the modern topsoil throughout Pullman purportedly sits above as much as 1.5m/5ft of fill dredged from Lake Calumet in the 1880s. This is considerably more fill than anything found by the archaeological studies above or the core samples taken in the factory complex. The fill was to raise the elevation of the marshy ground and was intended to improve drainage, but because the clayey loam formed both the ground and the dredged fill, the new fill did not facilitate water flow and the town required extensively engineered subsurface drains. The relief of the original land cannot be known at this time because of the extensive landfilling and modification, but the original topography could be systematically reconstructed through sediment cores and monitoring of construction trenches throughout the monument. This would aid managers to predict potential zones for types of pre-industrial land use.

The landscape formation of Pullman's factory site was shaped by the clayey sediment, which many people often explain by pointing to the brickworks use of the dredged material and discussions of landfilling. The factory layout was also influenced by the locations of sand spits, dunes, and eroded relict beaches, since the rail lines were routed over those gravel deposits. The sediments continue to shape the lives of people in the Lake Calumet area because of the way the clays create chemical conditions that enhance or retard the transport of industrial waste in the area after more than a century of landfilling, shoreline reclamation, and lagoon design (Colton, 1988:212).

2.1 Topography and climate: Holocene Lake Levels

Since the end of the Pleistocene, lake levels have varied in the glacial lakes from lows at about 55 meters ASL to highs nearly 195 meters ASL. Figure #2-1 shows estimation of lake levels over the last six millennia, as presented in four different published studies from 1969 to 2004. As more studies have been completed and techniques of estimation advanced, scientists have improved the resolution of their reconstructions. While lake levels fluctuated, resulting in complex transgressions (land building) and regressions (land erosion), and while erosion and deposition rates in any location were very sensitive to local conditions, there are some generalizations that can be made about the processes acting upon the south shore of Glacial Lake Chicago and Ancestral Lake Michigan:[8]

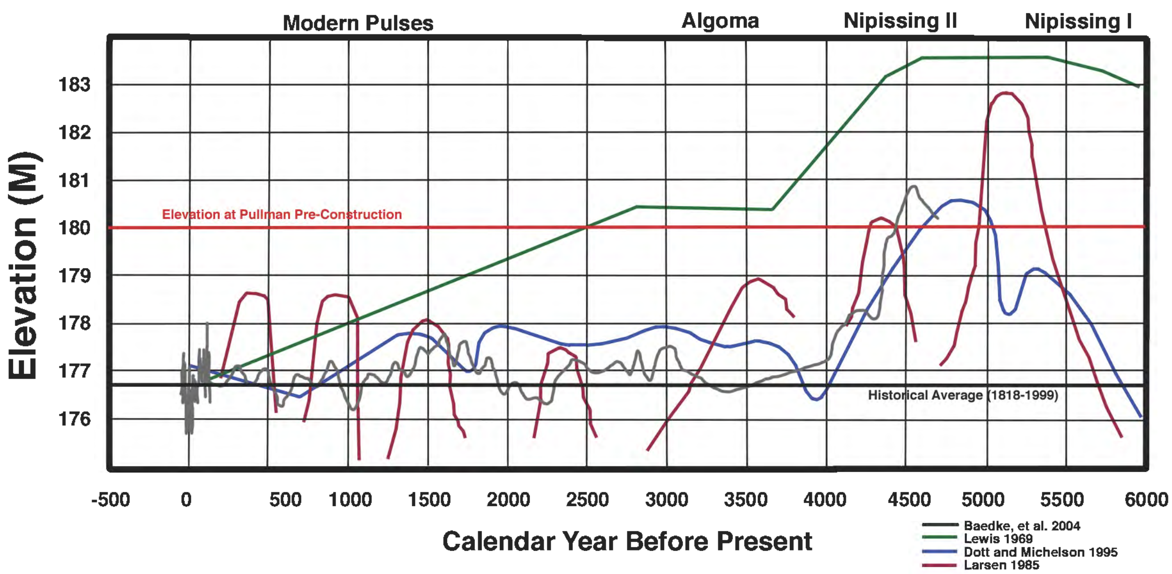

Figure 2-1: Estimated lake levels in four publications, plotted to 6,000 years before present with Lake Michigan's historical average level as well as the elevation of the Pullman factory site.

1. When lake levels changed frequently, the waters of the lake had less time to erode existing deposits. Lake waves and currents thus formed smaller new beach structures like ridges or erosion lines. As a result, longshore flows also carried much less sediment load during these periods.
2. When the lake levels stabilized for a longer period, this allowed consistent erosion to form pronounced "cut and fill" patterns that made terraces in older ridge deposits while allowing the aggradation of new beach landforms like dunes and spits.
3. The littoral current generally pushed eroded sediment southward along both sides of the lake in this region. The southward flow along the lake's eastern coast turned westerly at the lake's southern shore, pushing sediment along. These currents eventually met in the area around Stony Island, just north of what would become Pullman.

[8] These generalizations are extracted from publications describing Ancestral Lake Michigan and Glacial Lake Chicago, including water level changes, patterns of sedimentation over time, and relict beach locations. Recent studies of formations on Lake Michigan and specifically along the southern shore include: (Baedke, et al. 2004; Baedke and Thompson 2000; Booth, et al. 2007; Chrzastowski and Thompson 1992; Fisher 1999; Thompson, et al. 2011) For general reference, (Schwartz 2005) explains the technical vocabulary of costal geomorphology and related sedimentology.

4. During stable periods, the enhanced erosion liberated more sediment into the littoral flow. This sediment formed spits and lobes along with beach. When pushed up onto the southern shore, the sediment formed berms and crests on the backshore, along with dunes parallel to the lake.
5. While we can indicate times when the Pullman site was totally inundated or always above the lake level, the townsite was often flooded seasonally. As a result, archaeologists must understand the site to have varied from seasonal wetland marsh to pulses of inundated and dry land from the Nipissing through the modern period.
6. Ancient people tended to move through and reside on the areas of prairie-covered high ground, such as relict berms and beach dunes and faces, which became routes of movement through often otherwise marshy terrain. These locations generally did not flood and enjoyed fewer pests. Documented Archaic sites cluster above Thorn Creek and the Little Calumet River, south of Lake Calumet. Berms and dunes also extended north of Lake Calumet, so that the factory site sits between the High Tolleston ridge to the west and a smaller ridge to the east (c.f. Figure 2-4).

Figure 2-2 includes a series of maps illustrating how the landscape formed and evolved around the Pullman factory site over the past 14,000 years. Figure 2-2a-2-2c shows the site's location during high water levels in the Glenwood Phases (14.5-12.2 KYA), Calumet Phase (11.8-11.2 KYA), and the Nisipping Phases (4.7-3.3 KYA). The site is also shown in relation to three older and persistent landscape features: Blue Island, Stony Island, and Thorton Reef. During the stable periods of high water in these phases, beach erosion carried sediment southward and westward toward glacial Lake Chicago's outflows through the Des Plains and Sag Channels. Blue Island was above water in each of these periods. As it interrupted the littoral flow, the island trapped sediment moving from both the North and the East, joining with Forest Island. Two other bedrock outcrops in the area also influenced sediment transport, Stony Island and Thorton Reef. Thorton reef was a shoal during the Glenwood and Calumet phases, such that a sand spit connected to the reef and stabilized to create a lagoon during this time. By the Nipissing phases, the reef had become a bedrock feature on dry land.

Between these periods of high water, there were low periods when the site was dry land, including the Chippewa Phase that lasted more than 4,000 years, and the shorter Two Creeks, Algonquin, and Intra-Glenwood Phases. Any paleosols that formed during those periods of low water were then inundated and eroded, along with any related archaeological sites, as the lake rose again for the Nipissing I and II phases.

The waves of Nipissing I and II formed the High Tolleston shoreline (Schoon 2006). As indicated in Figure 2-2c, the Pullman factory site is very near this high ridge, upon which the city eventually built South Michigan Avenue, which passes approximately 900m/0.5mi from the factory site. In addition, another stretch of the Tolleston shoreline formed as the west-flowing current formed a long spit of sediment parallel to the relict shore of the Calumet spit. The new spit formed another lagoon, trapping water between the two spits and beaches.

Figure 2-2d-2-2f shows how Stony Island began to influence the flow of littoral sediment as water levels dropped toward current levels. During the Algoma Phase (Figure 2-2d), a spit of sand connected Stony Island with the much larger Blue Island, entirely cutting off the southerly longshore current that had come down along the lake's western shore. Long sand spits then formed north of the area, as the water flowed to the east around Stoney Island.

Meanwhile, to the south of modern Pullman, the westward flowing current on the lake's south shore had grown the long Tolleston Spit and enclosed the Calumet Lagoon, connecting it to the Sag Channel outlet. But the Algoma Phase ended as the glacial ice to the north retreated enough to open a lower outlet. The lake then drained to a level below the Sag and Des Plains channels. Water no longer exited

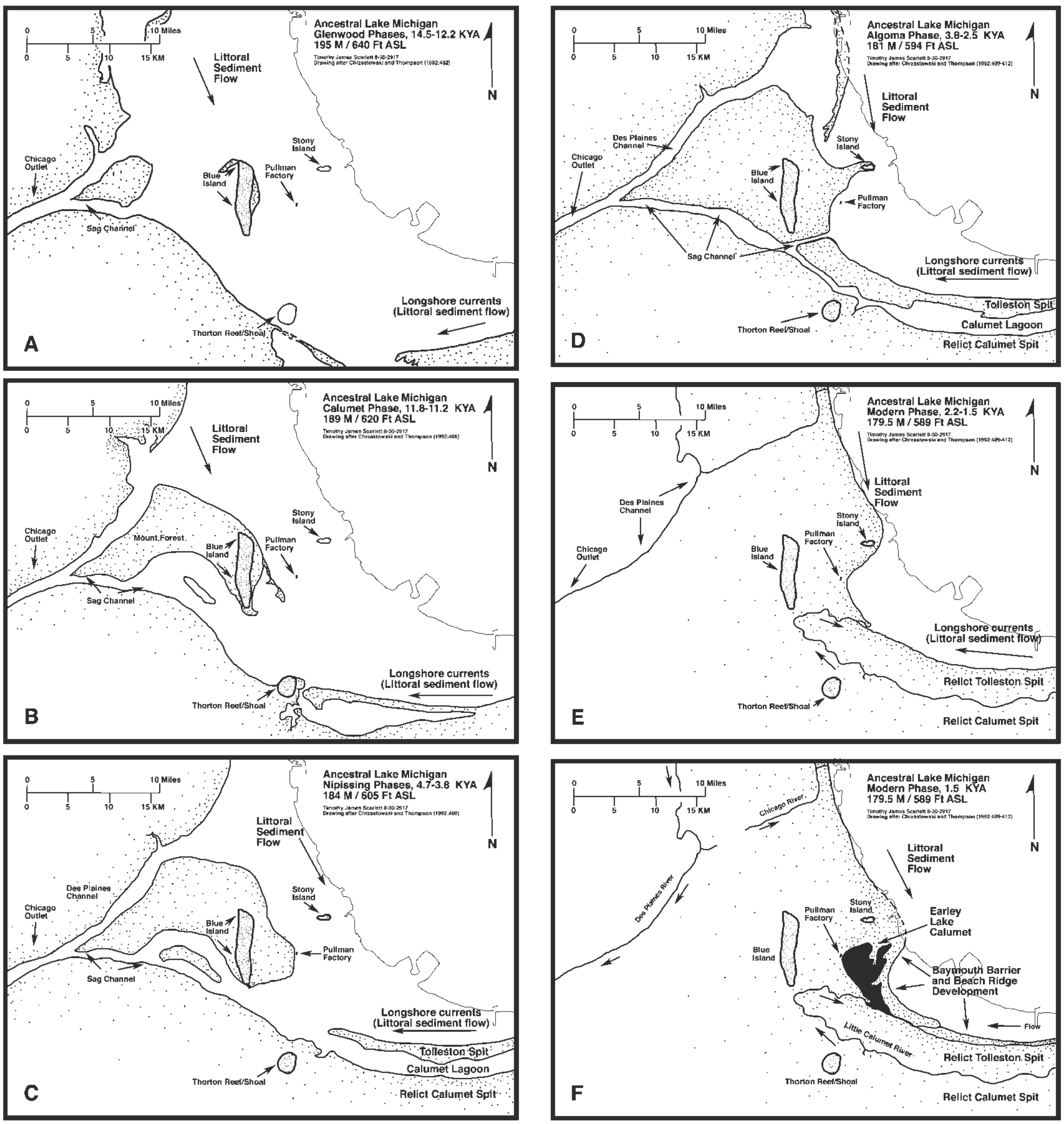

Figure 2-2: Location of the Pullman factory in relation to the evolving lakeshore over time. From 14.5 KYA until 3.8 KYA, the site was underwater during high-water phases while the absolute low water level is unclear.

from the lake into the Mississippi river system, the outflow drainage stopped affecting currents, and sedimentation rates around the area of Pullman began to increase.

By about 2,000 years ago, in the lake's Modern Phase, the sediment had filled over the Pullman factory site (Figure 2-2e) and Stony Island became part of the mainland. The Calumet lagoon had also filled in to the southeast and formed the channel for the Little Calumet River. About 1,500 years ago (Figure 2-2f), a long spit built down from the north to trap water in the Lake Calumet basin while also pushing the river west behind the current beach crest, forming the Grand Calumet River channel. The following 1,000 years saw the formation of Lake Calumet and Early Wolf Lake as the waterfront almost aligned with the modern shore.

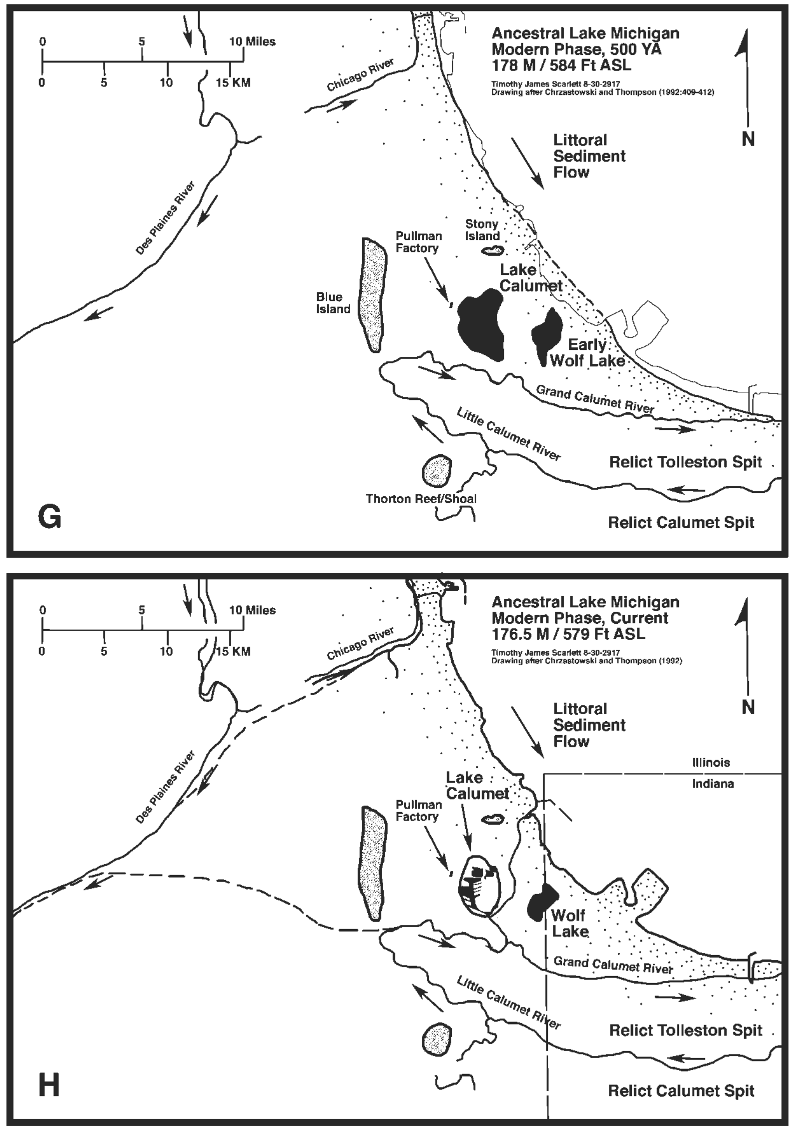

Figure 2-2 (cont.): The lake shore today with major features and flow boundaries, along with the site of the Pullman factory.

The final maps in Figure 2-2h-2-2i show the current major landforms, with landmarks like Blue Island, Stony Island, and the Thorton Reef, Lake Calumet's historic and current outline, along with the state border. In addition, Figure 2-3 indicates the same features but shows the location of the Pullman site in relation to the boundary between the North and South Lacustrine Plains (Chrzastowski and Thompson 1992). North of that line, the sediment that formed spits and land came in the southward littoral flow from the western shore of the lake. South of the line, the lake flow brought the sediment from the east along the lake's southern shore.

Figures 2-3 and 2-4 plot the location of the Pullman site in relation to the landscape features known to be preferred terrain for people during the past 12,000 years. Note the regression of the shoreline north of Stony Island and the longshore current eroded existing beaches between modern Chicago and that point, while the current formed new dunes and beaches to the south. The site is very close to the Tolleston Shoreline and Lake Calumet. Of particular note, for the last 2,000 years, the site has been less than a kilometer from the High Tollerston shoreline; between three major high-ground landscape features (Blue Island, Thorton Reef, and Stony Island); and the Pullman land included other shorelines, beach ridges, and relict dune features, several of which were used as rail grades between different factory areas (Bretz 1939). Once in the water in Lake Calumet, the factory area is a short paddle from the Little Calumet and Grand Calumet rivers and Lake Michigan.

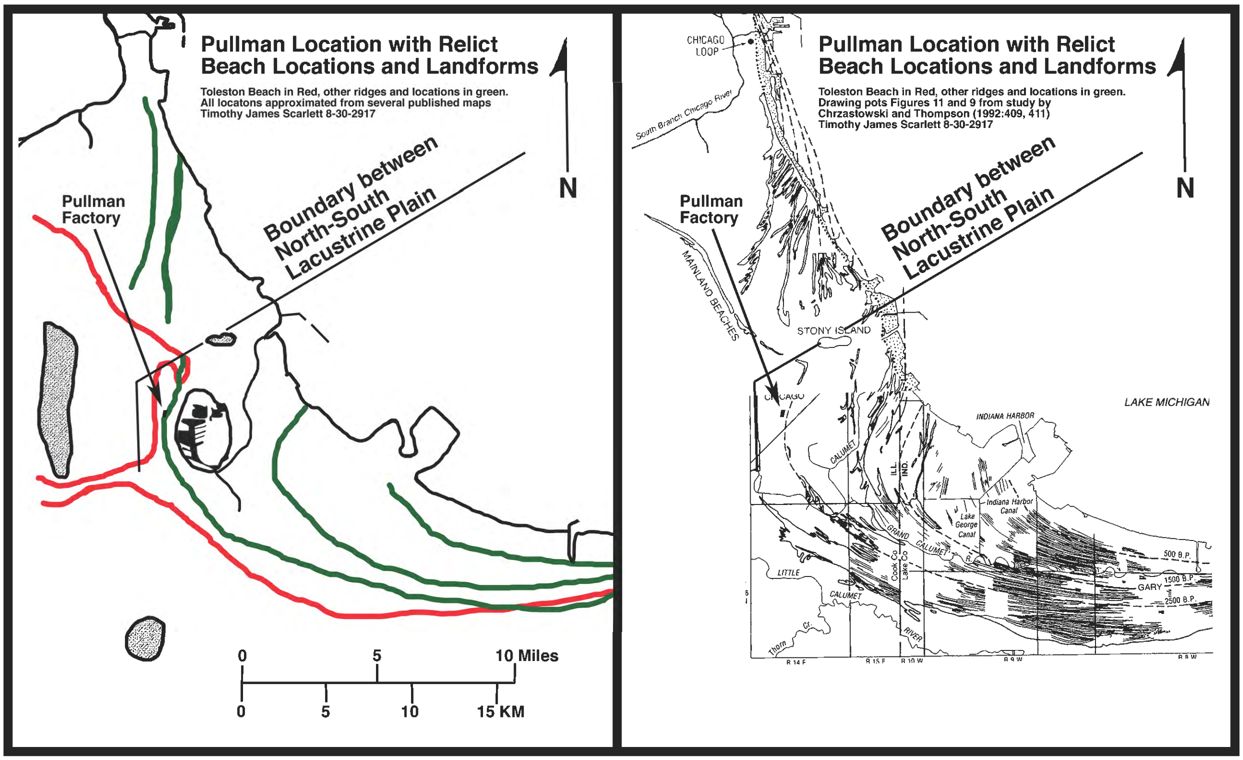

Figure 2-3: Location of Pullman in relation to two visualizations of relict shorelines and beaches, dunes, and other features.

Figure 2-4: Beach ridges and dunes around Pullman factory site. Detail from 1939 Surface Geology Quad Map (Bretz 1939).

2.2 Cultural Contexts

Settlers have used The Lake Calumet Plains and potentially the Pullman region since people colonized the area in the Paleoindian era, 12,000 years ago. It is unlikely that pre-1880 cultural resources remain within the factory footprint and surrounding area, primarily considering the construction of the site detailed in this report. As we have indicated, it is very unlikely that intact archaeological remains will be discovered from any of the pre-Pullman periods. For sake of reference, we include a simplified summary of cultural periods relevant to the Pullman site (Walthall 1991; Yerkes 1988):

Period	Time Period	Pullman site primarily inundated or dry
Paleoindian	12,000–10,000 BP	Inundated 14KYA-12.2KYA and 11.8KYA-11.1KYA. Short intraphase dry periods
Archaic, Early	10,000–8,000 BP	Chippewa phase dry
Archaic, Middle	8,000–5,000 BP	Inundated Nisipping 4.7KYA-3.3KYA Dry from Algoma phase to present
Late Archaic/ Transitional	5,000–2,000 BP	
Woodland, Middle	2,000–1,500 BP	
Woodland, Late	1,500–400 BP	
Mississippian	900 BCE – 1400 CE	
Late Mississippian	1400-1540 CE	
French Colonial	1634-1717 CE, 1717-1765 CE, 1765-1803 CE	
American	1803 CE – present	

In general, archaeologists have not done many substantial Cultural Resources Management-driven excavations of proto- or prehistoric settlements within Chicago's modern boundaries (Graff 2013: 18). The research in preparing this document allows us to project some hypotheses about human use of the Pullman region over time. We expect that humans occasionally used the Pullman area for gathering resources during the past 5,000 years and that any sites in the area will be found to consist of temporary resource gathering camps. During human use, the terrain would often have been a wetland between the swales of the well-traveled High Tolleston ridge and the smaller relict beaches that run parallel to the Lake Calumet shore. Although archaeologists don't really understand the ancient human use of space in this region, Rebecca Graff reported that civil engineer and prolific avocational archaeologist James Marshall noted an extant mound located at 79th Street and Lake Michigan, likely built during the Late

Woodland (Graff 2013: 18-19). That site is approximately 6 miles or 10 kilometers from Pullman. People living near that site would have a short canoe trip southward to harvest resources from Lake Calumet, while people traveling overland along the Tolleston ridge might camp to harvest resources from the area.

In portions of the community and factory sites that experienced less disturbance from post-1880 filling and twentieth-century development, archaeological features may still survive, encapsulated between the 1880s fill and the older paleosols that underlie them. In their collaborations, it will be important for NPS and the State of Illinois to work with the community's private property owners to try to learn more about the region's paleoecology and human activities. Any construction project within the monument that requires digging can become a voluntary opportunity to map the paleosols and assess the depth of landfilling, for example, to determine the measurement of ground slope of ancient surfaces, map drainage patterns, and to extract samples to determine the variation of plant communities over time in different areas. One potential area for field research, for example, would be the now empty rail grade that ran alongside the foundry buildings and the freight car shops. That privately held land is currently greenspace and may host buried features along the now-buried relict beach ridge. The NPS could also partner with community heritage organizations to see if any antiquarian research was done during the period 1880-1920, combing through the papers of known antiquarians that studied the ancient history of Chicago and contacting descendants of people that lived in the town who may have collected things found while digging around the neighborhood. While no records or correspondence about this is found in the various archives of George Pullman's papers or company records, there may be letters or other records in the antiquarians' archives of family papers. A more complete understanding of the evolving landscape will allow community heritage groups to tell the complete story of human land use at Pullman, and in the authors' opinion, is the natural starting place for a robust environmental history that makes Pullman National Monument a western anchor point for the developing Calumet National Heritage Area.

3 Establishing Pullman, Illinois

During the mid-nineteenth century, the area around Pullman was generally an uninhabited marshy flatland between the Illinois Central railroad and Lake Calumet. There were scattered farmsteads to the north and considerable settlements to the south and west, but the 200 acres that became Pullman were not previously occupied.

3.1 Before Pullman

There's a certain mythology that Pullman was built, isolated, in the middle of the prairie, and to a certain extent this is true. The land that became the town was marginal agricultural land in the mid-nineteenth century, with a smattering of small farms across the largely flat landscape. A number of small settlements predated Pullman's purchase of the land and construction of the factory and town. The town of Roseland (originally High Prairie) was a thriving settlement less than a mile to the west since 1849 (Rowlands 1987), and Kensington developed as a bustling junction on the Illinois Central and Michigan Central just south of what would become Pullman (Figures 3-1 and 3-2). In the 1870s the whole area was filling in with farming settlements and Pullman had to resort to some subterfuge of a ghost land purchases through Col. James Bowen, Calumet & Chicago Canal and Dock Co. president (people thought he was buying land for the canal), to avoid being blocked by the rampant speculation that would easily have occurred, had real estate interests known what he was planning (Lewis 2008: 53). All this allowed the Town of Pullman to pretend it was isolated in its own idyllic bubble with buffer farmlands to the north and south (which also served as Pullman-owned market gardens for the town and for sale to Chicago as well) and recreation grounds on the shores of the picturesque lake to the east.

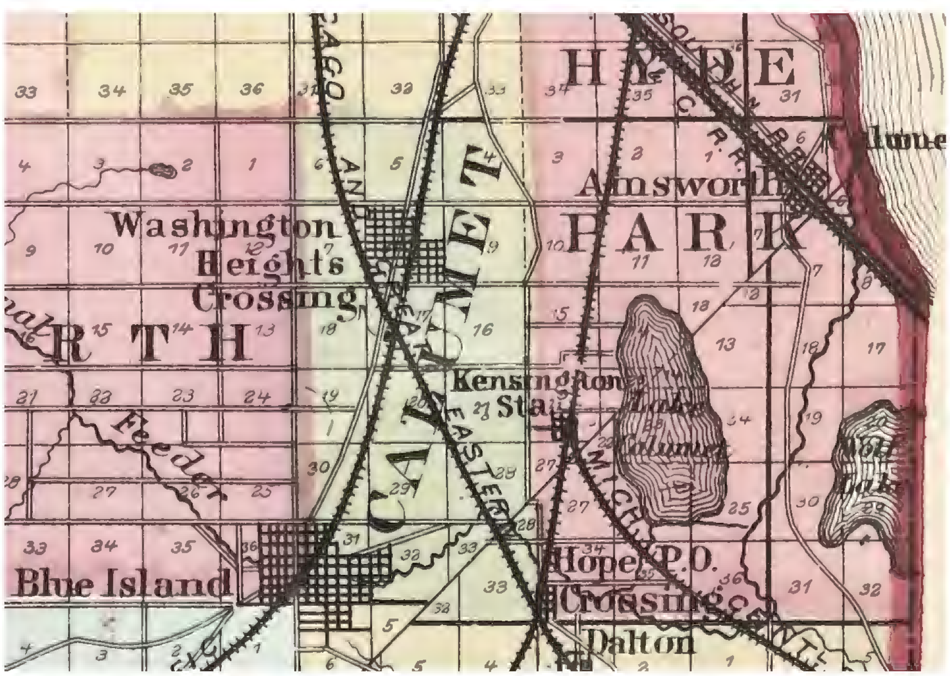

Figure 3-1: Region of Lake Calumet in 1871 (Warner, et al. 1871: pl17)

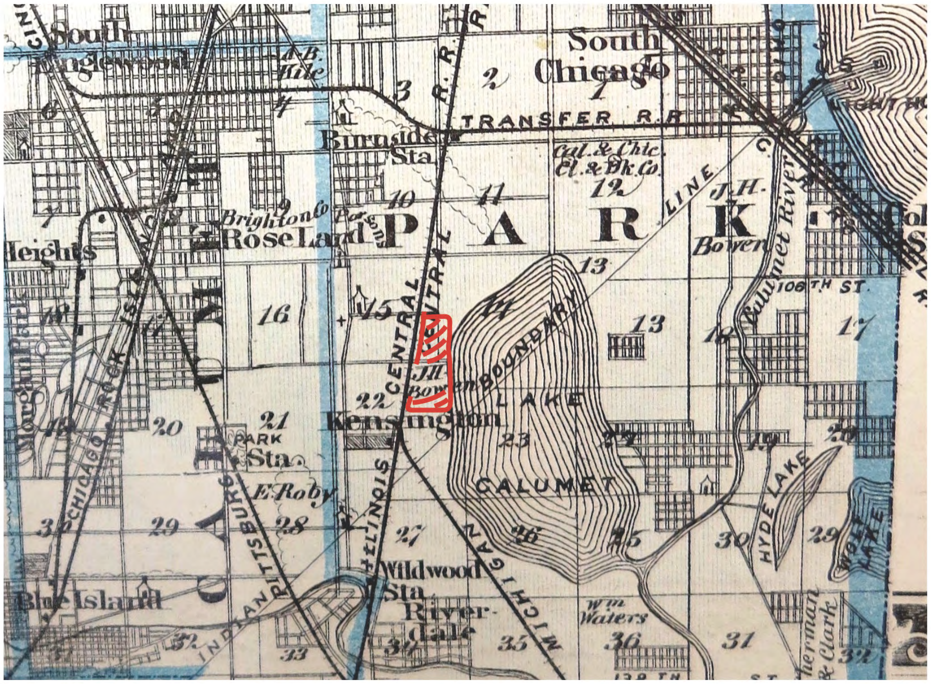

Figure 3-2: Region of Lake Calumet in 1879 with the eventual town of Pullman shaded (Edwards 1879: pl12)

In reality, it was a mere twelve miles south of the Loop, about eight from the enclave of Hyde Park, and with its own rail stop on a line directly into the city from the very first day. It is notable that George Pullman and the other executives did not build their own stately homes in Pullman, but rather in the city itself, finding the commute easy enough that they could return home in the evenings (Buder and Kulash 1967: 29-31).[9] Thus, the town was well connected to the goods, materials, and labor of the bustling metropolis of Chicago, whose population had just crested half a million as Pullman broke ground, even while its moderate isolation insulated it, and more importantly in George Pullman's eyes, its workers from direct corruption from the city.

3.2 Origins of the Town (with particular reference to the factory)

Pullman was at once wholly separate from, yet tied to Chicago's 'Second City'—that is, the city as reborn from the ashes of the great Chicago Fire of 1871.[10] In 1870 a population of 300,000 fit comfortably within a 35-square mile footprint. Only 300 people died, but the fire displaced 90,000, and the city got back to work rebuilding. By 1880 Chicago had 500,000 people and more than a million by 1890, at which time the city spread out over 185 square miles (Papke 1999: 1). While the core of Chicago rose phoenix-like from the ashes, Pullman watched the struggles between capital and labor with a wary eye as he built his sleeper car service.

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[9] George Pullman did maintain a room in the Hotel Florence for evenings when he was working or entertaining late (Glessner House Museum 2012).

[10] The term is from (Mayer, et al. 1969: ch. 3, "The Second City, 1871–1893).

When George Pullman decided to consolidate his railcar production business in a new factory and town and move his main works to Chicago, he sought out an area of flat, open land that had good rail and water connections for his raw materials and finished products. But perhaps more importantly, he wanted an area sufficiently outside the corrupting influence of urban life so that he could build a model town with workers who shared his vision of American life and industry, free of the radicalism that had crippled the country during the Great Railway Strike of 1877.

Technically the land he bought was within the municipality of Hyde Park, though people had not built up the southern or western ends of that community before Pullman was established. This tony suburb on the south edge of the city was described in 1874 as the most perfect *rus in urbe* ("the countryside in the city"), second only to Evanston, and the epitome of a first-class hotel, residences, drives, and "a first-class society" (Chamberlin 1874 [rpt. 1974]: 352). To bring workers into such an area required a commitment to controlling their movements (Buder and Kulash 1967: 41-42), and his purchase of many hundreds of acres, more than he would ever need for housing and the factory served that purpose well. Of course, that land also served as important agricultural land for foodstuffs for the town (as well as more space in which to generate a profit as booming Chicago was always hungry for more produce close to the city) and helped preserve the aura of isolation, even as they were sold off piecemeal over the next decades.

In a test of Pullman's isolationist philosophy that allowed him to retain control over the character of the town and to a certain degree the behavior of its residents, when the streetcar came to town, Pullman declined to connect to it. In 1893 an electric street railway ran from a loop in south Roseland west of Pullman, up Michigan Ave. to 93rd, then east to Calumet Harbor and up Cottage Grove Ave. to 75th, where it interconnected with other cable car and omnibus lines into the city. Although the town's population would have been an obvious draw for the streetcar company, somehow the Town of Pullman was noticeably not connected to this transit system (Mayer, et al. 1969: 137). George Pullman originally bought 4,000 acres but only used 600 for his factory and town, suggesting that he might have bought extra land for expansion; alternately it could suggest that he wanted a buffer around his model factory town to insulate it from the problems of the city and earn profit from workers' lives. Even if the town of Pullman tried to behave as it was an isolated utopia, it also had the benefit of being able to draw on all the distribution networks from Chicago that allowed it that comfort. So, for example, they did not have to deal with the problems of wholesalers or slaughter yards, as they had the whole of the Chicago Stock yards less than 5 miles away. They simply referred any crime or injury, questions concerning Boards of Health and inspections, or even cemeteries to Hyde Park or Chicago.

In reality, the area was not really virgin prairie in 1880 when Pullman set out this vision. Just to the west, the village of Roseland (originally called High Prairie before 1873) ran for a mile along the ridge between what became 103rd and 111th St., centered on Michigan Ave. It had been settled by Dutch farmers as early as 1849.[11] By 1852 the Michigan Central RR had a passenger stop called simply "Calumet"

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[11] Unless otherwise noted, for this section, see the articles by Janice L. Reiff, on "Pullman," "West Pullman," "Kensington," and "Roseland," in The Chicago Historical Society, *Encyclopedia of Chicago*, online at http://www.encyclopedia.chicagohistory.org/; accessed 26 June 2017.

(rechristened "Kensington" in 1872) at its junction with the Illinois Central and settlers arrived even more readily into the area. By 1880, Kensington had about 400 residents (1,000 by 1889), a close-knit group of German, Irish, Scandinavian, and northerners who serviced the railroads, and boardinghouses and dozens of notorious saloons, giving the area the nickname of "Bumtown" (Stachmus, et al. 1984: v-xvii). James H. Bowen, president of the Calumet and Chicago Canal and Dock Company,[12] sold 4,000 acres of land to Pullman for his works and town in 1880. Kensington served as the nucleus of construction for supplies and workers as the factory and town took shape and over the next decade the two towns developed a certain symbiosis. And as soon as Pullman's plan for his town became known, other land speculators tried to capitalize on the project. A French developer from Cincinnati bought land south of Roseland and Thomas Scanlan platted the village of Gano in 1883, marketing it to Pullman workers who wanted to own their own homes and be free of the corporate control of life and house in Pullman.

By 1892 the factory and community were established between the Illinois Central RR and Lake Calumet, but they had also run a meandering spur from the Kensington Ave. interchange up to the east-west potion of the Chicago and Western RR that ran just above 95th St., which in turn gave easy access to the rail termini at South Chicago harbor as well as lines east (Manslein 1892; Mayer, et al. 1969: 125; Reisenegger 1895). At this point, Pullman still sat relatively isolated from neighboring villages, with open land to the north to 95th St. and only Cottage Grove as a thoroughfare to South Chicago. The insulated communities of Riverdale and Blue Island sat a few miles to the south and southwest, respectively, but the lands further south and curving east around Lake Calumet were entirely undeveloped, and though there was continual housing development in the area known as Roseland, along S. Michigan Ave. from 95th south to about 130th St, it was all west of the Illinois Central; and the two tracts immediately west of Pullman in this area remained empty (there is one curious strip of residential development that connected 105th St from Cottage Grove over to S. Michigan Ave.).

Workers broke ground on 24 April 1880 for 600 acres of factory and town, two miles long by half a mile wide, and the first resident moved in on January 1 of the next year. The erecting shops were up and running by March, and by the spring the town housed 600 residents (Pacyga and Skerrett 1986: 429). By the summer of 1885, they had built brick tenement houses for 1,450 families and another 60 frame houses, and the city superintendent bragged in filling out a questionnaire for the city that none of Pullman's houses were overcrowded because they were owned by the company and such things were attended to, and with regard to any municipal regulations about over occupancy, "None are needed." The town had grown to 8,603 people, about half native born, the other half European, including 764 children under the age of 5, 1,742 aged 5-15, and only 10 "[Nailez?] in the hotel" (answering a question of how many Negroes or mulattoes in town) and no "Asiatics."[13] Pullman had managed to buy the land

[12] Back in 1865, Bowen was the Republican State Central Committee Chairman who met George Pullman while planning President Lincoln's funeral train to Springfield and who incidentally who had suggested the name change of High Prairie to Roseland and Calumet to Kensington, in both cases to "class up the joint".

[13] Chicago Public Library, Historic Pullman Collection, box 8, folder 7, "Demographic Questionnaire" (1885), p. 1.

for $75–2,000 per acre, and within a year the value of land in the area had jumped to $1,000–3,000 per acre (Pierce 1937b:210). The city superintendent reported that when construction began, the land sloped gently from NW to SE, ranging from 8-25 ft above the level of Lake Michigan.[14] Little cutting and filling was needed. They found the whole area underlain by about 15 ft of blue clay, and in the few areas they had to fill, some 5 ft of clay was dredged from Lake Calumet to serve this purpose. They were pleased that all the basements in the town ("made of the best cement") were "dry enough to reside or sleep in."

A Chicago minister noted that Pullman was not really about "railcars and wheels", but "stands related to the question of how cities should be built and in general how man should live." (Mayer, et al. 1969: 188) A French visitor described Pullman as a town whose purpose was "to mould not only a body of employees, but a whole population of workmen and their families to ways of living which would raise their moral, intellectual, and social level." (Mayer, et al. 1969: 188). One British newspaper, when reporting of the 1888 national political conventions being held in Chicago and St. Paul, paused to tell its readers of the wonders of Pullman:

> There is a suburb of Chicago, not included in the city jurisdiction, which may be called a town *sui generis*. It is named Pullman, from the inventor of the Pullman car, and cars (freight cars or luggage vans, that is to say) are turned out from its workshops at the rate of one for ever fifteen minutes of the working hours. It is the only town in existence built from the very beginning on scientific and sanitary principles. Before a brick or stone was laid, perfect system of drainage and water supply were provided. The streets and open spaces were then laid out on a clear and well-considered plan. About 4,500 workmen are employed by the Pullman Company, who keep the streets and public places in order, and maintain schools for over 1,300 children. The population is 10,000, and the town does not include a public house, or any place where liquor can be bought. There are several clergymen, two or three policemen, four doctors, and one lawyer. (Anon. 1888)

3.2.1 Philosophy of the Town of Pullman

George Pullman was not a pure utopianist nor motivated primarily by philanthropy; every element of his town was designed to turn a profit. Profits need not be exorbitant, but business "sense" demanded that there be some profit, which was ultimately the root of the 1894 strike. But by 1888 his plan had come to fruition and the world noticed. The city was a relatively late foray into the creation of a utopian community, though by this time along the lines of what had come to be known as "practical philosophy." Early utopian and utopian socialist experiments had been tried at places like New Lanark in Scotland, Brighton in the UK, and the Oneida Colonies (VT then NY) and Lowell, MA, in the U.S. Many of these had industrial components, though each had its own characteristics: Lowell was fundamentally an industrial town set at a cataract on the Merrimac River, but was built by numerous companies and thus lacked any coherent vision, while the Oneida Colonies were experiments in social and spiritual organization that only later turned to industrial production (e.g., Oneida silverware) to sustain themselves. Pullman, on the other hand, is often considered to have been the first purposed-built *industrial* utopian experiment.

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[14] Chicago Public Library, Historic Pullman Collection, box 8, folder 7, "Demographic Questionnaire" (1885), pp. 13, 2-3.

An obituary for Pullman explained the run of the town's history to 1897:

> When the Town of Pullman was founded, its fame was spread to all quarters of the earth. It was described everywhere as a magnificent piece of work in practical philanthropy. That the scheme was not entirely satisfactory to those for whose benefit it was designed, that murmurs arose against the regulations enforced to insure care and cleanliness, and that severe criticism was finally hurled against the entire plan, should not detract from the acknowledgment of the high motive which influenced Mr. Pullman when he conceived it. The deplorable strike at the Pullman Works in 1894 clouded his relations with the workmen and caused much bitterness of feeling against him which time only can efface, but in all probability, this was intensified a thousand-fold by the work of outside labor agitators who seized the opportunity to make themselves prominent. (Anon. 1897a)

The city generally developed smoothly, but the resistance to the corporate paternalism was intense from the beginning. When the question of annexation to the City of Chicago came up in 1889, a mere 8 years after the town took in its first inhabitants, the residents voted overwhelmingly to join Chicago over the objections of Pullman himself as well as the managers of the Pullman Land Association (Pacyga and Skerrett 1986: 392). The Village of Pullman was formally annexed into the City of Chicago in 1890, along with all of the former township of Hyde Park, becoming Ward 34 (Pullman later became part of Ward 33 in 1910 and Ward 9 in 1912; (Styx 1988: 26).

3.2.2 Factory Design Antecedents: The Pullman Palace Car Company Works in Detroit

The Pullman company had been in operation for 23 years when the designers laid out the new factory south of Chicago. Established rail car shops built George Pullman's first sleeper cars on contract. In 1870, the Pullman Palace Car Company bought the Detroit Car & Manufacturing Works (DC&MW) to manage their own manufacturing facility. By purchasing existing shops, George Pullman did not need to design a production facility or process himself, since he took control of both a facility and (presumably) most of the existing workers. The DC&MW was originally Robinson, Russell, and Company (RRCo), who supposedly established the first car works west of Albany when they repurposed a small pre-existing shop on Gratiot Avenue. DC&MW then built shops on Croghan Street in 1856 (now Monroe Ave). Sometime after that, the company moved their facilities to "the foot of Beaubien Street" and eventually onto Monroe Avenue, near the Detroit, Grand Haven, & Milwaukee tracks. This may have been a consolidation into the existing Beaubien St/Monroe Ave facility. RRCo merged with a group of other rail car producers in 1868 to create the DC&MW. The Pullman Palace Car Company then purchased these consolidated Monroe Street shops in the winter of 1870-1871, while the Detroit Car Company built an extensive, but short-lived works at Adair Street in 1872. Burton, Stocking, and Miller explained that Pullman wanted to expand the works on Monroe Ave by replacing the residential block on Macomb Street, but the city's Common Council refused the plan, which pushed George Pullman to develop his plans for building in Illinois (Burton, et al. 1922: 537).

The PPCCo employees operated an existing factory with established and functioning work process, which had been operating for nearly 15 years. Very little is known about these shops, but three important documents provide information about the architecture and workflow of these shops. The Sanborn Fire Insurance Company published maps of the works in 1884 (Figure 3-1) and 1897 (Figure 3-2), roughly contemporary with the Rascher Company maps of the shops in Pullman, Illinois. In addition, an 1889 bird's-eye view depicted the works (Figure 3-3). While none of these images captures the works when they were the exclusive manufacturing facility before the design and construction of the Pullman shops, they provide clues regarding the general structure of the facility.

By 1884, the Detroit works are very similar to the design of the Pullman shops. The compact facility occupies a large urban block with two long rows of buildings sharing common walls. From an aesthetic perspective, the design shares some interesting commonalities with that of Pullman in Chicago. The front row of buildings includes a tall central office building, three stories high, bounded on both sides by tall, but single-story woodworking shops. The 1884 map does not identify any of these spaces as "erecting shops" and instead as "woodworking," "general woodwork," and then variations on carpentering, varnishing, woodwork, general finishing work, and painting which seem to be equivalent to Chicago's Erecting Shops.

There are some specialized shops, including Cabinet Work and Glazing 1st floor with Upholstering 2nd; Planing and Sawing Mill with general woodwork on the 2nd floor; a Machine Shop for woodwork; Drying Kilns; Pipe-Bending Shop; Tin and Plumbing Shop; and a steam-hammer equipped Forge Shop for iron. The woodwork machine shop adjoined the Forge Shop. The factory has a dust and shavings collection system, which blows into a vault not mapped on the property; this feature was replicated at Chicago with the dust and shavings from the wood shop being evacuated directly to the 12 boilers for the Corliss engine (Buder and Kulash 1967: 54). The two rows of buildings are joined by a "transfer track" that seems similar to the Chicago work's transfer table system, but interestingly this system connects directly to a single siding on the Detroit, Grand Haven, and Milwaukee line (the Grand Truck RR by 1897). This yard lacks any siding yard or roundhouse facility, suggesting that completed cars were immediately removed from the works as they left the shops, transported either directly to customers or to a remote storage yard.

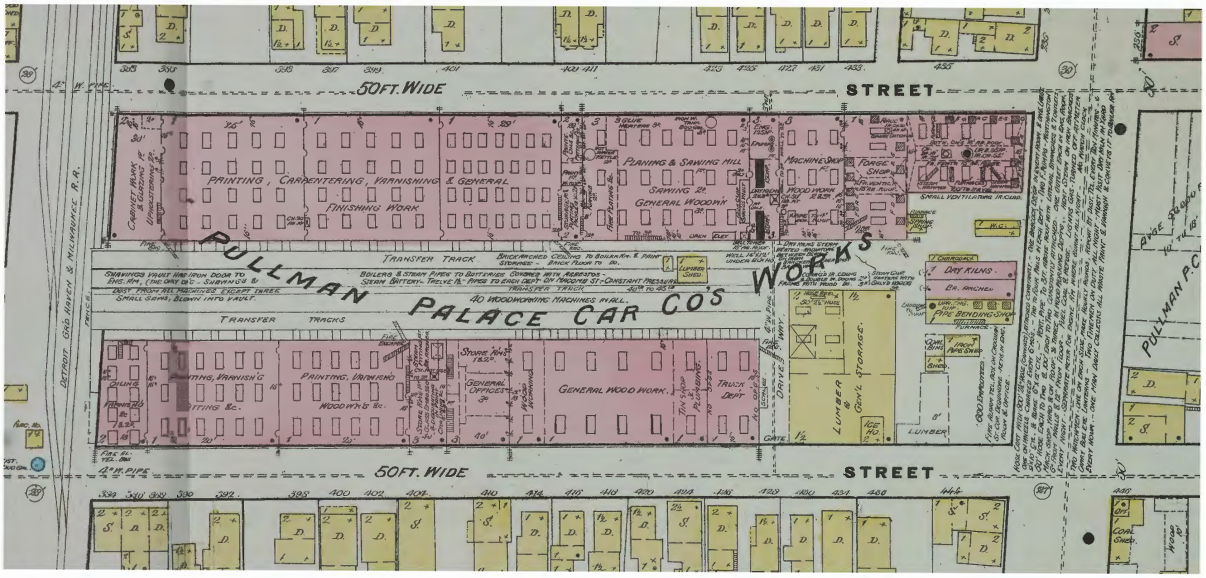

Figure 3-1: 1884 Sanborn Fire Insurance Map of Detroit showing the Pullman Palace Car Company's Works on Monroe Street (Sanborn Fire Insurance Company 1884: 60).

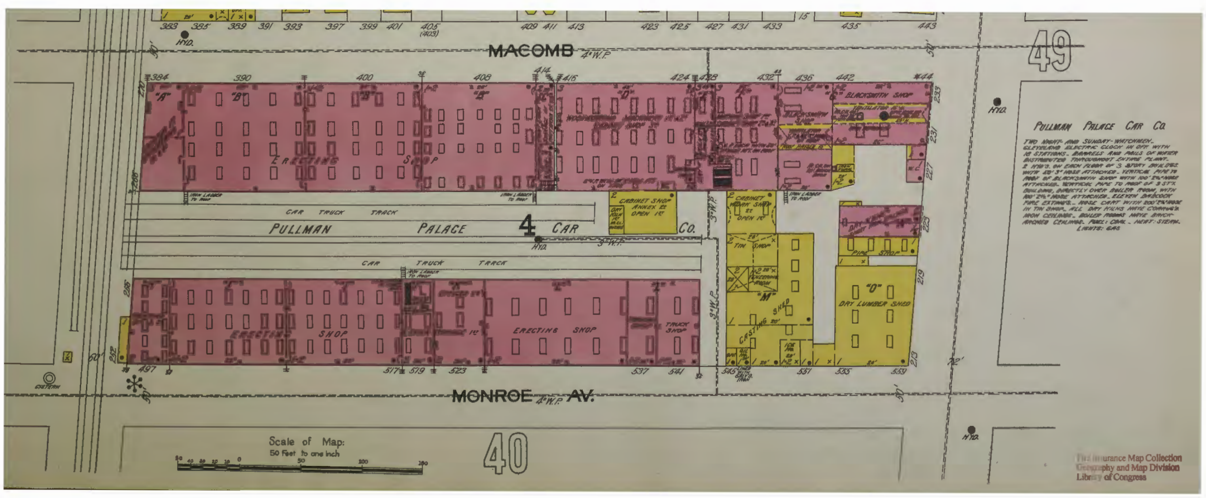

Figure 3-2: 1897 Sanborn Fire Insurance Company map of the Pullman Palace Car Company's works on Monroe Street (Sanborn Fire Insurance Company 1897: 38).

Figure 3-3: Detail of the Calvert Lithographing Company's Birds eye view—showing about three miles square—of the central portion of the city of Detroit, Michigan (ca. 1889). Birds eye drawing is not to scale (Anon. 1889a).

3.2.3 Laying out the Town of Pullman

George Pullman retained the services of the architect Spencer Solon Beman after being impressed with work he had done on another project, and invited him to Chicago to design the new factory and town. That Pullman would hire Beman, who as far as we know, had no experience whatsoever designing factories, remains a bit of mystery, though it should also give us pause to realize that in 1880 it did not take a specialized engineer to layout a railroad erecting shop. To only slightly overstate the case, almost any architect or engineer who could raise a one-to-three story building in brick and then successfully roof it over with a clear-span truss (which in that age of railroad construction was a widespread skill) might conceivably have been hired, and it may be as simple as the fact that Pullman was pleased with Beman's aesthetics that he felt him qualified (Woods 1999).

Beman arrived in Chicago in the spring of 1880 and went to work immediately laying out the town in conjunction with landscape architect Nathan F. Barrett, railway engineer Max Hjorstberg (apparently temporarily hired away from the CB&Q Railroad), and Benzette Williams, a sanitary engineer well-known for solving the drainage problems of many cities in late nineteenth-century America and who also went on to install the sanitation systems in other company towns like Morgan Park for U.S. Steel (Alanen 2007; Jackson 1892). It is clear from descriptions of the building that they were all flying by the seat-of-the-pants at times, even though each was relatively skilled in their own trade. As is clear from the reminiscences of Irving K. Pond (1857-1939), a junior designer hired in March 1880 to assist with developing plans for the town, the design team grew only after the site had been decided upon and continued in a somewhat ad hoc fashion:

> Late in March 1880, when I was for the second short period with Major [William Le Baron] Jenney, a call came from the architect of the town of Pullman as later the place was named, for a draftsman who was also a designer, to aid in the preparation of building plans and elevations. Mr. Solon Spencer Beman, a promising young New York Architect with an excellent background and good offices, notably that of Richard M. Upjohn, had come to Chicago but a few weeks previously to prosecute the Pullman work. He had been assisted by the

> car draftsman but needed help of a more architectural sort… [Pullman architectural tracer Will J. Dodd] had in mind to procure the services of my roommate, Clarence Arey, of Michigan ’78[15], who would come to Jenney, as had I, to have a place from which to leap! Arey just procured what proved to be a permanent job with another architect in was not available. I was the only foot loose person in Mr. Jenney’s office [and although] I well knew my limitations and sought the advice of Mr. Jenny who was enthusiastic over the prospect. (Pond, et al. 2009: 82-83)

Pond thought the job would be a short one lasting a few weeks, but in the end, he worked for six years on the project. The factory and town went up conjointly, as land preparation and materials would allow, but erecting the building was less straight-forward that expected:

> The elevations for [the APWC] building from Mr. Beman’s on hand well along when I entered the office and I was put on that job. After a week or two it was discerned that we were ready for the roof drawings and there was no structural engineering draftsman available. I modestly suggested that I might design the roof trusses on the side. The suggestion was gladly entertained; the job was successful when I became the head designer of the structural engineering force which was soon established; maintaining that position and also that of had architectural draftsmen, which office Mr. Beman seemingly took for granted what’s mine from the very first. (Pond, et al. 2009: 84-85)

That Pond, a relatively unskilled structural engineer designed the trusses in the APCW Co. Building may help explain why some of the truss forms in the surviving north erecting shop (Bldg. 2) demonstrate relatively unusual features. But even that level of improvisation at the beginning was nothing compared to how the free-for-all of design-build evolved over the next 12-15 months:

> During the summer [of 1880], as soon as the site could be drained and buildings made habitable we moved our offices from the city to a temporary structure near the Illinois Central tracks, a mile or so north of Kensington, and then my architectural education really began. The building of a World’s Fair nowadays is about the only thing comparable to what was going on in Pullman, especially in the years 1880 and 1881. Although our force was augmented from time to time[,] the work, seemingly, was ever one jump ahead of the Architect. Plans for all the buildings were finished sooner or later but in one or two instances, not until after the building had been completed and occupied, and perhaps, measured. I laid out and detailed full size trusses and other items of construction on the broad floor of the shop or church or theater or other structure—generally from sketches worked up the office. As head draughtsman I was in demand all over the “lot”. The carpenters would be calling from here, the bricklayers and stonemasons, there! Many a time the proposition put to me was beyond my knowledge and experience and then I bluffed for time—I had a hurry up call from another quarter and I would see them in the afternoon or next morning! But when I did see them, as you maybe sure I always did, I had it at my tongues end [*i.e.*, the answer was “on the tip of his tongue” as we would say] or on my fingertips the correct solution of the problem. This process cost me many a sleepless night, but it was worth it not only for the knowledge I acquired but for the respect I gained any eyes of my fellow workers (Pond, et al. 2009: 85-86).

This sort of situation characterized the project from the beginning, it would seem, for when George Pullman had retained the services of S.S. Beman and N.F. Barrett to design the buildings and landscape, respectively, for Pullman, their initial discussions were apparently so remarkably grand that the men

[15] Pond was Class of 1879

took them as “magnificent ideas” that were but “the chimera[s] of a fevered brain.” When Pullman then showed up in New York some time later, asking to see the plans, Beman,

> pleaded a previous engagement and asked if the next morning would answer just as well, how, when he found that he was expected to deliver the plans, he worked straight through the night making an outline of the ideas which he had thought were merely delirious dreams; and how, when the sketch was presented the next morning, it was found to be faithful delineations of the 'dreams', requiring but a few changes. After these were made, the plans were approved and Messrs. Beman and Barrett were commissioned to work them out in detail, not only on paper, but on the shore of Lake Calumet (McLean 1919: 225).

Ultimately, the team of Beman and Pond for the building envelopes, the internal layout of Bissell and external landscaping of Barrett, not to mention the track organization of Max Hjorstberg, brought to fruition a manufacturing complex that would turn out thousands of cars over the next 80 years. And indeed, the fast and simultaneous buildout meant that all the core buildings were standardized in size and materials, leading to both economization in construction costs in the beginning, but also a great interchangeability and flexibility in using the shops during their first phased of use (i.e. 1880-1907), when they had to be modified to construct the new all-steel designs then coming into use (Bradley 2011; Pond 1934: 7). It is also worth noting that Pullman realized more economies by buying materials in bulk, buying them in their raw state and manufacturing his own building materials—as, for example, buying his own green lumber, air-drying it, and then building a wood and sash shop on site (which then continued on to build casework and windows for the palace cars) to construct all the casement windows for the town’s buildings (Buder 1967: 52)—as well as using his own employees for most of the construction crew in that first year, before shifting them back to car building.

3.2.4 The Sanitary Angle

One feature of the model town of Pullman was largely lost in the post-1894 debates about industrial paternalism, worker rights and autonomy, and corporate profiteering on the backs of the laboring classes: the town was built to be a model of the new “Sanitary City” movement, and in that quest, it largely succeeded. The overall story of the nineteenth-century revolution in sanitary engineering in cities is well-known (J. A. Peterson 1979; Schultz and McShane 1978; Tarr 1979), and it is recognized that the last 30 years of the century saw Illinois in particular (and especially with its complex yet flat hydrology in Chicago) become a model leader in solving the sanitation problem (Davenport 1973).

Benzette Williams, formerly supt. of sewage for Chicago took on the challenge of draining the western shore of Lake Calumet and putting in water, sewer, and gas mains for the city grid. It was in fact this strong devotion to creating the *sanitary* city that initially captured the attention of the world media. The second half of the nineteenth century saw a number of major cities starting to rebuild their infrastructure, beginning with London in the 1840s (Goldman 1997; Hamlin 1992). Other cities followed suit, but it was only in such lucky circumstances as Pullman, building on a tabula rasa (or, perversely, in the case of a catastrophic fire like that in Chicago in 1871) that all new septic and water systems could be easily installed anew. One is struck by the 1885 demographic survey, which asked about foul waterways, stagnant ponds, refuse and rodent problems, and all the other ills of city life (all these sorts of questions were pre-printed on the form), and the superintendent consistently was able to report “none of these”, “not a problem”, “no pollution,” nothing that produced disease in the workmen, or that any ills occurred “very rarely, so little that no record is kept of it” (that in response to inspectors condemning meat or fish for sale), and in response to nuisance manufactories: “none whatsoever.”

Pullman used no well water or river water (it was noted in 1885 that the Calumet River, two miles to the south, was “not becoming any cleaner”), but rather ran a 30-in iron main out to Lake Michigan, with pumps at Hyde Park to provide all the city’s drinking and fire suppression water.[16] The town had parallel sewage systems, one for waste and a separate one for storm water runoff. Pullman even had Benezette Williams design an elaborate “sewage farm” two miles to the south where all the town’s waste was pumped to be used as fertilizer on the company farmland (Historic American Engineering Record 1976: 53-61). In fact, the year before his death, Pullman was awarded a plaque at the Prague International Hygienic and Pharmaceutical Exposition for having the most perfect town in the world (Stachmus, et al. 1984: xvii).[17]

3.3 Evolution of the Factory Complex

The administration building and the original erecting shops—that is, the original west/front range of the clock tower and its attached north and south erecting shop, and then the east/rear range consisting of, from south to north, the rear erecting shop, the blacksmith shops, the finishing shop, the wood machine shop, the engine house and boiler room—were apparently laid out and built within a year and were up and running by April 1881 (Lindsey 1942: 39-40). Pond related that, the first permanent building to be erected was “the Allen Paper Car Wheel Company (APCWCo.),” slightly further north of the main buildings, “which for a long time made all the wheels for the Pullman sleepers” (Pond, et al. 2009: 85). In either case, the complex went up very quickly with labor from Pullman’s own shops driving it forward and materials flowing in from Chicago and beyond.[18]

The HABS report (1967, 2) credits S.S. Beman with the quasi-Romanesque exterior of the buildings, while the interior layout was apparently done by T.A. Bissell of the Pullman Company itself. Bissell was at the time the general manager of Pullman’s Detroit shops. Within a year, however, he had resigned to take over the management of the Barney & Smith Manufacturing Co. car shops in Dayton, OH, which he had purchased an interest in, possibly using his fees for having laid out Pullman. McLean (1919) reported that it was rumored that he was offered the general manager position at the new shops, but declined. Within a decade Bissell defected to the Wagner Palace Car Co. (which was itself later acquired by

[16] Chicago Public Library, Historic Pullman Collection, box 8, folder 7, “Demographic Questionnaire” (1885), pp. 6-7.

[17] The particular early published report on the sanitation of Pullman has not yet been obtained: (Anon. 1885).

[18] It is likely that Pullman benefitted from the timing of his endeavor in Chicago. The Great Fire of 1871 had necessitated the growth of a massive building-materials industry in Chicago as well as a regionally-wide network of material suppliers (for lumber, lime, etc.). Thus, by the time that Pullman broke ground for his factory and town in 1880, there was a ready supply, and perhaps oversupply of materials on hand that could easily supplement the materials that he made himself, notably the bricks, which were made from locally-reclaimed clay from Lake Calumet.

Pullman) and was replaced at Barney and Smith by H.D. Spaulding, a 25-year veteran of car building (Anon. 1881: 666; McLean 1919: 231).

While the IDNR had generated and now the Pullman Museum maintains indexes that include construction dates on Pullman's buildings, the exact evolution and order of construction of the factory buildings is unknown because, before 1889, the Town of Pullman was part of the larger outskirts of Hyde Park and no building permits were required (or at least none were filed). Even after the incorporation of the area into the City of Chicago in 1889, no building permits for construction, demolition, or modification were ever apparently filed with the City (Historic American Buildings Survey 1967: 3). While we know that the paper car wheel shops were the first up and running in 1881, early photos of the factory complex seem to indicate that most of the buildings were constructed simultaneously: at least the front rank of the main office building with its north and south erecting shop wings and then the second rank of what is now known as the rear erecting shop north to the Corliss engine building and water tower, all the rail spurs and the transfer tables, and possibly some further ancillary buildings in the northwestern corner of the factory area. Pond's (1934; 2009) recollections also seem to suggest that the architecture, infrastructure, and rail system within the factory complex were being built simultaneously around each other, sometimes without a clear distinction between which department was responsible for each element. Rather, the designers and laborers moved from one building to another and between factory and town sites as work progressed.

3.4 Work at the Factory Complex

The daily rhythm of work and life in Pullman's factory is not yet clear, yet understanding the organization and evolution of work at the factory is essential to this assessment. Very few surviving historical documents provide first-person accounts of daily work, and to date we have identified no diaries or oral histories from the early period. Some work has been done studying the workers as a group and their overall characteristics (Hirsch and Reiff 1982; Peterson 1992), though not their daily activities in the plant per se. Similarly, there are a number of modern studies about worker and shop organization in general (Biggs 1996; Bradley 2011; Brown 2001; Dinius and Vergara 2011), but in the absence of specific records from the Pullman works themselves, their focus has not helped us with this particular manufacturing complex any more than deciphering the insurance maps over time. There remains only a tiny handful of secondary sources that get at small aspects of work within the Pullman factory, and none that investigate the car construction process in any detail.[19]

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[19] Such accounts would have to be built up from period primary sources like railway journals and shop magazines (Anon. 1896; Home Morton 1913; Oudet 1905; Pattinson 1922; Rusche 1929). Even then, details might not reflect Pullman perfectly as it may well be the case that those kinds of shops, or those specific shops, did not fit contemporary industrial trends. For example, there is no evidence that they had any assembly line production (one would have expected to see some spatial rearrangement to facilitate a more unidirectional flow throughout the property on the later Sanborn maps if this had been the case), suggesting discrete work stations continued to be sufficiently efficient for them throughout the period. In personal communication, University of Virginia historian and author Jack Brown (2001), confirmed that in the railroad literature, secondary information on erecting shops for facilities *other than* locomotive shops are non-existent.

The Pullman Palace Car Company's corporate records are divided among a group of archives and facilities, most notably the Newberry Library, the Pullman Library at the Illinois Railway Museum, the South Suburban Genealogical and Historical Society Library, and the State of Illinois's Tenneco Collections. Smaller collections are held at the Chicago Historical Society, the Chicago Public Library, and the National Archives. Of these various institutions, primary records that included details of production of cars are mostly held as part of the Tenneco Collection, which is not yet available for detailed research. Resources are available to study maintenance systems at the Calumet Works and other sites around the country, as well as the working lives of porters, maids, and other operations staff. Primary voices about production could not yet be revealed from documentary records.

We have assembled below different ways of examining the work process at the factory from existing records, including documentary record types, photographs and maps, and testimonials. These provide a framework within which managers can evaluate the significance of the physical evidence of daily life, found in the archaeological remains of the buildings and intact features buried around them.

We have minimized the importance of the 1894 Pullman Strike in this report. That strike was about Pullman's refusal to lower rents on town housing when workers were faced with a reduction in wages due to a general downturn in orders following the Panic of 1893. The Panic itself was caused by railroad overbuilding and speculation of continued expansion, which then resulted in the collapse of a number of banks and the retrenchment by most railroads in the country, leading to a collapse in orders for rolling stock. As the dockets show below, since most of the skilled workers were paid by the hours spent on each order (*e.g.*, an upholsterer might put in 2 hours on job no. 2352, 6 hours on job no. 2311, and 1 hour on another job on a given day), when the orders dropped, there was simply no work for them to do. One can understand, then, why Pullman's workers' wages collapsed; even while one criticized George Pullman's refusal to lower rents in order to preserve his 6% annual return on all sectors of his business.[20]

3.4.1 Managerial Structure and Relations

The shifting relationships between workers and managers is a key problem to understanding the evolution of the work process at Pullman. A full management history needs to be written using the information in documents in the Tenneco collection, which when available, can be usefully compared with administrative records at the Newberry and other archives. While George Pullman can be described either as a "paternalistic capitalist" or a "welfare capitalist," his management strategy was best categorized as very typical of the late nineteenth-century approach known as "Systematic Management." As the company evolved after Pullman's death, under both Robert Todd Lincoln and John S. Runnells, the company's mangers adopted some elements of Scientific Management (developed by Frederick W. Taylor, among others, from about 1909 onwards; for the statement of the company about its adoption, see (Husband and Runnells 1916)) as well as many of the progressive policies of

[20] For the company's statements on the Strike, see Anon. 1894; Ashley 1895; for labor's position see Carwardine 1894; Stead 1894; for the government's position, see Nimmo 1894; United States Strike Commission 1894. The secondary literature on the 1894 Strike is large, but for a good overview, see Hirsch 2003; Lindsey 1939, 1942; Papke 1999; Salvatore, et al. 1999; Stein 2001.

welfare capitalism. In that same era, philosophies of corporate governance were shifting toward the view that large, publicly-held industrial enterprises served a public trust beyond the shareholder's interest (Heald 1970: 28-30).

George Pullman's brash and uncompromising style was notorious, but his business operations have made him (and his experimental town) a classic case study in Human Resources Management (cf. Kaufman 2010: 38-43). But we do not understand Pullman's engagement with systematic management, a movement that arose as he was building the new works on Lake Calumet. Both large industries and railroads had grown plants and operations that were larger and more complex than ever before, and often geographically fragmented. This scale made work flows impossible to oversee or control, production costs and inventory became increasingly difficult to track, trouble grew in materials acquisition and tracking, and labor became harder to manage. Before there were academic responses or organized movements, as with Scientific Management, managers created ad hoc solutions for systematizing management. Managers experimented with ways to track production costs, establish hierarchical supervision through middle managers, centralize accounting and quality control, and shift toward incentive wage systems (Litterer 1963; Nelson 1974: 480-481). Systematic management also brought attention to the "human element" of production, primarily in concerns for workers' motivations through incentive pay system and quality of life issues (Kaufman 2008: 66-71). Pullman's company included these traits and struggles with worker autonomy and their impressions of capricious and petty middle managers contributed to labor strikes.

After Pullman's death, the presidents that followed him would continue adopting systematic management ideas. In 1916, *System: the Magazine of Business* printed a series of essays that Joseph Husband had edited from narrations and writings by Pullman Palace Car Company president John. S. Runnells. These essays explained how the Pullman company had transformed the management of production during the transition from wooden to steel car production. Over a period of months, a member of the managerial staff (perhaps Eugene Morris) worked with Carl G. Barth, one of Frederick W. Taylor's assistants, and recommended changes to increase efficiency. The reports recommended selectively adopting some elements of Scientific Management that the leaders felt were appropriate for a company of Pullman's size and would work in their traditional Systematic Management practices. Runnells referred to the new approach as a "common sense system" which he also called "The Pullman System of Management." The company rolled out new systems in different departments around the plant and in 1913 began to introduce a general shift away from gang-system organization to a piece work checking system. Previously, foremen would assign a job to a gang of workers, who would then divide up the work themselves. Now the company was tracking production by person and by machine, and claimed to be adjusting worker's salaries up for highly productive labor—and presumably down for the reverse (Chandler 1979).

Among the new systems that Pullman adopted over the period from 1907 to 1916, the repair shops were revolutionized by instituting a decision-making process that put draftsmen in charge of when, if, and how to repair broken machinery. The brass foundry instituted a timestamped paperwork system for tracking work orders that allowed clerks in accounting, stores, and thirty other departments to compile details about efficiency and cost as order forms, color coded tickets, cards, and tags were gathered by the Stores department. This allowed managers to tabulate total material costs and total labor costs along with the standard price for items being manufactured. Managers centralized tools into collective tool rooms and from which workers could check out equipment and request sharpening or replacements of broken tools, and where managers could track tool use. Finally, the company instituted methods of "Progressive Car Building" where the old erection shops were reorganized. The work process was reorganized, abandoning the older "ground-up" style of manufacture in static bays to which all materials were brought. Instead the Freight Car shops were redesigned to include a moving production line with specialized work stations for individual tasks. (Chandler 1979).

The management system increasingly embraced Welfare Capitalism as an alternative to George Pullman's original vision of a bucolic community that would repel the evils of industrial capitalism. By 1916, management was providing protective eyewear, gloves, and other safety equipment and clothing, along with medical care. As late as 1923, the company's Welfare Department provided for worker safety, comprehensive medical care, locker rooms and cafeterias (or at least lunch rooms), toilets and rest rooms. These programs affected the movements of workers and their lived experiences in the factory. We do not yet know the fate of the latter-day social welfare programs, but with the steady decline of passenger rail by the 1950s, the company moved away from these strategies and adopted other management philosophies.

3.4.2 Work Process from Testimonials

Pullman's factory was designed decades before the concepts of mass production or of the assembly line, yet the production there was an important example of the growth of craft practices into what we would recognize as full "industrial" production. Pullman employed scores of highly-paid master craftsmen to create his luxury Palace Cars, but his staff also deployed jigs, fixtures, some standardization and forms in order to achieve some economies of scale in this process. But the car industry, at least for sleepers, parlor cars, and dining cars could never be a full mass production system. Each order—whether it be for one car or two dozen—was its own unique thing: the car length, compartmentalization, layout, amenities, and virtually every detail could be specified by the ordering railroad. Far from the days of Henry Ford's Hobson's choice of "Any color as long as it's black" (even if most Pullman cars were painted in Pullman standard green), customers had virtually complete flexibility above the car trucks, and other than that they had to be 4ft 8½in to match standard gauge, only the customer's pocketbooks limited the choices available.

As a production process that long-predates the moving assembly line and full Fordist production, the Pullman process was a combination of batch production and station work. The original erecting shops consisted of ten-bays in each of the north and south wings. HABS (1967: 3-4) proposed the following as a general description of the process, which we have here broken into smaller parts inserted some corrections and commentary about terminology and offer alternate interpretations:

> A freight or passenger car was started on one of the tracks with the assembly of its wheels and undercarriage.

In fact, these were temporary truck systems (Figure 3-1); the car was only put onto its running trucks once it was nearing completion and then brakes and any other undercarriage apparatus were installed. Not surprisingly, the mechanical systems evolved over time, but it still appears that components for things like power in the cars (generators) or, later, air conditioning (compressors) were bought to the frame as the car was built upon it.

> This frame would then be rolled along the track and at consecutive locations have various operations performed on it.

It is more likely that a number of operations—in fact a large majority of them—came *to* the car in one position. In the original shops, at least two cars could sit on one track segment inside the building, so moving one around another would be inconvenient. There are photographs of small delivery vehicles with a small wagon train behind them delivering a wide variety of parts upon them, suggesting that it

Figure 3-1: Temporary wood-blocked trucks (Tenneco Papers, box 585406)

was delivering to multiple stations where cars of various sorts would have been in various stages of production. But just as orders did come in for single cars that would entail fully individualized construction details, they also came in from one railroad for a small batch of cars (2 sleepers or 4 parlor cars or 12 baggage cars, for example), each bay or perhaps sets of adjacent bays could well have been working on the same design, resulting in efficiency as workers with different skillsets moved among the set of cars. HABS (1967) continued:

> When the car had progressed the entire length of the track in one bay, it would be rolled outdoors at the east end of the shop onto the tracks embedded into the pavement. Running alongside this pavement and at right angles to it was a slightly depressed roadway with a series of rails running its length. Along this transverse rail system ran several "trolleys" or long low flat cars with a pair of rails fastened to the top surface. These rails were at the same level as those of the shop floor and east pavement. The partially completed car would be rolled onto the trolley (which was aligned with the pavement rails) and the trolley would then be moved with

> its cargo to a second bay. The car would be pushed off the trolley and into the shop where the second series of operations would begin.

They are here describing the two sets of transfer tables that were set to the east of each of the erecting shops that allowed the cars to remain oriented E-W but then shifted N-S to any bay for any operation that might be needed. Transfer tables were a somewhat revolutionary development in moving rolling stock within a factory complex, as it greatly compressed the space necessary for extra track for shifting cars and minimized the problem of having one car stranded behind one or many other cars that had to be moved to get it out. While Pullman was not the earliest example of a linear transfer table, as compared to the more familiar shunt system or roundhouse–turntable method of shifting cars from one track to another, it is possibly the first rail factory complex built with them as the key to car mobility on the property.

> When the entire length of the second track had been covered, the car would again be rolled outside and onto the trolley and moved to a third track. This process was continued until the car had been finished and the last piece of brass trim and lacquer had been applied.

While we agree that it was easy and convenient to move the cars to multiple locations, the HABS description implies that only one or a small number of processes occurred on each track and at each station, and also that each car would visit every bay of the erecting shops. This is too much like a moving assembly line, and the HABS report provides no contemporary evidence to back up that claim. From examination of the layout of the buildings, the descriptions of each building's contents and task, and the photographic evidence of cars under construction that we have, it seems much more likely that each car was assembled from the ground up in one place until it was structurally and mechanically complete, then it was shifted to the painting shop for overall painting, and then (back?) to one more bay where it was put on its road trucks, fitted out with furniture, cabinetwork, carpeting, and final detailing, including all detail painting. A number of photos, for example, show individual painters hand-painting the car and railroad names on the car while other workers finish out the interior.

Evidence from surviving fire insurance maps rather suggests that all the steps for the construction of a car likely happened in whichever bay the frame started in until the car had to be moved for a process that could not take place there. So, for example, a car might start in position 2 of bay 3, where the frame was constructed, whether in wood in the early decades or later in steel. In the wooden car era, we have the statement of the town superintendent's wife, who noted that in the building of freight cars,

> Lumber enters the south end of these shops from the lumber yards and is cut to proper lengths, planed, mortised, bored and fashioned for use. In every onward step of its progress, and it never moves backward, it received additional shaping and treatment till it reaches the erecting rooms, where the car builders take it and build it into cars upon the tracks which have already been set in place (Doty 1974: 72).

Further, the work was staged so that all the erecting bays might "flip" in relatively symmetrical batches, when possible, which was often the case when freight cars were in production (recall that the ratio of freight to passenger to sleeper production in the first half century of Pullman was roughly, but consistently, about 1:10:100). Doty (1974, 73) explained that in building 40 freight cars a day,

> they are erected in trains on parallel tracks, along which all the materials, with the trucks, are carefully distributed the day before for the gangs of builders[:] 182,000 pounds of cast iron wheels…, 64,000 pounds of car axles, 118,000 pounds of cast iron other than wheels, 115,000 pounds of wrought iron, [and 500-900] bolts [in each car].

And the erecting shop was set up so that 80 cars could fit on the parallel tracks at a time, "so that while forty are building to-day on part of the tracks, laborers are distributing lumber and iron for forty more along the vacant tracks, this material to be built into cars on the following day."

In other cases, we know that the steel frames were welded and riveted together on the ground outside (Figure 3-2), and the roof assembled independently and dropped into place, as well as then the steel vestibules built on to the ends, all before the car was lifted onto its trucks. Later photos of steel frames for the aluminum-clad cars in mid-century indicate, for example, that they might be pieced together in the bays and flipped for welding and riveting as was convenient before being set on temporary trucks for the buildout of the frame.

Certainly, there were steps in the construction where moving the car to another station was desirable, if not in fact necessary, such as the sandblasting and painting of the all steel frames (Husband 1917, 126-127; though see (Limbrock 1953). But the very next steps of installing insulation in the wall and floor cavities and then turned over to the steamfitters, plumbers, and electricians, these were more likely to have been conceived of as they are in house-building—where the tradesmen come to the job, not the other way around—as the cars were to have been moved to the steam shop, the plumbing shop, and the electrical shop… for which there is no evidence of the independent existence of in the erecting shops on period fire insurance maps. Husband (1917, 128) all but confirms this when he notes that, "As soon as these gangs of workmen have finished, other workers fit into place the interior panel plates, partitions, lockers, and seat frames, and the car instantly assumes a new and almost completed aspect," without mentioning that it moved to any other station. Similarly: "The car is now completed with the exception of the fittings. A gang of men hang curtains in the doors and windows; the upholsterers contribute the carpets, cushions, mattresses, and blankets; the various little fixtures are added, and the car is finished." Even before the final fitting out, he also provides an image of the workshop where partitions were assembled on tables (Figure 3-3), well away from the cars and apparently on upper floors of shops that the cars could never visit, again indicating that at least in the era of the all-steel car, parts went to the assembly bays rather than cars moving from bay to bay.

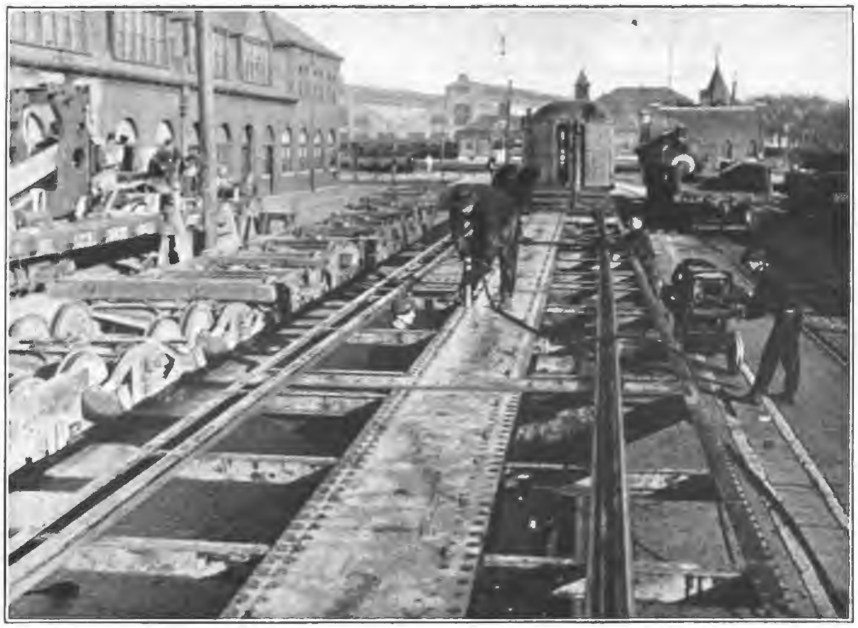


Figure 3-2: Assembling a steel frame, outside, off the trucks (Husband 1917, 126)

Figure 3-3: Assembling interior car partitions in an upper-floor shop (Husband 1917, 106)

After a touring the factory and interviewing George Pullman in 1890, French economist Paul De Rousiers later extolled:

> The planning of these workshops is remarkable, and every detail seems to have been considered., to cite one point the buildings in which freight cars are built our series of vast sheds as broad as the cars are long., opposite each car a large bay opens on the iron way of a car as soon as it is finished, runs along the rails and leaves the shop. All the timber that forms the car is cutlery required, size and it's got ready for fitting together in a special department. When it is brought along the same rails to the sheds where the car is built. Tiny little locomotives are running along the lines which are built in the spaces between the various workshops…. Everything is done in order and with precision; one feels that each effort is calculated to yield its maximum effect... One feels that some brain of superior intelligence, backed by a long technical experience, has thought out every possible detail. Besides the fitting-shops that deliver the finished car, there are many preparatory shops. The most important are the timber-shops, for wood is the raw material most used in the making of every kind of car; then comes the metal-works, wheel and bolt shops, forges, steel-works, etc., and then those which are more especially for passenger-cars, such as the hair-cloth factory, etc., etc. It is easy to understand the wonderful material complexity of such an enterprise. It needs a number of different kinds of factories which must be run for the common end. From the purely industrial point of view, it is an interesting sample of the great American manufactories (Buder and Kulash 1967: 58; Rousiers 1933: 264-265)

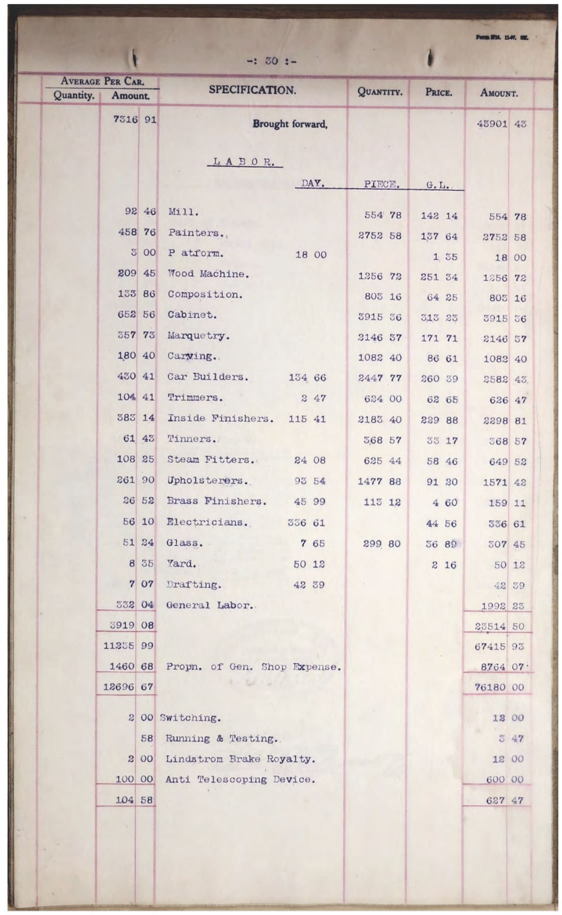
3.4.3 Work Process from Order Dockets

Although we have yet to find the surviving archival collections with explicit evidence of how a car was tracked from order to completion and delivery during its construction, reconstruction of the level of detail available can also be found in surviving order dockets where the final accounting of the costs to the customer were recorded. We hope to discover a future collection that includes documents like inventory control slips and worker time-tally cards. We know that workers in the early and middle periods were not paid a flat rate for, say 8 or 10 hours of work a day, but rather recorded their hours spent on each lot and summed them up in each pay period, and so on. Yet we can use existing documents for insight into the management of the work process.

When an order came into the company, it was assigned a lot number which allows us to track a car of that type through production and still identify it today. So, for example, Lot 1390 was taken May 12, 1887 from C.P. Huntington for one private car of plan type 515. The details were inscribed in a "list book"[21] and a delivery date was set, in this case list book G140 (many of these survive at the Illinois Railway Museum in Union, IL) and 26 Jan. 1888. The logbook noted any specific details such as number of identical cars in the lot, which could range from one to dozens, any identifying car numbers or names for the customer (Huntington named his private car "Onronta"), its destination and routing rail lines to get it there (here Weehawken, NJ, and via the Michigan Central and West Shore RR), and a cost estimate. The range of costs is particularly striking, with private cars clearly being built at the very highest of standards (Huntington's was estimated to cost $13,450.80, about $350,000 today) while

[21] In this case, Smithsonian Institution, National Museum of American History Archives Center, Dubin Pullman Palace Car Company Materials collection (Acc. 181), "Record of Completion of Cars, 1887-1893"."

others orders reflect large orders of very inexpensive freight cars (for example, the CB&Q railroad ordered 400 stock cars in January 1888 for an estimated total of only $430.22 [per car, it is presumed]).



-: 30 :-

Form 3718. 11-97.

Average Per Car. Quantity.	Average Per Car. Amount.	Specification.	Day.	Quantity. (Piece.)	Price. (G.L.)	Amount.
	7316 91	Brought forward,				43901 43
		LABOR.				
	92 46	Mill.		554 78	142 14	554 78
	458 76	Painters.		2752 58	137 64	2752 58
	3 00	P atform.	18 00		1 35	18 00
	209 45	Wood Machine.		1256 72	251 34	1256 72
	133 86	Composition.		803 16	64 25	803 16
	652 56	Cabinet.		3915 36	313 23	3915 36
	357 73	Marquetry.		2146 37	171 71	2146 37
	180 40	Carving.		1082 40	86 61	1082 40
	430 41	Car Builders.	134 66	2447 77	260 39	2582 43
	104 41	Trimmers.	2 47	624 00	62 65	626 47
	383 14	Inside Finishers.	115 41	2183 40	229 88	2298 81
	61 43	Tinners.		368 57	33 17	368 57
	108 25	Steam Fitters.	24 08	625 44	58 46	649 52
	261 90	Upholsterers.	93 54	1477 88	91 20	1571 42
	26 52	Brass Finishers.	45 99	113 12	4 60	159 11
	56 10	Electricians.	336 61		44 56	336 61
	51 24	Glass.	7 65	299 80	36 89	307 45
	8 35	Yard.	50 12		2 16	50 12
	7 07	Drafting.	42 39			42 39
	332 04	General Labor.				1992 23
	3919 08					23514 50
	11235 99					67415 93
	1460 68	Propn. of Gen. Shop Expense.				8764 07
	12696 67					76180 00
	2 00	Switching.				12 00
	58	Running & Testing.				3 47
	2 00	Lindstrom Brake Royalty.				12 00
	100 00	Anti Telescoping Device.				600 00
	104 58					627 47

Figure 3-2: Final Labor Accounting, Docket 2293, General Service Parlor Car for the PRR, 1898 (Smithsonian NMAH Archives Center, Pullman Collection, box 1, folder 26, p. 30)

Investigating a lot number docket reveals a great deal of how the company accounted for each car's features, as well as some suggestions of the division of labor and workflow in constructing a car. As a case study, consider lot 2293, an order for six general service parlor cars for the PRR, built over four months at the start of 1898.[22] A standard plan 1278 A-1 car, the price of the car was broken down by "trucks", body, extra equipment, and sundries. Each of those categories were in turn itemized in exacting detail (also averaged per car in the lot if it was for multiple units): trucks in this docket consisted of a total of 6123 bd Ft of oak costing $162.27, a whole series of castings (bolster chaffing blocks, bolster chafing plates, bolster spring caps, bolster spring seats, Equalizer spring caps and seats, side bearings, transom plates and so on right down to the 18lbs. of washers costing 58¢. Total for castings averaging $63.95 per car); forgings (nearly 4 dozen types itemized for almost $260 per car); and so on. The dockets ran to many dozens of pages and end with a summary of all labor (Figure 3-4) and approval signatures.

Some items are itemized by quantity, others, notably the larger parts and construction materials, by weight, so in the PRR's cars, they accounted for axels weighing 3180 lbs per car for a total weight of 19,080 lbs. costing $314.82 and also for the "¾ Q" of sandpaper worth 7¢. This incredible level of detail may let future researchers reconstruct some work processes, as for example the breakdown of the finishing on these PRR cars: 210 lbs of "Penna Truck Color", 1½ lbs of white lead, 6 lb of putty, 12 gallons of red roof paint, 3 gallons of wheel paint, 1½ gal of turpentine, and 7½ gal of "Murphy's Truck Varnish." Similarly, the lumber used in the cars is accounted for in full detail, broken out by species and type (structural, moldings, paneling, veneers), every single casting and forging is itemized, often with size and finish details, as are all bolts, nails, screws, glue, pins, rods, and every other part of the whole. One interesting feature noted in a number of dockets was that the purchaser had the option of providing their own interior details such as curtains or lamps, as well as turning in

[22] Ibid., box 1, folder 26.

scrap materials (brass, bar stock, etc.) to be used or recycled as a credit against the materials account drawn up by Pullman.

Some labor costs are itemized as piecework (blacksmith's labor for the forgings billed at $13.90, though with no indication of time spent, showing that Pullman accounted much labor internally on a piecework system), while most dockets include a summary breakdown for the lot:

Amt. [hrs?]	**Type**	**Day**	**Piece**	**G.L.**	**[totals]**
6.39	Mill		[$]38.34	[$]9.58	[$]38.34
3.00	Iron Machine		18.00	5.40	18.00
3.78	Paint		22.70	1.13	22.70
22.53	Truck	46.36	88.80	20.27	135.16
6.06	Gen. Labor				36.38[23]
41.76	[subtotals]				250.58
1340.83	[not specified, but overall hours?]				8045.02
174.31	Prop[ortion] of Gen. Shop Expense				1045.85
1515.14	[TOTAL]				[$]9090.87

From this kind of evidence and other materials that have only been cursorily inventoried in the Tenneco Papers and other archives, it should be possible to reconstruct the manufacturing organization and workflow with some precision. Siting those activities on the ground will also be easy in a general way using the fire insurance maps, though the detailed interior arrangement of each floor of the buildings still remains a challenge, due to no separate floor plans having yet come to light and the limited number of photos of the interior of the shops in general.

3.4.4 Work Process from Maps and Inventories

In the following sequence of maps, we interpret changes to the work process as determined by evidence from the known maps and plans of the these eight of the factory's buildings. Figures 3-4 through 3-7 show moments in time selected to express the evidence visible in the maps and historic documents[24]. Generally speaking, the maps sometimes described the function of a building or a floor, but rarely more detail than this. While detailed maps of the Calumet Shops are part of the Pullman papers held at the Newberry Library, that archive does not hold records from the manufacturing division which would have included blueprints and drawings of the factory core. While many of the manufacturing division papers are included in the Tenneco Collection, as far as we know, that collection does not include bound sets of

[23] Note that the general labor in the third column sums down to this entry.

[24] The documents used to create these maps include the Rascher Company and Sanborn Company Fire Insurance Maps (1888/1892, 1911, and 1938), the American Appraisal Company map and inventory (1924), the United States War Department's c. 1955 building plans, a series of topographic maps (1929, 1953, 1960, 1965, 1991, 1997) and aerial photographs (1952, 1959, 1962, 1963) from the United States Geological Survey, and an aerial photograph from the Illinois State Geological Survey (1938).

drawings or blueprints for the manufacturing division. Finally, the buildings are numbered here using the 1955 number designations. On this map, that means that the North and South Erecting Shops numbers are reversed, as became practice at the firm after the expansion of the southern shops to accommodate steel car manufacture. In addition, since the Foundry and Iron Machine Shop were located off the IDNR and NPS properties, that building is not included in these figures.

Figure 3-4 shows the operation at during the early period of operation. The office building is in use as an office on the second floor, while some of the first-floor space has been dedicated to storage. All three of the erecting shops (Buildings 2, 3, and 4) have similar layouts for similar work flow for wood car production, as explained above. Building 4 includes a series of storage areas along the covered passage that separates the eastern and western portion of the Rear and New Erecting Shops. These storage and activity areas include gas fitting, marble works, paints and oils (storage?), and steam fitting. This building also includes the only privy identified on the early map. Identified as a privy, this may have been built and used for a period before the sewers were installed. The 1901 "deep sewer" plan map showed plumbing connected to this privy location. The Finishing Shop has varnishing and painting on the third floor, which is connected by bridges to the Wood Machine Shop (Building 6) so that millwork can be brought directly into building 5 for finishing. The wood machine shop presumably has three floors for woodworking machinery turning out elements that can be delivered to the erecting and finishing shops. Finally, the Boiler and Engine houses form the showroom for Pullman's grand Corliss Engine and power the subsurface drive shafts throughout the factory.

By 1925, Building 3 has been converted to produce steel cars and wood cars are now primarily worked upon in the repair shops (Figure 3-5). The main office is still managerial space, but also includes dramatically expanded drafting facilities and storage space for drawings. Building 2 had been converted into a machine shop with pattern storage, but the company has converted space in this building to administrative functions like accounting and purchasing. The expanded steel passenger car shop (Building 3) is filled with jigs, templates, and dies for pressing and forming metal parts for cars and then spot-welding them together. Building 4 had become the steel car erecting shop, equipped with similar tools as Building 3. In the Finishing Shop, now the body and roof pieces are fit to car frames although some metals pressing and forming happened here also. The second and third floor are still dedicated to working and finishing wood elements. The first floor of the Wood Machine Shop is being used for pattern storage, but the 2nd and 3rd floors are still woodworking areas. These woodworking shops also shut down by 1938 as less and less word elements are used in cars. Since the power system had been replaced by electricity in 1907, initially to power the welders, the steam engines throughout the factory are scrapped out thereafter in 1911. The Boiler House was adapted to warehouse iron with additional wood working on the 2nd and 3rd floor.

PULLMAN CORE INDUSTRIAL BUILDINGS, ca. 1886

1: OFFICES (3 floors)
- Storage and Ware Room 1st, Executive Offices 2nd, Ceiling and Glass Painting & Headlining 3rd.
- Elevator.

2: ERECTING SHOP (1-1/2 floors)
- Shop for assembling 40- to 65-foot long Palace Sleeper cars, perhaps two per track in each bay, totaling up to 80 cars at one time.
- 40 cars built per day, while lumber and supplies distributed to open spots for the next day's 40. According to Doty (1974: 73), "118,000 lbs of cast iron other than wheels, 115,000 lbs of wrought iron, [and 500-900] bolts" went into each car
- Driveshaft from Corliss engine ran in trench below floor.
- 25 HP steam engine in northwestern corner by 1892.

3: ERECTING SHOP (1-1/2 floors)
- Shop for assembling 40- to 65-foot long Palace Sleeper cars, as above.
- Driveshaft from Corliss engine ran in trench below floor.

4: ERECTING SHOP (1-1/2 floors)
- Shop for assembling 40- to 60-foot long Cars
- Work tasks, storage, and activity areas include gas fitting, marble works, paints and oils, steam fitting.
- Privy located in southern and northern ends of building.

5: FINISHING SHOP (3 floors)
- Varnishing and painting on third floor.
- Elevator by 1886.

6: WOOD MACHINE SHOP (3 floors)
- 500 HP engine on 1st floor, 1886 and 1892.

SMOKESTACK
- Brick, 185 feet tall.

7: ENGINE HOUSE (2-1/2 floors)
- Held Corliss steam engine, 2,500 horsepower.
- Steam engine powered machinery factory-wide.

8: BOILER HOUSE (3 floors)
- Held 12 steam boilers and 2 steam pumps.
- Coal storage along north wall (1st floor).
- Lumber storage on 2nd floor, "Coal R. Filling R." on 3rd.

Figure 3-4: Map of factory processes ca. 1886

PULLMAN CORE INDUSTRIAL BUILDINGS, ca. 1925

1: MAIN OFFICE (3 floors)
- Office space underwent major renovations in 1921, including the Purchasing and Accounting Departments (1st floor); Superintendent's, General Mechanical Engineer's, and Production Manager's offices (2nd floor).
- Engineering Department had offices throughout the building. Drafting rooms, blueprinting rooms, Photostat room, and drawing vaults were on the 2nd and 3rd floor as well in the clock tower's two floors.
- Elevator (1911, but not shown 1938).
- In 1924, more than 56,000 engineering drawings stored on 2nd floor. Kept in furnishings like a nine-drawer pine-wood blueprint file 26" x 36" x 35" high and Art Metal Steel files of many sizes.

2: TRUCK SHOP (1-1/2 floors)
- 1911 Machine Shop in Section C (1911) converted by 1938 to lumber storage 1st floor with a pattern shop on the second floor of Sections B and C.
- By 1924, the Purchasing, Accounting, and Auditing Departments occupy two floors and the balcony in Section A and a telephone exchange was installed there by 1938.
- Ladies Dining and Rest Room in Section A run by Welfare Department
- Small steam engine removed by 1911.

3: STEEL PASSENGER CAR SHOP (1-1/2 floors)
- Wide enough to build the 80-foot long, heavy steel cars.
- All four sections included dozens of dies for slotting, punching, notching, blanking, forming, and piercing sheet and stock steel. Sections A and B also included a cast iron hood forming mandrel and sash rest capping tools, along with a portable spot welding outfit.
- Besides standard passenger cars, New York subway cars were made in this building.
- Roof and Bottom Fitting occurred in Sections C and D, so the work areas included jigs for assembling, drilling, molding, and forming steel car elements such as the deck and lower deck, end frame, car line, door header, top hood, side post, scoop panel, and cap. Most of the dies in Section D were specific to sheet metal work.
- Section A also included a dining area/break room run by the Welfare Dept.
- Templates stored in Section B.

4: STEEL CAR ERECTING SHOP (1-1/2 floors)
- Steel car assembly, with Body Fitters in Sections A and C and Roof Fitters in Section D.
- Fitters worked with an array of assembling jigs and dies, including for side frame and side post, sash rest, vestibule corner post, hood, and lower deck flanging jigs. Dies for pressing, forming, blanking, notching, piercing, slotting, punching, and flattening metal for Pullman Standard parts and parts for other cars.
- Fireproof transformer room by 1938.

5: FINISHING SHOP (3 floors)
- Iron working (1st floor) in 1911, included both Body and Roof Fitters in Sections B and C by 1924.
- The first floor included a wide array of welding, flanging, and forming jigs for top and corner hoods, side door frames, trap door frames, window frames, and car steps.
- Varnishing and painting on 2nd and 3rd floors, including a Paasche Air Brush Company spray outfit, 8' wide and 6'6" deep, in Section A.
- Additional woodworking (2nd floor).
- Elevator, no sprinkler system in 1911.

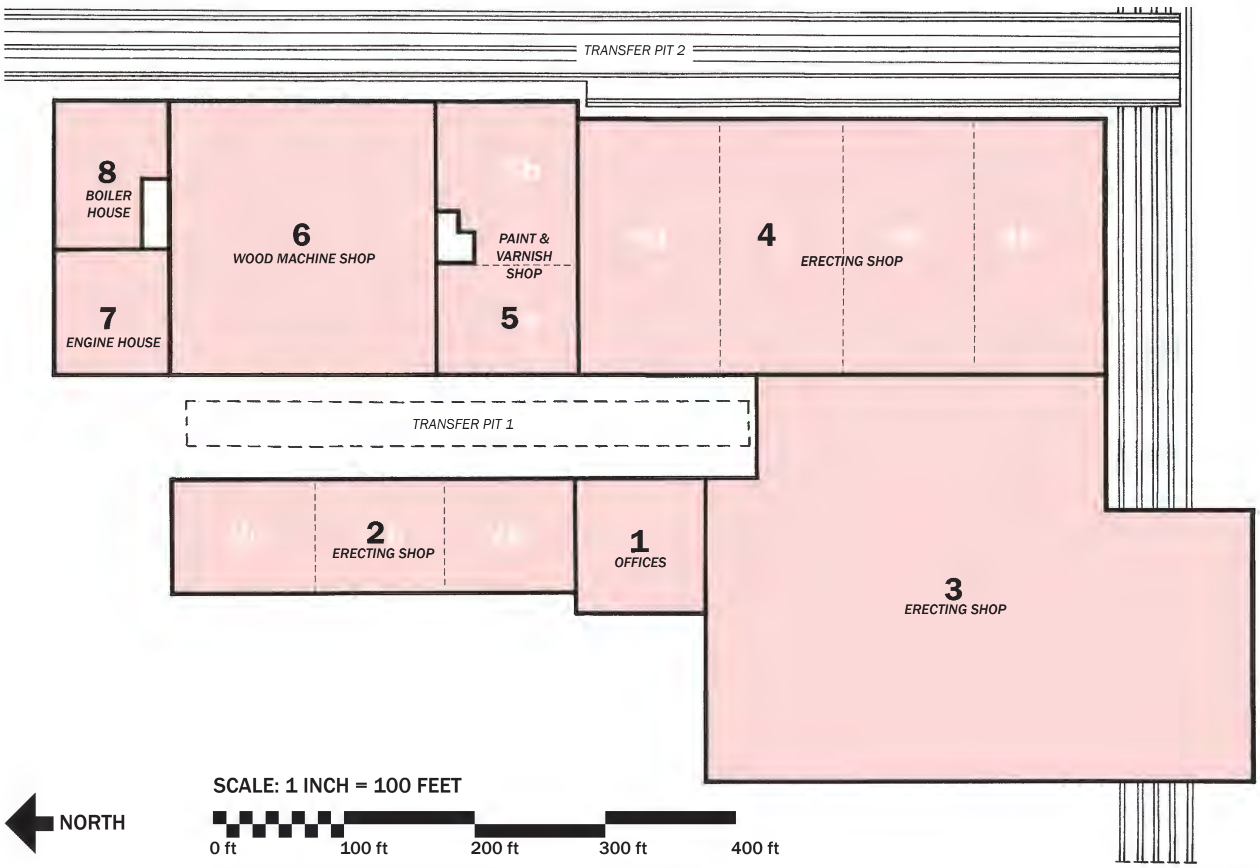
6: WOOD MACHINE SHOP (3 floors)
- Machines included Greenlee Bros. & Co. powered self-feed rip-saw, a London Berry & Orton 22" swing special column face lathe, and a J. A. Fay & Egan Co #3 horizontal double spindle radial chair borer.
- Storage 1st Floor, wood working 2nd and 3rd in 1911. Dining room added on 3rd floor by 1924.
- 1924 inventory shows workers using the second floor for storage of hardwood templates for band and trim saws, boring machines, shapers, and carvers, and also including wood carving molds made of plaster of Paris.
- By 1938, office space defined on 1st floor and painting on 3rd.
- Supplemental steam engine removed by 1911.

7: PATTERN STORAGE (FORMER ENGINE HOUSE)
- Electric power replaced steam power in 1907; Corliss engine scrapped in 1911.
- Elevator added by 1932.

8: STATIONARY STORAGE AND WOODWORKING (FORMER BOILERHOUSE) (3 floors)
- 1911 Iron Warehouse on the 1st floor was replaced by Stationary Storage by 1924; Woodworking 2nd and 3rd during this period.
- Machines in use and storage include a Chas. E Francis Co. 42" x 96" heavy duty open side hydraulic veneer press.
- By 1932, Basement and 1st floor used for Steel Storage and 2nd floor used for Pattern Storage.

Figure 3-5: Map of factory processes 1925

PULLMAN CORE INDUSTRIAL BUILDINGS, ca. 1955



1: OFFICES (3 floors)
- All executive office space and storage vaults.

2: ERECTING SHOP
- Sections B and C included 2 stories, dedicated to drafting space, offices, and vaults.
- Section C was 1 story, including offices, toilets, and a vault.

3: ERECTING SHOP (1-1/2 floors)
- U.S. Army Ordnance sub-assembly work took place here during World War II.
- Welding facilities for 120 operators per shift.
- Track conveyor system for production line.
- Power distribution substation attached, steam heating, compressed air, toilets and locker rooms.
- Three 2-ton overhead cranes and jib cranes, two turn tables.

4: MACHINE SHOP (1-1/2 floors)
- U.S. Army Ordnance Production took place here during World War II.
- Four shop floors with separate darkroom and x-ray room in Section D.
- Toilets, steam heat, sprinklers, power throughout.

5: UNUSED (FORMER FINISHING SHOP) (3 floors)
- Freight elevator.
- By 1945 sprinklers throughout.

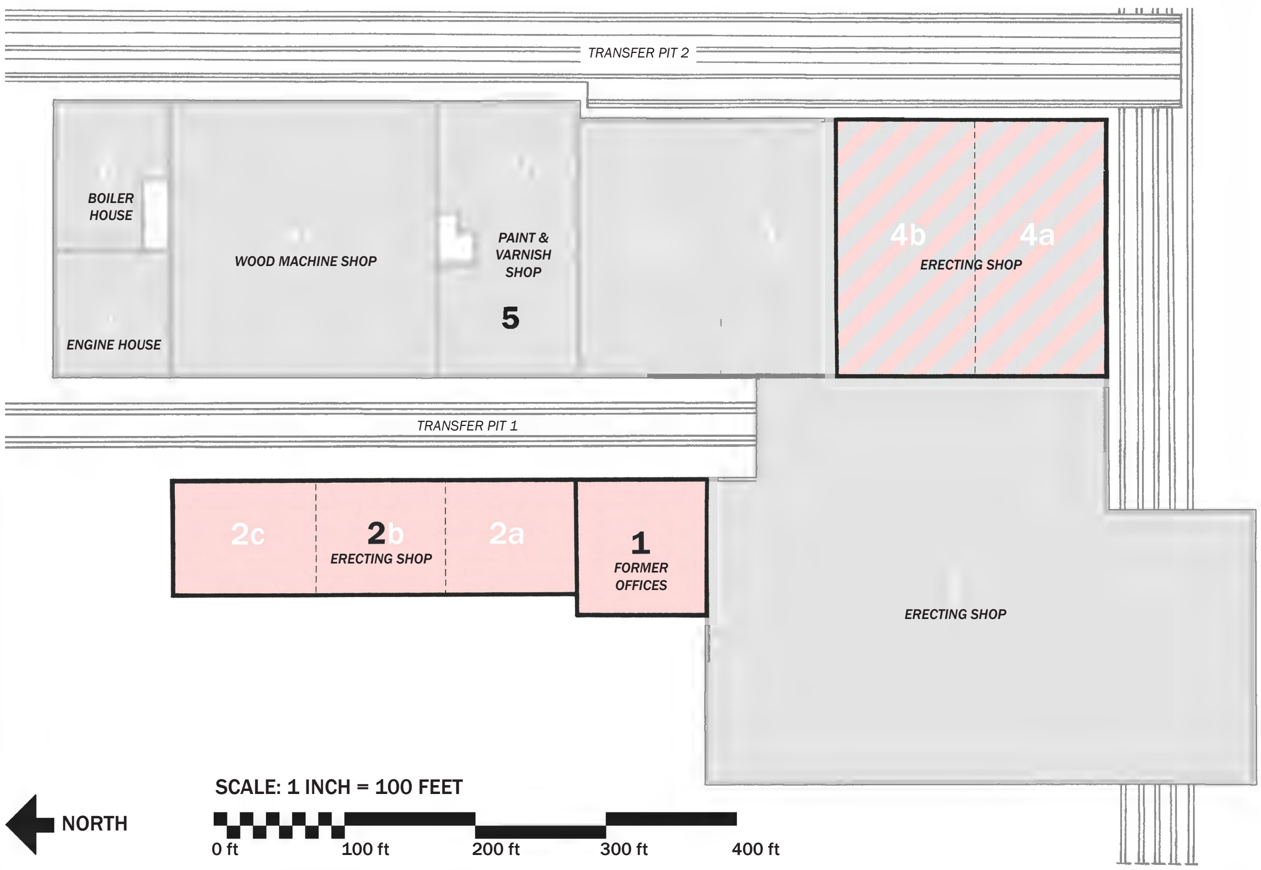
6: STORAGE SPACE (FORMER WOOD MACHINE SHOP) (3 floors)
- Accessible to transfer table and railcars can enter building.
- Electric lighting and power, sprinklers throughout.

7: LABORATORY AND OFFICE (FORMER ENGINE HOUSE) (2-1/2 floors)
- First floor includes separate laboratory and office rooms.
- Steam heat and sprinklers throughout.

8: UNUSED (FORMER BOILER HOUSE) (3 floors)
- 2nd and 3rd floor connected by bridge to Building #9.
- Toilets and sprinklers throughout.

Figure 3-6: Map of factory processes 1955

PULLMAN CORE INDUSTRIAL BUILDINGS, ca. 2017



1: PULLMAN NATIONAL MONUMENT (FORMER OFFICES)
- 3 floors and clock tower owned fee simple by National Park Service in 2016.
- Burned due to arson in 1998, rebuilt by IHPA in 1999-2005.

2: ERECTING SHOP
- 2002-2003 roof removed on Section A of building, replaced by 2004.
- IHPA purchased the building in 1991.

3: ERECTING SHOP
- IHPA purchased the building in 1991.
- Burned and demolished in 1998.
- Foundations and floors remain intact.
- Subfloor features associated with plumbing and utilities very likely.

4: ERECTING SHOP
- Section D of the building was torn down between 1952 and 1959.
- IHPA purchased the building in 1991.
- Fire gutted the building in 1998 and Section C was subsequently torn down.
- Section A and B's walls and trusses remain; the roof is gone.

5: FINISHING SHOP
- Demolished between 1952 and 1959.
- Foundation and ground floor surface may remain intact.
- Subfloor features associated with plumbing and utilities very likely.

6: WOOD MACHINE SHOP
- Demolished between 1952 and 1959.
- Foundation and ground floor surface may remain intact.
- Subfloor features associated with plumbing and utilities very likely.

7: ENGINE HOUSE
- Demolished between 1952 and 1959
- Rail siding laid overtop after demolition.
- Foundation remains intact, buried under rubble imported from off site.

8: BOILER HOUSE
- Demolished between c. 1953 and 1959.
- Rail siding laid overtop after demolition.
- Foundation remains intact, buried under rubble imported from off site.

Figure 3-7: Map of factory processes 2017

Sometime after the War Department completed its inventory, several buildings were torn down, including Buildings 5, 6, 7, and 8, all of which had been removed by 1959 (Figure 3-7). In addition, Section D of Building 4 had also been removed by this time. The State of Illinois's Historic Preservation Agency (now the Illinois Department of Natural Resources) purchased the property in 1991 with an eye toward heritage use of Pullman's resources. A disastrous arson fire in 1998 burned buildings 1, 3, and 4 and might have damaged the roof in Section A of building 2. Building 3 was demolished after the fire, along with Section C of building 4. Sections A and B of Building 4 were left standing in ruin, while buildings 1 and part of 2 were repaired between 1999 and 2005.

Around 1955, the War Department drew a set of building plans as it prepared to transfer the plant back to civilian industrial use (Figure 3-6). Both buildings 1 and 2 were used as office and drafting space during the Korean Conflict era. Buildings 3 and 4 produced ordinance during the World War II and also perhaps also during the Korean Conflict. Buildings 5 and 8 were unused at the time, while building 6 was dedicated storage space. Building 7 was also largely empty, but included separate laboratory and office spaces.

4 Evaluation of Previous Archeological Work

A series of archaeological research projects have been completed within the boundaries of Pullman National Monument. Of those projects, one set of excavations occurred on the grounds of the factory core considered in this study, one investigated the nearby Pullman Water Tower, and five have examined different residential and commercial properties in the town. In this section, we briefly review these projects and relate them to the resources under consideration in the factory core.

4.1 2000 Pullman Water Tower Excavation

In 2000, Dan O'Rourke and Kevin McGowan reported on a project undertaken by the Department of Anthropology at the University of Illinois at Chicago, The Public Service Archaeology Program of the University of Illinois at Urbana-Champlain, and the University of Chicago undertook a Phase I survey of the remains of Pullman's famous water tower. An expansion of the University of Chicago Press's warehouse was impacting the property and community objection led to an archaeological documentation project. The project staff examined approximately 70 x 100 m of excavated area that included the foundation of the water tower and three large debris piles from demolition. The water tower's foundation was built of limestone block, was buttressed, and measured 35.5 m on each side. Staff documented three of the four foundation walls and a portion of the fourth, since a large section of the south wall had been demolished during the expansion project. Documentation included measured drawings of the foundations interior surface, locating pipes of various diameters, variations in building material, and the depth of fill. The crew identified and documented a surface foundation north of the Water tower that they identified as a nearby boiler house post-dating the Pullman-era. Staff also monitored the removal of fill from the water tower foundation to expose the Phoenix column bases and the sewer vault. After documentation of the vault, the site was backfilled with clean sand. The follow up analysis included efforts to match the pipes and features with historic maps, including the 1888 Rascher and 1901 Doty maps, along with the City of Chicago's current sewer maps. The study included a review of S. S. Bemen and the water tower, including how the tower worked with the town's fire suppression, drinking water, and sewage system. In addition, the report recommended that additional excavation for construction be allowed to go forward, but that an archaeologist should monitor that work to map and document the locations and size of sewer and water pipes as they were uncovered. It is unclear if any additional reports were prepared from subsequent work.

4.2 2004 Factory Excavations

In 2004, Scott Demel and William Middleton ran a DePaul University-sponsored excavation in Pullman, including some extensive testing at the factory site with some additional tests on the grounds of the Hotel Florence. Drs. Demel and Middleton were both temporary faculty at DePaul University and they both departed the university before an excavation report was complete. In 2007 and 2008, Dr. Jane Baxter and Dr. John Burton studied the collection of artifacts from this excavation campaign as DePaul initiated the process of transferring the collection back to the landowner and permit-issuer, the State of Illinois. As part of that process, Jane Baxter wrote a report summarizing what she could about the collection of artifacts in the absence of any excavation paperwork. That report (Baxter 2011b) concluded that the majority of the artifacts recovered had been deposited following the demolition of the factory buildings in the mid-twentieth century. But she also observed that the majority of the metal artifacts were "fragments of hand tools, industrial machinery, and architectural and building elements" (Baxter 2008a:5).

Figure 4-1: DePaul University students excavating in the factory's core, perhaps in the Engine House. Presumably taken from the roof of the North Erecting Shop (Building 2). Photo courtesy of Scott Demel, Northern Michigan University.

In the summer of 2016, Dr. Demel exchanged a series of emails with us in which he explained that he still intended to finish a report of the excavation. Dr. Middleton returned email inquiries that he no longer had any data from the excavation and had nothing else to contribute. Dr. Demel described the contents of his research files from Pullman:

> I have sketch maps, and a draft of a 13 page preliminary report of the 2004 investigations that I wrote in 2005. I also have my notes on features and test units. The sketch map with distances and angles has not been added to a Pullman map yet showing where we dug exactly. I can sketch something out to give you a better idea of

> where we were. […]. I took basic transit data that should be useful.
> Also present in the files are the following:
> Maps, notes, transit data
> Notes on aerial photos, brick locations and drawings, student brick research write-up
> Unit profiles
> Artifact catalog spreadsheet and forms
> Photo log, CD with photos?
> Student note books
> Hotel Florence shovel probe survey forms
> Small bag of artifacts used in exhibit at the Field Museum

From those resources, Dr. Demel shared the following images with us. Figure 4-1 shows open excavation units in the factory buildings. The test pits appear to have been placed In the Corliss Engine House building (Building 7). The next image is a sketch map, dated 2005, of bearings and distances calculated from optical transit readings (Figure 4-2). The photo and the sketch plan seem to match, if the photographer is looking from high up in, or on top of, the North Erecting Shop (Building 2) and the two excavation units in the photo are then likely U1 and U2 in the drawing. The crew apparently also did some excavations on the property surrounding the Hotel Florence, bordering on St. Lawrence Street, depicted in Figure 4.3

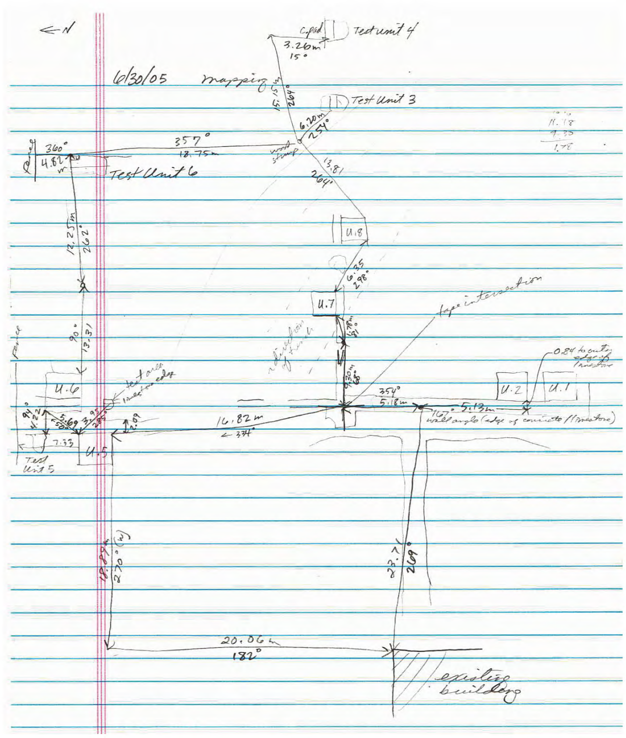


Figure 4-2: Sketch map of optical transit bearings with distances, calculated either by tape or from

Without an interpretive report, research design, or the original excavation paperwork, it is not possible to evaluate this excavation. We can make some important observations from just this material at hand, however. As late as 2004, there were well preserved segments of building floor under the topsoil in that area of the Pullman factory. Further, there were areas in the ground around the floor where the crew identified features filled with stratified sediments and soils. We have not yet taken the measurements from the sketch and drawn them in our GIS, but it seems that the student teams excavated at least eight test units within the factory. It appears that the team was trying to define a structure wall while also excavating below openings in the concrete floor surface. The breaks in the floor may correlate with pits underneath the steam engine.

The State of Illinois and the NPS should put emphasis on either acquiring a final report or retrieving the original records and artifacts from Dr. Demel. The excavation was considerable and any future recording of the floors and wall foundations in this building must also re-document these excavations to establish the depths and extent of the 2004 digging. This will help to identify any remaining features likely to have intact stratigraphy from pre-demolition periods for Buildings 7 and 8, as well as throughout the factory core.

Figure 4-3: Digging along Lawrence Avenue on the lawn of the Hotel Florence. Scott Demel provided this photograph of excavation at the Hotel Florence. In Volume 1 of the DePaul University reports (Baxter and Hartley 2011: 21), Jane Baxter identifies this as Lawrence Avenue.

4.3 2005-2008 Pullman Town Excavations

In 2002, DePaul University and The Field Museum initiated the Program in Urban Historical Archaeology at the Pullman State Historic Site (Agbe-Davies 2008; Baxter 2008b). The 2004 excavations at the factory and the Hotel Florence were the first season of fieldwork at Pullman associated with the project. Work continued in 2005 with a study of the turnaround area (Baxter and Hartley 2011) and inside the Carriage House (Baxter 2011b); then again in 2008 with an investigation at the Pullman Arcade (Baxter 2011c), and the Echols and Sexton House Sites (Baxter 2011b). Jane Baxter has also published and co-published about the role of archaeology and heritage in Pullman (Baxter 2012; Baxter and Bullen 2011)

These studies have made a substantive contribution to the archaeological studies of industrial and urban communities, in both the questions asked and the collaborative posture of the project (Palmer and Orange 2016). Given the factory focus of this report, we will not review the details of the archaeological work here, since the survey designs, excavation strategies, and artifact analyses are all contained in the individual reports. Most relevant to the current study is that Jane Baxter and her colleagues put forward their orientation toward archaeological practice:

1. Research should be community-based through collaborative partnerships so that projects are responsive to local interests and needs. This is particularly important in a community that served as "research subjects" for generations. This allows archaeologists to assist local agencies as they do work and train students.
2. While field research occurs on sites, the research focus should be multi-sited and landscape oriented.
3. The *Historical Archaeology of Industrial Communities* is oriented as a social archaeology of labor, rather than *Industrial Archaeology* in the "old-school" sense.
4. Focus should be on the lived experience of people in the past, informed by tools that consider race, class, ethnicity, gender, and age in people's lives.

The details of their archaeological studies do not need extensive discussion here, but among the most significant is that Baxter and her colleagues demonstrated that Pullman residents' patterns of land use are different from those of other industrial communities studied by archaeologists. The use of yard space, in both front and back yards, was not for functional activities during the Pullman era. After the homes begin to pass into private hands, then yard space becomes functional, but even after that change, the yards are not used for household production. Baxter and her colleagues also generally reported encountering subsoil at 20-30 cm below the surface of the ground, indicating very little fill (Baxter 2011a, 2011b, 2011c; Baxter and Hartley 2011).

They also identified an integrated thematic framework to guide their investigations, with literature reviews. These themes are summarized here:

1. Transformations of Industry and Society in the Guilded Age.
2. Planned Communities and Utopias
3. Labor and Collective Action
4. Community History, including Immigration, Gender, and Ethnicity
5. Working Class history and heritage

These themes are all applicable to archaeological work in the factory at Pullman National Monument. In Section 6, we will discuss the themes identified by Baxter et al. in relation to the Pullman National Monument's mission, the relevant NPS Thematic Studies, and best practices in Industrial Archaeology and Heritage.

4.4 2016 Archaeological Study

In 2016, Midwest Archaeological Research Services, Inc., undertook a Phase II investigation of the site of the Pullman Artspace Lofts development. M. Catherine Bird reported on the survey of 18,500 square feet on 11137-11149 South Langley St. (11-Ck-1226). This study was intended to see if intact deposits from the period of significance would be negatively impacted by the planned ArtSpace redevelopment or if any prehistoric land use was evident. After a review of historic maps and documents, the excavation of six shovel test probes, and three excavation units, as well as a transect across the back yard using a blunt-end soil probe, the archaeologists concluded that the historic buildings were demolished and that rubble was dumped to the rear of the lot along the rail tracks. The excavations from the front of the buildings revealed that the bulk of artifacts were deposited post-prohibition, ranging in date from 1935-1964, with a few pieces of material associated with the demolition of the buildings. Based upon the finding that all artifacts were associated with the "Historic Euro-American Pullman residential occupation" period post-1907, the defined period of significance for Pullman, the report recommended that no further work was required and the project should be cleared for construction (Bird 2016).

5 Research Potential of Known Archeological Resources

5.1 Area Investigations

This following section is limited in scope to the factory buildings now owned by the State of Illinois and the National Park Service. Recommendations about other industrial areas in the Town of Pullman or of factory remains on private land may be found in §6 *Recommendations for Future Research*, but the focus of this document is the 8-building core of the factory. This document includes discussion of the adjoined NPS-owned and State of Illinois-owned properties because the wise management of these historic resources will be best accomplished through collaborative effort. The historical, architectural, and archaeological resources extend from the NPS property onto State of Illinois property and all are part of interconnected systems. We are providing advice on the entire block of the factory site in the hope that collaborative decision making will produce a unified approach to these cultural resources.[25]

The map analysis in §3.4.4 *Work Process from Maps and Inventories* illustrated the rough evolution of activities in the various buildings in the factory's core, when possible subdivided by floor and/or section. In order to evaluate the potential for archaeological deposits over the factory landscape, we have extracted information about known subsurface utility installations at various points in time. Figures 5-1 to 5-5 show the footprint of various utilities systems throughout the complex. These drawings are clarified illustrations derived from tracings of blueprints and plan maps in various archives. As such, they should be understood to be interpretive plans. The source drawings were of widely varied scales and quality and the plotted locations of pipes were not always precise or accurate. For instance, standpipe locations in the Steel Erecting Shop and the Wood Machine Shop often appeared in slightly different locations within those buildings in different maps. The final drawings represent the best estimation of the number and location of such features.

We have not yet found plan maps or blueprints for several expected systems, including compressed air lines and the vacuum system for removing sawdust from wood-working areas. Dan O'Rourke reported references to the reuse of utility trenches and access points for new utilities (O'Rourke 2000), suggesting that infrastructure systems may be "nested" in existing features in some areas. When the drive shafts were removed after the Corliss steam engine was scrapped, the trenches in which the shafts had run were purportedly reused to run other utilities. We have not attempted to determine which, if any, of the pipe systems are still in active use as drains or sewers or are connected to the city water supply.

These pipes and trench features are the archaeological manifestation of utilities planning, installation, and evolution. They reflect ideas about technical process and design, worker health and safety, and risk management and response planning and therefore have potential to yield important information about the history of these topics. Site managers should seek to map these features and systems using non-intrusive remote sensing technologies and documenting elements found intact during essential

[25] It is the intention of this report to support the collaborative agreement signed between the National Park Service, the State of Illinois Department of Natural Resources, and Pullman National Monument. The research team played no role as the agreement was established, but we will continue efforts to support the adoption of best-practices from industrial heritage and archaeology.

underground work anywhere in the factory complex. While the standing architecture from one part of the factory may have been removed, the ground floor surface and the subsurface deposits may still have archaeological integrity. As an example, the deep sewers installed during initial construction and the separate drainage system for surface runoff are part of the key infrastructure that made the town's hygiene engineering famous. Other trenches were installed at various times in the factory's history, and fill in those trench features could contain artifacts that will help date various phases of utilities installation. Because construction workers often discard trash into pits and trenches they are about to fill, artifacts in the trenches may also reveal information about daily and mundane workplace behaviors, including those that were seen as undesirable by company managers. When these features must be disturbed for site management, such as environmental remediation or installation of new utilities, work should be monitored and documented to record key historical information that may be present. This documentation will then mitigate adverse effects to these features which are otherwise eligible for the National Register of Historic Places under Criterion D. In this instance, the information contained by these remains is significant, while the physical objects or features are not.

The amount of historic digging for the installation and maintenance of utilities between the buildings reinforces the low probability of intact, pre-Pullman era features in lower stratigraphic levels. Since the drains and sewers were dug into the subsoil below the initial landfilling in order to facilitate drainage, the trenches also likely disturbed any buried sites. The only area of the factory grounds with minimal disturbances of this type is in the small section of ground between the front factory buildings and Lake Vista. The excavation of the engine's cooling pond likely compromised any pre-Pullman features as well.

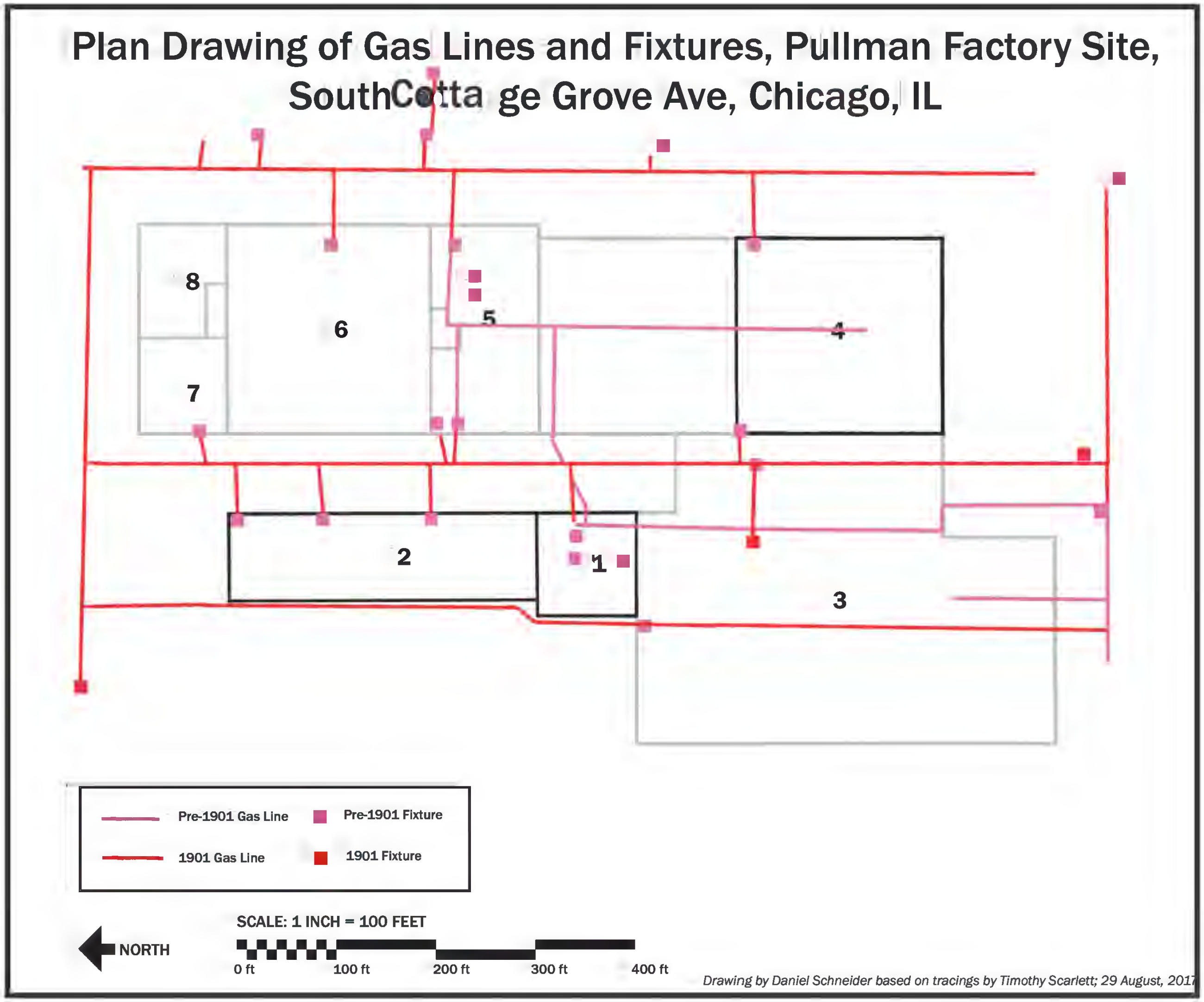


Figure 5-1: Gas lines extracted from maps dated 1900-1910.

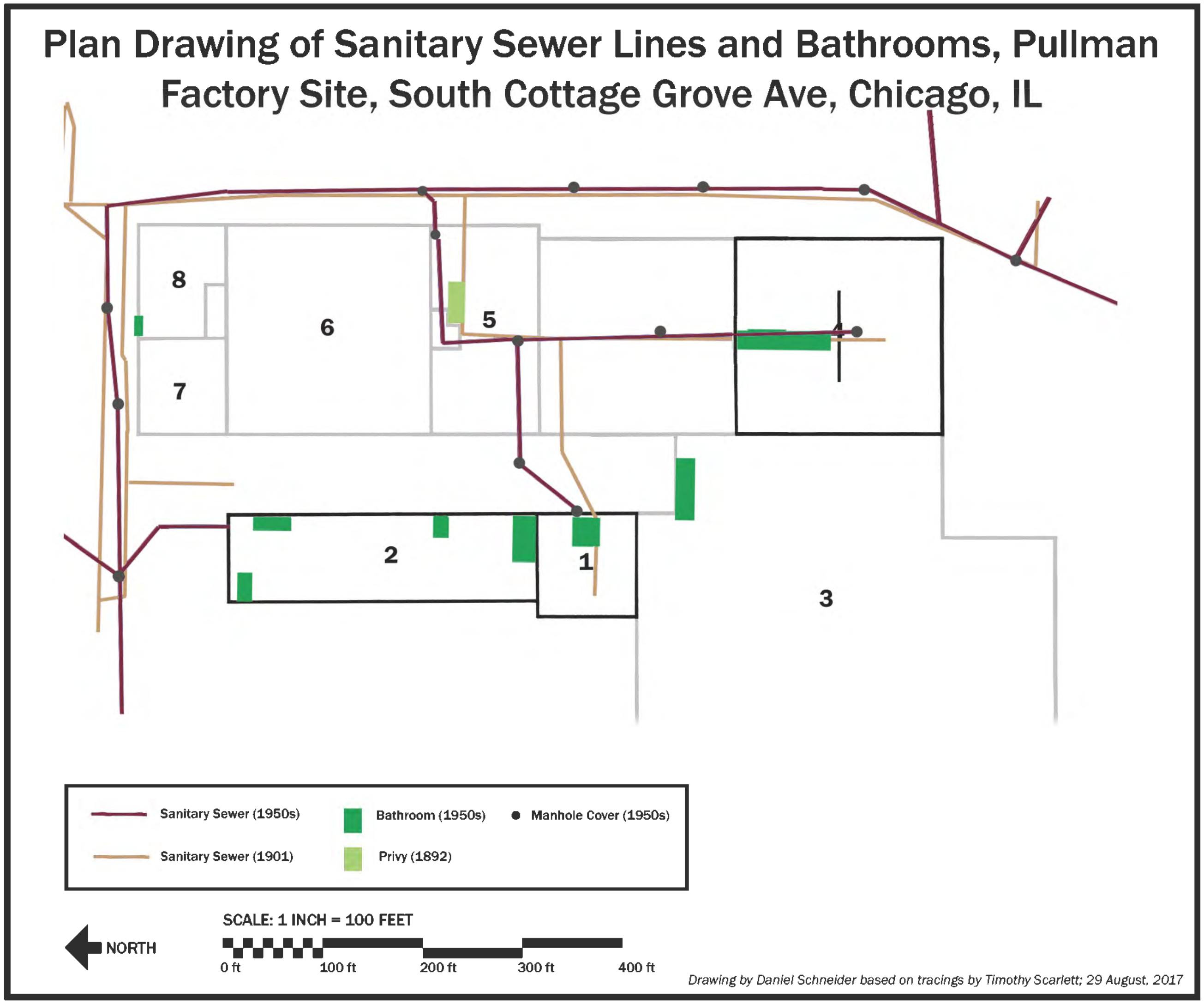


Figure 5-2: Sewer Lines, Privies, and Toilets, 1880-1955.

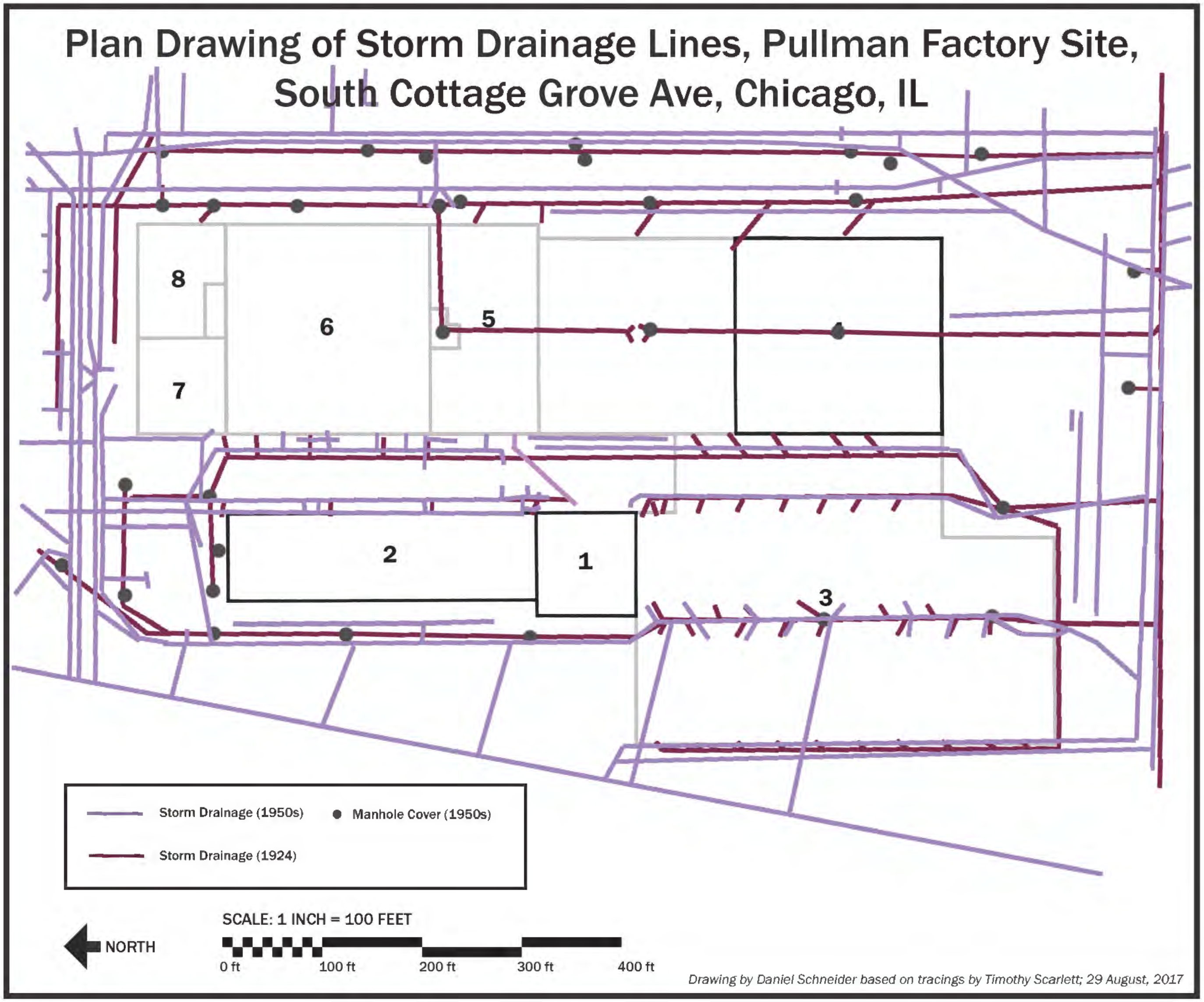


Figure 5-3: Storm drainage lines, 1901-1955.

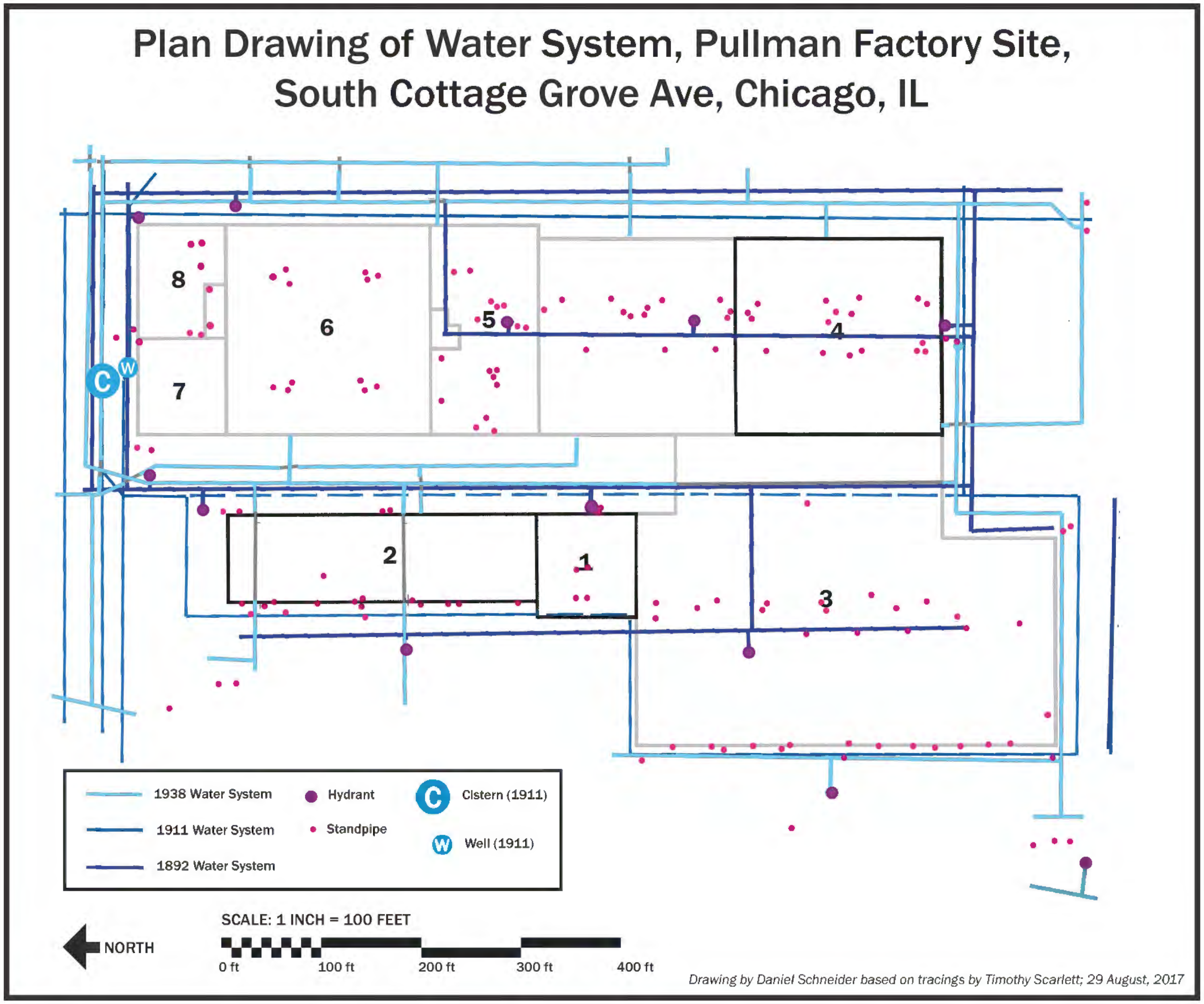


Figure 5-4: Plan of water system with hydrants, standpipes, wells, and cisterns, 1880-1955.

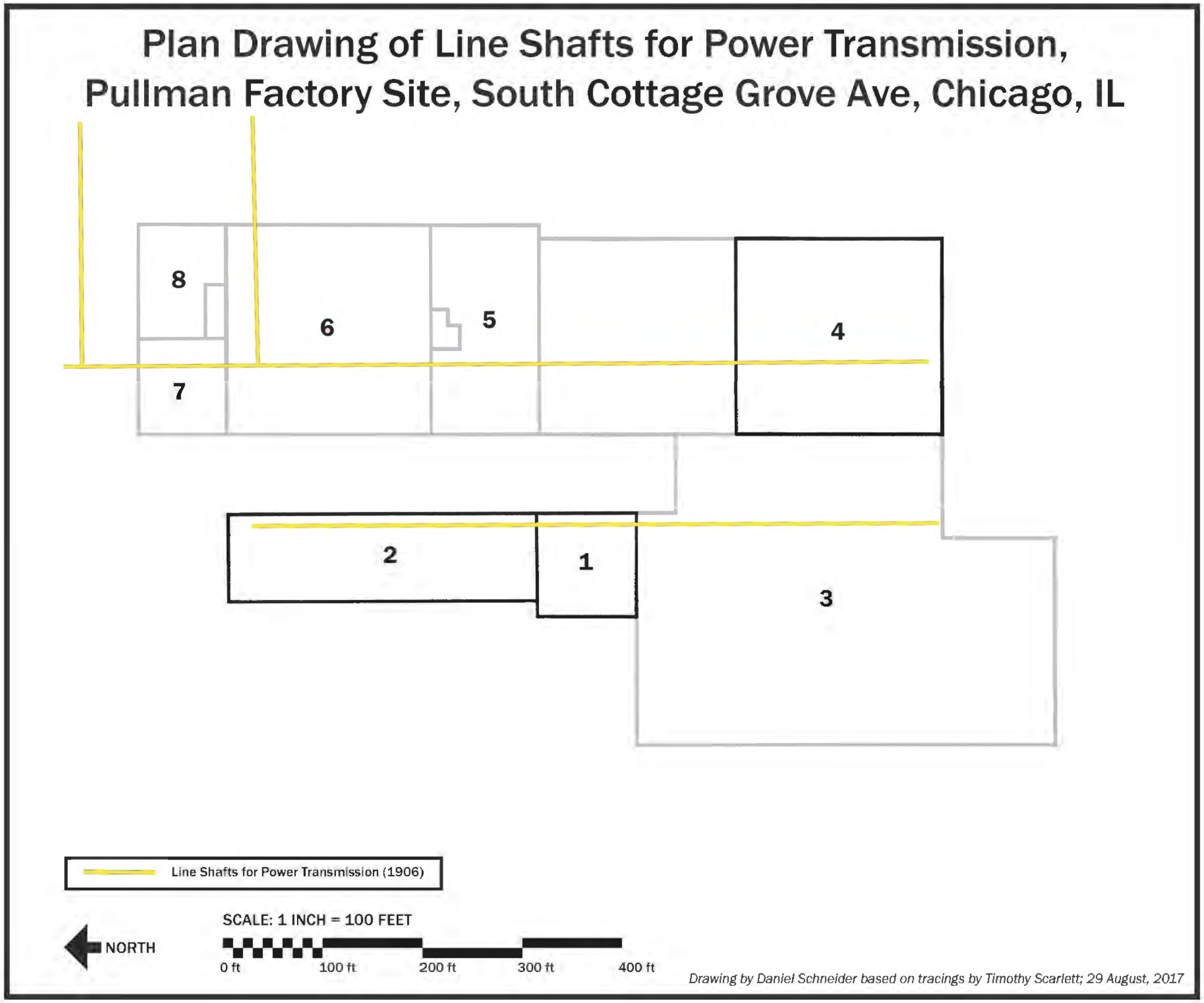


Figure 5-5: Plan of drive shaft system for factory core, c. 1880-1905. There is no indication as yet where the connecting shaft ran between the eastern and western drive shafts through the factory core.

The factory core includes standing buildings, buildings in ruin, and buildings which remain only as the ground floor and foundations. Our recommendations are primarily directed at capturing details about how space was used over time between and within the factory buildings in an attempt to gain more resolution for activity areas and work process changes over time. While the factory buildings and the landscape are documented in many photographs and archival documents, those historic records focus on particular moments in time, are composed to present a particular scene, and are not systematic or comprehensive. Since the archival sources lack any records of key periods, archaeological recording will provide very important data on "as built" and "as used"/"as lived" aspects of factory work over time.

All of the buildings should be mapped with an EDM or total station and then recorded using LiDAR or photogrammetric documentation that allows for high-resolution photorealistic 3D renderings, including remaining floors, foundations, and walls/roofs. Buildings floors should be scanned with remote sensing instruments, at least using ground-penetrating radar (GPR). If possible, remaining floors should also be assayed for chemical residues using portable X-Ray Fluorescence (pXRF). The remote sensing and point cloud modeling work will establish complete surface maps and subsurface projections of underground features for all buildings, while the pXRF survey will reveal any residual chemical traces that could indicate specialized use of space within individual rooms. The photorealistic 3D point clouds can be used for several purposes, including documenting the current state of the brickwork; looking for patterns of wear on floors that can be attributed to work flow, machine locations, and any patterned movement of people and things in workspaces; examining walls, structural elements, and ceilings for traces of anchors or supports for machinery, catwalks, or other infrastructure; and finally for future deformation study to assess the long term stability of the remaining buildings and standing ruins. While all of this information, particularly the digital scans, can also find applications for interpretation and public education, the primary purpose is to record the historical and scientific information to ensure effective decision making in management planning.

The monument needs a Geographic Information System data library which can become a permanent archive for both the scientific *and historical* data. This historical geospatial data structure (HGIS) will need to be designed to include geospatial information that ranges from georeferenced historic maps and the data scans mentioned above, to historical photographs, spreadsheets of historic and environmental data, and text documents. Collecting these data and building an HGIS need not be completed all at one time for the entire factory. Priority can be given to areas of the factory remains that will be damaged through essential tasks, such as remediation of environmental hazards, installation of utilities, and preparation of grounds and facilities for visitor access. The maps of utility pipes and related features that were gathered for this study provide for the first major ground truthing exercise for the remote sensing data in the GIS, starting with the factory floor of the concrete factory addition (Building 3, see below).

5.1.1 Office and Clock Tower Building (Bldg 1), North Erecting Shop (Bldg 2), and Rear Erecting Shop Sections A and B (Bldg 4).

Since the 1998 fire, the main office building has been gutted, and through the re-erection of the clock tower, moderately altered by the addition of a wood-frame. At the same time, a considerable amount of interesting archaeological detail remains in the brick walls at all levels, patterns that can be used to examine the past configurations of the building, as well as the floor. The main office was substantially remodeled in 1921, and perhaps in subsequent years as well, all of which left indications on the brick walls that survived the fire and restoration. Of particularly interest are the two E-W interior walls running the width of the building that frame the central well. They have numerous blind arches built into the fabric which appear in some cases to be load-distributing arches (this is particularly the case under the tower itself), and in other cases blind arches from former wall penetrations that may hint at the use of the interior central well. The floor has been disturbed in places during the post-fire restoration and ongoing assessment, but sections still appear to have reinforced footings and *in situ* degraded wood flooring. By contrast the North Erecting Shop (Building 2) is largely intact, although after the fire the first bay was reinforced with a steel frame. The floors and interior walls of both these buildings may contain useful information about the past work process in surface details and subsurface features.

Building 4 is in ruins and is unsafe for entry at the present time. The building has the same potentials as those just mentioned. In addition, there are two features of particular note that may include subsurface elements requiring investigation. The first of these is a fireproof electrical transformer room that was built in the 1930s. The other is one of the earliest privy locations identified on the map. That privy sits over identified sewer plumbing that appears on a 1901 plan, so it was probably built as part of the original 1880-1 configuration. It may have originally been a vaulted privy later hooked up to the sewer, but this could be confirmed through excavation. According to the 1894 map, that privy is the only toilet in this part of the eight-building factory complex.

Staff should have care when accessing or using the trench along the Eastern wall of all these buildings, looking for remnants of earlier power transmission (line shaft, pneumatic, and electrical) systems. In addition, effort should be made to identify where the main drive shaft connected to the power train for the front and rear shops.

When the buildings have intact (or partly-intact) floor surfaces or walls, as is the case in Building 2 (the North Erecting Shop), these surfaces should also be considered for photogrammetric or LiDAR recording. This would allow for the recordation of both surficial markings and uneven wear patterns on the floor and modifications to the walls, including anchor points for equipment and changes to the brickwork over time due to adding and removing mezzanine or catwalk structures, cranes, or equipment. While the floor in Building 2 seems to have clues to past use, assessment is difficult because the space is crowded with stored material and accumulated soils and vegetation. We would recommend that as things are moved around in the course of other activities, such as construction, staff clean and record floor surface features opportunistically and stitch those scans together as possible.

5.1.2 South Erecting Shop and 1907 Steel Car addition (Bldg 3), Finishing Shop (Bldg 5), Wood Machine Shop (Bldg 6), Engine House (Bldg 7), Boiler House (Bldg 8) and Rear Erecting Shop Sections C and D (Bldg 4).

These buildings have all been demolished. While the standing architecture has been removed, the original floor surfaces appear to be at least partly intact under the shallow topsoil and piles of rubble.

Some of the floor surfaces, such as in Building 3, have large patches of significant degradation from exposure and vehicle traffic. The preservation of other floors is much better, particularly those of the rear shops. Some of this floor was highly visible in 2004, as seen in the Scott Dremel's DePaul University field school photos. As with the buildings above, these floor surfaces should be cleaned and recorded, using EDM, LiDAR, or photogrammetry, along with elemental and remote sensing surveys for the same reasons identified above. In these buildings, floor feature maps or detailed digital elevation models should be imported into a GIS for comparison with historic maps to try to identify machine footings, worn paths of worker movement, plumbing and utility access and changes, and other clues that would enable more detailed reconstructions of activity areas and the evolving work process within the different buildings. When combined with historic photographs, these investigations will allow for 3D visualizations of the space for both research and interpretation efforts.

The 1907 expansion of the South Erecting Shop into the Steel Car Shop (Building 3) allowed for a transformation of work at Pullman and it is critical that the remains be thoroughly documented. This was an early adoption of concrete for industrial architecture. Maps show the general arrangement of some elements of the organization of metal part fabrication and the internal organization of workspace, but much more detail is needed. Close examination of the floor will show the details of how the 1880 building was expanded in 1907 and how the use of space changed over time.

While Dr. Dremell has not yet produced a report of the 2004 fieldwork in the factory, and we have not had access to original excavation notes, Jane Baxter's 2008 summary report included a review of the artifacts. She reported that while most of the diagnostic artifacts recovered dated to the building's demolition, some of the artifacts included possible tool fragments (Baxter 2008b), which would be very significant if they were recovered in stratigraphically meaningful contexts. It seems that much of the archaeology was aimed at the Engine and Boiler houses, which made sense, but more work needs to be completed to determine if stratified remains exist in different buildings.

In addition to floor surfaces, these building areas may be subjected to excavation for essential management purposes such as remediation of environmental contaminants, installation of modern utility services, and other activities. In these situations where excavation is unavoidable, managers should use the excavation as an opportunity to record information about site formation processes, including earthmoving, construction, changing use over time, demolition, and post-demolition landscape use. This is not to say that piles of demolition rubble are significant and require documentation, but until the subsurface deposits have been conclusively shown to be post-demolition rubble, managers should proceed with caution.

5.1.3 Outdoor areas, including trackways, transfer tables, staging areas, Lake Vista, and other open space.

A number of open areas and transportation features exist within the city block that includes the factory buildings. These areas include the former site of Lake Vista and the area of greenspace to the west of factory Buildings 1-3; Transfer Pit 1 between the two rows of buildings; Transfer Pit 2 to the west of Buildings 4-8; the trackage and walking paths south of the buildings; and the trackage and walking paths north of the shops (c.f. Figures 3-4 to 3-7). These areas of the site have similar potential for research.

Buried walking paths and the extent of Lake Vista could be mapped as part of the historic landscape and the changing patterns of movement in the factory block. The Transfer Pits are an innovative technology that should be studied in more detail to examine the “as built” and “as used” phases of these features. Also note that we do not know ow the mechanical drive shafts of buildings 1-3 were connected to the main drive train, nor do we know how utilities or power were routed under the transfer pit that ran between the buildings. The fill within these large features, such as Lake Vista and the Transfer Table pit, will be from later periods at Pullman. While disturbances to the fill should be monitored, the monitoring can occur during excavation work. In this sense, the Water Tower project is a good example of how these activities can be conducted, with the exception that archaeologists should help design plans and then monitor the digging process because certain types of features should be anticipated in specific locations and examined closely.

We provide specific examples of the kinds of evidence here, although this list is not intended to be comprehensive:

1. Sealed or encapsulated features will be found around (and within) the buildings. These features will date to initial construction, episodes of fill and re-excavation, and final abandonment. Example features include covered or filled-and-covered drive shaft trenches, cisterns, water intake and fire suppression pipes, and builder’s trenches along foundations. Some of these features will be filled with artifacts and ecofacts from the initial construction of the factory complex in 1880, while others will be filled with post-WWII sediments and artifacts outside the period of significance for the Monument. Features like these provide an opportunity to recover soil and sediment samples for palynological, geochemical, archaeomalacological, paleoentomological and other samples that will provide gritty and detailed pictures of the factory’s physical environment over time. These can provide unique evidence of the temperature, humidity, acidity, salinity, air quality, and other details of microclimate in and around workplaces over time, providing details for environmental and landscape history, as well as information about the nitty-gritty lived experience of working in Pullman’s shops, things that nobody wrote down.
2. This microclimatic and paleoenvironmental data must be connected to the overall landscape history of the site, documenting the landfilling that preceded construction, subsequent cut-and-fill or depositional events, transformation of spaces or reuse of them, such as running new track spurs over building ruins, and the post-demolition environment. These studies can link to those of the town’s landscape over time, giving a holistic view of the landscape and environment.
3. Any sealed features, such as those that students seem to have excavated in the Engine House in 2004, should be considered highly sensitive. They are likely to contain information about work in activity areas. In the Engine House, for example, perhaps those features were filled when the Corliss engine was installed or when it was scrapped. Both of these time periods are of interest to industrial archaeologists, as they were times of punctuated change in the factory’s operations. This material is also significant because historic documents do not capture the level of detail beyond general descriptions of major activities done in specific floors of different buildings.

4. Given the story of the frantic pace of the build-out of the factory and community, excavators should pay close attention to any stratigraphic deposit that appears to be associated with construction. Given Pond's description of how the buildings were assembled, with designers and builders sketching out details together on building floors and foundations, it is easy to imagine buried artifacts that include pencil or chalk sketches from those deliberative moments and the remains of workers' meals. Artifacts such as these would be invaluable records of the process of collective creativity among a community of "makers," being a physical manifestation of the social negotiation of design. Particularly since the masons and artisans contributions are otherwise mute in the historic record, these objects would be of great importance to both research and interpretation at the Monument.

5.2 Environmental Hotspot Concerns

The National Park Service has expressed concern about three potential hotspots of environmental contamination identified by the Illinois Environmental Protection Agency. We overlay these locations onto our scaled drawings to see if any observed features could explain the hotspot pattern. Figures 5-6, 5-7, 5-8 and 5-9 plot the areas of concern as dotted red rectangles. These rectangles appear on top of the 1888/1894, 1911, 1938 fire insurance maps and the "stitched" ca. 1955 plan maps. In each case, there seems no obvious correlation between the hot spots and known past land uses.

The first hot spot is a concrete box containing an electrical transformer, sitting just outside of the front door to Building 1. This transformer box does not appear on any of the maps, particularly not the two maps that show other transformers: the 1938 Sanborn and the ca. 1955 War Department plan drawings. This suggests that the concrete transformer housing was built sometime after 1955.

The second identified hot spot is a hydrocarbon plume under the concrete floor of Building 3, the steel car shops. Given the location of this hot spot, there is nothing on the maps to suggest why hydrocarbons would saturate sediment in that location. We have not reviewed the analysis, so we have no understanding of the concentration of the plume, but the residue is not necessarily connected to steel car manufacture.

The final hot spot was indicated by a visible venting pipe emerging from the ground. The NPS is concerned that it might be venting an underground tank of some type. The maps show no indication of a tank ever being in that area, nor any activity that would require one. It is possible that the pipe was installed post-1959 after the building was razed. It is also possible that the pipe is actually part of the fire suppression sprinkler piping, abandoned gas lines, or pneumatic pipes running through the shop. The pipe system is chaotic, as shown in Figure 5-10, which plots all the raw data overlay upon the 1938 map. Considerable data are missing, however, so these maps should not be read as comprehensive.

Our review did suggest some other area for consideration, including features from the 1880s (a buried mass of lead, above-ground varnish and paint storage, and a painting activity area) and two 1950s features (X-ray and darkroom facilities destroyed by fire). With the exception of the lead deposit, the other uses were are all above ground activities on floors that have now been exposed to weather for at least 30 or 70 years. The lead deposit was purportedly poured into a major crack in the foundation of an engine. Historic documents may refer to the foundations of the Corliss Engine on this property or it may have been the smaller engine in the Freight Shop which also provided power to the drive shaft system (Viall 1915). The former is more likely than the latter.

5.3 Conclusions

Hotspot remediation is a good illustration of decision making regarding these resources. Managers must remediate contamination that poses a threat to public health. The remediation will likely have an adverse effect on the resources, but in the case of the foundations and buried pipes, the adverse effect can be mitigated with historic research and scientific recording of the features exposed during remediation. The recordation can occur before or during remediation work, depending upon the type of work. In situations like the vent pipe, a cultural resources professional can monitor things as excavation occurs to uncover the tank. During excavation, the monitor can record all information about the buried feature, its integrity and period of construction or abandonment, its contents, and other noteworthy information, along with recovering any artifacts or samples needed for processing. While it is always best to preserve *in situ* as much of the historic and archaeological fabric as possible, the significant information about utility pipes, cisterns, and power systems can be recovered and recorded through excavation and analysis.

The National Park Service and the State of Illinois should do all they can to conserve the remaining building foundations and ruins intact, available for research, and visible to the public—so long as public health and safety are not compromised. All of the buildings and foundations in this area are significant to the mission of Pullman National Monument. All the buildings were built in the initial construction of the factory in 1880-1, except for the 1907 concrete addition. The 1907 addition was built upon one of the original 1880s erecting shops. This change shows the transformation of the company as it shifted from wooden to steel car manufacture, a change with transformative ripples that spread throughout the rest of Pullman's employees, from the foundry to the porters working throughout the network. If remediation requires that this entire foundation be removed in order to access contaminated soils underneath, this loss must be mitigated though through recordation of the building's remains and the associated subsurface features like those described above.

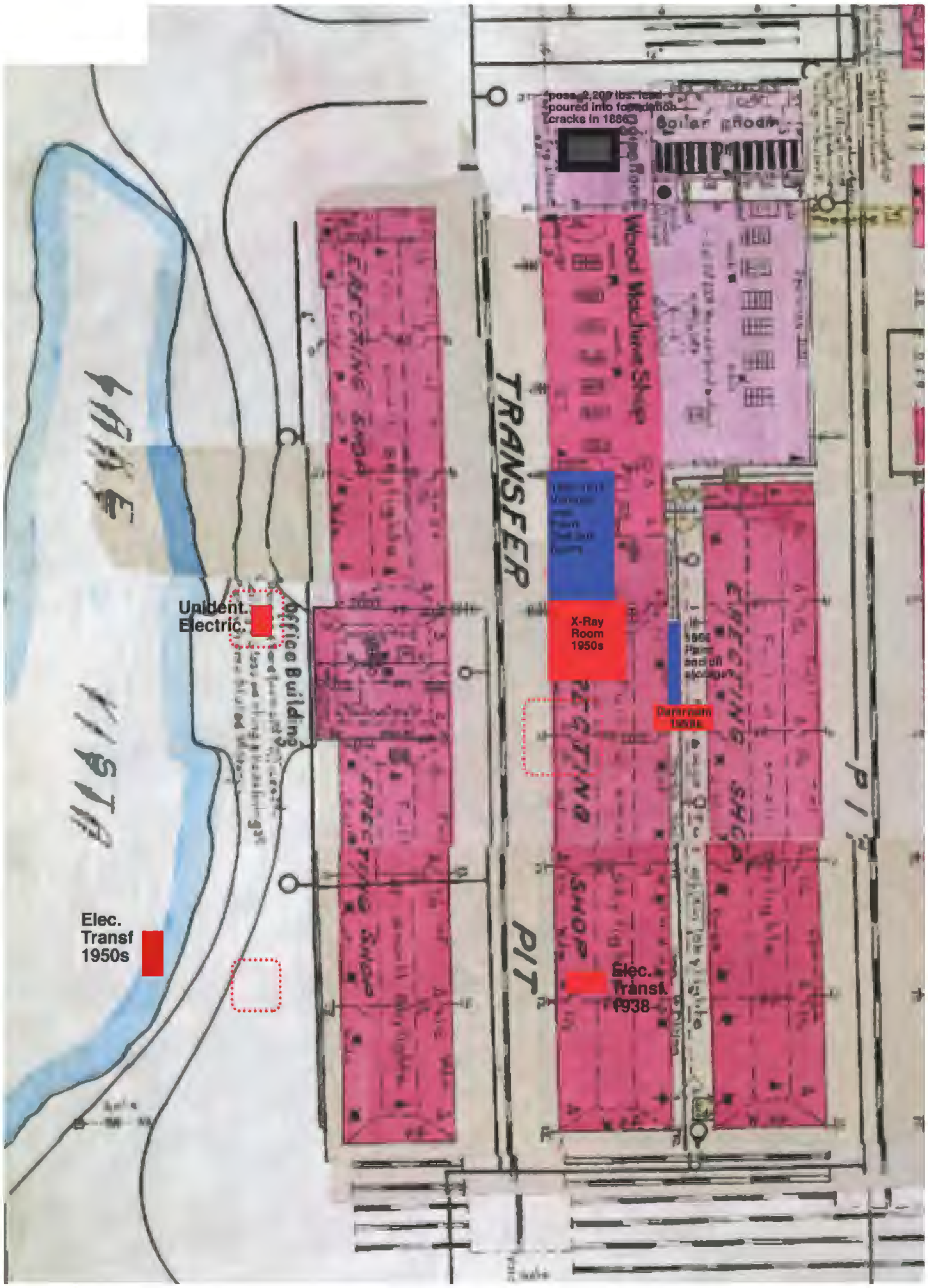


Figure 5-6: All IEPA-identified hotspots superimposed upon 1888/1894 Sanborn Map, showing relationship between identified concerns and building rooms/use areas.

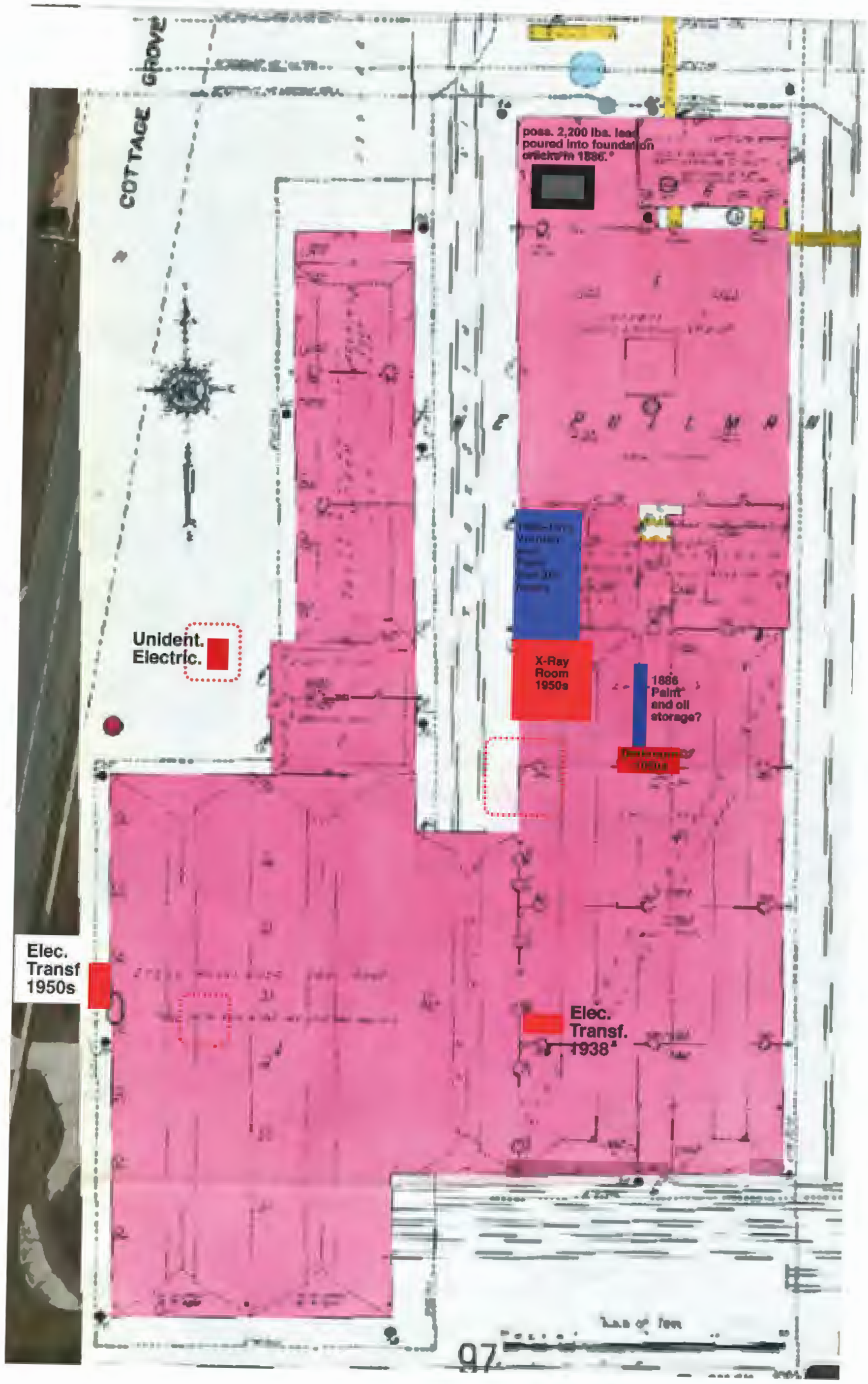


Figure 5-7: All IEPA-identified hotspots superimposed upon 1911 Sanborn Map, showing relationship between identified concerns and building rooms/use areas.

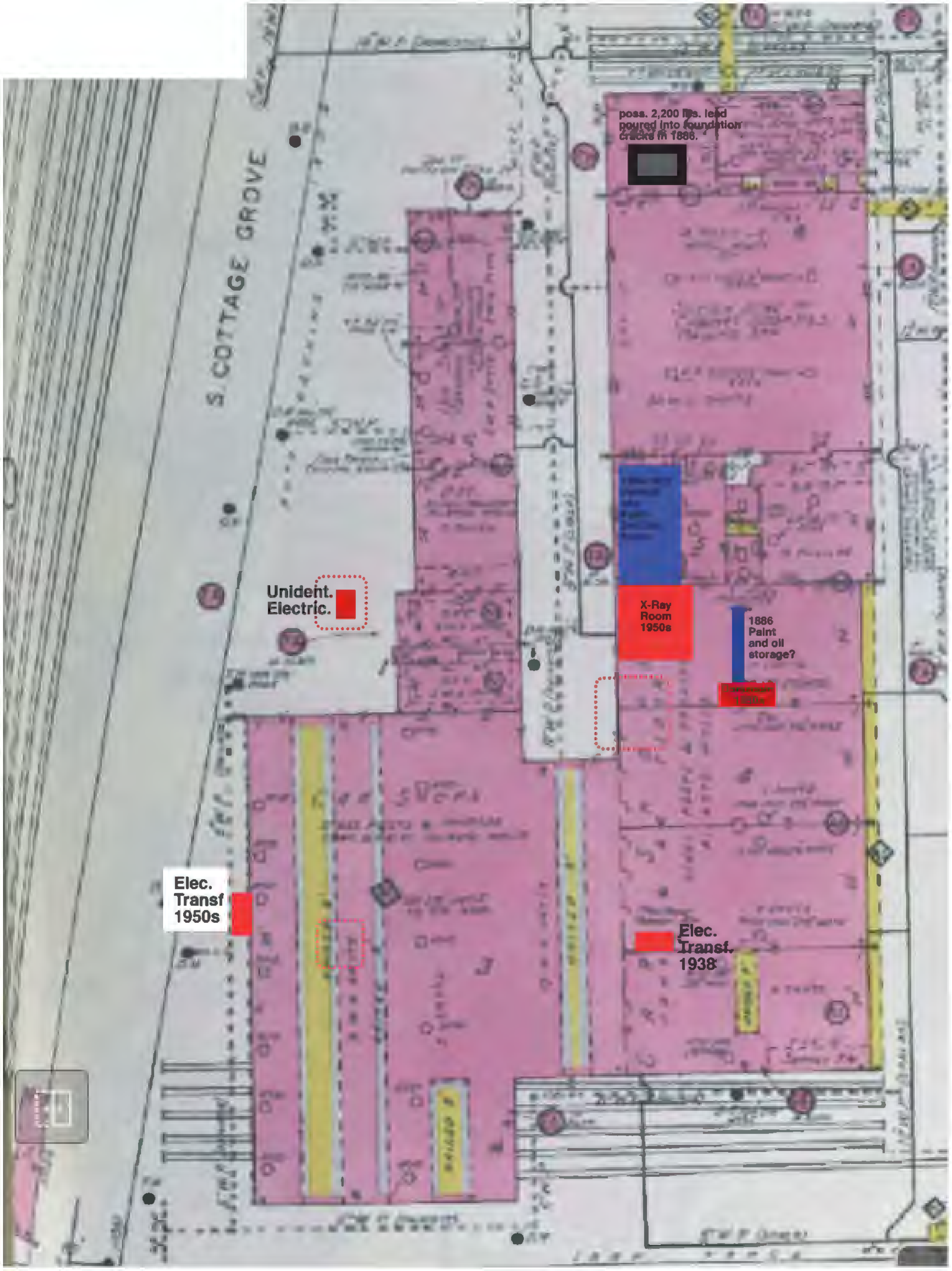


Figure 5-8: All IEPA-identified hotspots superimposed upon 1938 Sanborn Map, showing relationship between identified concerns and building rooms/use areas.

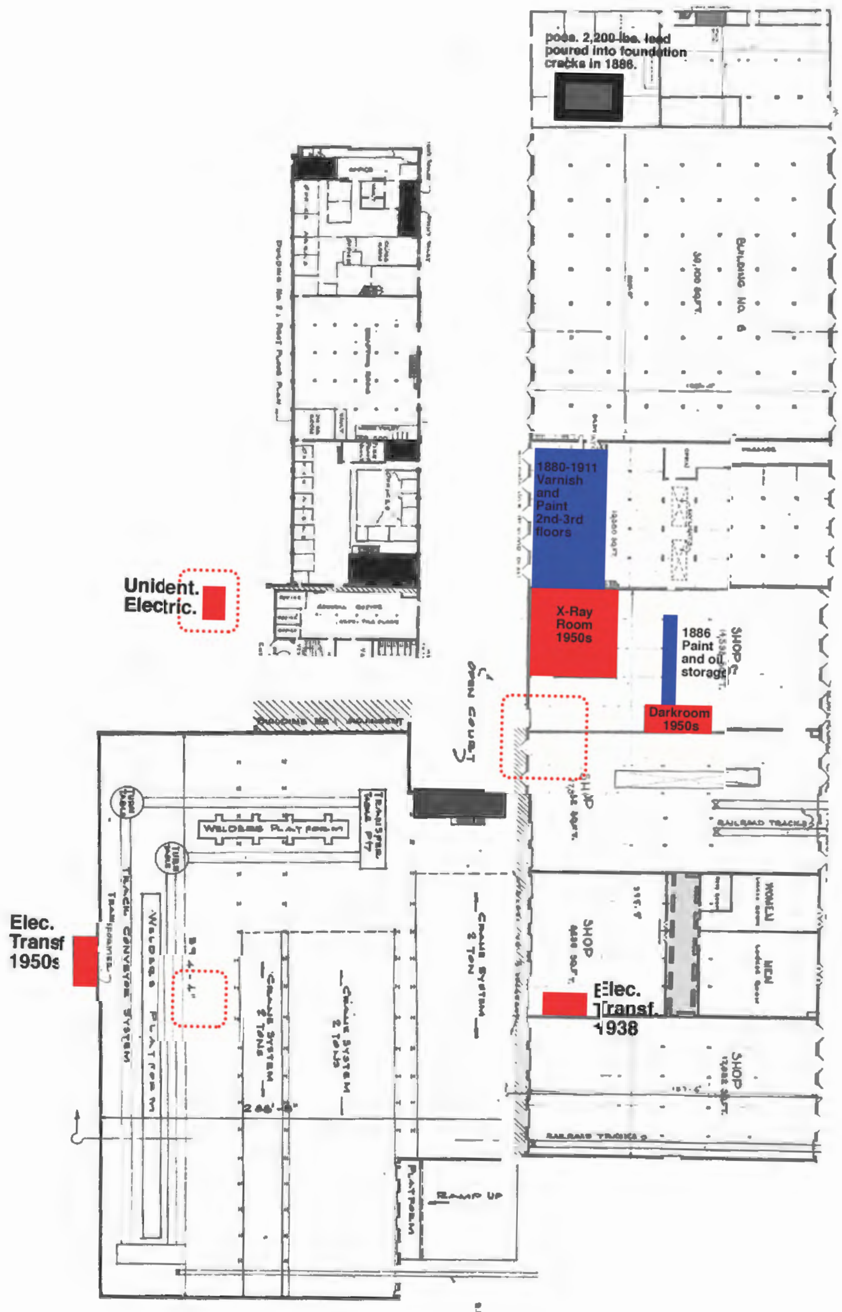


Figure 5-9: All IEPA-identified hotspots superimposed upon c. 1955 Building Plans, showing relationship between identified concerns and building rooms/use areas.

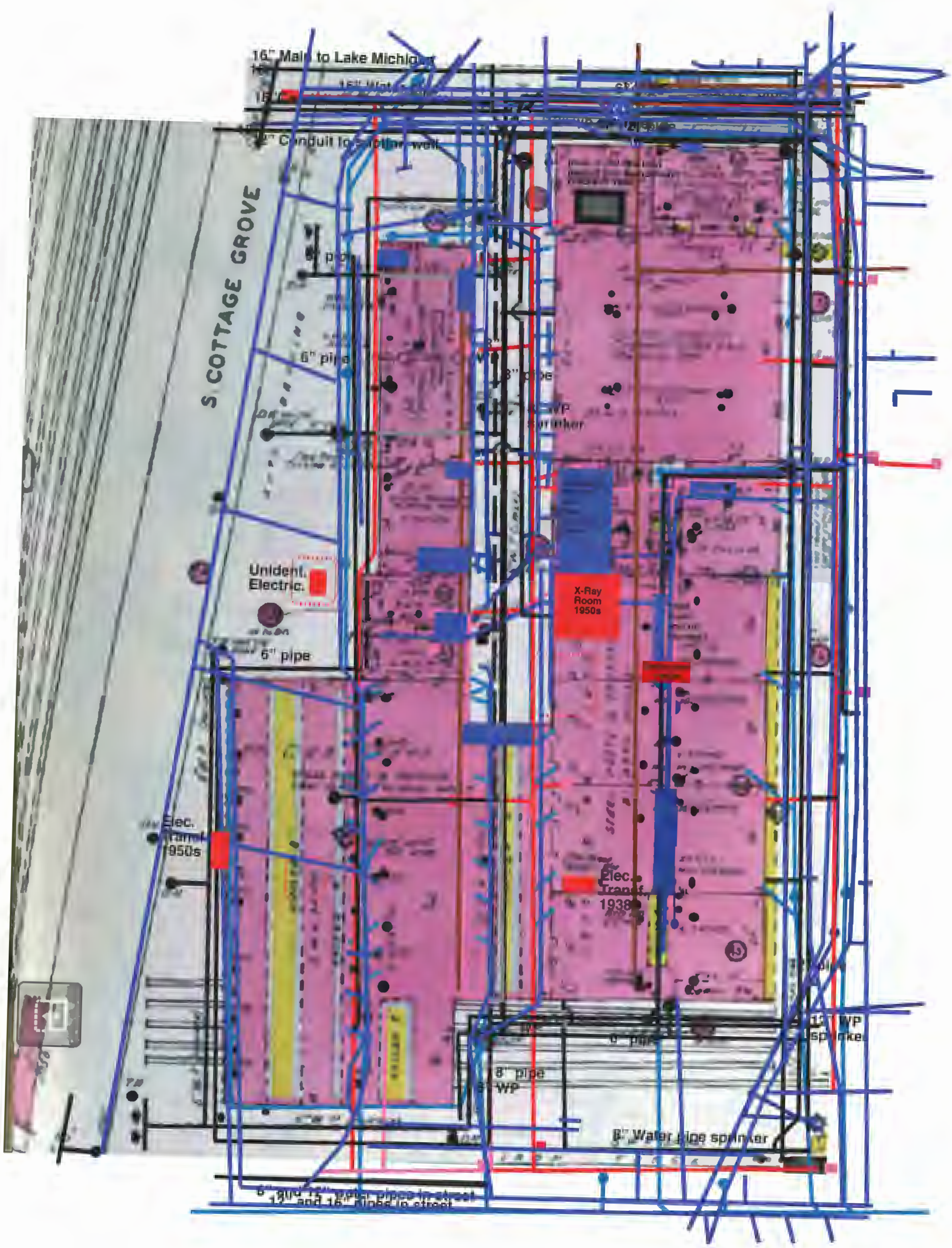


Figure 5-10: Total Utilities Systems raw plot map with IEPA-identified environmental hotspots and concerns identified from historic maps and records. This raw plot shows the chaotic nature of utilities as drawn, rather than as schematic plots in Figures 5.1-5.5.

6 Recommendations for Future Research and Management

Pullman National Monument benefits from varied and rich heritage resources, including a very wide range of primary and secondary documents numbering in the hundreds of thousands of pages spread through numerous archives, hundreds of historical photographs, a tremendous array of artifacts and material culture objects related to the Pullman company and communities, diverse oral histories, and active community organizations. Although little remains of the extended factory complexes or the commercial and academic architecture, the core of the passenger car manufacturing buildings are owned by the state and federal governments. The neighborhood landscapes and many residential structures still have a great deal of integrity. Using all this material, the managers at Pullman National Monument will be able to establish exemplary practices in the management of industrial heritage, including the coordination and facilitation of future research, interpretation, and management planning.

As Michigan Tech's research team transitions to the task of preparing the *Historic Resources Study* for Pullman National Monument, it is appropriate for us to consider how the existing factory remains can contribute to future research goals beyond those addressed in Chapter 5, and to the extent possible, how scholars and interpreters can connect the factory with the community, landscape, and metropolitan, national, and international contexts. This consideration is informed by three key National Park Service documents: *Revision of the National Park Service's Thematic Framework* (U.S. Department of the Interior 1996), *Labor History Theme Study* (Arnesen, et al. 2003), and *Labor Archaeology Theme Study* (Siebert 2014). These sources frame the groundbreaking work of Jane Baxter and her colleagues in the DePaul Program in Urban Historical Archaeology and Pullman (Agbe-Davies 2008; Baxter 2008a, 2012; Baxter and Bullen 2011), who defined a thoughtful set of goals and objectives for community archaeology in this Chicago neighborhood. We expanded upon DePaul's goals in order to look at the factory site in our *White Paper: Designing Best Practice for Industrial Archaeology and Industrial Heritage at Pullman National Monument* (Scarlett 2017). Finally, in considering the significance of academic discussions that can shape future work in Pullman National Monument, we use the unpublished Trip Reports and our personal discussion notes from the Organization of American Historians Round Table held at Pullman National Monument in May of 2017. The meeting included historians Marcia Chatelain, Eric Arnesen, Janice Reiff, and Davarian Baldwin, as well as several National Park Service staff and other guests.

This discussion examines several key areas of future research into life at Pullman. These themes are connected to the National Park Service's revised Thematic Framework and Theme Studies in order to show how research can be used to inform staff decisions to prioritize issues in management and interpretation. These studies can all draw upon documentary and photographic evidence in regional archives, archaeological investigations, material culture studies, and oral histories in order to establish robust case studies in different thematic areas.

6.1 Themes

All of the questions and topics in this chapter connect the stories of Pullman to the National Park Service Thematic Frameworks (U.S. Department of the Interior 1996), including:

1. Peopling Places (especially Family and the Life Cycle; Migration)
2. Creating Social Institutions and Movements (Clubs and Organizations, Reform Movements; Religious Institutions and Recreational Activities)
3. Expressing Cultural Values (particularly Educational and Intellectual currents; architecture, landscape architecture, and Urban Design)
4. Developing the American Economy (Distribution and Consumption; Transportation and communication; Workers and Worker Culture; Labor Organization and Protest)
5. Expanding Science and Technology (Experimentation and Invention; technological applications)
6. Changing Role of the United States in the World Community (Commerce; immigration and emigration).

Any large-scale study of Pullman's employees and the community will generally include topics that align with themes identified in the *Labor History Thematic Study*, including Working and Moving, Living and Dying, Playing and Praying, Teaching and Learning, Organizing and Struggling (Arnesen, et al.: 4-18), as well as those highlighted by the *Labor Archaeology Theme Study*: Labor Processes; Labor and Identity; Labor, Class, and Conflict; and Communities and Collectives (Siebert: 11-37).

The DePaul Program in Urban Historical Archaeology and Pullman combined these different threads into a set of five themes for their community-engaged projects. These themes are useful as places from which to explore the future of work at Pullman National Monument, Pullman State Historic Site, and in the community of Pullman:

1. Transformations of Industry and Society in the Gilded Age
2. Planned Communities and Utopias
3. Labor and Collective Action
4. Community History (including Immigration, Gender, and Ethnicity)
5. Working Class History and Heritage

Pullman is a worthy place to ask many historical questions about industrial growth and change during America's Gilded Age in and beyond the country's "Shock City." While much has been written about George Pullman, the origins of the Sleeper Car, and the planned factory and community, we need more detailed and systematic understandings of how the community of workers at the Pullman company compared with those of other major manufactories in Chicago. Nor do we really understand the Pullman Company's growth as an international business, but these are not questions for this study. We will not focus upon these questions, since this study concentrates on the factory and looks outward to the town, city, nation, and the world. The future research needs identified here are those which most clearly and effectively grow from the factory site itself, but connect in compelling ways to the records, materials, and resources that can tell larger stories about Pullman, the nation, and the world.

Following the example of Jane Baxter and her colleagues, these examples also generally focus on the "lived experiences" of people in the past, where business or technological history are understood through the lives of people. Yet these research projects need not be "archaeological" in a narrowly defined sense, since industrial and historical archaeology also draw upon documentary, architectural, material culture, oral history/ethnographic, experimental, and ecological evidence. Future research should also be collaborative, starting with the *Historic Resources Study*, where the strong community organizations in Pullman can identify local interests and needs. Academic research and management decisions should not be divorced from community objectives and research into how collaborative research is best structured should be a part of this process.

6.2 Networks of Labor

The story of labor at Pullman is a critical element of many interpretive themes for the National Park Service and is one of the basic missions of Pullman National Monument. The networks of work and labor are critical to understanding Pullman, both at the factory site and at the many networked places where Pullman cars operated on rail around the world: Where do workers come from (both factory and porters, as well as other workers in the Pullman network)? How are they educated in their work skills? How long do they stay in Pullman's employ? Did workers shift from manufacture to maintenance and vice versa? How much professional, economic, and social mobility do they have? What access did they have to education and recreation? What were rates of injury or disease and how did health compare in different communities? To what extent do relationships established at Pullman's shops continue in labor elsewhere? How did workers organize themselves? Which workers lived in Pullman vs. other neighborhoods and communities in South Chicago? Did porters cluster in specific locations through the rail network? How often did Porters move between routes of service? To what extent did family connections shape the opportunities within Pullman, for maids, porters, carpenters and steelworkers?

The research focus must be on networks that stretch beyond site boundaries, despite the limiting focus on this particular study, connecting the makers of cars with the operators and the maintainers of the rolling stock around the country and in other Chicago neighborhoods. A series of case studies should use historical and archaeological analyses to determine patterns of common experience as well as individual stories aimed to represent the diversity of people's backgrounds and experiences with race, gender, class, religion, skill levels, and so on. These studies must be linked with other archaeological studies of Chicago neighborhoods, such as those undertaken by DePaul University's Urban Historical Archaeology collaboration with the Field Museum, which ran projects in Bronzeville (Agbe-Davies 2008, 2010a, 2010b) as well as studies of Mayfield, Edgewater, Chinatown, and Camp Douglass, a Confederate Prisoner of War camp (Gregory 2015). Rebecca Graff has also run a research program in nearby Jackson Park (Graff 2011, 2013) which became essential to the NEH-funded project *Digital Chicago*.

6.2.1 Big Data about Workers

How can big data be used to examine industrial workers in innovative geospatial ways? Pullman's rich records of employee cards and ledgers of worker pay, duties, health, and service can be used to establish an Historic Geographic Information System database (HGIS) that would allow for detailed analyses of workers' lives. Scholars like Susan Hirsch and Janice Reiff have already been working in this area. Eric Arnesen and his coauthors also identified movement as a key theme in understanding how people interact with places, each other, and their communities in labor history (Arnesen, et al. 2003). A large-scale collaboration among many of the archives and heritage sites could produce an HGIS that provides a valuable research tool for network-wide studies while also allowing for innovative digital interpretive materials and collaborative community projects (Bodenhamer 2007; Lafreniere 2015; Ridge 2013). Pullman National Monument could host the HGIS as a lead collaborator, while operating a brick-and-mortar archive in partnership with the Pullman State Historic Site and Industrial Heritage Archives. This would unite the digital and historical archives for research and interpretation.

6.2.2 Drawings and the Transformation of Artisanal Skill and Labor

Drawings played a key role in the transformation of autonomy in the visual culture of work as artisans were transformed into disciplined workers for industrial capitalism while creating new forms of skilled labor in American industry (Brown 2000; Lubar 1995). In Architecture, Bemen and Pond's drawings became tools of communication about design and construction, but were part of the social process of creativity in the building of the factory and town. Within the Pullman company, hundreds of thousands of drawings of cars further extended administrative control over production. As drawings and blueprints became increasingly detailed, authority shifted in the process of design and manufacture and increasingly removed artisanal judgement from work, similar to how jigs and guides operate on machine tools and affected the transition to steel car manufacture. As management and labor changed in the late nineteenth century, drawings became one of many ways that management sought to document, track, and control work processes and decision making among the employees. The drawings relate to job cards and other tracking paperwork that rose with the Pullman company's adoption of elements of Systematic and Scientific Management. From the work of draftsman Pond, Pullman saw the rise of a new group of managerial professionals that shaped the work process from a room filled with drafting tables and drawing equipment. Future research should examine this process at Pullman and relate it to the evolving management practices used to regulate the shop floors.

6.2.3 Biographical Investigations of the main engineers of Pullman

The network of individuals responsible for the design and construction of the town and factory of Pullman have long been known, yet their work at Pullman has not been contextualized within their overall careers. To what extent were Pullman's shops training grounds for professionals at different times? When did Pullman draw in outside experts vs. promoting the company's own staff? To what extent did their associations with one another and with Pullman continue to be important over their careers? Studies of these individuals can track them through their respective professions' literature because each was also responsible for other major projects in the late nineteenth century. As such, their collaborations at Pullman should be situated within each of their careers as fully as archival resources and secondary literature may allow. Studies should examine the lives of Nathan F. Barrett, T.A. Bissell, Max Hjorstberg, Irving K. Pond, and Benzette Williams.

This should not be read as advocacy for "top-down" or "big man" style historic studies. The HGIS will provide ample resources for new studies of other workers at the company, including those who left scant documentary evidence of their lives. These studies will be essential to understand how/if the community of workers at Pullman formed, changed, and influenced trajectories in workplaces around the region (Knowles 2013; Meyer 2006). The lead engineers' stories can be told alongside those of carpenters and upholsterers who were less well known. To what extent did people build networks at

Pullman that they exported to workplaces elsewhere, as directors/managers, those with trades, or laborers?

6.2.4 Race and labor

One of the largest areas of research is the need to compare and contrast the role of race in Pullman's networks of labor. Scholars have produced considerable research on the American Railway Union and the Pullman Strike as well as the Brotherhood of Sleeping Car Porters, their struggles against the company, and efforts to advance civil rights. These two areas of scholarship have not been correlated or integrated, and they are usually told as separate stories of struggle. Race and Racism are central to understanding labor at the company, and as emphasized in the OAH discussion, telling this part of the story will be difficult without creating false equivalency or treating the struggles as entirely separate. The HGIS will provide a new tool to examine these stories, allowing for the geospatial as well as geochronological analysis of workers and their communities in the production, maintenance, and operations divisions. Race and racism must become a central axis to the stories of Pullman, at the factory and throughout the network.

In addition to race and the networks of labor, the HGIS will enable detailed study of the Pullman community and its transformation. Pullman National Monument needs to know how the neighborhoods in and around Pullman changed over time. How did property values, economic cycles, and environmental degradation relate to changing racial and demographic patterns in the town? How did racism influence deindustrialization in the community of Pullman vs. the network of other employees in the company's operations and maintenance divisions?

Finally, the palace car was itself a mechanism for growing consumerism in the United States. The OAH returned repeatedly in their discussions to the fact that the Pullman company built a market based upon upper-class service that sold ideas of class, refinement, gentility, and postbellum plantation nostalgia among white travelers throughout the country. Are there geospatial patterns of these racialized experiences as rail travel moved people among different geographic regions? What patterns exist in social mobility among the Porters and maids vs. the factory workers over time? What about spatial mobility? Can a large-scale study reveal the influence of the Pullman company in the Great Migration and flows of people and ideas between places? Are there patterns of recruitment, training, and work assignments that pattern along other lines, such as family or social networks?

6.3 Invention and Innovation

Pullman is a center of technological innovation, although the inventions are not always technologies in the narrow sense of that word. Pullman's innovation mentioned above was in service and marketing, not the invention of novel machines or work process. Factory innovations included operations at scale and the resulting management strategies, organizational techniques, and motivational tools developed within Welfare Capitalism. As mentioned in this report, the sanitation and hygiene systems were innovative, for example, but for more than simply engineering distinct sewer and storm water drainage—the entire community plan was noted as an achievement (for better or worse). We have begun an inventory of innovations and developments, but this must be expanded to the entire factory site, the entire nationwide operations network, and the entire history of the Pullman Company. The

Monument should be able to show production flow diagrams that include both evolving feature system and related activity areas throughout the factory and town and explain how those flows were regulated and controlled. This should then articulate with the maintenance and operation divisions. With more research in the archaeological remains and the historic documents, it will be possible to map taskscapes at the Calumet Shops for example, or complete Mobility or Access Graphs for the Foundry and the Palace Car Works. These studies will allow for thick descriptions of daily life for different workers in the HGIS, following their tasks and goals as they move about the landscape of the factory, town, cars, and other locations.

This research will connect the themes of Developing the American Economy and Expanding Science and Technology, although Pullman research will extend these themes into business and management practice and workplace culture. Systems operation and management are also key for the national and international network of clients with Pullman cars. Even at the factory, there are several examples of how research at Pullman National Monument can contribute to studies of Innovation and Invention, including those that are useful explorations of the transformation of industry during the Gilded Age.

6.3.1 Transfer table technology

One of the most notable technologies at Pullman was the use of transfer tables to move railcars in various states of construction between the rail sidings and the erecting shops, painting bays, and final detailing stations before they were sent out to their purchaser. Although Pullman was not the earliest railway erecting shop to use a transfer table, Max Hjorstberg, the CB&Q railway engineer who laid out the trackage at Pullman, was a relatively early adopter in 1880. The history of railway transfer table has yet to be written, though it would appear that they existed in embryonic form from the 1860s onwards,[26] but interest in and broad use of this technology was not developed until the mid-to latter 1880s. In 1889 for example, the New York Central replaced the toll transfer table with a new, lighter electrified one, replacing the old steam-driven one. As the *New York Times* noted, “this transfer table is an important adjunct to the yard, and by its use passenger cars are shifted from one track to another without the use of locomotives, except all them from the table” (Anon. 1889b). In fact, it was only by the end of the decade that railway publications started taking particular notice about transfer tables, how they were being used and how they were constructed, especially new electrified ones (Crofutt 1889). One pair in Fitchburg, MA, for example, were described as “two of the most complete and ingenious transfer tables in the country, one driven by wire rope and the other by electricity” (Crofutt 1889), even though this seems to be what Pullman installed in his factory In 1881. This innovation reinforces the usefulness of understanding movements of individuals, materials, and energy when considering the changes in labor processes and embodied work during this period.

6.3.2 Materials, Efficiency, Waste

Another of the themes of the late nineteenth and early twentieth century is the idea of efficiency in factory production, as in fact in all walks of society (Alexander 2008). This widespread interest applied

[26] For example, the Morris and Essex Railroad Company had built a repair ship in New York City in 1864 which included one of the earliest forms of transfer table (Anon. 1864), and patents were granted for “Improvements in Transfer Tables” in 1874 (no. 146,685) and 1876 (no. 171,726).

not only to the efficiency of workers and power, but also to materials. Henry Ford and his production managers, in one well-known example, sought to utilize every scrap of waste from his production line to somehow benefit the overall bottom line. Thus, among numerous efficiency measures in his automobile plants in Detroit, so, too, developed a whole sub-industry of manufacturing charcoal briquettes from the scrap wood at his Kingsford, MI, plant (McCarthy 2006). Stuck with what to do with literally tons of scrap wood from Model T lumber production at the plant, his managers came up with the idea to market the notion of grilling while picnicking on a road trip as an integral part of automobile culture. They sold charcoal as a way to profit on the wood waste from the factory.

In the case of Pullman, the company preceded Ford's famous efforts by decades. The draftsman Irving Pond recalled in his memoirs that, "In the building of the finely finished cars a considerable amount of fragmentary hardwood, Cherry, Oak and Mahogany was left over. It devolved upon the architectural department to employ this material in the design of wainscotings, furniture, etc. in hotel, church, and residences" (Pond, et al. 2009: 87). In another case, Pullman engineers patented the idea of grinding the slag from their own foundry to make the base material for a durable paint, leading to the "standard Pullman green" of many early Pullman cars (Perkins 1887; Sahlin 1891). A final example is George Pullman's well known plan to pipe the town's sewage to company farm fields where it could be used as fertilizer to grow food to sell back to the community. The company expected a profit from the removal of the sewage, the sale of fertilizer, and the sale of the vegetables. The contribution of George Pullman and the Pullman company to this trend of waste and efficiency must be researched and understood in terms of the development of Gilded Age industry.

6.4 Landscapes of Labor

Landscape is an important area of archaeological research. Industrial archaeologists have long been concerned with the physical arrangement of technical sequences and production processes in space within a factory and how interacting industrial facilities were connected through networks of transportation infrastructure. While this report has focused on the central buildings of Pullman's Palace Car factory, later for passenger car manufacture, the maps we have gathered will allow us to organize the entire factory landscape. In addition, Pullman National Monument staff must consider the daunting landscape of the entire rail network connecting the lines on which Pullman cars operated, the supporting structures like laundries and repair shops that enabled service, and the communities they connected.

Phenomenological or Sensorial approaches to landscape and labor at Pullman will rely upon detailed studies of past environments, including microclimate studies mentioned in Chapter 5. Being able to reconstruct aspects of temperature, humidity, air quality, odors, vibrations, and light levels will all add significantly to our understanding of the "as lived" work experiences of people at Pullman. Since pubic health and environment were so important to the Pullman experiment, including water, sanitation, and air and light in the residences, it will be important to extend these analyses to the workplaces throughout the factory as well. Recently published studies like Dubay and Fuldner's study of air quality using soot trapped in bird plumage gives direct evidence for the healthfulness of air over time in south Chicago neighborhoods (DuBay and Fuldner 2017), and environmental archaeology at Pullman could contribute more detail to similar efforts to understand the qualities of Pullman's industrial and residential landscapes.

6.4.1 Movement and Embodied Labor

Movement is increasingly important way to understand human activities. In industrial archaeology, labor has always been understood as embodied in skills and knowledge related to tool use and production sequences (Gordon 1997). This embodiment extends to the landscape of work as people experience the physical world through their senses during work, making up berths while moving between rooms in a car; moving between sleeping, lounge, and dining cars; moving from the factory tool room to the erecting shop or from the wood machine shop to the bathroom in the erecting shop. We have elsewhere discussed the significance of taskscapes, mobility graphs, and access graphs in understanding the movement of people within the factory spaces and between the factory and community (Scarlett 2017). As historical records about work duties and residence location are added to the HGIS, the database will enable studies that follow people from their residences along likely commutes to work and into specific activity areas within the factory, for example, as important ways to understand the flow of people in space and time. These studies of movement tie workplace and residential space, but also the multiple networked locations throughout the nationwide Pullman system, a situation ideally suited for a "multi-sited" approach in industrial archaeology (Ryzewski 2012)

6.4.2 Soundscapes of Industry in Industrial Archaeology

Often absent from interpretations of industry are the sounds and smells associated with the long-gone work processes in the shops under investigation. While quite a number of scholars have considered soundscapes of the past (Cowgill and Hewitt 2007; Kelman 2010; Picker 2003), only a few have seriously considered the industrial setting in detail (Benjamin 2014, 2016; M. M. Smith 2012). However, a primary source from 1917 described how the soundscapes of the Pullman shops fundamentally changed when the all-steel car was introduced in 1908:

> The songs of the band-saw and the planer were stilled and in their stead rose the metallic clamor of steam hammer and turret lathe, and the endless staccato reverberation of an army of riveters. Ponderous machines to bend, twist, or cut a bar or sheet of steel filled the vast workrooms. An army of steel workers, Titans of the past reborn to fulfill a modern destiny, fanned the flames in their furnaces and released the leash of sand blast, air hose, and gas flame (Husband 1917: 124).

The factory soundscape, with its vibrations, whines, and humming, affected people profoundly and the lived experience of this must be understood at Pullman. Would the simple brick common wall between the Office Building and the Steel Car Shops have muffled the staccato bursts of riveting and the pneumatic blasts of air? Or would the main offices have been filled with an incessant buzz of background sound? How does this soundscape contrast with the formal, embodied prestige and well-appointed settings of the office's executive functions? How did race, gender, and age influence a person's daily soundscape in Pullman? How many blocks did one need to go from the factory before one could hear a bird song in the gardened landscape? Did people notice the quiet when something was wrong? The HGIS can enhance studies of soundscapes as well, since historic references to sound from newspapers and diaries can be geotagged and included in studies of what people might have heard as they moved through space and time. The 3D point cloud or photogrammetric models of the factory buildings (discussed in Chapter 5) can be imported into software within which one can model sound volume and reverberate throughout the complex, extrapolating from lists of known machinery and equipment and their auditory characteristics known in Industrial Hygiene and government records.

6.5 Environmental History of Pullman's Industrial and Post-Industrial Phases

Pullman National Monument should facilitate research into the environmental history of industry. Given the design aspirations of Pullman as a healthy and bucolic industrial community, and its subsequent transformations into the post-industrial era, the Monument is a natural place to consider detailed stories of the ecological and social costs of industrial wealth production. Led by scholars like Donald Hardesty and Frederic Quivik, industrial archaeologists increasingly explore the effects of industrial activities on their environments, including considerations of how residues of waste teach about the history of technological processes (Hardesty 2001; Quivik 2000, 2001, 2003, 2007; P. J. White 2003). Active research and experimentation also includes elements of remediation and reuse of industrial landscapes, considering the potential role of "rewilding" or "renaturation" vs. the aesthetics of ruin and the beauty found in *Industrienatur* (Gerndt 1999; Quivik 2016; Tempel 2012).

Pullman and the Lake Calumet area have rich resources for environmental history. In 1985, the Illinois Department of Energy and Natural Resources formed the Hazardous Waste Research and Information Center (HWRIC). The staff of the HWRIC provided research and technical assistance to landowners and industry, collected and curated environmental data, and provided laboratory analyses. The center focused on pollution and recycling, attempting to shape the waste streams of Illinois residents. From the formation of the HWRIC, staff completed a number of reports, including *Industrial Wastes in the Calumet Area, 1869-1970: A Historical Geography* (Craig E. Colten 1985), created in collaboration with the Illinois State Museum. Efforts included developing a statewide inventory of land-based disposal sites (Brutcher, et al. 1986) and a Hazardous Substance Database for the Lake Calumet area (Craig E. Colten and Samsel 1992) created collaboratively with the Illinois State Geological Survey. As a result of this inventory effort, Craig E. Colten published a series of articles about the Lake Calumet region that explored industrial archaeology, geography, policy analysis, and environmental history (Craig E. Colten 1985, 1986, 1988, 1991, 1994, 1998a, 1998b). As another consequence of studies like these, the United States Environmental Protection Agency recently added a cluster of sites on Lake Calumet's eastern shore to the "Superfund" list (Hood 2010).

The Lake Calumet region has been featured in an array of studies on the history and legacies of industrial life in the environment. Using the HGIS and environmental archaeology, these could be extended into the racial and economic analysis of the communities. Environmental data is readily included for analyses in HGIS (Baeten 2016). Research should extend this background to consider the interplay between the environment, hygiene, occupational safety, and health and wellness in Pullman and the surrounding communities, all of which intersects social power systems within Capitalism, structured by race, gender, and other sociological factors (Cowie 2011).

The postindustrial cleanup of the Lake Calumet region is a case study in environmental remediation, cultural renewal, and economic revitalization. Since 1998, the Calumet Heritage Partnership (CHP) has included volunteers from Illinois and Indiana working for the creation of the Calumet Heritage Area within the National Park System and drawing attention to the needs of the post-industrial region. The organization represents environmental, cultural and historical organizations; libraries; educational institutions; and municipal agencies. The CHP promotes industrial history alongside environmental remediation, including a collaboration with the Field Museum where participants gather oral histories from the region's communities. Pullman National Monument, with its historic connection between the factory, community, and the lake, would be a natural leader and a western anchor point within this area.

Archaeological research at Pullman National Monument can push the field to a broad consideration of how industrial archaeology and industrial heritage can contribute to the archaeological analysis of the Anthropocene (Lane 2015; Rockman 2012). These studies can build toward understanding Pullman as an anthropogenic biome (Ellis 2015), examining how the community has been or can become sustainable and just, where cultural and natural heritage are no longer treated separately (Harrison 2015). Pullman can become a center of what Don Hardesty called "Global-Change Archaeology" (Hardesty 2007), contributing to historical ecology, sustainability studies, and informing future urban and development planning, rather than leaving archaeology to serve as a metaphor for ecological thinking about Chicago (Washington 2005).

6.6 Conclusions: Future Research

This study lays the groundwork for the management of archaeological resources on the grounds of the factory complex at Pullman National Monument. We summarized the site's antiquity and then examined what was known about the history of the company. Given the perspective of industrial archaeology, we spent considerable time examining existing details of the work process within the sleeping and passenger car factory. Because the primary records of Pullman's manufacturing division are either missing or unstudied as part of the Tenneco collection, we conclude that the archaeological remains within the factory are of even greater significance. While the documentary records held at other archives give detailed resolution to work areas and processes at other parts of the factory, such as the remarkable collection of maps and blueprints of the Calumet Shops held at the Newberry Library, the existing records of the passenger car manufacturing shops only give a general sense of what people were doing within different buildings. Any disturbances of those buildings and remains, even those in ruin, require detailed monitoring and recording.

The Monument has already hosted interesting archaeological studies, which is surprising for its small size. Following from those studies, we examined the potential of known and likely archaeological features at the factory site. The study concluded by pointing to some productive areas of future research using Pullman materials, research that will enable better management of the Monument's resources, advance industrial archaeology and archaeological studies of industrial communities, and provide more and novel information for interpretation. Given the public interest in archaeological research at Pullman, we have every reason to expect that any future investigation would generate a great deal of interest in studies of Pullman history.

Of particular note, many of our recommendations indicate the need for substantial investment in a "virtual Pullman" HGIS, collaboratively built with local heritage organizations and local and regional archives. So much of the digital raw material for this exists, including architectural, newspaper, municipal records, census and directory data, photographs, correspondences and oral histories, and maps. These all simply need to be drawn into a robust HGIS framework designed to support innovative research and public-facing user interfaces, and enhanced with a focused effort to add geocoded records from Pullman's employee records. This HGIS could also enable sophisticated visualizations of the historic landscape, perhaps including enhanced reality interfaces.

We urge that future research projects be collaborative with community organizations, particularly as studies like the *Historic Resources Study* will include much more privately owned land and resources. This means that this document should not stand as some kind of defining limit on significant topics of future research, since community interests will provide new perspectives on questions that count and stories that matter in Pullman. Future studies may examine the social construction of creativity among Makers, Maintainers, and Operators in Pullman, the post-industrial revitalization and the use of heritage in modern resident's placemaking activities, or perhaps the role of Pullman as a source of social solidarity among different descent communities.

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