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The Purpose, Function, and Performance of Streetcar Transit in the Modern U.S. City: A Multiple-Case-Study Investigation, MTI Report 12-39

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M I N E T A   T R A N S P O R T A T I O N   I N S T I T U T E

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A Multiple-Case-Study Investigation

MTI Report 12-39

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REPORT 12-39

THE PURPOSE, FUNCTION, AND PERFORMANCE OF STREETCAR TRANSIT IN THE MODERN U.S. CITY: A MULTIPLE-CASE-STUDY INVESTIGATION

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16. Abstract

The streetcar has made a remarkable resurgence in the United States in recent years. However, despite the proliferation of streetcar projects, there is remarkably little work on the streetcar's role as a transportation service. This study examines the experiences of the modern-era streetcars operated in Little Rock, Memphis, Portland, Seattle, and Tampa. The authors discovered that in these cities, the primary purpose of the streetcar was to serve as a development tool (all cities), a second objective was to serve as a tourism-promoting amenity (Little Rock, Tampa), and transportation objectives were largely afterthoughts with the notable exception of Portland, and to a lesser degree, Seattle.

Key informant interviews revealed that in most cities, private sector actors from the local development and downtown business communities as well as streetcar advocacy groups were the key forces behind streetcar implementation and that these actors did so in order to use the streetcar primarily to achieve development goals. These informants viewed the streetcar as a catalyst for development that stood as a symbol of a permanent public commitment to an area. Despite the lack of serious assessments of the streetcar's development effects, most informants believed the streetcar to be an important contributor to any development effects that had occurred. Many informants also regarded the streetcar as an icon or symbol of the community and an important way of denoting the city's identity in efforts to attract visitors to the community.

When assessed as transportation, Portland's streetcar emerged as the clear standout performer with the highest ridership and service productivity and the second-most cost effective service. Portland was also the only city in which streetcar performance (service productivity and cost effectiveness) measures surpass that of the average local bus. Planners' decisions to locate the streetcar lines in an area with strong ridership potential combined with decisions to provide frequent service that is well integrated with other transit services help to explain Portland's strong performance. These decisions reflected a view that the streetcar was not just a development tool, but that it also needed to function effectively as a transit service that catered to a broader ridership.

Based on this study, the authors suggest that planners and policymakers in other cities think carefully about the fundamental purpose of any proposed streetcar in their communities and to proceed in all their decision making with that fundamental purpose clearly in mind. The authors also urge planners and policymakers in other cities to regard the example of Portland with much more caution. Many streetcar advocates point to Portland's experience and proceed as if it could be easily replicated elsewhere. But the authors suggest that Portland's experience is the result of a unique combination of external factors (local population and employment patterns, the health of the real estate market) and local decisions (land development policy decisions, financial decisions, other public investments, streetcar alignment location and length, streetcar operations decisions, streetcar fare policy decisions) that may or may not be applicable elsewhere.

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EXECUTIVE SUMMARY

This study examines the transportation performance of modern-era streetcars operated in five U.S. cities: Little Rock, Memphis, Portland, Seattle, and Tampa. The objective of the study is to examine streetcar performance, test hypotheses about variation in performance through a combination of empirical analysis and insights derived from key informant interviews, and to identify lessons for other cities that operate or are contemplating operating streetcars. The particular cities were selected to represent all modern-era streetcar services operating in year-round revenue service in the U.S. at the time of the study for which the authors could obtain relevant data. Services for which data were incomplete, such as Tacoma and historic legacy systems such as New Orleans and Philadelphia, are excluded from the investigation.

The streetcar lines in the five case-study cities were first opened between 1993 and 2007, with the most recent line opened in Portland in late 2012. Two cities (Seattle and Tampa) feature only a single line, two cities (Little Rock and Portland) operate two lines, and one city (Memphis) has three lines. The streetcar systems in Memphis and Portland are much more extensive and feature many more stops or stations than those in the other three cities, where the streetcars function as very short circulator services.

Streetcar service is operated by the local transit agency, either directly or under contract from another entity. However, the streetcar has a distinctive branding that differentiates it as a special service: River Rail (Little Rock), The Trolley (Memphis), Portland Streetcar (Portland), South Lake Union Streetcar (Seattle), and TECO Line Streetcar (Tampa). Streetcar services in these cities operate primarily in mixed-traffic environments, with Tampa being the only city that operates its streetcar entirely within an exclusive right-of-way. Service hours and service frequencies vary across the cities, with Tampa and Little Rock noteworthy for not operating streetcar service during the morning commuter period.

Streetcar Ridership and Transportation Performance

The authors examined streetcar ridership and other transportation performance measures for each city for 2012, as well as trends over time for the years immediately preceding 2012. Annual streetcar ridership was much higher in Portland than elsewhere, with patronage more than 2.5 times that of Memphis (the next-highest ridership city), and more than 30 times that of Little Rock (the lowest-ridership city). Little Rock, Memphis, and Tampa have a much more seasonal pattern to streetcar ridership than Portland or Seattle, which points to the importance of seasonal visitors as a key riding market in each of these three systems. The seasonal ridership pattern observable for the streetcar in the three cities is not apparent in its bus ridership. Average weekday streetcar ridership ranges from a low of about 400 riders per day in Little Rock to about 12,000 riders per day in Portland. In Little Rock and Tampa, ridership declined in the years leading to 2012, while in the other cities ridership was either stable or increased.

The authors also examined basic performance measures. Streetcar operating expenses range from a low of \$2.61 per trip in Memphis, the most cost effective case, to a high of \$9.61 per trip in Little Rock, the least cost effective case. Between 2008 and 2012, cost effectiveness improved in Memphis and Seattle, and it deteriorated in the other three cities. In 2012, the streetcar system in Portland was by far the most productive (carried the most riders per unit of service), followed by that of Seattle. Little Rock, Memphis, and Tampa were much less productive. Between 2008 and 2012, service productivity declined in Little Rock and Tampa, and it improved in Memphis and Seattle. Data are incomplete for Portland due to the mingling of streetcar and LRT statistics in the original NTD data prior to 2011.

The authors finally identified a set of factors that might be related to streetcar performance in the study communities. The factors included: alignment (streetcar line length, and location with respect to population covered, employment covered, and special generators served), network coordination (streetcar accessibility to connecting transit services), fare policy (streetcar fare level, streetcar transfer policy), service policy (streetcar service frequency, streetcar service duration), and rider market (seasonality of streetcar ridership). The authors assigned each city a score between 1 (worst, or lowest ranked) and 5 (best, or highest ranked) for each factor, save for two factors that were scored on a binary basis (1= meets the ideal; 0= does not meet the ideal). The authors then compiled the rankings and related the results back to the ridership and performance measures noted earlier.

Portland emerged as the city whose streetcar system was planned and operates closest to the ideal suggested by the literature (total of 39 points out of 47 points possible), followed by Memphis (36 points) and Seattle (31 points). Tampa and Little Rock emerge with the lowest scores (16 points and 20 points, respectively). The two sets of cities ranked similarly on the factor assessment, as they do on the ridership and performance measures. Portland, Memphis, and Seattle were the better performers and Little Rock and Tampa the weaker performers on the ridership and transit performance measures. Portland's emergence at the top of the point scale echoed its performance as the highest ridership, most productive, and second-most cost effective streetcar system. A critical difference between Portland and the other cities appears to be that planners and policymakers explicitly thought about the streetcar as transit and as a development tool when they made crucial decisions about the service, as the authors learned during interviews with key local informants.

Goals and Assessment of Streetcars by Key Informants

Given that the streetcars in most of the cities do not seem to be very effective transit services when assessed on standard transportation criteria, the authors conducted 21 interviews with 23 key informants to better understand how local planners, developers, businesspeople, advocates, and other important local actors viewed the purpose and performance of the streetcars in their cities. The interviews identified several important themes about streetcar planning and operation in the five cities.

First, in most cities the private sector emerged as the key set of actors promoting streetcar development. Private sector actors from the local development and downtown business communities as well streetcar advocacy groups, whose members often included development and business community representatives, played critical roles in placing the idea of a streetcar on the local policy agenda. In several cities, the private sector then led the drive to implement the streetcar.

Second, the primary objective of streetcar implementation has been development and urban revitalization of underused or declining urban cores. In most cities, the streetcar was seen as a development “catalyst.” The streetcar also stood as a symbol of a “permanent” public commitment to a particular area within the community. The streetcar’s symbolic role appeared to be particularly important as its presence, and status as a public investment, reassured developers and business owners that it was now “safe” for them to make their own private economic investments in the same area.

Third, the streetcars in many cities have now taken on an iconic role completely separate from any transportation function they possess. In three cities (Little Rock, Memphis, Tampa) they are widely regarded as icons of the city, and they play a role in promoting the city to others outside the community.

Fourth, strong support remains for the streetcar among key actors even in what appear to be the most troubled streetcar cities. However, even the most supportive actors do recognize the challenges facing their streetcar, whether due to financial difficulties, declining ridership, or some other factor.

Fifth, and finally, there does seem to be a real disconnect between enthusiasm for the streetcar and its transportation performance. In most cities, streetcar ridership is very low and compares quite unfavorably with the ridership on a local bus route operating in the same general area. A strict transportation assessment would tend to regard a streetcar that had lower ridership than a typical bus route as a misuse of scarce transportation resources. But few of the informants tended to think in such terms. Instead, poor transportation performance tended to be downplayed because the streetcar was not seen as primarily a transportation investment but instead as something else.

Lessons for Other Communities

First, the authors urge planners and policymakers to think very carefully about the fundamental purpose of any proposed streetcar in their community and to proceed in all their decision making with that fundamental purpose clearly in mind. The authors strongly believe that a transportation investment should be primarily about providing transportation service, and they would thus suggest first evaluating the streetcar versus other transportation services on transportation criteria. However, even if the planners and policymakers have another approach in mind, they should proceed carefully, clearly, and cautiously.

Second, the authors urge planners and policymakers in other cities to approach the model of Portland with much more caution. Many streetcar advocates point to Portland’s experience and proceed as if it could be easily replicated elsewhere. But the authors suggest that Portland’s experience is the result of a unique combination of external factors (local population and employment patterns, the health of the real estate market) and local decisions (land development policy decisions, financial decisions, other public investments, streetcar alignment location and length, streetcar operations decisions, streetcar fare policy decisions) that may or may not be applicable elsewhere.

Third, the authors urge planners and policymakers in other cities to beware of unintended consequences. Communities must think much more carefully about the wisdom of a streetcar investment given the state of their local transit finances. In some cases, the opening of a streetcar might necessitate later cuts in bus services, for example, when budgets tighten. Such an outcome would seem to defeat any transportation rationale for making a streetcar investment. Additionally, the decisions made early on about seemingly trivial things such as the type of vehicle to operate (modern, replica, or vintage) can have significant consequences for operations and finances later on.

I. INTRODUCTION

The streetcar, an urban transportation technology whose golden age was thought to have been the period from roughly the 1890s to the 1910s, has made a remarkable resurgence in the United States in recent years. As of September 2012, transit agencies in eight cities reported to the Federal Transit Administration (FTA) that they are operating streetcars in regular, year-round revenue service: Little Rock, Memphis, New Orleans, Philadelphia, Portland, Seattle, Tacoma, and Tampa.[1] Boston and San Francisco also operate streetcars on their Ashmont-Mattapan and F lines, respectively, although their streetcar statistics are folded into those for their light rail transit (LRT) services in the National Transit Database (NTD) statistics.[2] Several other cities, from Kenosha, Wisconsin to San Pedro, California, operate seasonal or weekend-only streetcar lines. Several cities report streetcar projects under construction, while more than forty other cities have streetcar projects in various stages of planning. The streetcar's apparent rebirth after decades of what had appeared to have been technological obsolescence is truly remarkable.

There are many reasons for the streetcar's return to the urban transportation scene, although the promotion of local economic development and the availability of federal capital funding under the new-starts/small-starts program are the most frequently cited rationales for its reemergence.[3] Both streetcar supporters and critics point to Portland, Oregon to support their assertions about the streetcar's purported economic development effects (Figure 1). Supporters point to hundreds of millions of dollars in commercial development activity, particularly in the city's Pearl District, which they argue can be traced directly to Portland's decision to build a streetcar line.[4] Skeptics assert that local real estate market conditions, public financial incentives, and local regulatory inducements were far more important than the streetcar in attracting development to these locations.[5]

The relative abundance of federal capital funding under the small starts program for streetcar development, and the relative lack of such funding for more expensive LRT development, has also encouraged cities to look to streetcars instead of other rail modes when they consider making fixed transit investments. Officials in the Obama Administration have been especially strong promoters of streetcar development. The American Public Transportation Association (APTA) has also promoted streetcar development as a lower capital cost alternative to LRT, and this cost differential versus LRT accounts for the increased popularity of streetcar projects in recent years.[6]

Despite the proliferation of streetcar projects in recent years, there is remarkably little work on the streetcar's role as a transportation service. The streetcar is a transit service designed to move riders; even its potential land use and economic development effects derive principally from its potential ability to provide rider access to the destinations it is designed to serve.[7] Thus, planners and policymakers would benefit from a better understanding of the streetcar's capabilities, and its limitations, as a transit mode. This study fills in existing knowledge gaps by examining the experiences of people involved with or affected by streetcars in five U.S. cities.

The objective of the study is to examine streetcar performance, test hypotheses about variation in performance through a combination of empirical analysis and insights derived from key informant interviews, and to identify lessons for other cities that operate or are contemplating operating streetcars. The particular cities were selected to represent all modern-era streetcar services operating in year-round revenue service in the U.S. at the time of the study for which the investigators could obtain relevant data. Services for which data were incomplete, such as Tacoma and historic legacy systems such as New Orleans and Philadelphia, are excluded from the investigation.

The streetcar systems of interest are all modern-era systems built and opened in either the 1990s or 2000s. The systems include those located in Little Rock, Arkansas; Memphis, Tennessee; Portland, Oregon; Seattle, Washington; and Tampa, Florida. The systems in Seattle and Tampa consist of one streetcar line, while Little Rock has two lines. Portland opened its second line during the year of the study (2012), and Memphis operates three lines.

Figure 1. A Streetcar in Portland, Oregon[8]

These streetcar lines operate in different ways, feature different levels of coordination with other transit services, and exhibit different levels of ridership and performance. Most streetcars were developed with a primary objective of promoting development activity in the areas they serve. This report investigates these five cases in order to develop lessons that might assist policymakers and planners in other cities that are operating, constructing, or considering the implementation of streetcar transit in their city.

STRUCTURE OF THE REPORT

The report is divided into a set of sections that represent the body of the report and a series of appendices that provide more detail on each of the five cities included in the study. This first section of the report introduces the focus of the research. The second section is a literature review presenting the state of knowledge on the performance of streetcars as transit and as development tools. The third section discusses the rationale for the case selection in more detail and introduces the research methodology for the study, which employs a combination of quantitative analyses of transit, census, land use, and other relevant data, with qualitative analyses derived from documents and key informant interviews.

The heart of the report consists of the next two sections, which collectively present the results of the five-city investigation. The first section offers an examination of the streetcar as a means of transportation. Drawing on a combination of agency and national data, and insights gleaned from key informant interviews, the section discusses the transportation performance of the streetcars in each city and identifies factors that account for variation in performance across the streetcar cities.

The second section draws primarily on key informant interviews to consider the views of key local actors representing transit agencies, city planning offices, development interests, and the business and tourism communities about the purpose and performance of the streetcar in each city. The section identifies common themes across the cities with a view toward understanding how streetcars are viewed, why they are selected, and how their performance is measured by these different sets of stakeholders. The section also discusses possible strategies identified by the informants to improve streetcar performance. The main body of the report then concludes with a short summary of the key findings and lessons from each of these two study sections.

The appendices conclude the report materials. Each case-study city has a detailed appendix that provides additional descriptive information about the streetcars, the local settings in which they operate, their performance, an historical narrative about streetcar development in the city, and more in-depth discussion of the key informant interviews. The key informant interview questions and the interview consent form follow toward the end of the report materials.

II. LITERATURE ON STREETCARS IN U.S. CITIES

The authors reviewed a wide-ranging set of academic and professional sources to better understand the issues around streetcar development, the goals and objectives of streetcar implementation, and the actual performance of the streetcars as part of the background for this study. The most striking result of this literature search is that, despite the increasing popularity of streetcars as urban transit investments in U.S. cities, there is remarkably little scholarly literature on the U.S. streetcar, particularly with respect to its role as an element of the local transportation system. Indeed, most literature instead focuses on the role of streetcars as urban redevelopment tools or as important contributors to enhancing the quality of life in cities and neglects its passenger-carrying performance.

Over the pages that follow, the authors provide a brief overview of key literature sources in two areas that provide important framing and background information for this study. First, the authors review the literature on streetcars as modes of transportation by focusing on works that discuss streetcar ridership and streetcar service productivity. These works are very few in number, but they speak specifically to the transportation-related objectives that are central to this study of five streetcar cities. Second, the authors provide a brief overview of the literature on streetcars as urban redevelopment tools and/or enhancements to the quality of life in local communities. This literature provides some insight into the factors that have tended to influence local decision-making around streetcar projects and, thus, should not be neglected due to their practical relevance to this work.

STREETCARS AS TRANSPORTATION

The limited literature on streetcars as modes of public transportation focuses on ridership, and its determinants, as well as on service productivity and cost effectiveness measures. Brown provides a descriptive snapshot of streetcar patronage (unlinked passenger trips and/or passenger miles), service productivity (passenger miles per revenue mile, or load factor), and cost effectiveness (operating expense per unlinked passenger trip and/or operating expense per passenger mile) in seven U.S. cities that reported operating streetcar service to the National Transit Database in 2011.[9] All five cities included in this Mineta-sponsored study (Little Rock, Memphis, Portland, Seattle, and Tampa) are included in the paper, as are two additional cities (Tacoma and New Orleans).

Study findings highlighted the much higher ridership and service productivity (load factor) in the older, legacy New Orleans system compared with the modern-era systems. Among the modern-era systems, Portland emerged as a much stronger performer than its counterparts, with annual ridership more than three times higher than Memphis, its closest peer. With respect to cost effectiveness, Portland emerged as the strongest performer, with Little Rock and Tampa the poorest performers. The author pointed to the slower speeds of streetcars compared with buses and the relative lack of service integration of the streetcar with other transit modes in the studied cities as key contributing factors to their performance. The author noted what appeared to be much more integration of the streetcars with other transit services in the legacy system of New Orleans as compared with the modern-era systems, particularly those in Tampa and Little Rock, which appeared somewhat disconnected from the rest of the transit system. Combined, these two factors mean that modern-era streetcars appear to be more dependent on casual and discretionary riders, such as visitors, and are likely not an attractive modal option for more utilitarian transit riders.

The author concluded that: “There is significant variation in performance, with some of this variation a function of the built environment within which the systems operate and/or of the degree of integration with the rest of the transit system, captured in the transfer rates.”[10] This current research further explores ideas first discussed in this paper, which is the only published examination of both ridership and performance across multiple U.S. streetcar cases.

Two other recent works examine determinants of streetcar ridership. First, Foletta, et al. focused on 67 streetcar stops in Portland, Seattle, and Tacoma. Using a multivariate statistical model, they found positive relationships between ridership (average weekday boardings) and population and employment accessibility within one-quarter mile (400 meters) of the stop, the number of transfer connections to nearby transit routes, the stop’s status as a terminal or fare-free (in the cases of Portland and Tacoma) stop, and the presence of special generators such as hotels, activity centers, colleges, and hospitals within one-quarter mile (400 meters) of the stop.[11] The presence of special generators appeared to be particularly important, and this finding pointed to the important role of streetcars as transport services catering to visitors and other non-commute riders.

Second, a working paper by Ramos and Brown examined a much larger set of streetcar cases than was included by Foletta et al. and also directly contrasted the determinants of streetcar ridership versus the determinants of light rail ridership, the streetcar’s closest rail competitor.[12] The authors found significant differences between streetcars and light rail in the study of seven streetcar systems (475 stops) and 15 light rail systems (405 stations) in the U.S. They also found significant differences between modern-era streetcars and the legacy streetcar systems in Philadelphia and New Orleans. Using multivariate statistical analysis, results indicate that streetcar ridership (average weekday boardings) was positively related to the size of the population residing within one-quarter mile (400 meters) of a stop, the amount of employment located within one-quarter mile (400 meters) of a stop, and a stop’s status as either a terminal stop or bi-directional serving stop (i.e. service in two directions). Ridership was negatively associated with fares, vehicle ownership within one-quarter mile (400 meters) of a stop, and average block size within one-quarter mile (400 meters) of a stop, with the latter two variables highlighting the primarily downtown and traditional development areas within which many streetcars are operated. But by far the strongest determinant of streetcar ridership was the presence of a special activity generator within one-quarter mile (400 meters) of a stop. The presence of these developments increased ridership more than five-fold over what would be expected in their absence. By contrast, the presence of special activity generators had only a 1.85 multiplier effect in the case of light rail ridership. The importance of special activity generators was particularly important for the modern-era systems, which had a much higher multiplier (7.76) than the legacy systems (4.17).

The authors found that streetcar ridership was not related to many of the variables that were related to light rail boardings, including service frequency, the number of bus connections, and the presence of park-and-ride facilities, all of which are variables that are more likely to be important to regular transit users, including commuters, than for casual riders or visitors.[13] They hypothesized that the differences between the streetcar and light rail results were a function of two very different rider markets using these services, with streetcars tending to serve more of a visitor and special activity centers related ridership and light rail serving more utilitarian transit trips. The consistency of these results with the other studies would seem to support this hypothesis, although the present study proposes to examine this issue in more detail.

Taken as a whole, the literature on streetcars as transportation highlights the important differences between streetcars and the other public transit modes, particularly light rail. Streetcars are slower, have lower ridership, lower service productivity, and lower cost effectiveness than light rail, although they also have significantly lower capital costs associated with their construction. Streetcars would seem to be serving a particular set of travel markets that includes large numbers of visitors and special activity center-bound riders, while light rail serves a more traditional commuter market. The literature also points to important differences between legacy streetcar systems in places like New Orleans and Philadelphia, where the streetcars appear to be better integrated with the rest of the transit system, and the modern-era systems in which some services, particularly the streetcars in Tampa and Little Rock, appear to be almost stand-alone public transportation modes. The latter issues will be considered in the research presented later in the report. But before examining the cases of interest in this study, the key works on the role of streetcars as urban development tools and/or quality of life investments, most of which derive from the exemplary case of Portland, Oregon, are briefly considered.

STREETCARS AS DEVELOPMENT TOOLS AND ENHANCEMENTS TO QUALITY OF LIFE

The primary focus of this study is the role of streetcars as transportation, but given the importance of potential development and quality-of-life effects to many policymakers who have decided to build and operate streetcars, it is important to the study to consider the key evidence and controversies in the literature in this area. Most of the evidence, and many of the controversies, surround the streetcar in Portland, Oregon, which is by far the most studied system and the system that many observers point to as a model system for other cities to emulate.

Hovee and Gustafson's work is perhaps the most cited recent work that attributes significant development effects to streetcar implementation in Portland.[14] They point to hundreds of millions of dollars in development in the downtown areas around the original streetcar line, and their work has often been interpreted to imply a causal relationship between the streetcar and this development activity. This implication is not, however, supported by detailed empirical study that controls for other potential causal factors. Nevertheless, the study and its claims have been cited by many streetcar proponents, and they have been criticized by streetcar opponents, including O'Toole, who asserts that sizeable public subsidies and other regulatory and financial incentives, as well as the state of the local real estate market, are collectively responsible for the development activity that would presumably have occurred even were the streetcar not in place.[15]

Despite these criticisms, much of the practice-oriented literature promotes streetcars for their perceived development effects. A Transit Cooperative Research Program (TCRP) Report presented results of a survey of streetcar properties in which nearly all the interviewees believed their streetcar had positive effects on development, although there was a lack of empirical support for these assertions.[16] Similar results were reported in a recent survey sponsored by the American Public Transportation Association (APTA) of streetcar operators.[17] Respondents reported $3.5 billion in development effects in Portland, presumably referring to the work done by Hovee and Gustafson,[18] while other respondents, representing proposed or then under construction streetcars in Salt Lake City, Los Angeles, Atlanta, and Seattle, emphasized that developers had approached them with proposals for new developments near the streetcar lines. Left unexplored in this literature is the nature of the other incentives that cities also have either used or are considering using to promote development in the areas near streetcar lines, or their costs. In short, the economic development effects of the streetcars are still the subject of much debate, although they appear to be the major determinants of the decision to build streetcars in most cities, including in the cities that are part of this study, as the authors discuss later in the report.

To determine whether the streetcar actually has an effect on urban development, one must understand how land values are affected by transportation. Indeed, the primary means of tracking any potential development effects of the streetcar, or any other transportation investment, is through changes in land values. The basic logic is that a transportation investment will have an effect only on land values, and hence on development, to the extent that it provides accessibility to the location that users of the transportation investment then take advantage of.[19] Measuring accessibility is often a very complicated task, and extensive literature exists on different approaches to measuring accessibility. However, it is easy to measure use of the transportation investment, which presumably reflects the value that people place on the particular service. Hence, this study's primary focus is on ridership and directly measurable transportation effects, which the authors argue are necessary preconditions for the streetcar, or for any other transportation investment, to exercise any development effects.

LESSONS FROM LITERATURE REVIEW

Assessing the literature as a whole, one is struck by the relative lack of knowledge on U.S. streetcars, despite the many millions of dollars being spent by each of the dozens of cities that are operating, building, or considering a streetcar in their communities. The literature notes that streetcars function differently from light rail, and thus it suggests that they are potential complements to light rail as opposed to substitutes for this other rail mode. The modern-era streetcars in particular seem geared toward non-commute and visitor travel markets, while light rail is more commuter-focused. Speeds are lower on streetcars than light rail, which is not surprising given the different rights-of-way and operating environments of the two modes, and streetcars also tend to be slower than buses. Ridership is relatively low, and so are service productivity and cost effectiveness.

The evidence for the streetcar's development effects is limited, controversial, and yet widely believed among many streetcar proponents. All of these observations are based on a limited literature that would benefit from much more empirical study of how streetcars actually perform in practice, which is the subject of this report and the focus of the remaining sections and appendices.

III. CASE SELECTION AND METHODOLOGY

This research employs a comparative case study approach, which allows the authors to better understand: 1) the purpose of streetcar development in the case-study cities; 2) the function the streetcar serves in the local transit system; 3) its ridership and service productivity as a transit mode; and 4) how planners, elected officials, and other key local actors assess the overall performance of the streetcar in each city. By employing multiple case studies, the authors can compare these issues across the different cities to understand whether and why streetcar performance might be different in one place versus another, with an eye toward identifying useful policy- and practice-oriented lessons.

Five case-study streetcar systems were selected to represent all the modern-era streetcars in the U.S. that now operate in year-round, everyday revenue service; thus, the study excludes systems that operate weekend-only, seasonal, or special event services. The study research design includes a combination of methods, including literature review, document analysis, quantitative analyses, and structured interviews, which collectively provide a deep, multifaceted understanding of the context for streetcar development in each case, the objectives of streetcar implementation, and the actual performance of streetcar service. The primary research emphasis is on the transportation role and transit performance of the streetcar, as opposed to its possible redevelopment effects, although some of these issues are considered due to their importance for streetcar decision-making in many communities. A more detailed explanation of the rationale for case selection and a discussion of methodology follow.

CASE SELECTION

The authors identified five cases for examination in the study: Little Rock, Memphis, Portland, Seattle, and Tampa. These five cases represent all the cities with modern-era streetcars that operate full-time, year-round revenue service that reported streetcar ridership and operational data to the National Transit Database (NTD) under the streetcar mode code (SR) in 2011, the most recent year for which a full set of data were available using the NTD database access tool developed by the Florida Department of Transportation (FDOT) at the time this study began.[20] The study omits systems that: 1) report their streetcar data as part of their light rail (LR) data; 2) classify their streetcar as a different rail mode for NTD reporting purposes; or 3) operate weekend, seasonal, and/or special event service, as opposed to regular, all-year service.

The authors focused solely on modern-era streetcar systems rather than the legacy systems in place in cities such as New Orleans and Philadelphia because modern-era streetcars are more typical of the kinds of projects now being considered in other cities around the country. They are new transportation investments inserted into an existing urban environment rather than long-established services that have had their urban environments evolve over time with the transportation service already in place. They are shorter in length than the older systems that serve many longer distance trips and function, in a market-service sense, more like light-rail service than modern-era streetcars. They tend to have had the same kinds of project goals and objectives with respect to transportation and urban development as proponents presently voice about new streetcar development in other U.S. cities. Their performance thus offers more useful lessons to policy and practice than could be provided by examining systems that do not resemble the kinds of projects contemplated now in most other U.S. cities that are considering streetcars.

RESEARCH METHODOLOGY

The research design incorporates a variety of qualitative and quantitative techniques, representing several project phases. The first phase of the study involved collecting documentary evidence, including reports, scholarly articles, and popular press accounts, to develop an understanding of the current issues in the literature on streetcars, more generally, and the history of streetcar development in each specific case. The general literature review began with the use of traditional search sites such as LexisNexis and the publications index hosted by the Transportation Research Board (TRB). The general literature search allowed the authors to frame the study, identify potential data needs, and develop a general research plan. The case-specific literature search allowed the authors to better understand the local context for each case, which proved especially useful for the key informant interviews discussed later. The results of the general literature search are located in the literature review section, while the case-specific search results are incorporated in the individual profile narratives in the appendix sections of this report.

The second phase of the study involved collecting transit agency data and local non-transit data to be used in the analysis in the third project phase. The transit agency data, most of which were obtained from the National Transit Database and/or agency contacts, included the basic physical characteristics of each streetcar line (length, number of stops, alignment type, and capital cost), operational characteristics (headways, hours of service, fares), and performance characteristics (ridership, service, operating costs) for the streetcar lines, the local bus system, and the transit system as a whole. The authors also obtained Geographic Information System (GIS) files for the transit network in each city from their agency contacts. The non-transit data include U.S. Census population, employment, and demographic information (on a block group level), local land use, property assessor and development activity data obtained from local agency contacts, and other locally-relevant data identified through discussion with agency contacts or the case-specific literature search. These non-transit data provide an understanding of the local urban environment within which each streetcar line operates in its community.

The third phase of the study involved analysis of the phase two data to identify lessons about the service performance of each streetcar, to test hypotheses about the reasons for variation in performance, and to develop questions for the key informant interviews in phase four of the study. This data analysis focused primarily on an assessment of the transportation-related streetcar data, although some data on local land use patterns, economic development, and the socioeconomic context for the streetcars were also included as part of the assessment.

The fourth and final phase of the study involved interviews with key informants. These interviews allowed the authors to understand the informants' perspectives on the purpose of streetcar development in their communities, including their identification of specific goals and objectives and their assessments of the streetcars' performances in meeting these goals. The interviewees consisted of transit agency planners, local elected officials, and representatives of the development community and other key local place-based constituencies. The authors conducted a total of 21 interviews, with an average of four interviews in each city. The authors interviewed a total of 23 key informants through these interviews. The interviews occurred via telephone and lasted approximately an hour each. The authors used the results of the interviews to provide important context for the quantitative assessment and to examine the relative importance that planners, policymakers, and other important stakeholders place on transportation versus economic development or quality of life factors in their approaches to streetcar planning and operation. A set of interview questions and the interview consent form may be found in Appendix F.

The authors then combined the results of the qualitative inquiry, quantitative analyses, and the key informant interviews to develop lessons about the overall performance of streetcars in modern US cities, the reasons for variation in their performance, and recommendations to cities currently operating streetcars and contemplating making these investments. These lessons are highlighted at the conclusion of the report.

IV. TRANSPORTATION PERFORMANCE OF STREETCARS IN FIVE U.S. CITIES

The study considers the transportation performance of the modern-era streetcars in five U.S. cities, with 2012 serving as the year of primary interest for the study. This section of the report provides a basic overview of the streetcars' physical and service characteristics, an accounting of streetcar ridership and other performance measures, and an assessment of factors that the authors believe help to explain streetcar performance in each city, as well as variation in performance across the cities.

STREETCAR PHYSICAL AND SERVICE CHARACTERISTICS

The streetcar lines in each of the five cities were first opened between 1993 and 2007, with the most recent line opened in Portland in late 2012 (Table 1). Two cities (Seattle and Tampa) feature only a single line, two cities (Little Rock and Portland) have two lines, and one city (Memphis) has three lines. The streetcar systems in Memphis and Portland are much more extensive and feature many more stops or stations than those in the other three cities, where the streetcars function as very short circulator services (Figure 2). Streetcar services in these cities operate primarily in mixed-traffic environments, with Tampa being the only city that operates its streetcar entirely within an exclusive right-of-way.

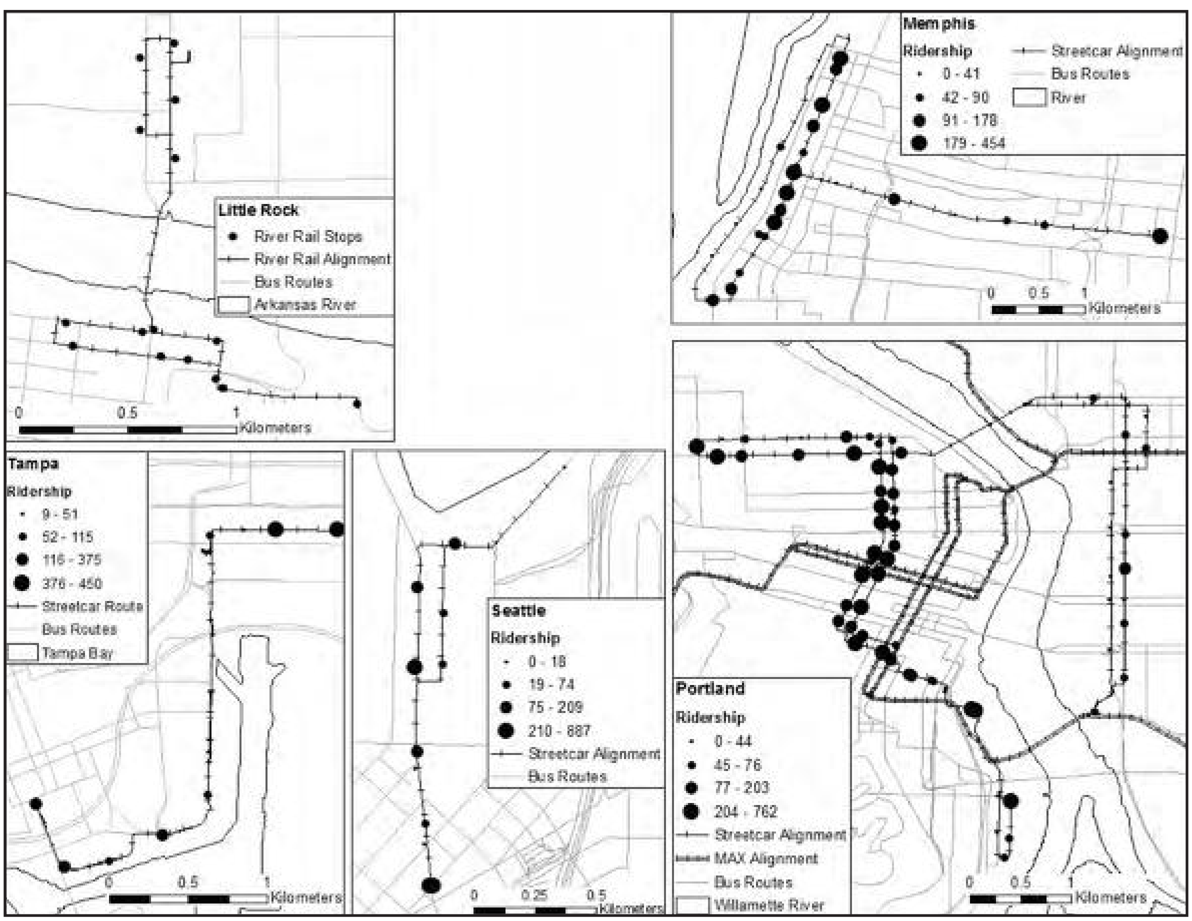

Figure 2. Streetcars in Five U.S. Cities (2012)[21]

Table 1. Physical Characteristics of Streetcar Systems in Five Cities[22]

Characteristic		Little Rock	Memphis	Portland	Seattle	Tampa
Year Open		2004	1993	2001, 2012	2007	2002
Capital Cost (unadjusted dollars)		$28,800,000	$104, 000,000	$251,420,000	$53,100,000	$32,000,000
Number of Lines		2 (Blue, Green)	3 (Main Street, Riverfront, Madison Avenue)	2 (North-South, Center Loop)	1	1
Number of Vehicles		3	10	11*	3	3*
Number of Stations		15	25	76	11	11
Length		3.4 miles (5.47 km)	7 miles (11.27 km)	7.35 miles** (11.83 km)	2.6 miles* (4.18 km)	2.7 miles (4.35 km)
Alignment Type	Exclusive	0.4 miles	2.8 miles	0.15 miles	0.6 miles	2.7 miles
	Mixed Traffic	3.0 miles	4.2 miles	7.20 miles**	2 miles	0

Notes:

* Alignment length is for round trip. (Email communication from Rob Coughlin and Ethan Melone on February 4, 2014.)

** The alignment is 7.35 miles of double track, or 14.7 miles of single track. (Email communication with Rick Gustafson on February 5, 2014.)

Streetcar service is operated by the local transit agency in each city, either directly or under contract from another entity. However, the streetcar has a distinctive branding that differentiates it as a special service: River Rail (Little Rock), The Trolley (Memphis), Portland Streetcar (Portland), South Lake Union Streetcar (Seattle), and TECO Line Streetcar (Tampa). Local transit agency operation permits potential integration of streetcar fares and schedules with those of other transit modes. In each city, transfers between streetcars and local bus services are permitted without additional fare payment, although in Portland these transfer privileges are time-limited to a two-hour window, and in Little Rock, transfers are free only from bus to streetcar and not from streetcar to bus. (See individual Appendices for more details on fare and transfer policies).

The streetcars have somewhat different service characteristics, which point to differences in the ways they are utilized in each of the cities (Table 2). In Memphis, Seattle, and Portland, service is reasonably frequent during the peak and off-peak, with somewhat more frequent service during the peak period. Daily service hours are also longer in each of these cities, both during weekdays and weekends. These characteristics make the streetcar service similar in many respects to local bus services. In Little Rock and Tampa, service is much less frequent and there is little, if any, difference in service frequencies between peak and off-peak periods. In Tampa, service hours are also noticeably shorter than in the other cities, with the added difference that Tampa's streetcar does not begin operations until late morning (11 a.m.) or noon each weekday. Little Rock also begins its streetcar service after the morning commute, with service starting at 8:30 a.m. These service characteristics point to the importance of the tourist and visitor riding market as a focus of streetcar service in these two cities in particular.

Table 2. Service Characteristics of Streetcar Systems in Five Cities[23]

Characteristic	Little Rock	Memphis	Portland	Seattle	Tampa
Headways					
Weekday Peak	25 minutes	10 minutes	14-17 minutes	10 minutes	20 minutes
Weekday Off-Peak	25 minutes	16 minutes	15-22 minutes	15 minutes	20 minutes
Weekend Average	25 minutes	13 minutes	17 minutes	12.5 minutes	30 minutes
Hours of Service					
Monday	14 hours	17 hours	18 hours	15 hours	10 hours
Tuesday	14 hours	17 hours	18 hours	15 hours	10 hours
Wednesday	14 hours	17 hours	18 hours	15 hours	10 hours
Thursday	16 hours	17 hours	18 hours	15 hours	10 hours
Friday	17 hours	18 hours	18 hours	17 hours	15 hours
Saturday	18 hours	15 hours	16 hours	17 hours	15 hours
Sunday	7 hours	8 hours	15 hours	9 hours	8 hours

STREETCAR RIDERSHIP AND PERFORMANCE

Ridership is the primary indicator of performance used in this study. The authors obtained from the National Transit Database annual ridership data (when available) extending from the time of streetcar opening to 2012 and monthly ridership for each month during 2012. They obtained average weekday boardings for 2012 on a stop-level basis from the individual transit agencies. The full complement of ridership data is reported in the individual case-study appendices.

Annual ridership is reported in Table 3 for the period from 2008 to 2012, a period during which streetcar service operated in each of the five cities. The results are reported as unlinked passenger trips (UPT, or boardings) in the top panel of the table and as passenger miles (PM; with kilometer mile equivalents in parentheses, PKM) in the lower panel of the table. Prior to 2011, streetcar statistics were reported as part of LRT data in the National Transit Database, so Portland's streetcar passenger mile statistics are unavailable prior to 2011. Annual ridership is much higher in Portland than elsewhere, with patronage more than 2.5 times that of Memphis (the next-highest ridership city) and more than 30 times that of Little Rock (the lowest ridership city). In Seattle and Memphis, ridership was higher in 2012 than it had been in 2008, while ridership declined during that time in the other three cities.

Table 3. Annual Ridership by Streetcar in Five Cities (2008-2012)[24]

	Unlinked Passenger Trips (UPT)				
Year	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
2008	134,204	1,014,777	3,880,079	413,253	439,555
2009	119,758	1,113,809	3,785,553	451,203	446,743
2010	107,088	1,154,848	3,950,860	520,933	399,637
2011	136,380	1,086,125	3,788,400	714,461	358,737
2012	104,868	1,491,841	3,664,538	750,866	301,516

Year	Passenger Miles (PM) (passenger kilometers, PKM)				
	Little Rock	Memphis	Portland	Seattle	Tampa
2008	206,572 (332,445)	820,185 (1,319,957)	not available	378,221 (608,686)	728,890 (1,173,032)
2009	183,751 (295,718)	940,028 (1,512,825)	not available	414,617 (667,260)	776,734 (1,250,029)
2010	165,718 (266,697)	917,815 (1,477,076)	not available	471,587 (758,944)	789,244 (1,270,162)
2011	240,083 (386,375)	718,468 (1,156,259)	3,652,854 (5,878,674)	631,655 (1,016,548)	685,934 (1,103,901)
2012	162,616 (261,704)	1,672,193 (2,691,127)	3,732,743 (6,007,253)	650,023 (1,046,108)	523,031 (841,735)

Monthly ridership data (unlinked passenger trips or boardings) are reported for 2012 for each of the cities in Table 4. T he dramatic differences in ridership between the cases already noted for annual ridership are also apparent in the monthly data, of course, with ridership in Portland significantly higher than that of any other city. One can also detect seasonal patterns to ridership in some cities and not in others. Little Rock, Memphis, and Tampa have a more seasonal pattern for streetcar ridership than is apparent in either Portland or Seattle, which points to the importance of seasonal visitors as a key riding market in each of these systems. The seasonal ridership pattern observable for the streetcar in the former three cities is not apparent in its monthly bus ridership, as the authors discuss in each of the case-study profiles in the report appendices.

Table 4. Monthly Unlinked Passenger Trips (UPT) by Streetcar in Five Cities (2012)[25]

Month	Little Rock	Memphis	Portland	Seattle	Tampa
January	5,236	74,306	275,340	52,257	33,378
February	5,049	83,680	264,540	53,828	26,895
March	13,650	140,217	334,810	59,118	39,205
April	11,506	136,711	318,980	59,778	25,213
May	16,536	182,956	330,530	64,337	22,071
June	10,420	154,976	308,650	66,623	22,546
July	10,221	157,432	312,300	73,888	23,583
August	7,310	150,602	320,100	72,004	17,328
September	5,915	114,425	315,680	64,966	18,238
October	5,855	118,069	338,040	66,392	28,220
November	5,589	93,205	322,000	60,077	19,373
December	7,531	85,262	294,750	57,620	25,466

Average weekday boardings for 2012 are reported in Table 5, except for Little Rock, where these data (and their stop-level counterparts) were unavailable from the transit agency, except as a very rough estimate of around 400 riders per day. Reported average weekday boardings range from a low of about 880 per day in Tampa to a high of more than 11,700 per day in Portland. These data are shown spatially on a stop-level basis in the maps that follow the table (Figure 2).

Table 5. Average Weekday Boardings by Streetcar in Five Cities (2012)

City	Average Weekday Boardings
Little Rock	not available
Memphis	3,240
Portland	11,729
Seattle	2,560
Tampa	880

Source: Agency contacts as noted in profiles sections of the report.

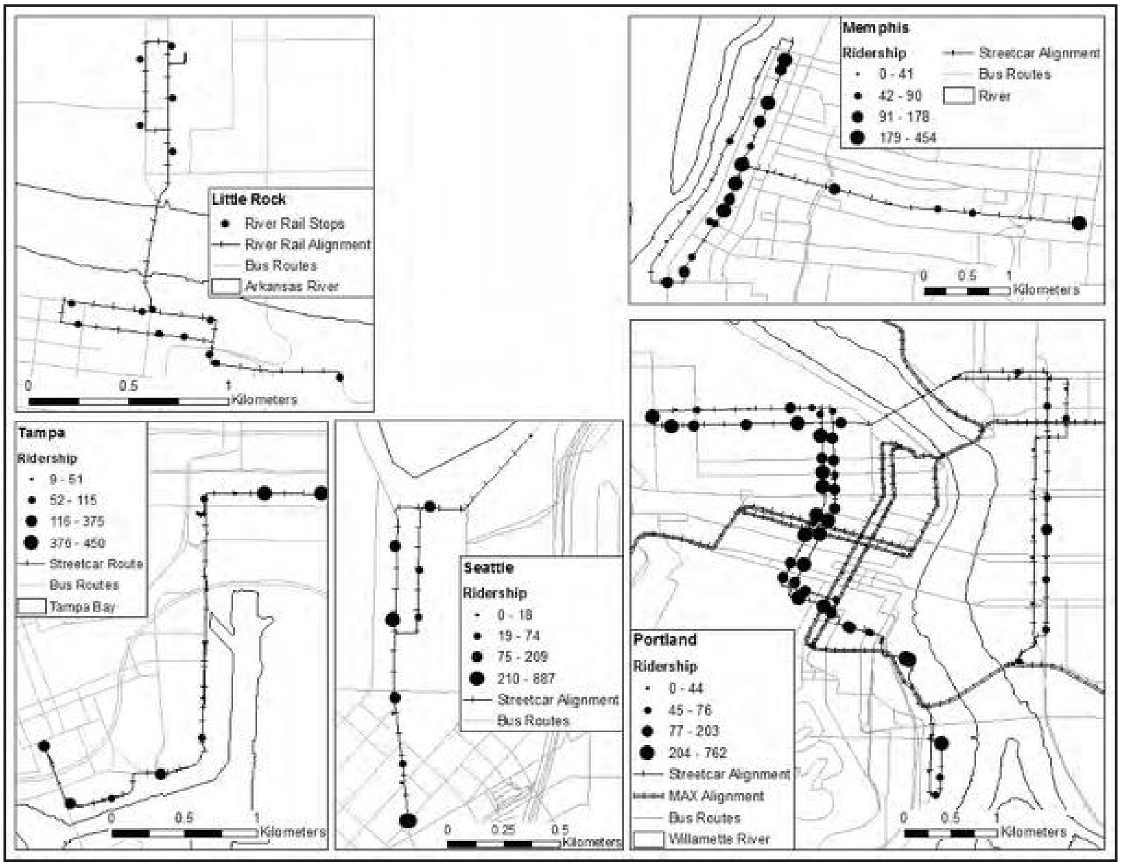

Figure 3. Average Weekday Boardings on Streetcars in Five U.S. Cities (2012)[26]

Figure 3 shows the average weekday boardings at the stop-level for each streetcar line in 2012. Stop-level data are unavailable for Little Rock. Examining the map panels, one can see variation in boardings levels by location. For Memphis, higher boardings numbers are found on the north-south Main Street Line than on either the Riverfront Line along the Mississippi River or the east-west Madison Avenue Lines. Portland's map panel notes the much higher boarding numbers on the downtown-serving North South Line, on the west side of the Willamette River, than on the newer Central Loop Line that primarily serves the east side of the river. Seattle's streetcar has higher boarding levels at its southern terminus and at a couple of stops in the middle of the alignment near established activity centers. Tampa's streetcar line registers its highest boarding numbers at its northeastern end in the Ybor City entertainment/tourism district.

Annual service statistics are reported in Table 6. Service is reported for vehicle revenue hours (RH; top panel of the table) and vehicle revenue miles (RM; with vehicle revenue kilometers, VKM, in parentheses) (lower panel of the table). Between 2008 and 2012, the amount of streetcar service declined in three cities (Memphis, Portland, and Tampa) while it increased in two cities (Little Rock and Seattle). Monthly service statistics for 2012 are reported in Table 7, which indicates that although ridership is seasonal in three cities service is operated at consistent year-round levels in all cities. Thus, the seasonal ridership pattern found for Little Rock, Memphis, and Tampa is a function of seasonal differences in demand and not a function of differences in service supply. Table 8 reports annual operating expenses for 2008-2012 in the cases where these expenses are available for streetcar as a separate public transit mode; operating expenses are reported both in unadjusted dollars and inflation-adjusted 2012 dollars. Generally speaking, the operating expenses tend to fluctuate in parallel with changes in service levels shown earlier in Table 6.

Table 6. Annual Service by Streetcar in Five Cities (2008-2012)[27]

	Vehicle Revenue Hours (RH)				
Year	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
2008	11,992	57,742	38,047	11,399	16,090
2009	12,087	54,561	37,001	11,207	14,564
2010	11,848	57,742	30,555	11,178	13,845
2011	12,535	40,448	35,241	11,509	14,423
2012	12,436	43,211	36,739	11,736	12,561
	Vehicle Revenue Miles (VRM) (vehicle revenue kilometers, VKM)				
Year	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
2008	53,000	374,280	216,308	56,613	81,856
	(85,295)	(602,344)	(348,114)	(91,110)	(131,734)
2009	53,903	345,416	210,362	60,150	74,603
	(86,748)	(555,892)	(338,543)	(96,802)	(120,062)
2010	52,702	374,280	173,714	59,964	71,395
	(84,815)	(602,344)	(279,565)	(96,502)	(114,899)
2011	54,901	259,867	199,075	61,727	76,806
	(88,354)	(418,214)	(320,379)	(99,340)	(123,607)
2012	54,668	332,469	209,283	62,522	67,599
	(87,979)	(535,056)	(336,808)	(100,619)	(108,790)

Table 7. Monthly Service by Streetcar in Five Cities (2012)[28]

	Vehicle Revenue Hours (RH)				
Month	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
January	1,050	3,593	3,086	960	1,087
February	938	3,505	2,923	894	986
March	1,098	3,829	3,124	965	1,070
April	1,028	3,553	3,005	961	1,008
May	1,054	4,081	3,110	1,008	1,043
June	1,042	3,575	3,019	989	1,039

	Vehicle Revenue Hours (RH)				
Month	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
July	1,028	3,575	3,100	995	1,049
August	1,094	3,705	3,135	975	1,160
September	996	3,400	3,793	962	1,021
October	1,086	3,692	4,894	1,035	1,054
November	1,018	3,480	4,679	998	994
December	996	3,452	4,774	994	1,040

	Vehicle Revenue Miles (RM)				
Month	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
January	4,618	28,183	17,268	5,117	5,805
	(7,432)	(45,356)	(28,375)	(8,235)	(9,342)
February	4,122	26,992	16,605	4,462	5,305
	(6,634)	(43,439)	(26,728)	(7,181)	(8,538)
March	4,832	29,691	17,748	5,140	5,757
	(7,776)	(47,783)	(28,568)	(8,272)	(9,265)
April	4,438	27,495	17,067	5,120	5,425
	(7,776)	(44,249)	(27,472)	(8,240)	(8,731)
May	4,636	29,389	17,666	5,370	5,616
	(7,461)	(47,297)	(28,436)	(5,642)	(9,038)
June	4,569	26,221	17,149	5,271	5,590
	(7,353)	(42,199)	(27,604)	(8,483)	(8,996)
July	4,524	26,326	17,611	5,303	5,650
	(7,281)	(42,367)	(28,348)	(8,534)	(9,093)
August	4,814	27,223	17,804	5,193	6,245
	(7,747)	(43,811)	(28,658)	(8,357)	(10,050)
September	4,383	25,019	22,489	5,126	5,494
	(7,054)	(40,264)	(36,200)	(8,249)	(8,842)
October	4,777	26,998	29,620	5,508	5,675
	(7,688)	(43,449)	(47,678)	(8,864)	(9,133)
November	4,477	25,579	28,378	5,317	5,349
	(7,205)	(41,165)	(45,679)	(8,557)	(8,608)
December	4,383	25,395	29,007	5,295	5,596
	(7,054)	(40,869)	(46,691)	(8,521)	(9,006)

Source: Federal Transit Administration. 2013. “National Transit Database: Monthly Module Adjusted Data Release for May 2013.” http://www.ntdprogram.gov/ntdprogram/pubs/MonthlyData/May_2013_Adjusted_Database.xls (Accessed July 29, 2013).

Table 8. Annual Operating Expense by Streetcar in Five Cities (2008-2012)[29]

	Little Rock		Memphis		Portland	
Year	**Unadjusted $**	**2012 $**	**Unadjusted $**	**2012 $**	**Unadjusted $**	**2012 $**
2008	$818,119	$872,445	$4,253,541	$4,535,994	not available	not available
2009	$898,802	$961,908	$4,271,523	$4,571,434	not available	not available
2010	$1,007,510	$1,060,848	$4,340,918	$4,570,728	not available	not available
2011	$942,933	$962,472	$4,796,905	$4,896,302	$7,695,125	$7,854,577
2012	$1,007,601	$1,007,601	$3,887,983	$3,887,983	$11,868,085	$11,868,085

	Seattle		Tampa	
Year	**Unadjusted $**	**2012 $**	**Unadjusted $**	**2012 $**
2008	$2,459,635	$2,622,965	$2,078,695	$2,216,729
2009	$2,366,620	$2,532,784	$2,383,666	$2,551,027
2010	$2,318,808	$2,441,567	$2,542,168	$2,676,752
2011	$2,396,642	$2,446,303	$2,209,652	$2,255,439
2012	$2,794,211	$2,794,211	$1,775,507	$1,775,507

The authors constructed a set of annual performance indicators by combining the ridership, service, and operating expense data just discussed. Two performance indicators are cost effectiveness and service productivity, both of which are reported in Table 9. Cost effectiveness is defined as operating expense per unlinked passenger trip, reported in inflation-adjusted 2012 dollars. Here, a lower-cost value means the service is more cost effective. In 2012, operating expenses range from a low of $2.61 per trip in Memphis, the most cost effective case, to a high of $9.61 per trip in Little Rock, the least cost effective case. Between 2008 and 2012, cost effectiveness improved in Memphis and Seattle, and it deteriorated in the other three cities.

Service productivity is the average number of passengers on a vehicle at a given point in time (ridership measured in either passenger miles or passenger kilometers divided by service measured in either revenue miles or revenue kilometers). A higher number means that each unit of service is carrying a larger number of riders. In 2012, the streetcar system in Portland was by far the most productive, followed by that of Seattle. Little Rock, Memphis, and Tampa were much less productive. Low numbers generally indicate less productive service, although they might also be a function of shorter trip lengths for the average transit rider, which the authors consider in Table 9. Between 2008 and 2012, service productivity declined in Little Rock and Tampa and improved in Memphis and Seattle. Data are incomplete for the entire time period for Portland due to the mingling of streetcar and LRT statistics in the original NTD data prior to 2011.

Table 9. Annual Cost Effectiveness and Service Productivity by Streetcar in Five Cities (2008-2012)[30]

	Cost Effectiveness (2012$)				
Year	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
2008	$6.10	$4.19		$5.95	$5.04
2009	$7.51	$3.84		$5.25	$5.71
2010	$9.41	$3.76		$4.45	$6.70
2011	$6.91	$4.42	$2.03	$3.35	$6.29
2012	$9.61	$2.61	$3.24	$3.72	$5.89
	Service Productivity				
Year	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
2008	3.90	2.19		6.68	8.90
2009	3.41	2.72		6.89	10.41
2010	3.14	2.45		7.86	11.05
2011	4.37	2.76	18.35	10.23	8.93
2012	2.97	5.03	17.84	10.40	7.74

A final set of performance statistics are shown in Table 10. Here, the authors report average trip lengths and average operating speeds. These values are reported in miles and miles per hour, respectively. Average trip lengths are much longer in Little Rock and Tampa, reflecting the peculiarities of these systems' rather long linear downtown alignments, while they are shortest in Seattle, reflecting the very short one-way alignment of the South Lake Union line in that city. Average operating speeds range from a low of 4.4 miles per hour (7.1 kilometers per hour) in Little Rock to a high of 7.7 miles per hour (12.4 kilometers per hour) in Memphis, with the other three systems operating between 5.4 and 5.7 miles per hour (8.6 and 9.1 kilometers per hour). In each of the cities, the average streetcar operating speed is much lower than that of the average bus operated in the same community, as noted in Table 11.

Table 10. Average Trip Length and Operating Speed of Streetcars in Five Cities (2008-2012)[31]

	Average Trip Length (miles, kilometers)				
Year	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
2008	1.54 (2.48)	0.81 (1.30)		0.92 (1.47)	1.66 (2.67)
2009	1.53 (2.47)	0.84 (1.36)		0.92 (1.47)	1.74 (2.80)
2010	1.55 (2.49)	0.79 (1.28)		0.91 (1.46)	1.97 (3.17)
2011	1.76 (2.83)	0.66 (1.06)	0.96 (1.55)	0.88 (1.42)	1.91 (3.07)
2012	1.55 (2.50)	1.12 (1.80)	1.02 (1.64)	0.87 (1.39)	1.73 (2.78)
	Service Productivity				
Year	**Little Rock**	**Memphis**	**Portland**	**Seattle**	**Tampa**
2008	4.42 (7.11)	6.48 (10.43)	5.69 (9.15)	4.97 (7.99)	5.09 (8.18)
2009	4.46 (7.18)	6.33 (10.19)	5.69 (9.15)	5.37 (8.64)	5.12 (8.24)
2010	4.45 (7.16)	6.48 (10.43)	5.69 (9.15)	5.36 (8.63)	5.16 (8.30)
2011	4.38 (7.05)	6.42 (10.34)	5.65 (9.09)	5.36 (8.63)	5.33 (8.57)
2012	4.40 (7.07)	7.69 (12.38)	5.70 (9.17)	5.33 (8.57)	5.38 (8.66)

The streetcar's closest transit modal counterpart is local bus service, which also features close stop spacing and typically operates in a right-of-way shared with automobile traffic. The authors thus contrasted streetcar performance with that of local bus service in each city. The authors selected ridership (trips or boardings), service productivity (load factor), cost effectiveness (operating expense per trip), and operating speed (revenue kilometers, RKM, per revenue hour, RH) as the comparison performance measures. Table 11 reports the results for 2012 for streetcar and bus services in each city. For each mode, these statistics refer to the modal total for ridership and the modal average for the other performance indicators.

Table 11. The Performance of Streetcars versus Local Bus Service (2012)[32]

	Little Rock		Memphis		Portland		Seattle		Tampa	
Characteristic	**Streetcar**	**Bus**	**Streetcar**	**Bus**	**Streetcar**	**Bus**	**Streetcar**	**Bus**	**Streetcar**	**Bus**
Ridership (trips/boardings)	104,868	2,823,614	1,491,841	8,562,828	3,664,538	59,509,235	750,866	95,592,084	301,516	14,314,610
Service Productivity (load factor)	2.97	6.84	5.03	8.22	17.84	12.19	10.40	13.75	7.74	9.76
Cost Effectiveness ($ per trip)	$9.61	$4.45	$2.61	$5.14	$3.24	$3.88	$3.72	$4.50	$5.89	$3.84
Speed (RKM/RH)	7.07	22.90	12.38	23.72	9.17	18.98	5.57	19.37	5.66	20.53

It is not surprising that, due to differences in network scale, bus ridership dwarfs streetcar ridership in each city. Bus ridership is about six times the level of streetcar in Memphis, where streetcar riders make up the largest share of combined bus and streetcar riders (nearly 15 percent), and bus ridership is more than 120 times the level of streetcar ridership in Seattle, where streetcar riders make up the smallest share of combined bus and streetcar riders (less than 1 percent).

Bus service productivity (passenger miles, or kilometers, per vehicle mile, or kilometer; load factor) also exceeds that of the streetcar in every city with the exception of Portland. In Portland, streetcar service productivity is more than 40 percent higher than that of the average bus. In the other cities, streetcar service productivity ranges between 44 percent (Little Rock) and 80 percent (Tampa) that of local bus service.

Streetcar operating costs per rider are lower than bus operating costs per rider in three cities (Memphis, Portland, and Seattle), while in the other two cities, streetcar operating costs are about 50 percent higher (Tampa) or more than double (Little Rock) that of bus service. Streetcar speeds are about half those of the average bus in each of the cities. The ratio of streetcar speed to bus speed ranges from a low of 31 percent in Little Rock to a high of 52 percent in Memphis. Obviously, streetcars do not operate as rapid transit, but instead operate as slower-speed local services.

Given that these ridership and performance statistics relate to modal averages, a variety of bus services (downtown, suburban, and commuter) are combined in the bus values. It is likely that local bus services operating in the same downtown (and adjacent) areas as the streetcar probably operate at slower speeds than the bus modal average. However, they also likely carry more riders than the average bus route, and thus would have higher productivity and better cost effectiveness than the bus modal average. So, in very few instances one could safely assert that streetcars provide operating efficiencies, either with respect to productivity or cost effectiveness, compared with buses. This result is due principally to the relatively low ridership on most streetcar systems.

Taking stock of the five cities, Portland emerges as the clear standout performer with respect to ridership as well as the service performance measures, with Seattle and Memphis in the next tier, and Little Rock and Tampa at the bottom. Portland has by far the highest ridership and the best service productivity, and it ranks second to Memphis with respect to cost effectiveness measures. Portland is also the only city in which streetcar performance on service productivity and cost effectiveness bests that of the average bus. So why is it that Portland's streetcar is so much stronger a performer than the other four cases? And what might other cities learn from Portland's streetcar experience that might be transferrable to their own?

FACTORS RELATED TO RIDERSHIP AND PERFORMANCE

Using the literature discussed in the prior section, the authors identified a set of factors that might be related to streetcar performance in the study communities. These factors include those over which planners and policymakers exercise some control either during initial planning or ongoing operation of the streetcar, and other factors that are external to decisions made by transit planners and policymakers. The factors include: alignment (streetcar line length, and location with respect to population covered, employment covered, and special generators served), network coordination (streetcar accessibility to connecting transit services), fare policy (streetcar fare level, streetcar transfer policy), service policy (streetcar service frequency, streetcar service duration), and rider market (seasonality of streetcar ridership). The first sets of factors are related to decisions made by planners and policymakers, while the last factor is an outcome related to use of streetcar service. The authors suspect that Portland's streetcar is closest to the ideal for each of these factors and that variation in streetcar performance among the other cities might be explained by variation in their own ranks on these factors.

The authors first defined an ideal condition as suggested by literature, and then ranked each city's streetcar from best to worst against this ideal (Table 12). The authors assigned each city a score between 1 (worst, or lowest ranked) and 5 (best, or highest ranked) for each factor, save for two factors that were scored on a binary basis (1= meets the ideal; 0= does not meet the ideal). The authors then compiled the rankings and related the results back to the ridership and performance measures noted earlier. Each factor is discussed in turn below.

Table 12. Streetcar Performance Factor Matrix (2012)

Factors	Little Rock	Memphis	Portland	Seattle	Tampa
Alignment Length	5.47 km	11.27 km	11.83 km	4.18 km	4.35 km
(in kilometers)	**3**	**4**	**5**	**1**	**2**
Population Covered	3,606	57,518	117,060	16,758	5,651
(number of persons within 400 meters of stop)	**1**	**4**	**5**	**3**	**2**
Employment Covered	1,859	24,847	64,899	10,821	3,503
(number of jobs within 400 meters to stop)	**1**	**4**	**5**	**3**	**2**
Transit Connections	62	296	687	120	75
(number of connecting services at stops)	**1**	**4**	**5**	**3**	**2**
Special Generators Served*	66	11	40	140	22
(number located within 400 meters of stop)	**4**	**1**	**3**	**5**	**2**
Fare Level	$1 ride; $2 day pass	$1 ride; $3,50 day pass	$1 ride; $5 day pass	$2.50 ride; $5 day pass	$2.50 ride; no day pass
(per ride and per day pass if available)	**5**	**4**	**3**	**1**	**2**
Transfer Policy	restrictive	free transfer	free within 2 hours	free transfer	no free transfer
(availability of free transfers to other modes)	**2**	**5**	**3**	**5**	**1**
Headways	25 min.	10 min.	14-17 min.	10 min.	20 min,
(average weekday peak period)	**1**	**5**	**3**	**5**	**2**
Service Hours	14 hours	17 hours	18 hours	15 hours	10 hours
(average weekday)	**2**	**4**	**5**	**3**	**1**
Day-long Service	No	Yes	Yes	Yes	No

Factors	Little Rock	Memphis	Portland	Seattle	Tampa
(serves both peak periods)	**0**	**1**	**1**	**1**	**0**
Seasonality	Yes	Yes	No	No	Yes
(monthly ridership variation by time of year)	**0**	**0**	**1**	**1**	**0**
Total	**20**	**36**	**39**	**31**	**16**

*Note: Special generators include hotels, convention centers, museums, university campuses, and other major activity centers.

Alignment Length

All else being equal, a longer streetcar alignment would seem to be the most desirable, as it would permit riders to reach a wider array of destinations.[33] Significant differences exist among the case cities in alignment length reported in Table 12.[34] Portland and Memphis have longer streetcar alignments (11.8 kilometers and 11.3 kilometers, respectively [7.35 miles and 7.00 miles]) than the other cases. It should be noted, of course, that Portland and Memphis also operate multiple streetcar lines, as does Little Rock, while Seattle and Tampa operate only single streetcar lines. The difference in the number of lines operated in each city is undoubtedly related to differences in alignment lengths. However, Seattle is in the process of building a new streetcar line at the time of this study, as is discussed in Appendix D. Based on its longer alignment length, Portland thus receives the highest score for this factor, and Seattle receives the lowest score.

Population Covered

Most transportation analysts use population to represent potential trip origins,[35] and there is indeed a relationship between population and streetcar ridership as noted in the literature review section.[36] Thus, one would expect streetcars that serve more people to enjoy higher ridership than those that serve fewer people. The authors used GIS analysis to identify the size of the population residing within 400 meters of a streetcar stop. The city with the highest population located near a stop receives the highest score, while the city with the lowest population near a stop receives the lowest score. The size of the population covered by streetcar service ranges from a low of 3,600 people (Little Rock) to a high of more than 117,000 people (Portland). Portland receives the highest score for this factor, as it registers the highest population covered among all five cases. Its count of population covered represents a two-fold difference compared with Memphis and more than 30-fold difference compared with Little Rock. Figure 4 displays the population coverage results in density map form.

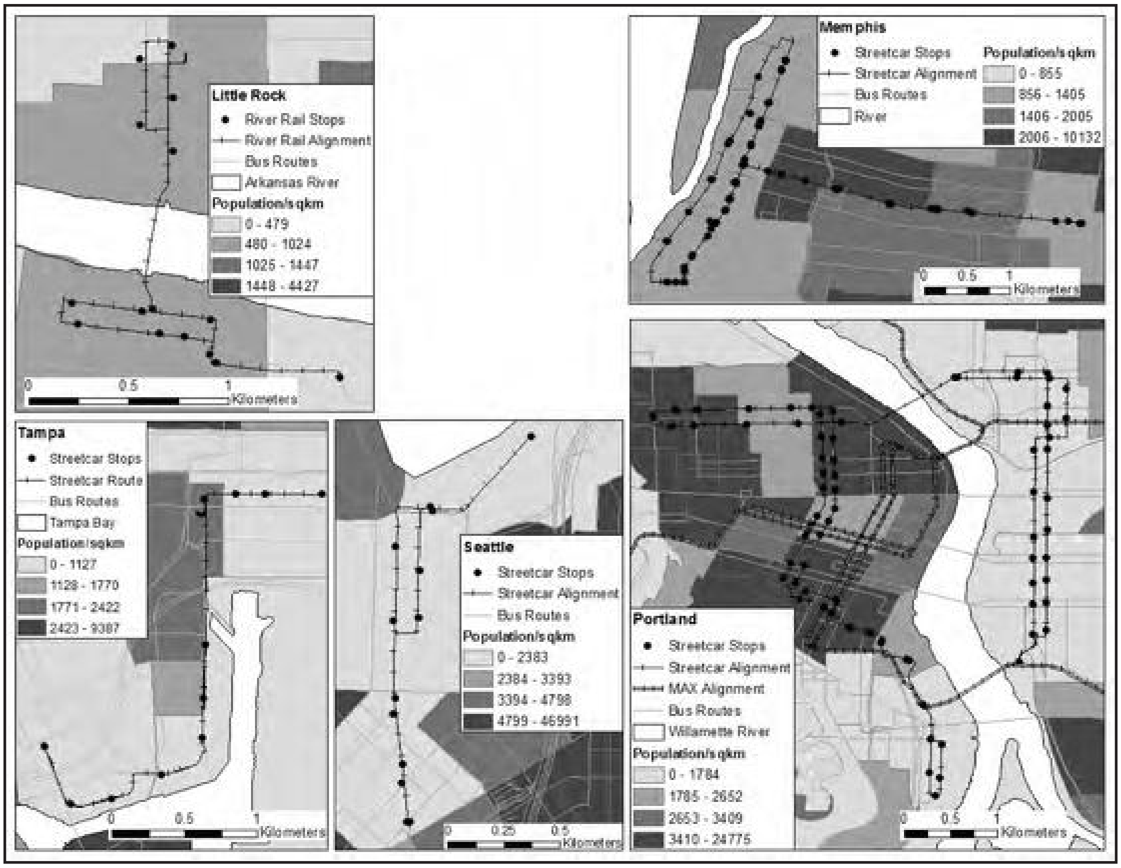

Figure 4. Population Density near Streetcar Lines in Five U.S. Cities (2012)[37]

Employment Covered

Most transportation analysts use employment to represent trip destinations,[38] and indeed a relationship exists between employment and streetcar ridership, as noted in the literature review discussed earlier.[39] This is because employment not only represents a destination for commute trips, but it also serves as a proxy for many other trip destinations that are co-located with employment. Given the downtown contexts in which most modern-era streetcars operate and the significance of employment levels within a 400-meter radius for stop-level streetcar ridership, it is plausible to think that employment levels might also represent trip generators for many non-home-based trips. For all these reasons, one would expect streetcars that serve more jobs to enjoy higher ridership than those that serve fewer jobs.

The authors used GIS analysis to identify the number of jobs located within 400 meters of a streetcar stop. Scores are assigned in the same manner as for population. The city with the highest number of jobs located near a stop receives the highest score, while the city with the lowest number of jobs near a stop receives the lowest score. The amount of employment covered by streetcar service ranged from a low of about 1,860 jobs (Little Rock) to nearly 65,000 jobs (Portland) (Table 12). Portland’s employment coverage stands out for being more than double that for Memphis and more than six times that of Seattle, the second- and third-ranked cities. The streetcars in Tampa and Little Rock serve very few jobs. Figure 5 displays the employment coverage results in density map form.

Interestingly, the cities rank in exactly the same positions on population covered and employment covered by their streetcar lines. Portland ranks as the top performer on both factors, followed by Memphis and Seattle, whose numbers of covered residents and jobs are far fewer than those for Portland. Little Rock and Tampa rank at the bottom, with far fewer residents or jobs covered by streetcar service, a function of the peculiarities of their streetcar lines' locations in their communities. Given the importance of population and employment as ridership determinants cited in the transit literature, it is perhaps not surprising that there is a remarkable consistency between the cities' ranks on ridership and the other performance measures and their ranks on the population and employment coverage factors. It would appear that certainly Portland, and to a lesser extent both Memphis and Seattle, made the decision to locate their streetcar service in areas with large existing population and/or employment or significant population and/or employment growth potential. This is not the case, at least thus far, in the other two cities.

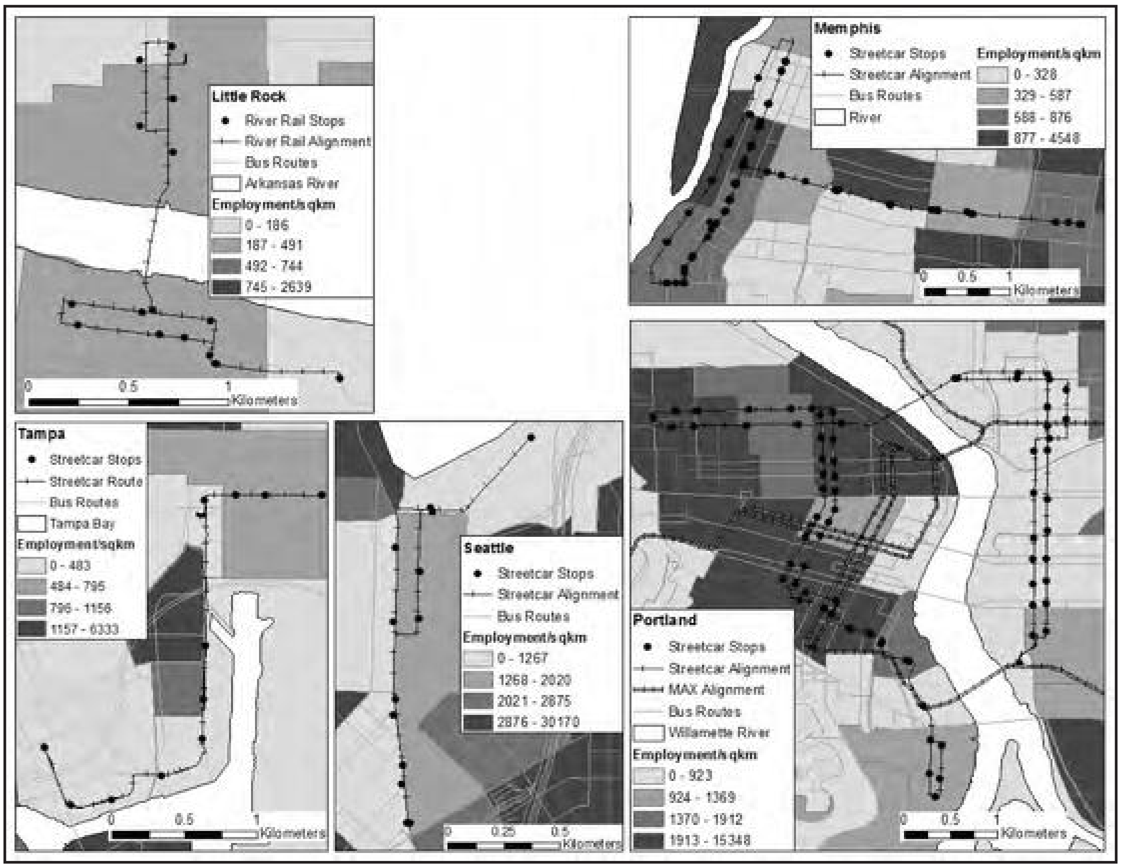

Figure 5. Employment Density near Streetcar Lines in Five U.S. Cities (2012)[40]

Special Generators Served

The literature discussed earlier noted the importance of special generators such as hotels, convention centers, museums, and university campuses as explanatory factors for stop-level streetcar ridership, particularly on modern-era streetcars such as those considered in this study.[41] Ramos and Brown pointed to the existence of special generators as being associated with a several-fold increase in ridership than would otherwise be expected at a particular stop.[42] Given these results, a streetcar that provides access to more special generators should thus expect to enjoy higher ridership than those that serve fewer such locations.

The authors used GIS analysis to calculate the number of special generators located within 400 meters of a streetcar stop. This count-based approach to accounting for these special activity locations is not as ideal an approach as one that might measure the actual intensity of activity at each special generator site, which could vary considerably from one location to another. However, given data availability constraints, the authors believe it provides a reasonable approximation to gauging such activity. Figure 6 displays the locations of special generators near the streetcar lines. The number of special generators served by streetcar lines ranges from a low of 11 in Memphis to a high of 140 in Seattle (Table 12). The city whose streetcars serve the most special generators receives the highest score.

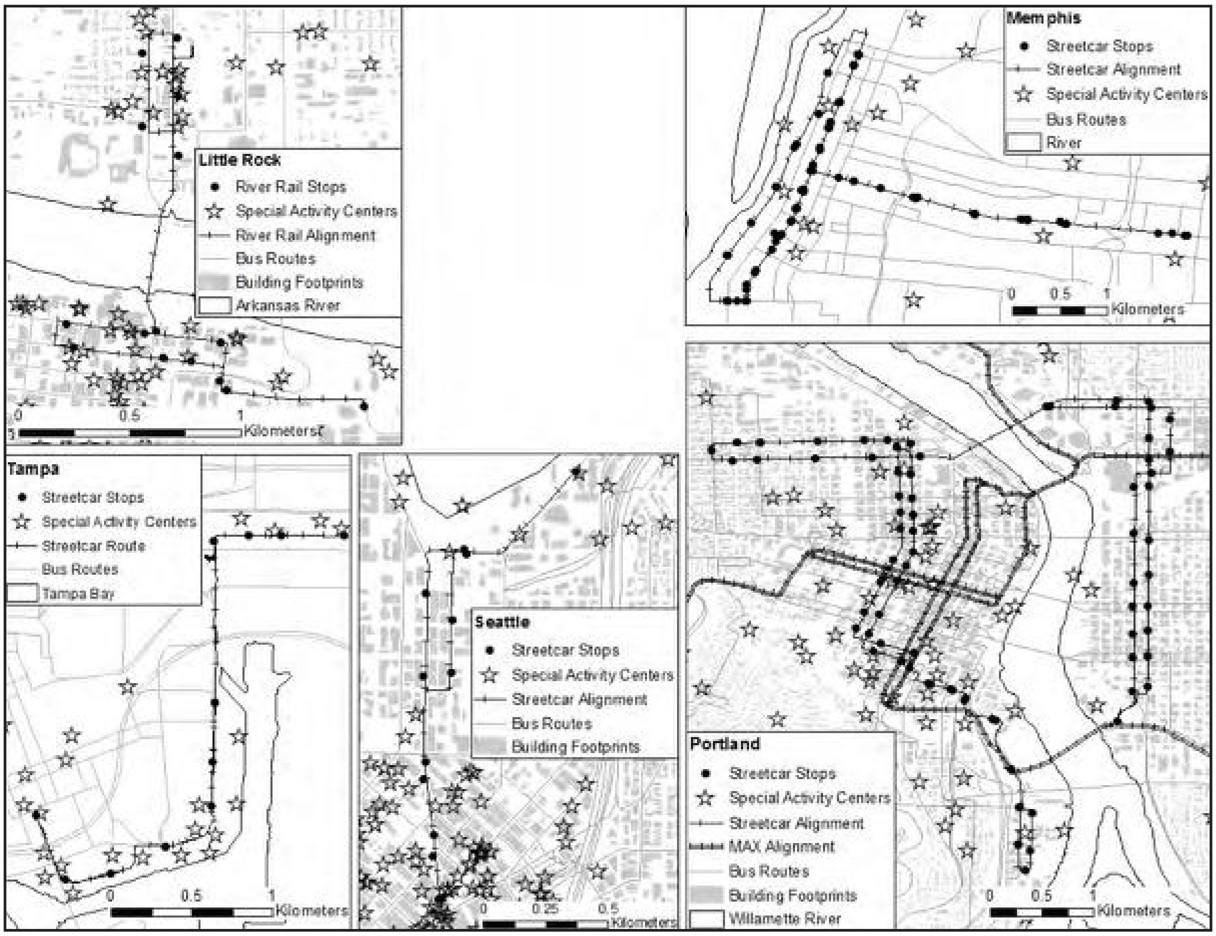

Figure 6. Special Generators Served by Streetcars in Five U.S. Cities (2012)[43]

Transit Connections

Previous research has suggested the importance of networks for ridership and performance, as well-designed networks with plenty of service connections allow riders to reach a wider array of destinations than less connected networks.[44] The authors assessed the connectedness of streetcars to other transit services by tabulating the number of transit connections available at streetcar stops. The city that has the highest number of transit connections at its streetcar stops receives the highest score. Figure 1, shown earlier, gives an indication of the connectedness of the different streetcar lines shown in map form.

Table 12 reports that Portland, Memphis, and Seattle have the most transit connections at streetcar stops, and Tampa and Little Rock have the fewest connections. The number of connections ranges from a low of 62 in Little Rock to 687 in Portland. Note that connections are counted on a stop basis and summed across the streetcar stops, so a connecting bus route serving multiple stops would be counted at each streetcar stop it serves. The high level of connectedness for Portland's streetcar is a function of its location within a downtown area served by a large number of bus routes. Transit planners in Portland clearly made sure that these routes are easily accessible, spatially, to streetcar riders.

Fare Level

Transit riders are sensitive to the fare charged, so one would expect ridership to be higher in cases with lower fares.[45] The authors considered fares for individual rides and day passes where available.[46] Little Rock's low per-ride fare ($1) stands out amongst the cities, as do the much higher fares on the relatively short Tampa and Seattle lines ($2.50 per ride on each line). Four of the five cities offer day passes to streetcar riders, with pass rates ranging from $2 per day (Little Rock) to $5 per day (Portland and Seattle). The higher day-pass rates in Portland and Seattle are perhaps not surprising given the wider array of services and greater geographic reach of the transit systems that day pass purchasers can access. The cities are ranked on their fare levels in Table 12, with Little Rock and Memphis ranked at the top solely due to the low cost of riding their streetcar services.

Transfer Arrangements

An optimal transfer policy would permit free transfers between services to facilitate easy rider movement.[47] This would remove one of the important barriers to transit use, which is the necessity to pay an additional fare for completing a single trip. The authors thus assessed whether streetcar riders could inexpensively move between different modal services in each city.[48] Seattle and Memphis permit unrestricted free transfers across their transit services, with a single ride fare, thus earning these cities a shared top score (Table 12). Portland permits free transfers within a two-hour time window with a single fare, earning it a middle score. Little Rock and Tampa have much more restrictive transfer policies. Little Rock permits free transfers from bus to streetcar but not from streetcar to bus, as streetcar fares are lower than bus fares. Tampa permits free transfers only with the purchase of a day pass and not with a single-ride fare.

Headways

Transit users are sensitive to the time spent waiting for a bus or train to arrive, and one would expect streetcar users to behave similarly.[49] Thus, an optimal condition would be for a streetcar to operate more frequent service to reduce rider wait time. The authors examined the weekday peak period headways as the indicator of streetcar service frequencies.[50] Streetcar service is most frequent in Memphis and Seattle, and it is least frequent in Little Rock. The cities are scored according to the frequency of their weekday peak service, as indicated in Table 12.

Service Duration

From a rider's perspective, the optimal streetcar service would have long service hours that would allow a wider array of potential trips to be served.[51] At a minimum, a service should operate during peak riding hours when most transit trips are taken. The authors considered the typical weekday service hours for each city and ranked the cities from the cases that operate the longest number of hours to those that operate the fewest.[52] Portland, Memphis, and Seattle rank in the top three positions (Table 12). These three cities are also noteworthy for offering streetcar service during both commute periods, which is not the case with the Little Rock and Tampa streetcars, which ignore the morning peak period. Little Rock's service begins at 8:30 a.m. on weekday mornings, while Tampa's service does not begin until 11 a.m. or noon. Because these cities do not serve the morning commute, these services become irrelevant for trips made during these hours of the day. The authors scored the cases separately with respect to the number of service hours (ranked from 5 to 1 [with 5 being best and 1 being worst]) and whether or not the two weekday commute periods were served (1 = Yes, 0 =No).

Seasonality of Ridership

The sets of factors just discussed are related to decisions that planners and policymakers make about streetcar service. The last factor is related to how the streetcar is used by riders, and it can be seen as at least partially an outcome of the decisions made with respect to the previously noted factors. The authors suspect that the streetcars with the highest ridership and strongest performance are those that serve a diversity of trip types and are not dominated by tourist trips, which are highly seasonal in nature. Because of inconsistency in rider surveys across the cases, as reported in the individual case-study profiles in the appendices, the authors use the seasonality of ridership to denote more tourist-oriented streetcar services (Table 4). It should be noted that the authors found no seasonal pattern to bus ridership in any of the cities (see individual appendices for details). Streetcar service levels are not seasonal in any city, so any seasonal ridership should be attributable to differences in rider demand and not supply (Table 7).

The authors scored Portland and Seattle as the optimal condition (score = 1) because they do not have a clear seasonal streetcar ridership pattern; the other cases exhibit the less optimal condition due to their seasonal ridership pattern (score = 0) (Table 12). Little Rock, Memphis, and Tampa have a much more seasonal pattern to their streetcar ridership than either Portland or Seattle. In these three cities, the transit operators provide a great deal of service that is quite underutilized for many months of the year, which leads to lower productivity and higher operating costs per rider. By contrast, a more balanced ridership permits more efficient use of streetcar service, which should result in higher productivity and lower operating costs per rider. These results certainly appear in Portland's performance statistics noted earlier.

Other Potential Factors

The authors conducted key informant interviews in each of the cities with planners and other streetcar observers, which are discussed in greater detail in the next section of the report. These interviews identified several other factors that might also be related to ridership and performance on the streetcars in each city. These factors are much harder to measure and assess than the previously discussed factors, but they are worth noting due to their mention by these informants.

One factor is the health of the local economy. This has implications both for the use of the streetcar as a development tool and the use of the streetcar in tourism and visitor promotion, and it certainly can be seen in ridership and other performance statistics. For example, the informants in Portland and Seattle stressed their communities' healthy local economies and vibrant real estate markets at the time of streetcar implementation. This allowed them to take advantage of these larger economic conditions in using the streetcars as "catalysts" to support additional development activity while also ensuring that there was some existing ridership already in place, or soon to be in place, to use the streetcar service because of preexisting development activity.

In the case of the two weaker performing cities, Tampa and Little Rock, larger economic forces affecting the tourism parts of the local economies hurt streetcar performance. With the onset of the economic recession in 2008, visitor and convention activity declined significantly in both cities, and it has not yet rebounded. Streetcar ridership began to decline as a result of the decline in visitors. Thus, these two cities' experiences emphasize that modern-era streetcar systems that specialize in tourist travel markets are much more vulnerable to economic conditions than those that focus on a wider array of potential users.

The key informant interviews also pointed to local parking policies and local streetscape improvements as important factors related to encouraging more people to use the streetcar instead of motor vehicles to make their trips. In Portland, the key informants suggested that the presence of these supportive policies aided transit ridership in general and streetcar ridership in particular, and one would suspect that their presence (or absence) might have similar effects elsewhere. Finally, in the cities that operate vintage vehicles (Memphis, Tampa), informants noted difficulties with maintenance and the high expense of obtaining parts for these vehicles. Some cities selected vintage vehicles in order to promote a sense of nostalgia that fit with the image they were developing for the area served by the streetcar. Little attention was paid to the practical implications of these decisions on service reliability or maintenance expenditures, which have proven to be significant.

DISCUSSION

The final scores on all the factors are shown at the bottom of Table 12. Portland emerges as the city whose streetcar system was planned and operates closest to the ideal suggested by the literature (total of 39 points out of 47 possible), followed by Memphis (36 points) and Seattle (31 points). Tampa and Little Rock emerge with the lowest scores (16 points and 20 points, respectively). The two sets of cities rank similarly on the factor assessment, as they do on the ridership and performance measures noted earlier in Table 3. Portland, Memphis, and Seattle are the better performers, and Little Rock and Tampa the weaker performers on the ridership and transit performance measures. Portland's emergence at the top of the point scale echoes its performance as the highest ridership, most productive, and second-most cost effective streetcar.

A critical difference between Portland and the other cities is that planners and policymakers explicitly thought about the streetcar as transit and as a development tool when they made crucial decisions about the service. Key informant interviews with transit planners and other streetcar observers in all five cities revealed that the emphasis placed on both transportation and other objectives sets Portland noticeably apart from Little Rock and Tampa, where key informants viewed the streetcars entirely as tourism and development tools, and to a lesser degree from Memphis and Seattle, where informants considered the streetcars as primarily development tools and attributed a much lesser status to their transportation role. According to the key informants, conceiving of the streetcar as both transportation and development tool meant that Portland's streetcar planners paid attention to the issues that mattered for ridership, as well as to those that mattered for development, when they made decisions about the alignment location, the service levels, and how well the streetcar connects to other transit services in the community. They attempted to make the streetcar attractive to more than merely tourist riders.

Portland isn't perfect in how it planned or operates its streetcars, but it is much closer to the ideal than the other cities. Portland now receives significant attention for its streetcar system's purported role in economic development, but this study suggests that more might be learned from how Portland approaches decisions related to its streetcar system's role as transportation. Other cities that now operate streetcar services and communities contemplating their own streetcar investments might learn a great deal by better understanding the lessons learned from Portland's experience.

V. KEY INFORMANT INTERVIEWS IN FIVE STREETCAR CITIES

Given that the streetcars in most of the cities do not seem to be very effective transit services when assessed on standard transportation criteria, questions arise about their “true” purpose(s) and their ability to serve this purpose(s). In this section, the authors use the results of interviews with key informants to consider a set of questions about the streetcars in the five cities. First, which groups were the key actors for leading streetcar development in each city? Second, what are their goals for the streetcar in their city? And third, how do the key informants assess the streetcar’s performance in meeting these goals? The authors close the section with their own assessment of streetcar performance, as well as their assessment of changes that would be required to improve streetcar performance.

INTERVIEWS

The authors conducted 21 interviews with 23 key informants; three interviews featured two informants on the same telephone call (Table 13). The authors provided the informants a set of between 12 and 25 questions prior to the interview (see Appendix F for a questionnaire). These questions related to the individual’s professional background, their duties in their present position, and the nature and duration of their involvement in streetcar issues. The authors also asked informants about the goals and objectives of the streetcar and their assessment of its performance in attaining these goals. The number and nature of other additional questions varied according to the informant’s role and expertise, as well as the history of streetcar planning, construction, and operation in the city. The authors granted the informants anonymity and identify them merely by their cities and their roles.

Table 13. Roster for Key Informant Interviews

Informant Role	Little Rock	Memphis	Portland	Seattle	Tampa
Local Transit Planner	1		1	1	
Regional Transit Planner		1	1		1
Streetcar Specialist		1			1
Streetcar Advocate			1		1
Local Land Planner			1	1	
Regional Planner	1				1
Redevelopment Agency		1			
Business Leader		1	1	1	2
Developer				2	
Tourism Promoter	1				
Total	**3**	**4**	**5**	**5**	**6**

The authors took detailed notes of each interview. Subsequent to the interviews, the authors identified key themes. These key themes were largely consistent across the interviews, despite the diversity of individuals who participated in the interviews, and across the cities, despite differences in their performance, their financing, their institutional arrangements, or the extent of the streetcar service. The convergence of the interviews around these key themes provides the structure to the heart of this section of the report.

THE KEY ACTORS LEADING STREETCAR DEVELOPMENT IN FIVE U.S. CITIES

In most cities, the private sector looms large as a principal force pushing for streetcar development, with representatives of the development community, property owners, and local business leaders playing particularly important roles. Even in the one case in which the public sector drove streetcar implementation (Memphis), the private sector played an important supportive role. The importance of very active private sector involvement is perhaps not surprising given the primary stated objectives of streetcar implementation that are discussed in the following sections.

***Little Rock*.** Key informants emphasized the presence of a diverse coalition of interests, including representatives of the business, tourism, and development communities as well as key political leaders in, as the transit planning informant noted, "creating the momentum" for River Rail's implementation. The regional planning informant emphasized the "existence of a streetcar working group early on that included business and development interests, the metropolitan planning organization, the local transit agency, and important local political figures (including the mayors of Little Rock and North Little Rock and a county judge)." This working group commissioned a downtown redevelopment plan prepared by the Urban Land Institute that proved critical for streetcar implementation, as it emphasized a streetcar's potential development effects. A River Rail streetcar can be seen in Figure 7.

Figure 7. Riders Leave a River Rail Streetcar[53]

Memphis. Key informants emphasized the leading role played by the public sector behind implementation of The Trolley, while noting that the private sector was more passively supportive than actively engaged in streetcar advocacy. The transit planning informant noted that the city of Memphis was the key force and there was little active role played by the private sector, which tended to be “supportive but not advocates.” A local business leader agreed that the private sector played more of a supporting role, particularly with respect to aiding the city in promoting the streetcar as a device that might aid the redevelopment of downtown and help to give an identity to local neighborhoods that lacked one. A third informant noted the importance of private sector development interests in supporting the city, after streetcar implementation, by making key real estate investments in properties located near the streetcar lines. Thus, while the public sector took the lead in streetcar advocacy and promotion, the private sector, particularly local development and business interests, served as key allies.

Portland. In contrast to the Memphis experience, the key informants emphasized the leading role of the private sector in initiating and driving the push for the streetcar lines in Portland. A local business leader recalled that “six people, all from the private sector, constituted the (key streetcar advocacy) organization.” Land owners, developers, and business owners were key figures in this organization, with most participants motivated by downtown revitalization goals. A local land use planner placed particular emphasis on the key roles played by major property owners who led the push for a local improvement district to help finance the first phase of streetcar implementation. The business leader characterized the local improvement district as a “financial and political strategy” that demonstrated strong private sector commitment to the idea of a streetcar. An important local streetcar advocate emphasized the important roles played by “six to eight key developers” in the initial push for the streetcar. According to this informant, the “property owners put (the) money together to build the streetcar.” The local land use planner concurred that the property owners played an important role by contributing about $12.5 million in property tax revenues, through the local improvement district, toward streetcar finance. Thus, in Portland, the private sector looms large as a strong force particularly early in the story of streetcar implementation due to its advocacy and its willingness to make a financial commitment to the streetcar, as it pursued a particular vision for the redevelopment of the downtown areas through which the streetcar operated.

Seattle. In Seattle, the role of the private sector is especially important with major land owners such as Vulcan, Inc. (owned by billionaire former Microsoft executive Paul Allen) and major companies such as Amazon (owned by billionaire Jeff Bezos) looming particularly large in the story of the South Lake Union line. According to the development informants, Vulcan executives participated in the Build the Streetcar committee that led the push for the construction of the streetcar, and they helped to promote the creation of the local improvement district to help finance it. The development informants recalled that Build the Streetcar ran its promotional efforts “like a political campaign” that utilized door-to-door advocacy with local business owners, targeted marketing and outreach to property owners, created a website, and implemented a public advertising campaign. Vulcan also participated in a formalized “community” advocacy group called South Lake Union Friends and Neighbors (SLUFAN) that includes representation from the business community and other developers. The transit planning informant noted the subsequent involvement of Amazon, which moved its operations into the neighborhood, and institutional actors such as the Fred Hutchinson Cancer Research Center as promoters and partial funders of streetcar service improvements. The informants also noted the importance of Portland’s streetcar experience as an inspiration and model for Seattle’s streetcar activities.

Tampa. Key informants emphasized the joint public-private role in promoting the creation of the TECO Line streetcar. One business leader noted the role of the local business community, and particularly the downtown business improvement district (Tampa Downtown Partnership), as a key advocate for the streetcar. Another business leader commented on the role of that entity's Ybor City counterpart (Ybor City Development Corporation) as a key advocacy group. This latter informant characterized the group as "cheerleaders for the streetcar." A local streetcar advocate emphasized the important early role played by the privately run Tampa and Ybor City Streetcar Society, the predecessor of today's non-profit Tampa Historic Streetcar, Inc., which manages the TECO Line, as an advocacy group that placed the idea of returning a streetcar to Tampa on the local transportation agenda. This individual emphasized the partnerships between the advocacy group and key public officials, including the former director of the transit agency and the former mayor of Tampa, in procuring the federal funding needed to build the streetcar line.

THE GOALS OF STREETCAR IMPLEMENTATION IN FIVE U.S. CITIES

The key-informant interviews focused a great deal on the informants' identification of streetcar goals and their assessments of the streetcars' performance in attaining these goals. Three goals emerged across the interviews. First, in each city, informants noted a development rationale for the streetcar, including the streetcar's potential role as a "permanent amenity" that might encourage developers to make investments in areas adjacent to a streetcar line. Portland's experience with development loomed large for each of the cities that built their streetcars after Portland's first line opened. Second, in many cities, informants emphasized the streetcar's role as a symbol or icon that might be used to give identity to the city, or to a neighborhood at a more localized scale, and might be a valuable asset in marketing the city to attract tourists, conventioneers, and other visitors. Finally, in a couple cities, informants discussed the streetcar's potential role as a transportation investment that might help to serve local goals to encourage more use of non-automobile transportation, including by serving as a pedestrian or bicycle "trip extender." Particularly noteworthy here is the striking contrast between the significance accorded to this role in Portland versus most other cities. It is important to note that the goal(s) for streetcar development in each city affected the selection of alignment locations and their lengths, as well as stop locations, which had significant implications for ridership and transportation performance once the streetcar began operations.

Streetcar as Development Tool

Most key informants identified development promotion as the primary goal of streetcar investment in their city. The business leader informants in Tampa and the business leader informant in Portland used the word "catalyst" and the phrase "tool to assist development" when discussing the streetcar's potential development role, while key informants in Memphis, Seattle, and Tampa referred to the streetcar as a development "amenity." The business leader informant in Portland went even further and asserted that the "streetcar was never primarily a transportation tool" and that the streetcar's goal was "assisting and reviving intercity neighborhoods" and "encouraging intercity development." Figure 8 depicts a Portland streetcar operating near higher density urban development.

Figure 8. Portland Streetcar Near Higher Density Urban Development[54]

In Portland, the business leader emphasized the role of the streetcar as a good “catalyst for change in decayed or underdeveloped urban areas,” and he pointed to European cities as models because of their well-developed transit systems that served their urban cores. The streetcar advocate added that the first streetcar line (NS Line) was linked to a central city redevelopment plan that called for 10,000 residential units and 3.5 million square feet [325,160 square meters] of retail development in areas near the streetcar line. The regional transit planner concurred with these views and emphasized that key stakeholders in the decision making process around the first line viewed it as “more of a land use project than a transit project… It was part of the package of a development strategy.” The local land planner and local transit planner concurred with the idea that the streetcar was a development tool that was placed in an area that both planners and policymakers felt had significant development potential.

According to the regional transit planner, the “city had a high density vision” for the Pearl District located adjacent to downtown Portland, and the streetcar was seen as a “permanent… symbol of public investment and commitment to the area and its high density vision.” The same informant said the recent Central Loop line (opened in 2012) is driven by similar development goals, although the city is not promoting very high densities in the area, as they wish to retain its “mixed use character.”

Portland served as a model for many of the other cities, which adopted the streetcar to further their own development goals. In Tampa, the streetcar advocate pointed to Portland as a key model for the streetcar in that community. He articulated the view that “urban redevelopment follows transit,” in this case the streetcar, and cited Portland as “the model” of a community that had successfully used its streetcar to further its redevelopment and densification policies. The developer informants in Seattle also pointed to Portland as an inspiration for Seattle’s own streetcar line and its development promotion goals. They recalled that Seattle officials had commissioned an appraiser to study the value of new development along the Portland Streetcar line with an eye toward estimating development potential in their city. The Seattle informants also noted that local policymakers took a field trip to see Portland’s streetcar when they were making the decision whether or not to build the South Lake Union Line.

Memphis’ first streetcar line predates the Portland streetcar line, and the key informants also emphasized the development rationale for its implementation. The business and transit informants described downtown Memphis in the late 1980s and early 1990s as a distressed area in need of serious revitalization. The immediate impetus to the construction of the city’s first Trolley was a desire to revitalize a failed pedestrian mall along Main Street. The transit planning informants characterized the streetcar as a tool that would provide better access to this area, which was perceived as lacking good pedestrian access, and that the streetcar would in turn stimulate development activity. The redevelopment agency informant agreed that the Memphis Trolley was built primarily to encourage development. Figure 9 depicts a streetcar operating on Memphis’ Main Street Trolley Line.

Most informants across the five cities spoke favorably of the streetcar as a development tool. Informants spoke about the streetcar’s potential to “activate the street” by encouraging walking and outside activity. They spoke about the signals the investment sent to developers about a strong public “commitment” to an area in the form of a “permanent” investment, which would then presumably encourage developers to make their own investments. The stark contrast with bus services, which were not seen as permanent, and thus would presumably be of little or no interest to private developers’ long-term market interests, was implicit in many informant interviews.

Informants viewed the streetcar as important for development, although few characterized it as a cause of development activity on its own. Instead, they tended to discuss the streetcar as being one of many assets necessary to attain positive development outcomes in their community. Informants also emphasized the importance of strong regional economies, healthy local real estate markets, and synergies with other public and private investments in areas adjacent to the streetcar as key factors for successful development outcomes.

Figure 9. Trolley on Memphis' Main Street Line[55]

Streetcar as Symbol or Icon to Construct Identity and Promote Tourism

The use of the streetcar as a symbol or icon was the second most noted goal that arose in the interviews. This goal was explicitly tied to local efforts to market a city to tourists, conventioneers, and other visitors, and it was particularly noteworthy in Little Rock, Memphis, and Tampa, the three cities whose streetcar ridership is overwhelmingly dominated by visitor-serving trips. These kinds of comments did not emerge as frequently or consistently in the Portland and Seattle interviews.

In Little Rock, the tourism promoter spoke about the "charming vintage streetcar experience" and the "nostalgic feel" of the local streetcar, which was something that the city tries to market to visitors. In Tampa, the regional planning informant spoke about the "abstract benefits" of the streetcar, including its role as "icon" or "symbol" of the city. He favorably noted the TECO Line streetcar's visibility in television coverage of major events, such as the Super Bowl, in the city. He thought it served as a very positive symbol of the city. The Memphis business leader informant made similar statements when he referred to the Trolley as a "marketing investment" for the city and spoke approvingly of its appearance on television coverage of Memphis events. One of the Tampa transit informants noted that the streetcar has become an iconic image of the city. He further reported that "it's cute," although he also lamented that most people "don't ride it."

The nostalgic image of the streetcar, derived from its central role in an earlier era of urban development, loomed large in the minds of many informants. The Memphis business leader spoke of the streetcar helping to "support the historic feeling of the neighborhood… (it) creates an emotional connection to downtown and (helps communicate) the sounds/ smells of the city." He characterized the streetcar as providing a "theatrical event" and a "unique feeling that can't be achieved with other modes." Along similar lines, one Tampa business leader informant characterized the TECO Line streetcar as a "cultural asset" that tells people what Tampa is "all about, (including) its historical significance." Figure 10 depicts a TECO Line streetcar in Tampa.

Figure 10. TECO Line Streetcar in Tampa[56]

Streetcar as Transit Service

In three cities, the key informants did not cite any transportation-related goals for the streetcar. The regional planner in Little Rock emphasized that River Rail was "not a commuter service." In Tampa, one business leader informant noted that the TECO Line was "less a mode of transportation" and "more of a cultural and entertainment piece." The Memphis transit informants noted that they didn't change any bus routes when the Trolley lines opened and do not try to coordinate Trolley service schedules with local buses. These comments together point to the lower priority placed on the Trolley's role as a utilitarian transportation service than its use to achieve other ends.

By contrast, the streetcar's transportation role emerged during the key informant interviews in Portland and Seattle. In Portland, the local land planner and local transportation planner characterized the streetcar as being a combination transportation service and development tool. They spoke of its placement in an area with ridership potential and its ability to serve as a pedestrian trip extender in the downtown that allowed people to shift from motorized transportation to combination streetcar-walking trips. The streetcar advocate and regional transit planner both spoke of a transportation role that has grown in importance as the streetcar lines have been extended over time. The regional transit planner further noted that now Tri-Met includes the streetcar lines as part of its frequent service transit network, which means they are seen by Tri-Met officials as important pieces of the regular local transit system.

In Seattle, the transportation role of the streetcar emerged in interviews, although not quite to the same degree as seen in Portland. The transit planner spoke about the South Lake Union line's role serving the "last mile" in the local transit system. He further noted its role as a circulator that also links to other transit services and to the nearby downtown core. In both Portland and Seattle, the key informants spoke with some pride about the higher-than-forecast ridership of the streetcar lines, which indicates that they pay some attention to the streetcar's ridership and other transportation performance measures.

ASSESSMENT OF STREETCAR GOAL ATTAINMENT

The authors asked the informants for their assessments of the streetcars' performance in meeting its goals. The authors discuss the informants' assessments of the streetcars performance as a development tool, as a symbol or icon used for tourism promotion, and as a transit investment in turn in the sections below. The authors then assess the streetcar's performance based on the evidence obtained during the study.

Informants' Assessment of the Streetcar as Development Tool

In most cities, the informants offered a positive assessment of the streetcar's performance in promoting development in the areas adjacent to its alignment, although these assessments were tempered to a significant degree in Tampa. Most informants stated that the streetcar's presence encouraged developers or businesses to invest in areas near the streetcar alignment. However, the same informants also recognized the importance of other factors, such as the health of the local real estate market, other synergistic public or private investments, and financial and regulatory incentives as factors in development outcomes. Most assessments were made on the basis of an individual's observations as opposed to any detailed analyses. Indeed, studies of streetcar development effects were available only for Portland and Little Rock, and these studies were purely descriptive in nature.

Little Rock. The Little Rock informants offered a minimal assessment of the streetcar's development effects, as they seemed more focused on its symbolic role in tourism and visitor attraction. Their assessments also emphasized the importance of the Clinton Presidential Library's opening in 2004 as a crucial factor that influenced economic activity in downtown Little Rock. The tourism promoter tended to place the strongest emphasis on the Library as the key local investment that drove economic activity, as opposed to the streetcar.

The local transit planner made the most specific assessment of the streetcar's development effects. He pointed to a study conducted for the transit agency that found $1 billion in new development activity (after streetcar implementation) within one-quarter mile [400 meters] of the streetcar alignment. The study implicitly attributed this activity to the streetcar's presence, although the informant was more careful to note that the streetcar is "one of only several factors" that are likely responsible. On the other hand, the tourism promoter pointed to a similar assessment done for the Presidential Library that claimed a role in $2.5 billion of development activity for the Library. Presumably, most if not all of this activity was also claimed for the streetcar in its study.

Later in the interview, the tourism promoter emphasized that so much has occurred in the downtowns of Little Rock and North Little Rock with the Library, Arena development, and the streetcar that it is hard to know which of these investments, if any, is really the key driving force behind downtown development activity. Nevertheless, the regional planner emphasized the view, echoed by the other informants, that the streetcar seemed to be a catalyst of some kind for development activity.

Memphis. The Memphis informants offered a positive assessment of what they saw as the Trolley's role in helping to redevelop a distressed downtown. The informants spoke of the Trolley as having been an influence on the decisions of developers and business owners to invest in the community. One of the informants spoke from his personal experience as a local business owner.

The redevelopment agency informant painted a picture of a Memphis in steep economic decline, with high vacancy rates for commercial properties. He noted that the area began to turn around about 20 years ago, and that growth has continued steadily except during the recent recession. In this informant's view, the Trolley fits in with Memphis' role as the regional cultural and entertainment center, and that it is an important amenity in its downtown district. The informant characterized the area around the Trolley as being "hot" for development activity because of its walkable, mixed-use character and its location. He also stated that developers did consider the Trolley's presence, along with more traditional financial and economic factors, when they made investment decisions.

The transit informants emphasized the Trolley's origins in revitalizing Memphis' failed Main Street pedestrian mall. The Trolley had been implemented to improve mobility along a corridor that was deemed too long to be walkable. These informants thought the Trolley had played a synergistic role, along with other investments, such as an Arena (Great American Pyramid) and the renovation of hotels and other historic buildings, in revitalizing downtown Memphis. These informants did note that they thought the redevelopment efforts had been more successful in attracting residents than in attracting other activity.

The business leader noted that "people in the area built their businesses around the Trolley; it provides a unique feel that can't be achieved with other modes (of transit). Personally, as a business owner, I wouldn't have moved to South Main without the Trolley." This informant's comments pointed to the importance of the Trolley as a tangible public commitment to the area, a permanent investment that sent signals to developers and business owners that they could safely make their own investments. The informant said that "(The) Trolley revived downtown Memphis… Memphis turned the corner after the Trolley came."

Portland. Portland's experience with development around the streetcar is by far the best documented, having been highlighted in a report by Hovee and Gustafson and discussed in a Transit Cooperative Research Program study as well. The Hovee and Gustafson study identified about $800 million of redevelopment activity in areas near the streetcar line in downtown Portland, with plans for an additional $1.2 billion in development.[57] While the authors do not explicitly claim the streetcar was the sole cause of this activity, they do suggest it played a very important role. By and large, the informant interviews take the same approach. They point to very favorable development outcomes and assign an important role to the streetcar as a catalyst as opposed to the primary cause of the activity.

Several informants offered very long-term perspectives on development outcomes as a result of their long involvement in streetcar-related issues in Portland. The streetcar advocate, who has been involved in these issues for several decades, recalled the streetcar's origins in earlier downtown plans that emphasized the redevelopment of the Pearl District and other central locations. The plans for these areas permitted higher densities than previously existed, and the informant emphasized that these high densities were not in place. The informant emphasized that the development goals for the area were exceeded and that the area now features high density, mixed use, walkable environments with some affordable housing. The informant characterized the streetcar as a catalyst for this development and as an "incentive" for the development of other policies. The streetcar enabled an "alignment of policies" developed to achieve the same ends, including land regulation, zoning, fiscal incentives, and investments in other amenities. In this informant's view, the streetcar was an important factor, although not the causal factor, for these outcomes.

The business leader offered a similar assessment of development outcomes based on his similarly long experience with streetcar issues in Portland. He noted that the streetcar's role has been as a tool to assist development; he also used the word "catalyst" in describing the streetcar. The informant pointed to high levels of development activity (50 percent of new development) and high densities (floor-to-area ratios that are more than double that of the downtown area average) along the streetcar alignment as important indicators of its development outcomes. This informant emphasized the attractiveness of the streetcar to developers because it operates on tracks that are "perceived as a permanent commitment of the city" to the area through which the tracks run. He contrasted this with the impermanence of buses. He said that the streetcar also permitted developers to be more creative and to approach development differently than they had in the past.

The informant noted that the streetcar "yes, absolutely" achieved its goals with respect to development. He said it has "proven to be an agent of change" in the Pearl District, the South Waterfront, and potentially on the East side of the Willamette River as well. He pointed to the increased residential and business activity in these areas as the clearest and strongest indicators of its performance. He pointed to increased street-level activity and higher property values as other key indicators of its success. He emphasized the "sense of vibrancy" it added to the central city. But he also acknowledged that the city also relied on tax abatements and other infrastructure investments to support development in these areas, so the streetcar was a contributing factor but not the sole factor.

The local land planner and local transit planner also spoke favorably about development activity in downtown Portland, and they spoke of the streetcar as a "big success" in its role as a development tool. As with other informants, they pointed to the change in development in the Pearl District and other downtown areas as the evidence for its performance. And like the other informants, they emphasized its role as a permanent, fixed amenity that appealed to developers and could serve as an anchor for redevelopment. These two informants seemed the most sensitive to concerns that streetcar proponents might be overselling its development capabilities, as they emphasized the particular importance of efforts now underway to develop a local model to separate the effects of the streetcar versus other factors (streetscape improvements, sidewalk investments, etc.) when assessing development outcomes. Nevertheless, they did conclude that the streetcar was an important part of a "convergence of public investments" in the Pearl District and South Waterfront areas that have resulted in the significant redevelopment of these two areas.

Seattle. The Seattle informants offered a highly positive assessment of the streetcar's development role, although many informants also noted that the area around the streetcar alignment seemed already well positioned to enjoy a development renaissance. In general the informants emphasized the importance of larger economic forces, private sector investments, and local land development policy as key factors in explaining the redevelopment of the South Lake Union area, with the streetcar's role being more that of catalyst than of cause. Figure 11 depicts a South Lake Union streetcar.

Figure 11. South Lake Union Streetcar in Seattle[58]

The local business leader, who also works in economic development, assessed the streetcar as being highly successful in increasing development, aiding retail activity, connecting neighborhoods, and supporting the use of alternative modes of transportation for mobility. This informant particularly emphasized what he regarded as the streetcar's role in encouraging street-level activity, which led to a more active street.

The developer informants also offered a favorable assessment of the development effects. They noted that rental rates and land values have increased since streetcar implementation, and they suggested that the streetcar has been a factor in these results. They further noted that the increased development activity generated about $155 million in tax revenues for the City of Seattle, suggesting the magnitude of the development activity. These informants mentioned a number of specific development outcomes that they related to the streetcar, including the doubling of the number of bank branches near the alignment, the development of an apartment complex that was quickly filled, and a number of other large projects, including Amazon's relocation to the South Lake Union area. These comments thus suggest that the streetcar's development goals are being met.

However, other informants recognized the difficulty in linking this activity specifically to the streetcar. The local land planner observed that "it's really hard to give a good approximation of success. The neighborhood had been rapidly changing. (The streetcar) likely helped (increase) land values along the 'spine' of the streetcar. (But) the South Lake Union district was already on a trajectory to grow so much, so it's hard to tell whether the streetcar was the reason. Perhaps it helped pushed development in that direction." The same informant believed that "(the streetcar is) probably more effective as a development tool" than as a transit tool because it generates "interest and excitement" around development in the South Lake Union area. But he thought the city had a very strong development market in any case. The local land planner seemed to share this view that the streetcar tended to attract attention to the area, "interest and excitement" so to speak, but that the underlying economic conditions made the area ripe for redevelopment anyway.

Tampa. The Tampa informants offered perhaps the most qualified endorsement of the streetcar's development effects of any of the study cities. The more negative assessments emphasized the vulnerability of the city's development sector to larger economic forces, such as the 2008 recession.

The business leaders characterized the streetcar as a catalyst for about $1 billion in development activity along the alignment, and they pointed to the new condominium developments in the city's Channelside district as an example of streetcar-related development that materialized without the aid of other local development incentives. The regional planner also pointed to development activity in this district, pointing to a major hotel and the condominium development as having been due to the presence of the streetcar. Both the business leaders and regional planner also pointed to development activity in Ybor City as being linked to the streetcar. However, the latter informant also noted that the Ybor City district had evolved into area that was not so family-oriented, with the presence of bars and other adult uses. This individual felt this evolution had affected both the level and nature of development activity and resulting streetcar ridership.

At the same time, the informants also spoke of the effects of the 2008 recession and larger economic forces as negative influences on local development activity. One business leader noted that "there were plans prior to the economic downturn for mixed use development in the north end of Ybor Channel but these have not happened." The streetcar specialist observed that "Channelside businesses are gone due to the economic and tourism downturn. This was one of the areas that was expected to activate streetcar ridership," but which has not done so due to the decline in visitor activity. The same informant also observed that the Channelside area had likely been “overbuilt” prior to the recession, which has made it harder for the area to recover.

As the interviews proceeded, many informants’ assessments of the streetcar’s development effects became more qualified. For example, the streetcar advocate informant stated that “I can’t say that new businesses have been established because of the streetcar; but one restaurant ‘Streetcar Charlie’ was established on the streetcar line across a stop. It ran for 4 years before closing for administrative reasons…it could have been established because of the streetcar.” And, one of the business leader informants observed that “there is new investment in Ybor City, although it is hard to gauge the streetcar’s role.”

Informants’ Assessment of the Streetcar as Symbol or Icon

As noted earlier, informants in three cities (Little Rock, Memphis, and Tampa) emphasized the streetcar’s role in tourism promotion and city marketing efforts by virtue of its use as a symbol or icon of the city. By and large, the assessment of its performance in this role was limited to noting the streetcar’s use in television coverage of the community during major events, or its use in marketing materials by local convention and visitors’ bureaus or business organizations. None of the cities had undertaken a formal assessment of the streetcar’s performance with respect to this goal. Several Tampa informants spoke about these “abstract benefits” of the TECO Line Streetcar in that city, especially its use in visitor marketing efforts, including the regional planner, transit planner, streetcar specialist, and business leaders. Many informants emphasized the importance of this role of the streetcar in this city. However, there had been no specific assessment undertaken in Tampa as to how well the streetcar actually performed in this role.

The informants in Little Rock and Memphis made similar comments. In Little Rock, River Rail’s role in city marketing and in local events catering to visitors came up in several interviews. One informant explicitly stated that River Rail’s purpose was to “promote tourism and visitorship, not to serve commuters.” The informants spoke about the role that River Rail operators play as tour guides in pointing out key sites along the streetcar line. So, clearly this is regarded as an important function of that city’s streetcar. One informant emphasized the need to evaluate streetcars that primarily serve this kind of role differently from those focused on serving commuters or other more utilitarian trips. However, there appeared to be no performance measures in place in Little Rock to assess River Rail’s actual performance.

In Memphis, the informants spoke of the Trolley’s use as a connection to the Mississippi Riverfront and to downtown attractions that served visitors. As noted earlier, one informant emphasized the “nostalgic feel’ associated with the streetcar. Another informant characterized the Trolley as “a marketing investment.” But as in the other two cities just discussed, there were no formal assessments of whether the Trolley had been effective or ineffective as this kind of investment.

Informants' Assessment of the Streetcar as Transit

Only in the cases of Portland and Seattle did the informants report that providing transit service was an important goal for the streetcar. In the other cities, the informants emphasized that transit service/transportation was not a primary goal of the streetcar, although many informants offered their assessments of the streetcar's performance as a transit service. In Little Rock, the informants spoke about the service's operating hours, alignment, and speed as leading it to be a tourism service as opposed to a utilitarian service. This in turn makes ridership very dependent on the health of the tourism sector, which has been in decline in recent years. The regional planner noted that "tourists are most of the riders... (the streetcar) has not evolved to serve the larger local community; …even for the tourist market it is still noticeably underused."

The key informants in Tampa made similar comments. The regional planner noted that "given the operating characteristics of the service, the streetcar functions now in a tourist serving role." A business leader reported that the streetcar's transit performance "is not really taking off because of the hours of operation/service; most riders are visitors and conventioneers and not the local community; the streetcar is not used as much for day-to-day (no commute); however residents will use streetcar to go back-and-forth to special events (i.e. Hockey games)." The transit planning informants spoke of ridership that continues to decline year after year, due to a combination of the long-term economic effects of the recession and budget problems that have led to a reduction in service and an increase in fare. The Tampa informants also noted that the availability of plentiful inexpensive parking also tends to reduce the attractiveness of the streetcar as a modal option. The streetcar ridership declines in Little Rock and Tampa stand in stark contrast with stable or increasing bus ridership in recent years (see details in Table 17 in Appendix A and Table 70 in Appendix E).

The key informants in the other cities offer somewhat different assessments of streetcar transit performance. Informants from Portland were particularly enthusiastic about the streetcar's transit performance, which is perhaps not surprising given its status as the highest ridership streetcar among these cases. Several informants emphasized that ridership, particularly on the original North-South (NS) streetcar line, is much higher than initially forecast. The streetcar advocate noted that the original goal was about 10,000 riders per day, but as of the date of the interview (summer 2014), they had reached about 16,000 riders per day. The business leader added that "the streetcar has become an effective transit system that operates near capacity at peak travel times." This informant emphasized the streetcar's connections to other transit services as an important factor in its high use. The regional transit planner noted that despite overlaps between streetcar and bus service in some corridors neither appears to have experienced any negative consequences for ridership. This informant thinks this is due to the streetcar tapping a different rider market than the bus.

In Seattle, the informants emphasized the riders' use of streetcars for a number of different types of trips, including for commuting. The local transit planner noted that the service carries some tourists and visitors but that its alignment does not make it as dependent on these rider markets as the streetcars in many other cities. The developer informants emphasized the streetcar's appeal to major employers, including Amazon, who view it favorably enough to have invested money in improving service quality. Both the local transit planner and local land planner spoke about the upcoming streetcar alignment extensions, which they believe might increase its utility as a transportation service.

Informants' Views on Greatest Challenges Facing the Streetcar

The authors asked key informants in each city about what they regarded as the greatest challenges affecting the streetcar. In most cities, funding issues emerged as the most frequently cited concern of the key informants.

Little Rock. The transit planner discussed policy decisions that undercut the River Rail's ability to serve tourists as major challenges, including decisions to suspend operations during major events. The regional planner agreed that this was a large problem, although he also raised the inability to extend the streetcar alignment to tap into other rider markets as a major challenge. This informant viewed dependence on the tourism rider market as having hindered River Rail's ridership. The tourism promoter thought the streetcar's slow speed and relatively high cost were serious challenges for the service.

Memphis. The transit planning informants emphasized that funding stability was a major challenge for the Trolley. These informants reported a 25 percent drop in streetcar service, which has resulted in a 20 percent decline in ridership. They still see demand for ridership but lack the resources necessary to adequately serve it. The redevelopment agency informant agreed that service levels were a challenge, and he noted that higher-frequency service was needed to increase the Trolley's appeal for serving utilitarian trips. The informants also spoke of the challenges associated with operating vintage vehicles. The transit informants noted that operating vintage vehicles has posed challenges because they are more difficult for disabled people to access, and they also suffer frequent breakdowns. The redevelopment agency informant also mentioned these concerns. The local business leader recognized these operating challenges but nevertheless thought it was still important for Memphis to operate vintage vehicles because of their role as a "signature" of the city.

Portland. All the key informants in Portland emphasized funding as the most important challenge facing the streetcar. The business leader mentioned that funding issues have required local officials to be creative when finding ways of paying for new investments or to operate existing services. The local transportation planning and local land use planning informants concurred that funding was a big challenge. These informants noted that Portland relies on general funds to cover operations, relying significantly on a local payroll tax. They believed a sales tax would provide a much more stable funding source for the community. A number of informants also emphasized the streetcar system's current incomplete status as a challenge that suppresses ridership, but they emphasized that when the final segment is completed that closes the loop around both sides of the Willamette River, this should be addressed. A number of informants believed that the lack of a complete loop suppressed ridership, particularly on the newer CL streetcar line.

Seattle. The key informant interviews pointed to funding as a challenge in Seattle. At present, the informants characterize streetcar funding as stable, while bus funding has been reduced in recent years. However, there is obviously some concern that unless transit funding is stabilized, streetcar funding might also one day be cut. Locating the tracks adjacent to curbs on the South Lake Union line was another challenge noted by the developer informants. This location has resulted in interference with bicyclists. The informants noted that future streetcar lines will locate the tracks in the middle of the street to avoid these conflicts.

Tampa. Funding issues also loom large in Tampa, where funding shortfalls have led to decreases in operating hours and service frequency, as well as fare increases, for the TECO Line streetcar. These issues have in turn led to declining ridership, which was also cited as a major challenge by the key informants. Tampa previously relied on an endowment to help finance streetcar operations, but this endowment has been depleted due to higher than anticipated annual expenses, particularly for insurance required to operate the streetcar across CSX tracks. The business leaders further noted that annual contributions by the Port Authority and other agencies have also declined in recent years. Every informant pointed to the need for more certainty and stability in funding, and indeed for enhanced funding, so the necessary quality of service can be provided for the streetcar to operate frequently enough, and for long enough during a day, to be attractive to riders. They felt that lack of funding led to the operational decisions and fare policy decisions that, in turn, led to ridership decline in recent years. A number of informants also pointed to the importance of identifying additional money to allow the streetcar alignment to be extended into other areas and to serve new destinations that might increase the rider market and provide connections to other transit services.

Authors' Assessment of Streetcar Performance

Most key informants offered very positive assessments of the streetcar's performance in attaining the goals set out by streetcar promoters, although few of the assessments were grounded in any careful evaluation of the streetcar's actual performance. Most assessments were instead based on the informant's general perception of outcomes. The exceptions to this pattern are the assessments of development outcomes undertaken in Portland by Hovee and Gustafson[59] and in Little Rock by the local transit agency,[60] both of which highlighted positive development outcomes using purely descriptive methodologies that have been questioned by some streetcar skeptics.

Also noteworthy across the range of cases discussed here is the important role played by the private sector as the instigators of streetcar development in most of the cities. The private sector role proved especially strong in Portland and also in Seattle where the private sector has even made financial commitments to help support streetcar operations. The authors offer their own assessment of the streetcars in each city in the paragraphs that follow.

Little Rock**.** The authors found Little Rock's River Rail streetcar to be the weakest transit performer among the five cases considered here, with its much lower ridership, lower cost effectiveness, and lower service productivity than its peers. The authors attribute these poor results to a number of planning and policy decisions related to the streetcar, including its operating hours and service frequencies, its alignment location, and the relative lack of integration between the streetcar and local bus services.

The informants appeared to recognize the poor transit performance of the River Rail, as well as the underlying reasons for the poor transit performance. However, the informants also emphasized that its purpose was not really transportation. Instead, they emphasized that River Rail functions as a development tool and as a marketing device to help the community attract visitors. It is difficult for the authors to gauge the performance of River Rail in both of these respects, given methodological concerns with the transit agency's development study and the lack of any quantitative assessment of its role in tourism.

The authors suspect that factors other than the streetcar, including the health of the local real estate market and the presence of other major investments such as the Clinton Presidential Library, are likely much more important factors than the streetcar in these two respects. However, the key informants believe the streetcar to be an important factor, and they perceive it to have had positive effects. And these beliefs and perceptions drive streetcar policy and planning decisions in the community.

***Memphis*.** The authors place Memphis's Trolley in the middle of the cases presented here, when it is assessed as a transit investment. Its ridership is second only to Portland, and it is the most cost effective system. The authors assess it as being partially integrated with the local bus system, due to the connecting bus services that are available at the two terminals, although the lack of schedule coordination between the various transit services reduces its attractiveness for utilitarian trips. The key informant interviews suggest that serving utilitarian transit trips was not a primary objective of the streetcar, save perhaps for the case of the Madison Avenue Line that serves the Medical complexes, so the Trolley's mid-level transit performance results are perhaps not surprising. The informants also noted the service's slow speed, which reduces its attractiveness for many potential riders.

The key informant interviews emphasized the Trolley's role as a development tool and as an icon of the city. The Trolley's origins in efforts to revitalize the Main Street pedestrian mall and its later role to aid in the redevelopment of downtown Memphis figured prominently in the interviews. All the informants perceive that the Trolley has had a positive effect on development, given the economic revitalization they have seen in the area over the past two decades. The clustering of redevelopment activity along Trolley lines or around Trolley stops stands as further testimony to the Trolley's role, in the informants' views.

Given the tone of the interviews and the nature of press coverage that is recounted in the historical narrative found in Appendix B, the authors suspect that the Trolley might have played a role in helping to excite people about downtown Memphis and its attractions and that the Trolley's presence might have indeed influenced decisions by businesses and developers to make investments in the area. The key informants indeed emphasized this *catalyst* role. There is little doubt that downtown Memphis is much more vibrant and stronger economically than it was two decades ago, and there is a strong belief that the Trolley has played an important role. The authors cannot make a definitive judgment on this aspect of the Trolley's performance due to the lack of studies that control for other possible factors that might have influenced development activity.

***Portland*.** Portland is by far the strongest performer of any of the streetcar cities considered here. The authors attribute its stronger performance to a number of key planning and policy decisions. First, the planners who selected the alignment located the original North-South (NS) streetcar line in area that already had strong redevelopment potential and where redevelopment activity was likely to generate relatively high transit ridership. Second, the city of Portland implemented other policies that supported the effort to redevelop this area and encourage residents and visitors to the area to use transit and other non-automobile modes of transportation. Third, planners paid attention to the transportation role of the streetcar by coordinating its schedules and fare policies with other transit services. The higher ridership and higher service productivity that place Portland's streetcar at the top on both of those critical transportation indicators were the result. Portland's streetcar stands out because of its strong transportation role, a role that attracts many utilitarian transit riders to use the streetcar service. The importance of the transportation role emerged in all the interviews, and the belief in the importance of transportation objectives influences local decision making around the streetcar to an extent seen in few of the other cities. Perhaps only Seattle even comes close.

However, Portland's streetcar is most known for its purported development effects, as assessed by Hovee and Gustafson. These development effects in turn led other cities, most notably Seattle, to implement their own streetcars. The authors explored the development effects of the streetcar in the interviews with key informants and learned that everyone interviewed believes the streetcar had a positive effect of some kind on development activity. However, none of them claimed the streetcar was the sole determinative factor. Instead, they characterized it as a catalyst, or an amenity, that was part of a set of other important factors including other public investments and most importantly the health of the local real estate market.

Perhaps the most interesting point made in the informant interviews was the streetcar's symbolic role as evidence of a public commitment to a location. The streetcar's "permanence" emerged in several interviews in which the informants emphasized the strong signal such a permanent public investment made to businesses and developers who could then make their own private investments in an area, safe in the knowledge that they would not be abandoned by the public sector. The authors suspect that this symbolic role is one of the most important non-transportation roles that the streetcar plays in Portland and elsewhere.

Seattle. Seattle possesses the shortest alignment of all the cities considered here, but its streetcar has the third-highest ridership, second-highest productivity, and third-most cost effective service of any of the streetcars. Assessed as a transit investment, the South Lake Union streetcar thus emerges as a pretty strong performer, as compared to its peers, and ranks perhaps second only to Portland. Seattle also stands out as a case, along with Portland, in which each key informant emphasized the streetcar's transportation role. The importance placed on the transportation role then influenced policy and planning decisions about service levels, including coordinating fares and schedules with other transit services.

Still, development objectives are the primary rationale for the South Lake Union streetcar, and the roles of major private sector developers, such as Vulcan, in leading the push for a streetcar are quite striking in Seattle. Indeed Seattle is the case in which the private sector's leading role was most visible. Self-interest on the part of major developers and landowners undoubtedly helps to explain their activities in support of the streetcar; it also helped to mobilize public opinion in support of the investment. The key actors perceived the streetcar as helping to bring about redevelopment of the area, and the development and business community have indeed made significant investments in this location.

Tampa. Tampa emerges from this study as one of the poorer performers, having the second-lowest ridership and second-least cost effective service. Only Little Rock's River Rail performed worse than the TECO Line streetcar on these two transportation performance measures. The poor transportation performance is the consequence of a number of factors, including its service characteristics (speed, operating hours, and headways), its relatively high fare, its lack of integration with other transit services, and its alignment in an area that does not appear to produce a large number of trips. Barring a sudden resurgence in the development market, it is hard to imagine its ridership increasing without significant additional public investment to extend the alignment to more trip generators, increase speeds, increase service hours and service frequencies, and reduce fares. The relatively low cost of nearby parking also is a factor in the streetcar's poor transit performance.

The TECO Line's poor performance as a transit investment emerged quite strongly in most of the key informant interviews, although the interviews with the non-transit informants had a more positive view of its future. The authors attribute this positive view to the belief on the part of many of these informants that the streetcar might be an effective transportation investment and development tool if its service characteristics were improved and the local real estate market were to turn around.

Strategies to Improve Streetcar Performance

The authors asked the informants for their recommended strategies to improve the performance of the streetcars in their communities. Their recommendations included calls for new capital investments such as extending streetcar alignments to serve additional origins and destinations, or creating a more extensive network of streetcars, to operational improvements such as improving service frequencies, extending service hours, and replacing vintage vehicles with more reliable modern streetcars. A few informants also mentioned the importance of having more supportive parking policies and land development policies in place to encourage streetcar use.

The authors concur with many of the suggested operational improvements, with the further recommendation that cities that operate streetcars should better coordinate their schedules with other local transit services to increase their utility for a wider array of trips beyond the tourist rider market. Portland stands out as a city that already does this, while most of the others do not. The authors are somewhat skeptical of extending streetcar lines to improve performance, particularly without making significant changes in how streetcars are operated in many cities, because of the high costs involved in doing so, as well as the uncertain benefit. The authors support strategies that use parking policy as a lever to encourage more transit use in general, and the authors support coordinating land development policy with transportation planning decisions. The authors discuss each city in turn.

Little Rock. The key informants had three recommendations for improving the performance of River Rail in Little Rock. First, all three informants recommended changing the current policy of shutting down streetcar service during some major downtown events. The city currently does this to increase the supply of on-street parking. This struck the informants as counterproductive, particularly given River Rail's dependence on visitors as its primary rider market. The authors agree that Little Rock should seriously reconsider this local policy.

Second, the informants suggested extending the alignment outside the downtowns and into neighborhoods, or potentially even further to the airport. The regional planner and transit planner informants thought extending the lines would allow the service to grow beyond its current primarily tourist market. The authors are somewhat skeptical of this recommendation given the River Rail's very uncompetitive operating characteristics (speeds, hours, headways) compared with local bus services or the automobile. The authors believe that a much more effective and lower-cost strategy to increase transit ridership would be to improve local bus services, and the transit planning informant did report that bus service improvements are the top priority in the community at present time.

Finally, the informants suggested implementing a more transit-supportive parking policy in the downtown area, which the authors agree would help to increase the attractiveness of transit vis-à-vis the automobile. However, such a policy must have significant support from a local business community that has not yet indicated a willingness to do so due to fears about the loss of business to outlying locations with plentiful free or low-cost parking.

Memphis. The key informants had few substantive recommendations to improve streetcar performance in Memphis beyond increased resources to restore some of the service cuts made in recent years. The transit planning informants reported that there were many potential Trolley riders who did not use the service because of service cuts that had reduced service frequencies. The other suggestion offered by the informants was to replace Memphis's vintage streetcar vehicles with more modern replica vehicles. The informants asserted that the vintage vehicles were good symbolic investments, but they also emphasized the frequent problems with vehicle breakdowns and difficulties obtaining parts for vehicle repair. They believed that replacing the vintage vehicles with modern replicas would maintain the sense of nostalgia while also improving service reliability and reducing maintenance and operating costs.

The authors generally concur that Memphis' Trolley would likely see improved performance as a result of some of these changes, particularly with respect to replacing the vintage vehicles with modern ones; however, the present poor service productivity of the Trolley system gives some pause for concern about the effectiveness of additional investments unless carefully targeted. It is likely that more targeted improvements on the higher-ridership streetcar lines would be better uses of limited public resources than investments across all three lines. For example, at present the Madison Avenue line has only about half the ridership of the other two lines, although its service levels are roughly comparable to the other lines.

Portland. Generally speaking, the key informants were pleased with the performance of Portland's streetcar service, which is perhaps not surprising given how much it stands out compared with the other cities. The only areas of concern were related to the newer CL streetcar line, in which ridership is much lower than on the older NS line. The transit planning and local land planning informants thought ridership on the newer line would increase over time, particularly once the envisioned southern section of the cross-river loop is completed. Completion of the loop would reduce travel times between the east and west sides of the Willamette River and thus increase accessibility of many areas on the east side.

The authors tend to agree with the key informants. Portland already coordinates its streetcar with other transit services, and it operates pretty frequent streetcar service, so no obvious operational improvements come to mind as logical next steps to improve streetcar performance. Portland also has a progressive parking policy that uses pricing to encourage non-automobile use and devotes some of the resulting parking revenue to transit uses.

Seattle. The key informants had few suggested improvements for the streetcar service in Seattle. Two informants emphasized the importance of the new streetcar lines that will eventually connect with the South Lake Union line. These informants believed that a more extensive system would increase the appeal of the streetcar to riders. The local transit planning informant suggested a need to better coordinate the South Lake Union line, and future streetcar lines, with other transit services. This informant believed that this had not yet been done as well as it could have been.

The authors generally rank Seattle as one of the better performers in this set of streetcar cities, so the authors support cost-effective strategies that might increase the appeal of the service to other riders. The operational improvements related to better coordination with other transit services is a logical step. Seattle's streetcar appears to serve commuters and other non-visitor riders, so such strategies that increase the service's appeal for utilitarian trips are likely to be beneficial. The authors are more cautious about the major capital investments presently underway on Seattle's emerging streetcar system, mainly because of the relatively high costs involved for what is still relatively low daily ridership on the present South Lake Union line.

Tampa. The key informants in Tampa seemed divided between those who liked the streetcar very much, despite its problems (which they largely conceded), and those who disliked the streetcar very much. This latter group realized that the streetcar was likely to be there for a while, given that shutting it down would require the city to repay the Federal Transit Administration's capital grant that helped build the line. The transit informants were most pessimistic in their assessments, but they did suggest improving service frequencies, extending service hours, and reducing the fare as strategies that would likely increase TECO Line ridership. The problem for them was the lack of local resources to make these changes. These informants also suggested moving away from vintage vehicles for many of the same reliability and cost reasons mentioned in Memphis. Every other informant agreed with these suggested changes to TECO Line service.

Many informants also suggested making additional capital investments to extend the TECO Line into areas with more trip attractors, particularly downtown Tampa and a transit center located downtown, where the streetcar might connect with other transit services. The regional planner was enthusiastic that extending the streetcar to the transit center would allow riders to transfer to and from the line to access more destinations. The streetcar advocate thought the streetcar likely needed to be extended to form a complete loop around the downtown area.

The authors are pessimistic about the TECO Line, given the continuing decline in ridership even after the Tampa area has begun to recover from the recession. Extending service hours and reducing fares seem like logical steps to better leverage the existing capital investment. However, the authors have serious questions about the wisdom of making additional significant capital investments in a streetcar extension, given the track record of the TECO Line's performance to date and the Tampa area's very low use of transit in general. Improvements to the local bus system's headways would likely result in larger ridership gains than any improvements to the streetcar, although local bus service does not have the same cachet as the streetcar.

VI. LESSONS AND CONCLUSIONS

Through this study, the authors sought to better understand the purpose, function, and performance of modern-era streetcars in five U.S. cities. The authors discovered that in these cities, the primary purpose of the streetcar was to serve as a development tool (all cities), a second objective was to serve as a tourism promoting amenity (Little Rock, Tampa), and transportation objectives were largely afterthoughts with the notable exception of Portland and, to a lesser degree, Seattle. The cities' different conceptions of streetcar goals led to different decisions about alignment locations, rider markets to be targeted, and service coordination (or lack thereof) with other local transit services, all of which in turn affected the function the streetcars serve in the community and the transportation performance that results.

In Little Rock and Tampa, the streetcars function as short circulator type services that cater primarily to tourists and visitors, and the streetcars have poor transportation performance. In Memphis, the more successful streetcar lines on Main Street and the Riverfront also serve circulator functions and cater to visitors, but they enjoy better performance than those in the other two cities. The difference in performance results across these three cities might be a function of the different urban environments within which the streetcars operate, with Memphis' streetcars operating in a much denser urban environment. They might also be a function of the health of the tourism sectors of the three local economies; the tourism sectors in both Little Rock and Tampa have been quite economically depressed since the 2008 recession.

In Seattle and Portland, the streetcars serve a wider variety of trip types as a result of the somewhat different function they play in the local transit system. Informants in both cities referred to the streetcars as "trip extenders," which gives an indication of their somewhat more utilitarian role. The ability of Portland's streetcar in particular to serve a wide variety of trips makes it much less dependent on the health of any one economic sector and increases the number of possible trips the streetcar can serve. The streetcar also operates within an area that already possesses a large number of potential trip generators and attractors by virtue of the relatively large population and employment near the streetcar.

The authors briefly recap the key lessons from the performance investigation and key informant interviews in the paragraphs that follow. The authors then conclude the main part of the report with a set of recommendations for other cities contemplating making their own streetcar investments.

LESSONS FROM STREETCAR PERFORMANCE INVESTIGATION

The authors' investigation of the streetcar's transportation performance had the following results related to performance and possible explanations for variation in performance. First, Portland emerged as the clear standout performer among the five streetcar cities with respect to ridership as well as the key service performance measures, with Seattle and Memphis in the next tier, and Little Rock and Tampa at the bottom. Portland had by far the highest ridership and the best service productivity, and it ranked second to Memphis with respect to cost-effectiveness measures. Portland was also the only city in which streetcar performance on both service productivity and cost effectiveness measures surpasses that of the average local bus.

Second, the authors attributed the higher ridership and better service productivity in Portland to a number of important local planning and policy decisions. Portland's planners, and to a lesser extent those in Seattle, made the key decision to locate the streetcar in an area that either possessed, or had the strong economic potential to possess, the population and/or employment necessary to generate higher levels of streetcar ridership. Portland's planners then worked to ensure that the streetcar was well connected with other local transit services, with respect to stop locations, service schedules, and fare policy.

These decisions reflected a view held by Portland's transit planners that the streetcar was not just a development tool, which was the original rationale for its creation, but that it also needed to function effectively as a transit service that catered to a broader ridership. The positive experience in Portland suggests that cities that approach streetcars with transit service objectives in mind are likely to have better ridership and performance results, all else being equal. Portland now receives significant attention for its streetcar's purported role in economic development, but this study suggests that more might be learned from how Portland approaches decisions related to its streetcar's role as transportation.

Third, the authors attribute the lower ridership and poor performance in Little Rock and Tampa to a combination of factors. The streetcars in these two cities were negatively affected by the economic recession and its impact on tourism and convention activity. Given that the streetcars were developed with a primary objective of serving this rider market, it has proven difficult for either system to recover. A number of local policy decisions about service hours, service frequencies, and fare levels have also undercut ridership. In general, these two cities' experiences emphasize that modern-era streetcar systems that specialize in tourist travel markets are much more vulnerable to changes in broader economic conditions than those that focus on serving a wider array of potential users.

LESSONS FROM KEY INFORMANT INTERVIEWS

The key informant interviews identified several important themes about streetcar planning and operation in the five cities. These themes emerged across several of the case-study cities.

First, in most cities the private sector emerged as the key set of actors in promoting streetcar development. Private sector actors from the local development and downtown business communities, as well streetcar advocacy groups, whose members often included development and business community representatives, played critical roles in placing the idea of a streetcar on the local policy agenda. In several cities, the private sector then led the drive to implement the streetcar. The strong role played by developers in Seattle in particular is noteworthy. These private actors then partnered with the public sector in pursuing the financing necessary to build and operate the streetcar services.

Second, the primary objective of modern streetcar implementation in these cities has been development and urban revitalization of underused or declining urban cores. Transit has been a secondary goal, at best, even in Portland where the streetcar has the strongest transit performance. The primary focus on development objectives is perhaps unsurprising given the strong role played by developers and other private actors. In most cities, the streetcar was seen as a development "catalyst" that could jump-start economic activity in an area. The streetcar also stood as a symbol of a "permanent" public commitment to a particular area within the community. The streetcar's symbolic role appeared to be particularly important as its presence, and status as a public investment, reassured developers and business owners that it was now "safe" for them to make their own private economic investments in the same area.

Third, the streetcars in many cities have now taken on a symbolic role completely separate from any transportation function. In three cities (Little Rock, Memphis, Tampa), they are widely regarded as icons of the city, and they play a role in promoting the city to others outside the community. It is no surprise that this role was most cited in the cities where serving tourists is a key emphasis of the streetcar. The streetcar's image as a symbol of a bygone age—the nostalgia factor—also emerged in numerous interviews. Streetcars seem to possess an image that makes them much more attractive to many individuals than other transportation modes.

Fourth, strong support remains for the streetcar among key actors even in what appear to be the most troubled streetcar cities. However, even the most supportive actors do recognize the challenges facing their streetcar, whether due to financial difficulties, declining ridership, or some other factor. These challenges are severe in cities such as Tampa and Little Rock, although most of the actors still generally support the streetcar investment decision.

Fifth, and finally, a real disconnect seems to exist between enthusiasm for the streetcar and its transportation performance. In most of the studied cities, streetcar ridership is quite low and compares quite unfavorably with the ridership on a local bus route operating in the same general area. A strict transportation assessment would tend to regard a streetcar that had lower ridership than a typical bus route as a misuse of scarce transportation resources. But few of the informants tended to think in such terms. Instead, poor transportation performance tended to be downplayed because the streetcar was not seen as primarily a transportation investment but instead as something else.

RECOMMENDATIONS FOR OTHER CITIES

So, what should other cities take away from this study? The authors suggest a few key lessons. First, the authors urge planners and policymakers to think very carefully about the fundamental purpose of any proposed streetcar in their community and to proceed in all their decision making with that fundamental purpose clearly in mind. The authors strongly believe that a transportation investment should be primarily about providing transportation service, and they would thus suggest first evaluating the streetcar versus other transportation services on transportation criteria. However, even if the planners and policymakers have another approach in mind, they should proceed carefully, clearly, and cautiously.

Second, the authors urge people in other cities to approach the model of Portland with much more caution. Many streetcar advocates point to Portland's experience, and then they proceed as if it could be easily replicated elsewhere. But the authors suggest that Portland's experience, whether in the form of its ridership or its development activity, is the result of a unique combination of external factors (local population and employment patterns, the health of the real estate market) and local decisions (land development policy decisions, financial decisions, other public investments, streetcar alignment location and length, streetcar operations decisions, streetcar fare policy decisions) that may or may not be applicable elsewhere. The reality is much more complicated than it seems to appear in many TCRP reports or consultant studies that have considered Portland's experience.

Third, the authors urge people in other cities to beware of unintended consequences. Of course, a streetcar is a major capital investment, and it also requires funding to operate and maintain the service. Communities must think much more carefully about the wisdom of a streetcar investment given the state of their local transit finances. In some cases, the opening of a streetcar might necessitate later cuts in bus services, for example, when budgets tighten. Such an outcome would seem to defeat any transportation rationale for making a streetcar investment. Additionally, the decisions made early on about seemingly trivial things, such as the type of vehicle to operate (modern, replica, or vintage), can have significant consequences for operations and finances later on.

APPENDIX A: PROFILE OF RIVER RAIL IN LITTLE ROCK, ARKANSAS

The first of the five case studies is Little Rock's River Rail. According to our key local informants, River Rail was explicitly built to serve visitors and promote economic development in the two downtowns (Little Rock and North Little Rock) (Figure 12). River Rail has the lowest ridership of the five case studies. Given its predominantly tourist and visitor ridership, it is not surprising that ridership follows a strongly seasonal pattern and depends highly on the health of the local convention and tourism markets. Ridership has declined significantly since the 2008 recession.

Figure 12. A River Rail Streetcar in Operation[61]

BASIC CHARACTERISTICS OF STREETCAR SERVICE

The River Rail Electric Streetcar operates on a 3.4-mile [5.47 kilometer] alignment that serves 15 stops in the downtowns of the cities of Little Rock and North Little Rock, Arkansas. There are five stops in North Little Rock (Main at 5^{th}; Main at 7^{th}; Maple at 6^{th}; Maple at Broadway; Verizon Plaza, 120 Main) and ten stops in Little Rock (Main St. Bridge Stop; President Clinton Ave. at River Market Ave.; River Market Ave. at 3^{rd}; Presidential Library/ Heifer Intl.; World Ave. at 3^{rd}; 3rd at River Market Ave.; Main Library Stop, 2nd at Rock; Historic Arkansas Museum Stop, 2nd at Scott; 2nd at Center; W. Markham at Spring; The Peabody Little Rock Stop, Markham at Scott) (Figure 13). The $28.8 million River Rail streetcar service began operation in 2004.

River Rail is operated by the Central Arkansas Transit Authority (CATA), which also operates the local bus system. The streetcar system includes three streetcar vehicles that operate primarily in mixed traffic, except for a dedicated segment on a bridge over the Arkansas

River connecting Little Rock to North Little Rock. The River Rail functions as a short, circulator system within and between the two downtowns. The physical characteristics of the River Rail streetcar service, which consists of a blue line and a green line, are shown in Table 14. The blue line provides north-south travel between the two cities' downtowns, along with east-west travel within downtown Little Rock. The green line provides east-west travel solely within downtown Little Rock.

Figure 13. Map of River Rail Electric Streetcar in Little Rock, Arkansas[62]

Table 14. Physical Characteristics of Streetcar System in Little Rock[63]

Characteristic		Value
Year Open		2004
Capital Cost (unadjusted dollars)		$28,800,000
Number of Lines		2 (Blue, Green)
Number of Vehicles		3
Number of Stations		15
Length		3.4 miles (5.47 km)
Alignment Type*	Exclusive	0.4 miles
	Mixed Traffic	3.0 miles

*Note: Alignment Types are measured from Google Map. Accessed date: December 20th, 2013.

In addition to operating River Rail streetcars, CATA also operates a bus system that consists of 22 local routes and four express routes. The bus system is primarily focused on the downtowns of Little Rock and North Little Rock, and thus it exhibits a largely radial structure. According to the CATA website, most local bus routes operate on 20-minute or 35-minute consistent all-day schedules during the week.[64] As Figure 14 indicates, River Rail is a very small piece of this local transit network, with service confined to the downtowns of the two cities, whereas local bus routes provide service primarily into the downtowns from many outer parts of the two communities. Figure 15 indicates that local bus service exists in the area directly served by River Rail, particularly in downtown Little Rock, where several bus routes provide potential connections to River Rail stops. The lack of passenger transfer data means that there is no way to assess the degree to which riders of one service also use the other. Our local transit informant suspects that little transfer activity exists between modes, given the very different rider markets for bus and streetcar transit in the community. Still, the fare structure, as noted later, is designed to permit cross-mode transfers.

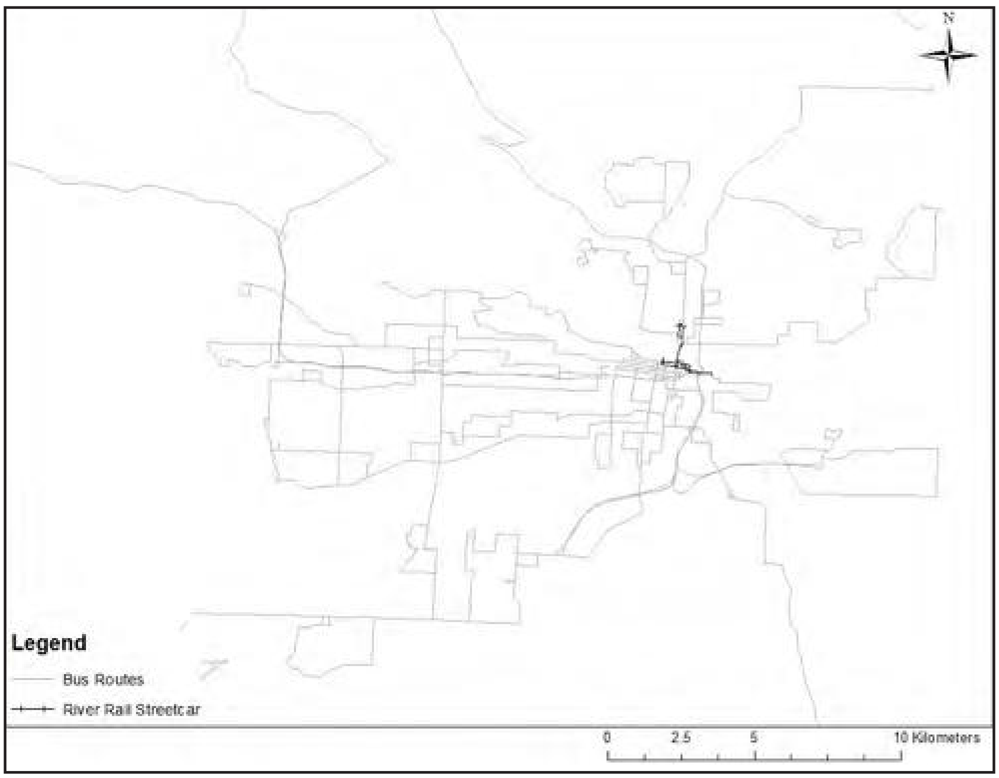

Figure 14. Map of Transit System in Little Rock, Arkansas[65]

According to Virginia Johnson, the manager of River Rail, “Our (three) streetcars consist of vintage Birney double ended replica cars from Gomaco Trolley Company out of Ida Grove, Iowa. We have limited dedicated ways of travel and no private boarding stations, as these are located on city owned properties. We were only expected to cover about 25 percent of operating costs through fare revenue and have exceeded this to date. We are all ADA compliant and have stop-level boarding. We average anywhere from 300 to 500 passengers daily and in upwards of 1600 on a typical peak season Saturday. Our ridership varies, as the system is dependent upon weather, local events and time of year. Our peak seasons are Spring and Summer.”[66]

River Rail does not collect station-level boarding data, nor does it conduct rider surveys, so this email communication, coupled with insights about rider markets gleaned from a key transit informant interview, represent the extent of the team's knowledge of the streetcar service's ridership derived from transit agency sources. The authors rely primarily on National Transit Database (NTD) data and other external sources for their examination of River Rail's mode-level ridership, service, and performance, discussed later in the profile.

The lack of regular data collection reflects the River Rail's primary local role as a downtown amenity and tourist-oriented service as opposed to a service geared toward serving more traditional transit riders. This specific riding market emphasis can be seen in the River Rail's service characteristics, which are shown in Table 15. The River Rail operates service at a consistent 25-minute headway across weekdays and weekends, as well as during peak travel periods and off-peak periods. The service operates for more hours of the day toward the end of the week than it does earlier in the week. It does not begin operation until after the weekday morning peak hours, so the streetcar operations do not interfere with, nor are negatively impacted by, rush-hour auto travel. Both of these service attributes denote a service that is not focused on regular utilitarian transit riders. The blue line provides service seven days a week, while the green line operates Monday through Saturday. Table 16 shows that fares are low and transfers are free between buses and River Rail, but not between River Rail and bus. This difference is due to the streetcar fare being lower than the local bus fare. No passenger transfer data are available to assess the amount of transfer activity between River Rail and local buses, although the local transit informant suspects little transfer activity occurs, given the predominantly visitor-based streetcar ridership and predominantly transit-dependent bus ridership.

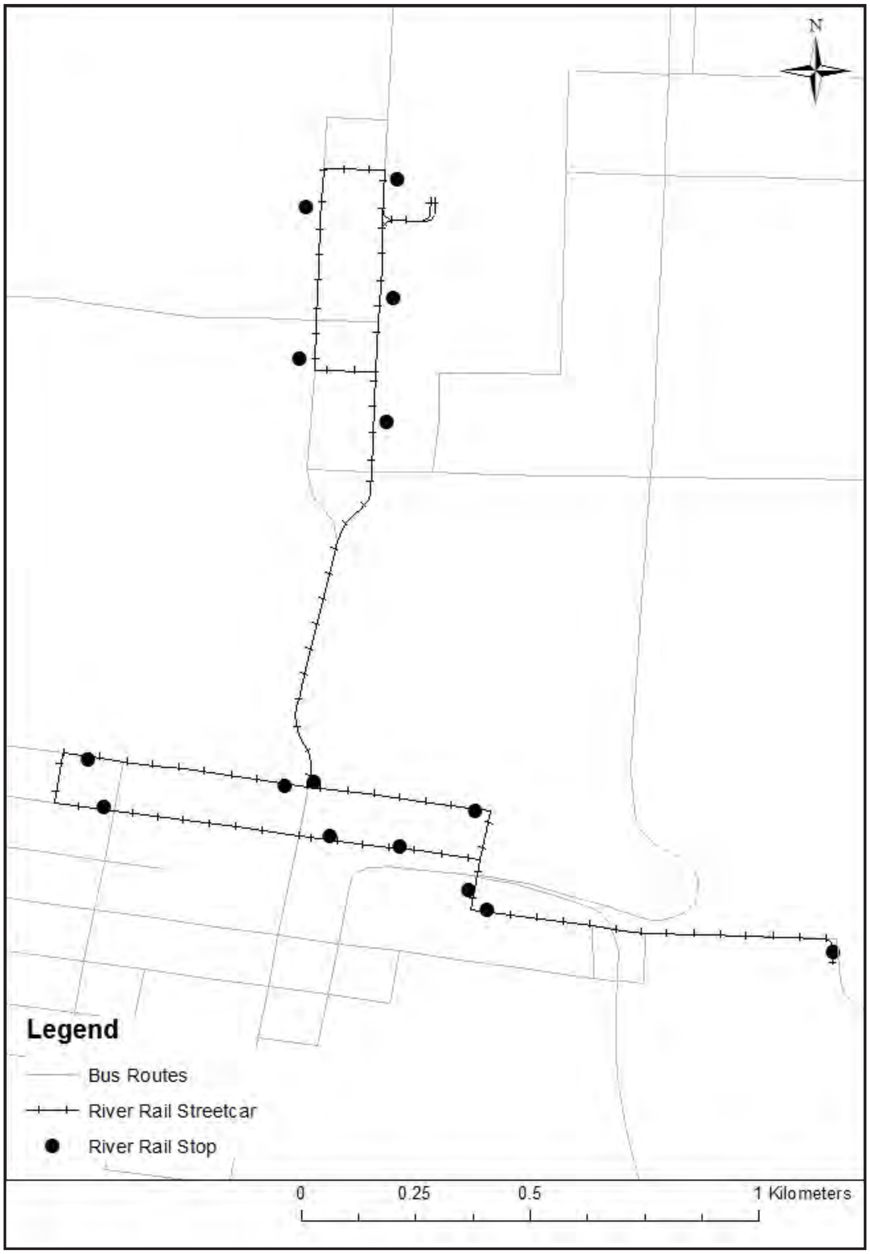

Figure 15. Map of River Rail and Local Buses in Core of Little Rock, Arkansas[67]

Table 15. Service Characteristics of Streetcar System in Little Rock[68]

Characteristic	Value
Headways	
Weekday Peak	25 min
Weekday Off-Peak	25 min
Weekend Average	25 min
Hours of Service	
Monday-Wednesday	14 hr
Thursday-Saturday	16 hr
Sunday	7 hr

Table 16. Fare and Transfer Policy for Transit Services in Little Rock[69]

Characteristic	Type	Cost ($)
Fare Type	Base fare	$1.00
	*Reduced fare	$0.50
	Persons age 4 & under	Free
Pass Type	Day Pass	$2.00
	3-Day Pass	$5.00
	20-Ride Card	$15.00
Transfer Fee	**Bus/Streetcar	--

Notes:
* Senior 65 years and older, persons age 5-11, and people with disabilities receive fares at a reduced price.
** Transfers are free from bus to streetcar but not streetcar to bus.

SOCIOECONOMIC AND BUILT ENVIRONMENT CONTEXT FOR STREETCAR SERVICE

The River Rail streetcar operates within the downtown areas of two cities: Little Rock and North Little Rock. The authors examined the socioeconomic characteristics and the built-environment contexts within which River Rail operates as part of the study, given the importance of these factors for transit ridership in other communities. The authors believed that a consideration of these factors would provide some explanation for the level of ridership on River Rail and the particular rider market being served. A discussion of these issues follows in the next several pages.

At the time of the 2010 census, the city of Little Rock had a population of just under 194,000 people, and the city of North Little Rock had just over 62,000 people; the metropolitan area population was just under 700,000.[70] Most streetcar service is concentrated in Little Rock proper, although the service connects the two downtowns. The city's median household income was just over $45,000 per year, while 18 percent of the population lived below the poverty line. The city population was more than 42 percent black and 49 percent white at the time of the census; the Latino population accounted for about 7 percent of the city's total population. North Little Rock's median household income was about $39,000 per year, and 22 percent of the population lived below the poverty line. In 2010, North Little Rock's population was about 54 percent white, 40 percent black, and 6 percent Latino.

Figures 16 and 17 display city-scale population and population density of the two cities, both by 2010 census block group. Looking over the two maps, one notes that the block groups in the areas in and around the two downtowns have comparatively low populations, particularly compared with the areas to the southwest and northwest of the downtowns. However, the population densities are moderately high. The highest population density areas in the downtowns appear to be located near, but not immediately adjacent to, River Rail stops.

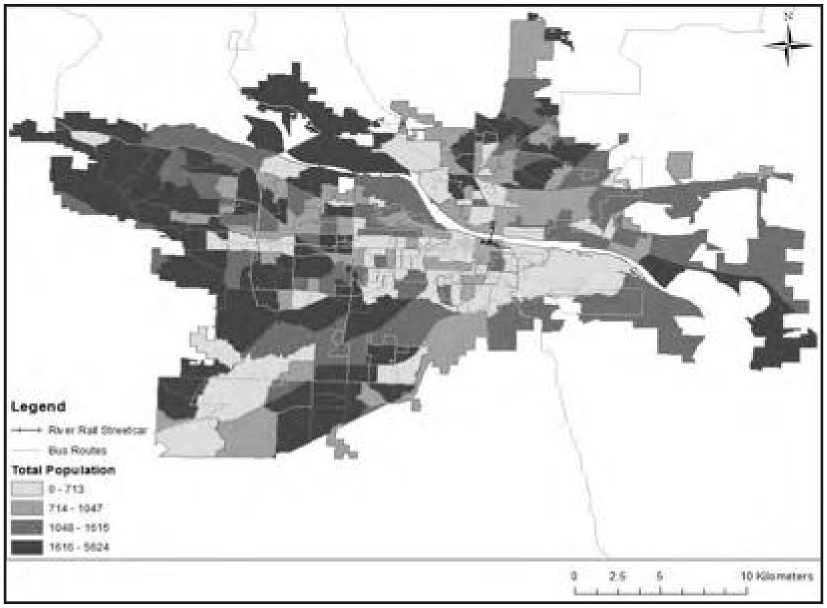

Figure 16. Population by Block Group in Little Rock (2010)[71]

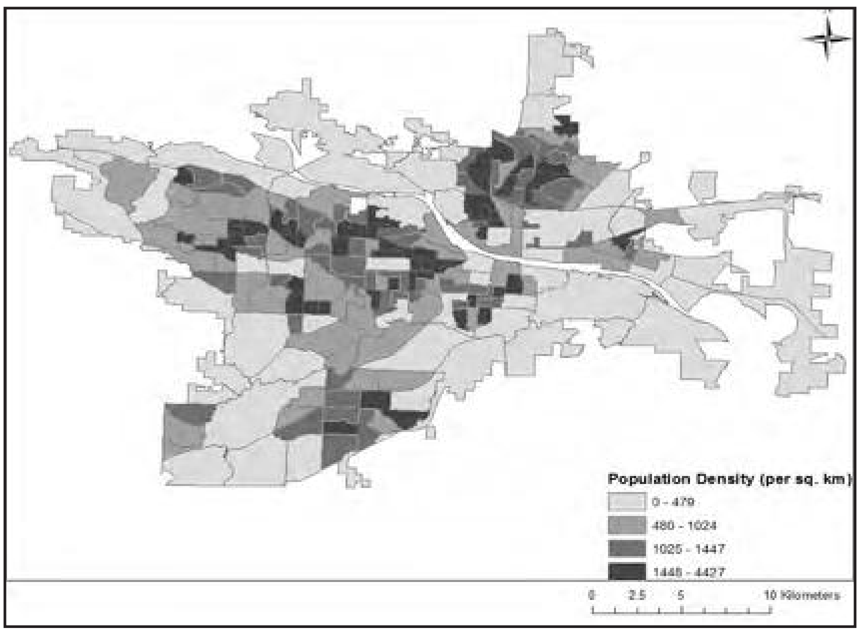

Figure 17. Population Density by Block Group in Little Rock (2010)[72]

Figures 18 and 19 focus on population and population density, respectively, in the areas immediately surrounding the streetcar lines. In these maps, the river is the empty space running east-west through the lower portion of the maps. Little Rock's downtown is at the bottom of the maps and, North Little Rock's downtown at the top of the maps. The maps highlight the patterns already noted above. River Rail's alignment takes it through areas of low-to-moderate populations, with the southeastern terminus in an area of very low relative population. Population density in the latter area is below the city's average, while population densities in the former areas are in the general range of the city average. These are clearly not major population centers in either community.

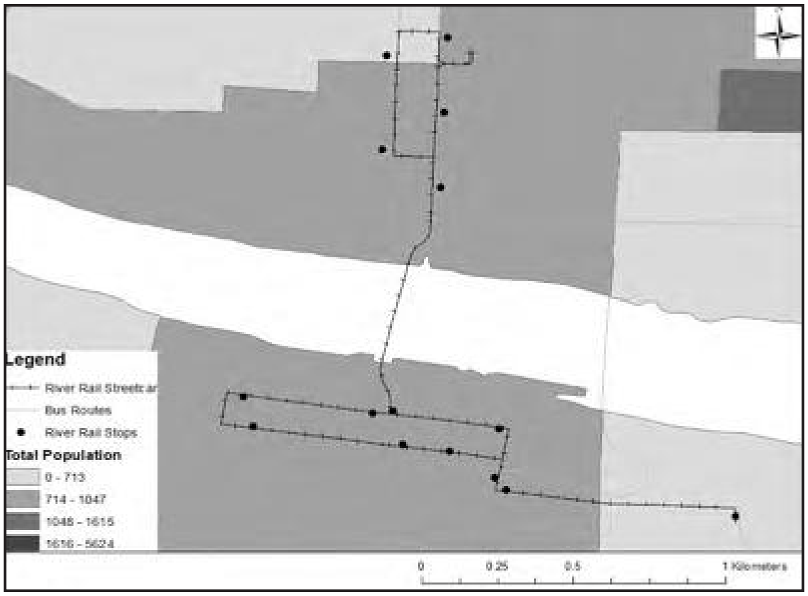

Figure 18. Population by Block Group in Core of Little Rock (2010)[73]

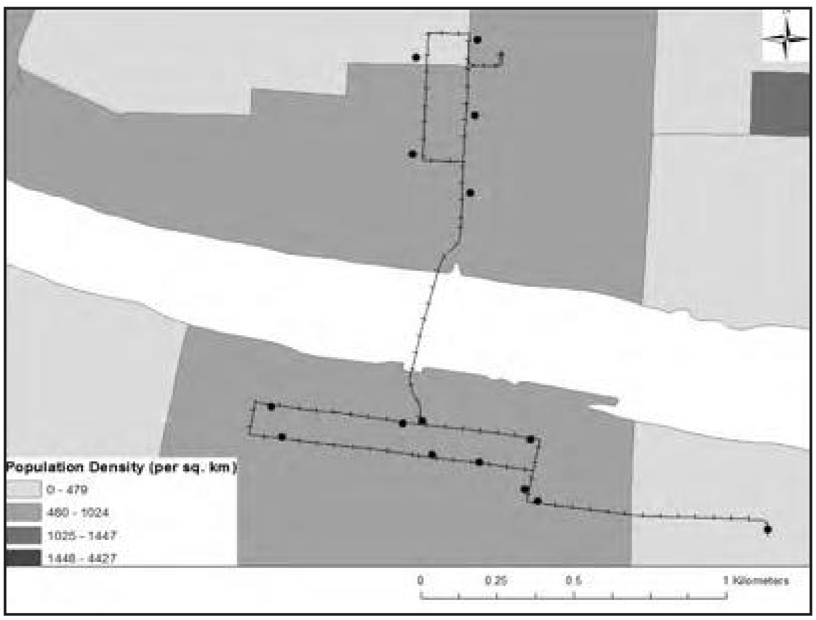

Figure 19. Population Density by Block Group in Core of Little Rock (2010)[74]

Population represents potential origins for many trips, including by transit, while employment can represent potential destinations for trips. Figures 20 and 21 display employment and employment density, respectively, for the Little Rock area. The maps indicate that the areas to the west and south of the downtowns have larger numbers of jobs than the downtown areas. There are several dense employment centers located outside the downtowns, including just south and just west of downtown Little Rock, in the west-northwest section of Little Rock, and just north of the North Little Rock downtown segment of the River Rail. Figures 22 and 23 depict the same phenomena solely in the core areas of downtown Little Rock and downtown North Little Rock. They also reemphasize that the downtowns are only moderately sized and moderately dense employment centers.

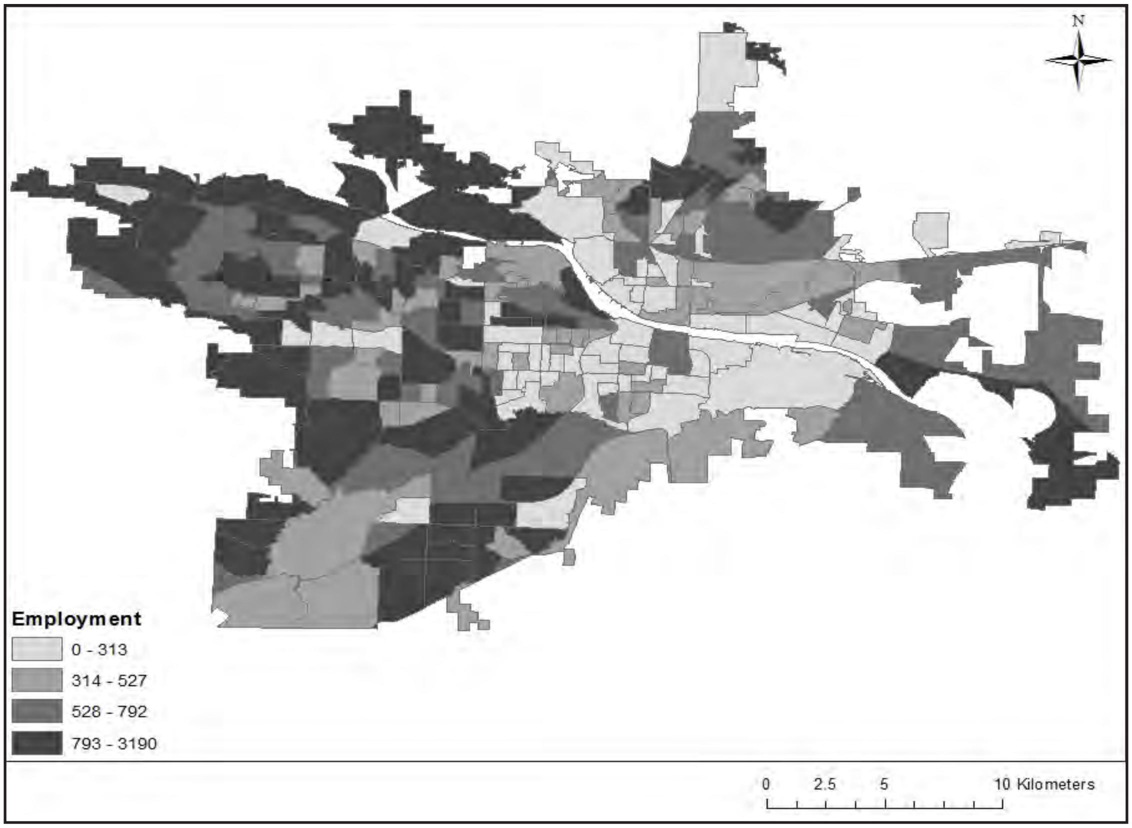

Figure 20. Employment by Block Group in Little Rock (2010)[75]

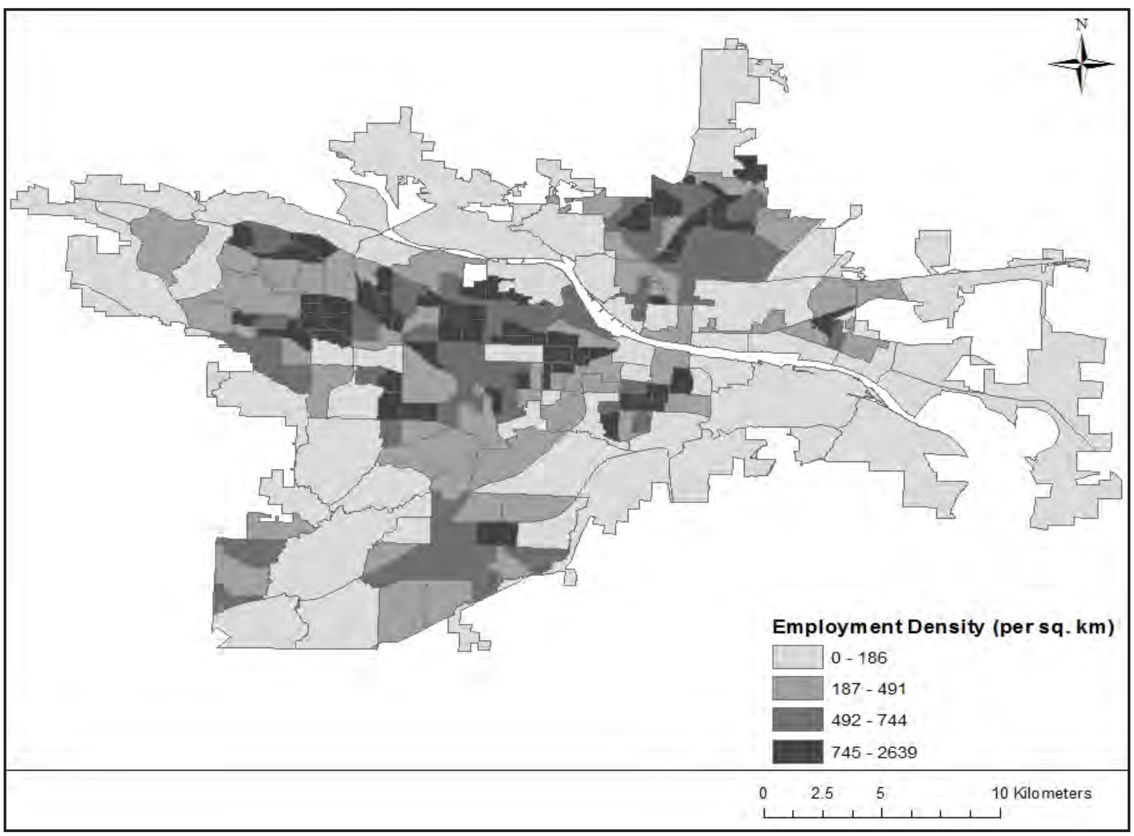

Figure 21. Employment Density by Block Group in Little Rock (2010)[76]

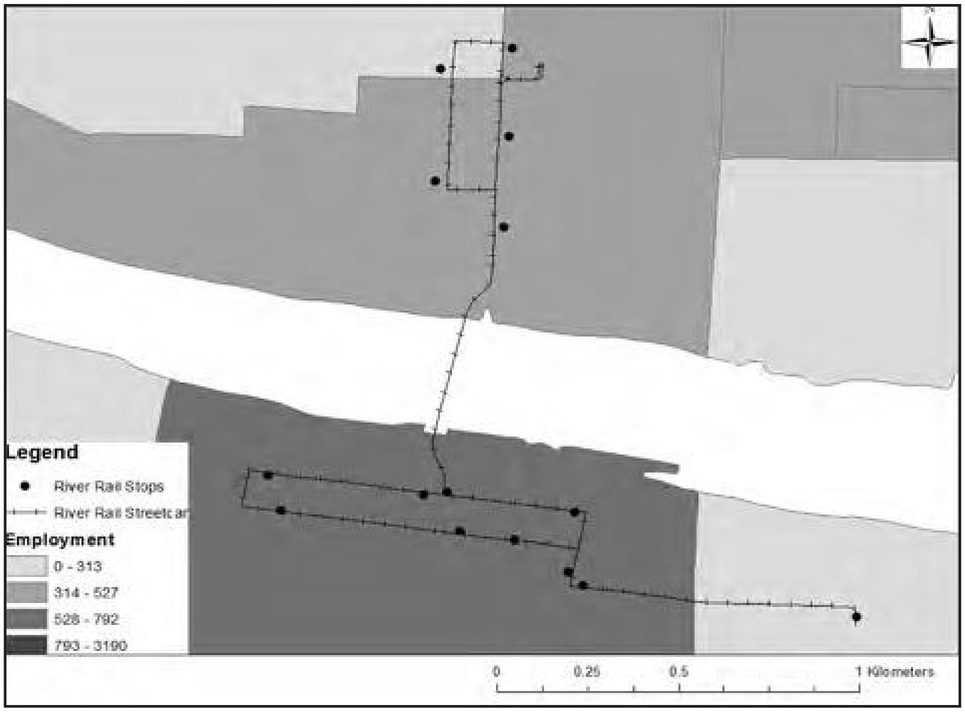

Figure 22. Employment by Block Group in Core of Little Rock (2010)[77]

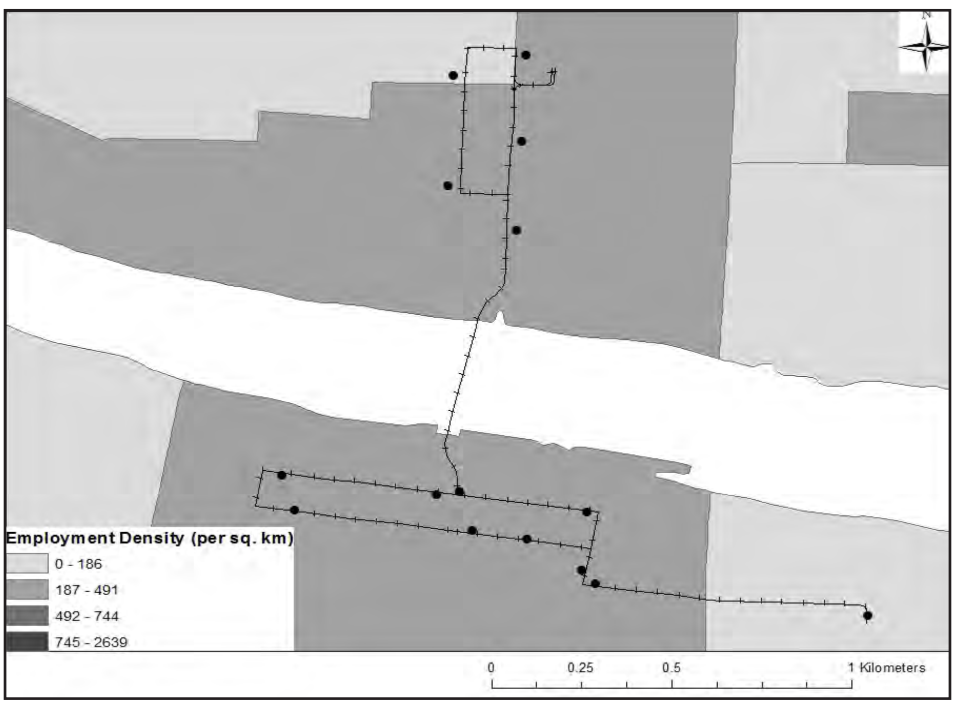

Figure 23. Employment Density by Block Group in Core of Little Rock (2010)[78]

Based on population or employment (or their density counterparts), which are among the variables most strongly associated with transit ridership, the areas within which the River Rail operates would not appear to be the most promising locations for attracting traditional transit riders to use transit. In fact, this is not surprising, given the primarily tourist market orientation of the River Rail streetcar. As Figure 24 depicts, while the downtown areas might possess only moderate employment densities and relatively modest population levels, they do possess a number of destinations that are important for tourists. These special activity centers include museums, libraries, and historic buildings. In North Little Rock, there is a cluster of such sites around the streetcar line. In Little Rock, significant clusters are located around the streetcar line, as well as to the south of the alignment. The Clinton Presidential Library serves as the terminus of the line in the eastern part of downtown Little Rock. River Rail is thus positioned to provide access to and across many of these locations, highlighting its role as a tourist and visitor oriented downtown circulator service in the two downtowns.

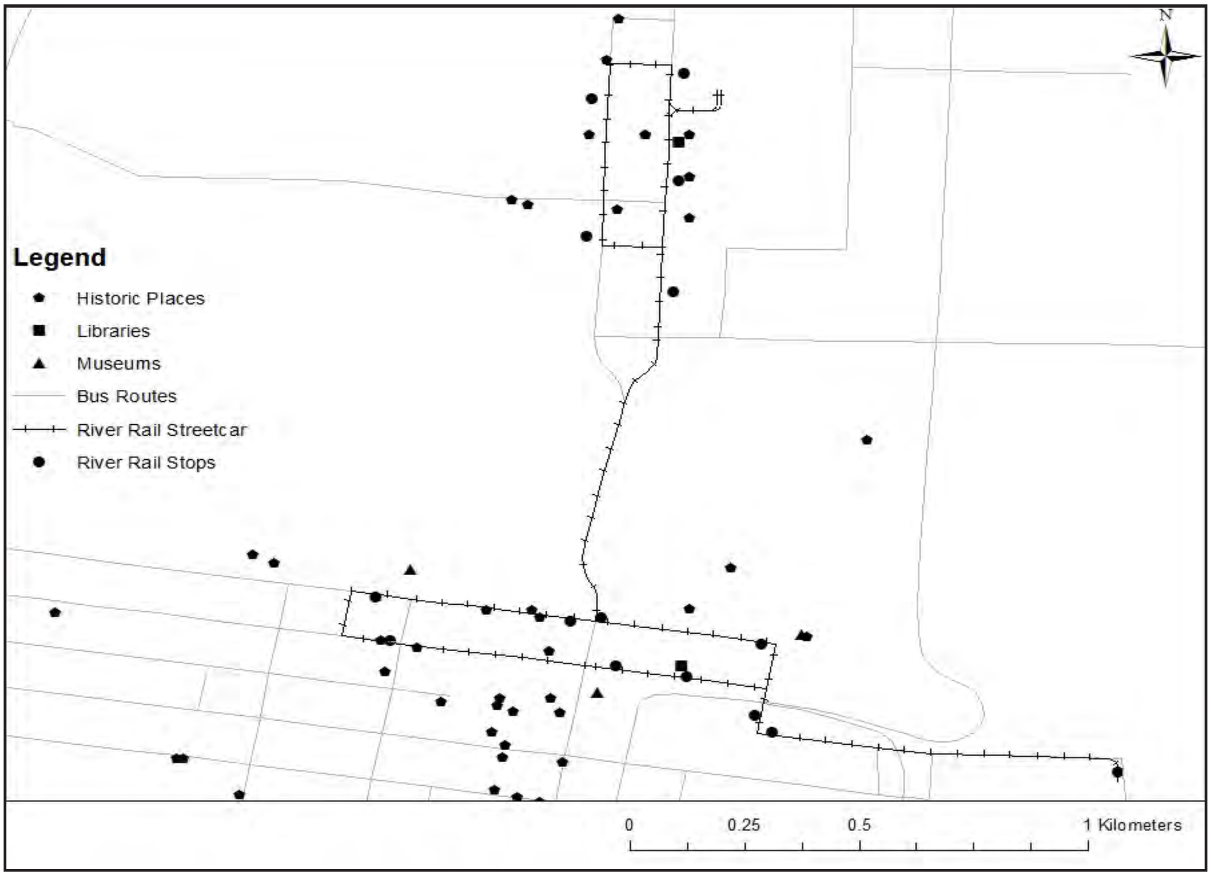

Figure 24. Special Activity Centers in Core of Little Rock (2012)[79]

As part of the exploration of socioeconomic conditions in the community, the authors examined the spatial distribution of a number of demographic and socioeconomic variables obtained from the U.S. Census. As noted earlier, Little Rock has a sizeable black population and a growing Hispanic population. Figures 25 and 26 depict the spatial distribution of the black population, highlighting the larger black populations in the eastern and southern portions of the two communities. The latter map also notes the relatively high black population shares among the residents of the block groups in the two downtowns. Figures 27 and 28 note that the white population tends to be higher in the northern and western portions of the community. This would suggest a degree of residential segregation by race. The white population share is moderately high in the downtown areas served by River Rail.

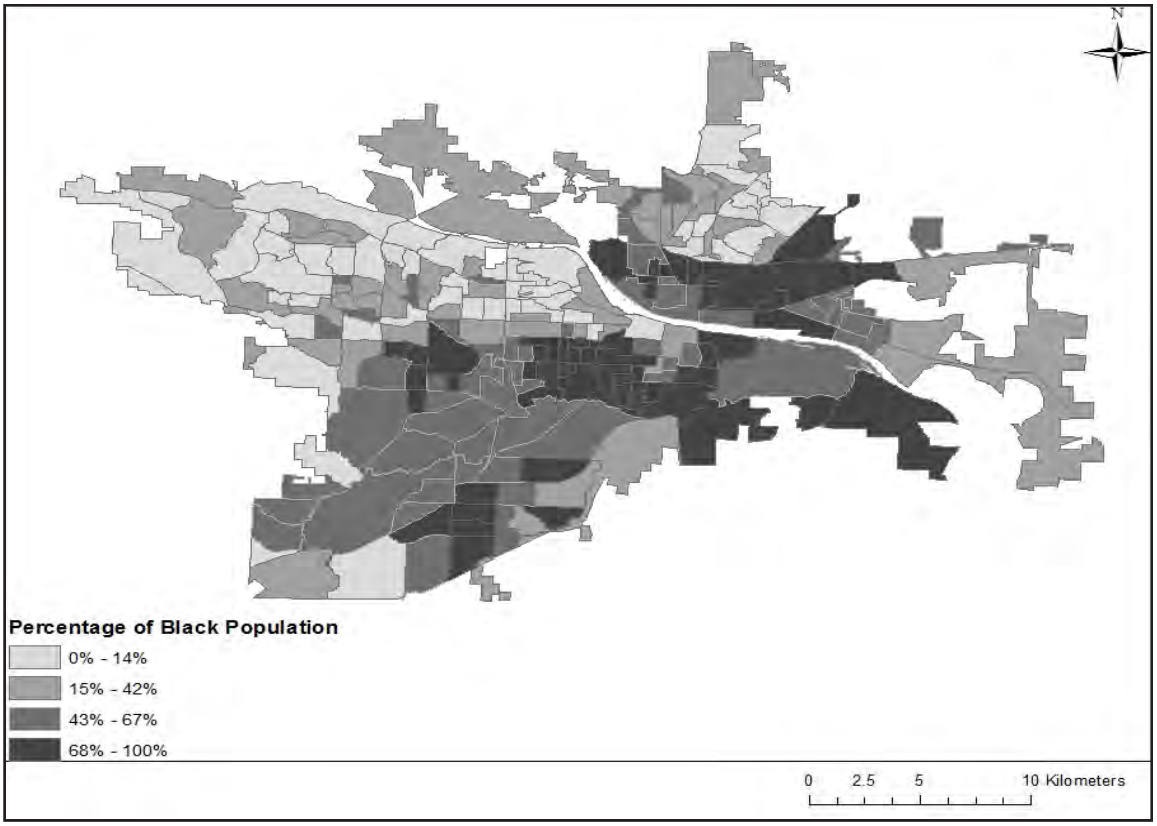

Figure 25. Black Population by Block Group in Little Rock (2010)[80]

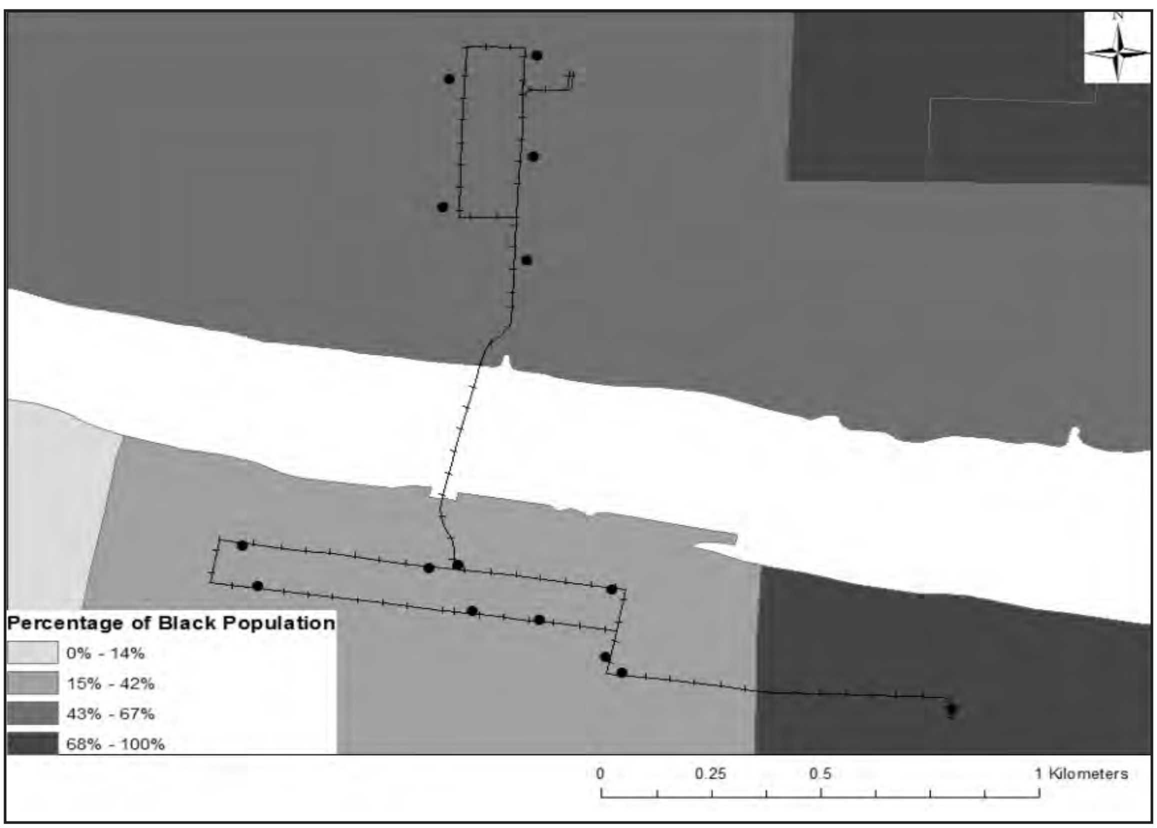

Figure 26. Black Population by Block Group in Core of Little Rock (2010)[81]

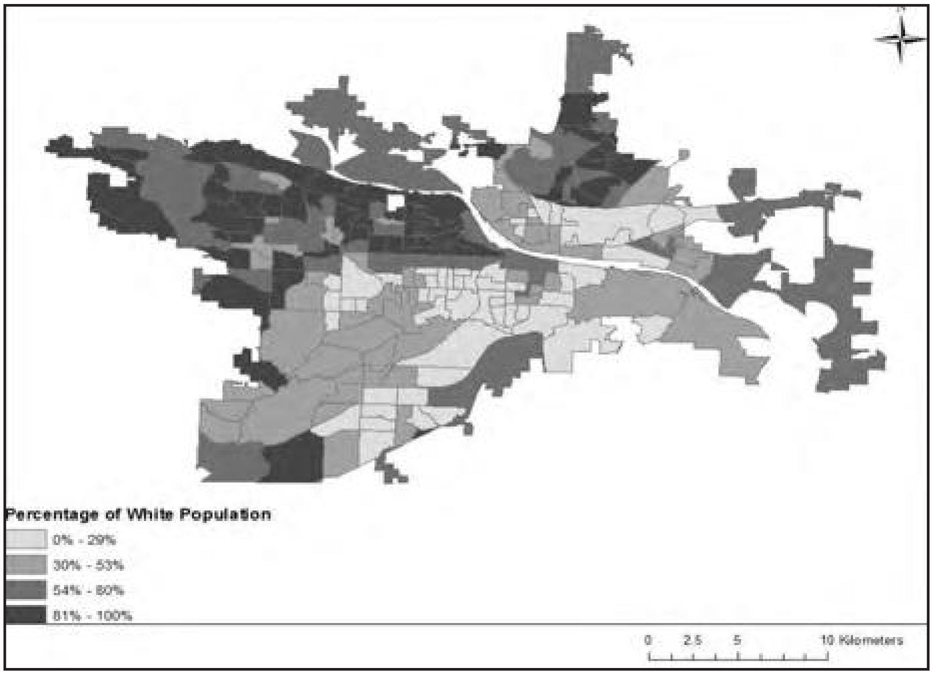

Figure 27. White Population by Block Group in Little Rock (2010)[82]

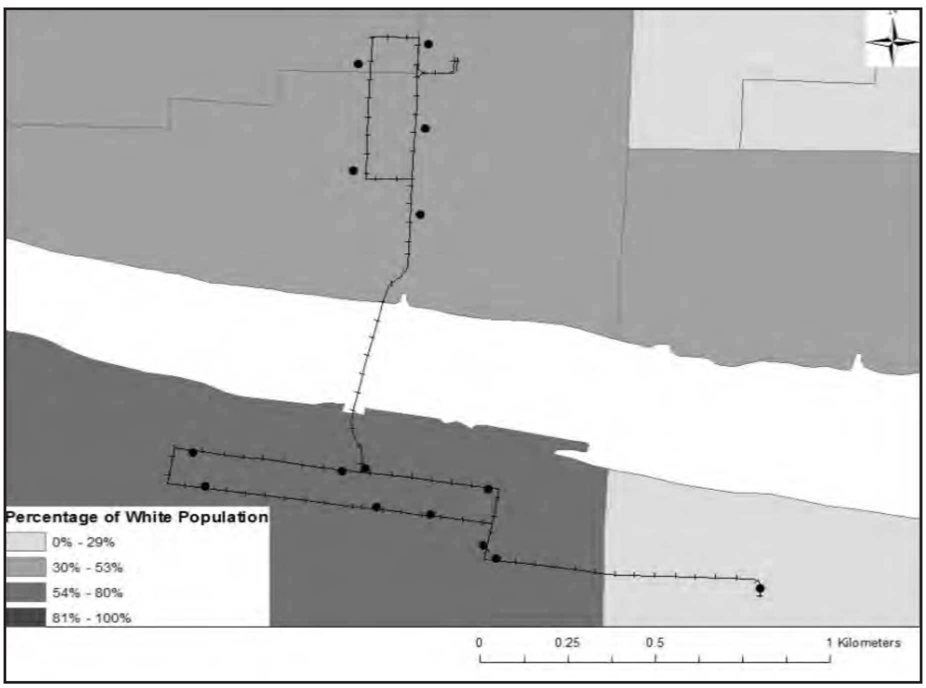

Figure 28. White Population by Block Group in Core of Little Rock (2010)[83]

The Hispanic population is higher in the southern and western parts of Little Rock and in scattered locations in North Little Rock (including its downtown) (Figures 29 and 30). However, the high-value categories for the Hispanic population share represent much smaller numbers than for the prior two groups due to its much smaller size in the total population. The Asian population share is much higher in the western portion of Little Rock and is very small in the areas served by River Rail (Figures 31 and 32).

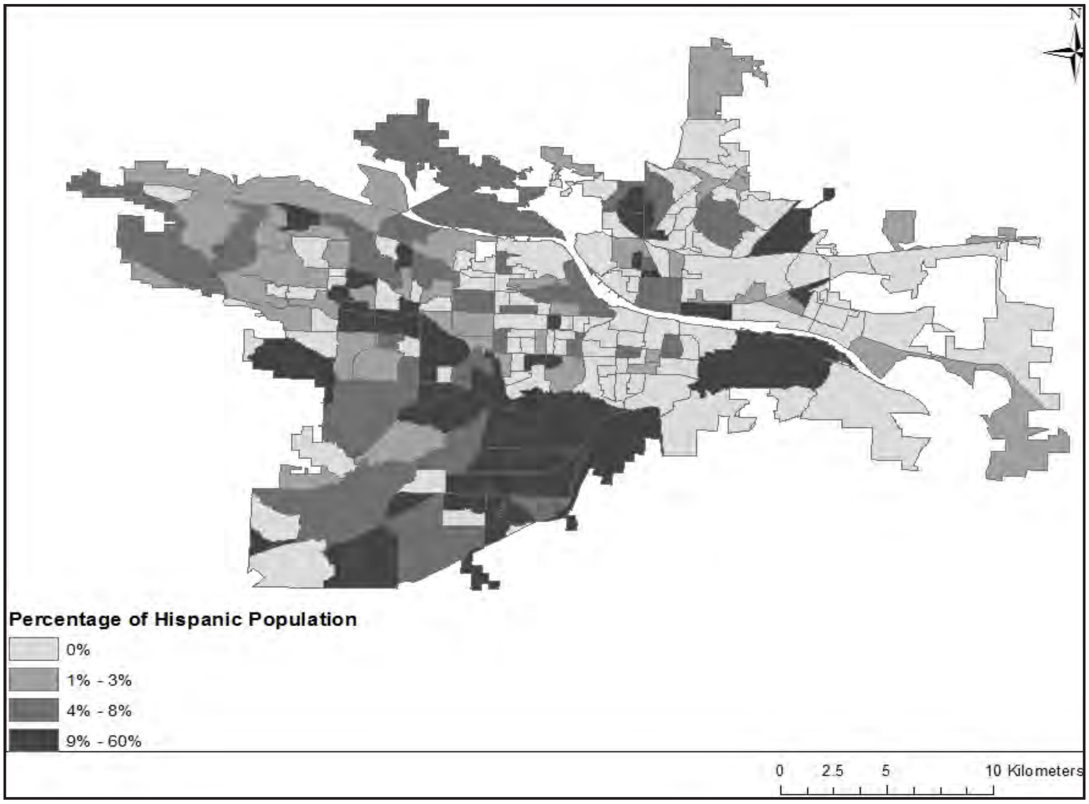

Figure 29. Hispanic Population by Block Group in Little Rock (2010)[84]

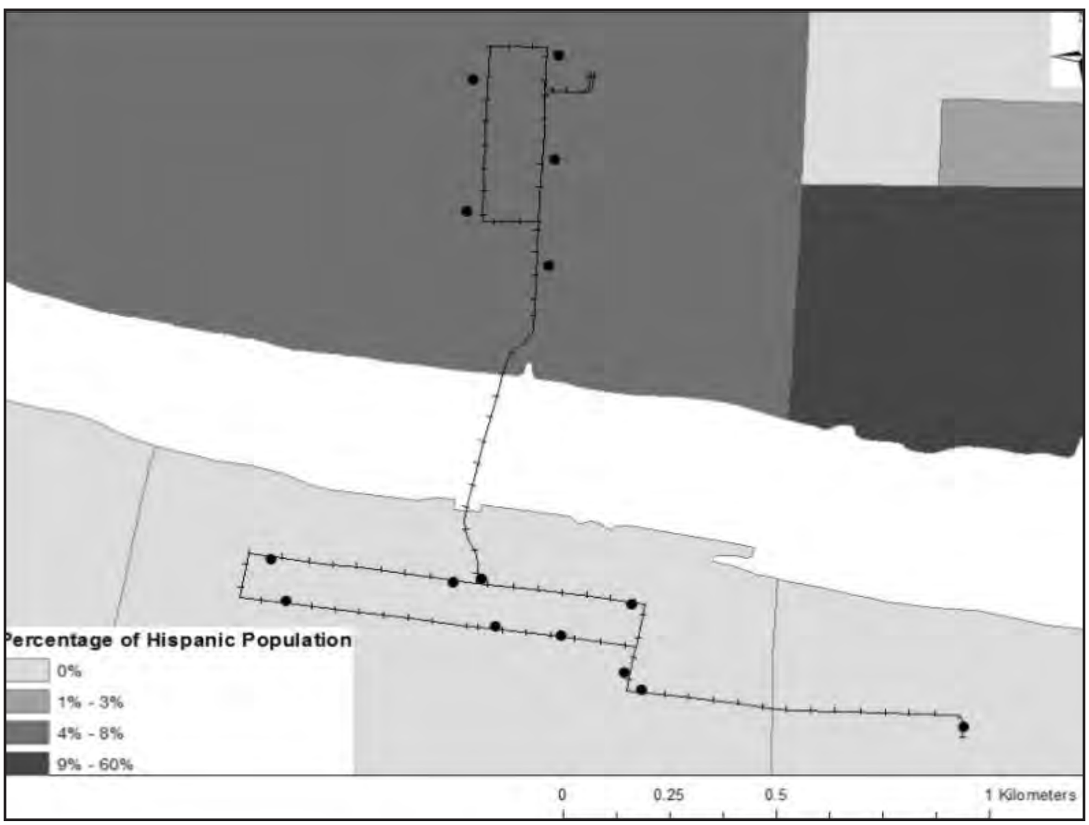

Figure 30. Hispanic Population by Block Group in Core of Little Rock (2010)[85]

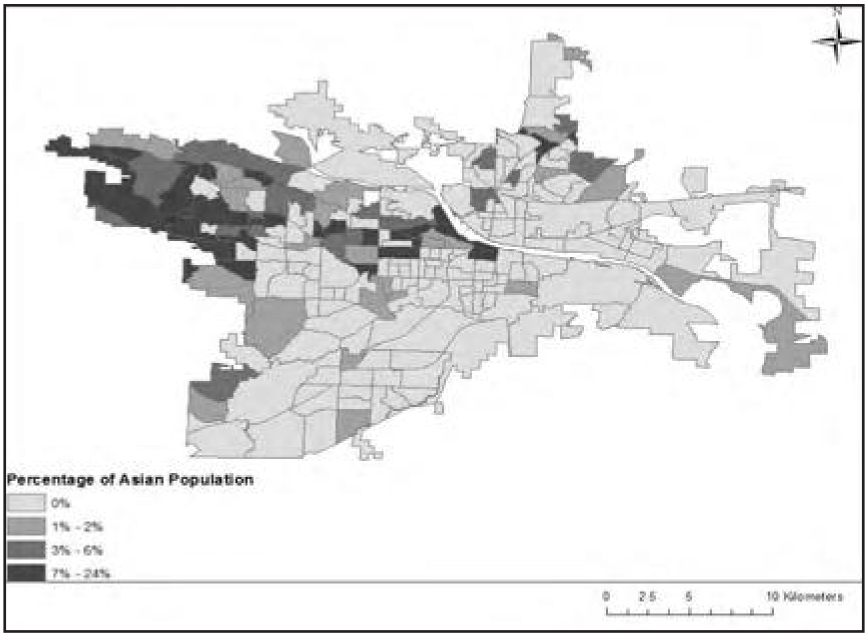

Figure 31. Asian Population by Block Group in Little Rock (2010)[86]

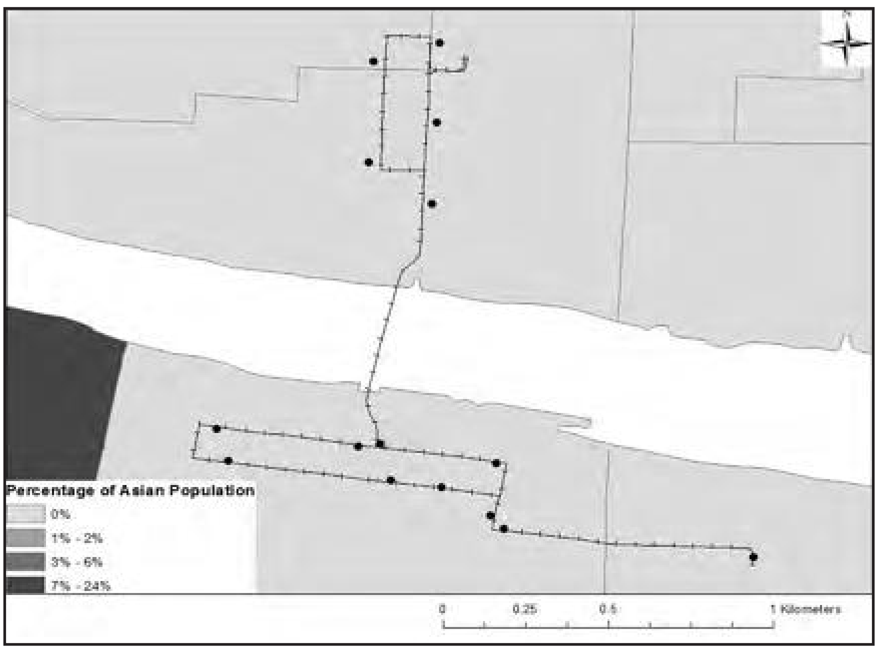

Figure 32. Asian Population by Block Group in Core of Little Rock (2010)[87]

Two of the key socioeconomic correlates of transit use are household income and vehicle access, which tend to be related to one another. The spatial distribution of median household incomes is shown in Figures 33 and 34. From the first map, one sees that the areas around the downtowns fall into the lower tier for household incomes. Income levels increase to the northwest and north of the two downtowns. These higher income areas are also the locations of larger white and Asian population shares, as noted on the preceding maps. Areas in the downtown core and to the south of the downtowns tend to have lower incomes; these were areas with higher black population shares, as noted in the preceding maps.

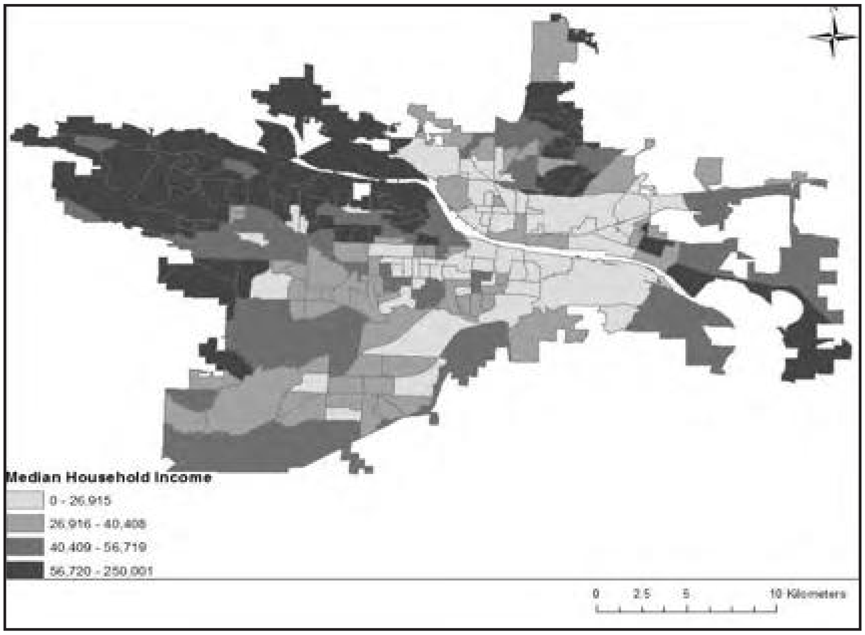

Figure 33. Median Household Income by Block Group in Little Rock (2010)[88]

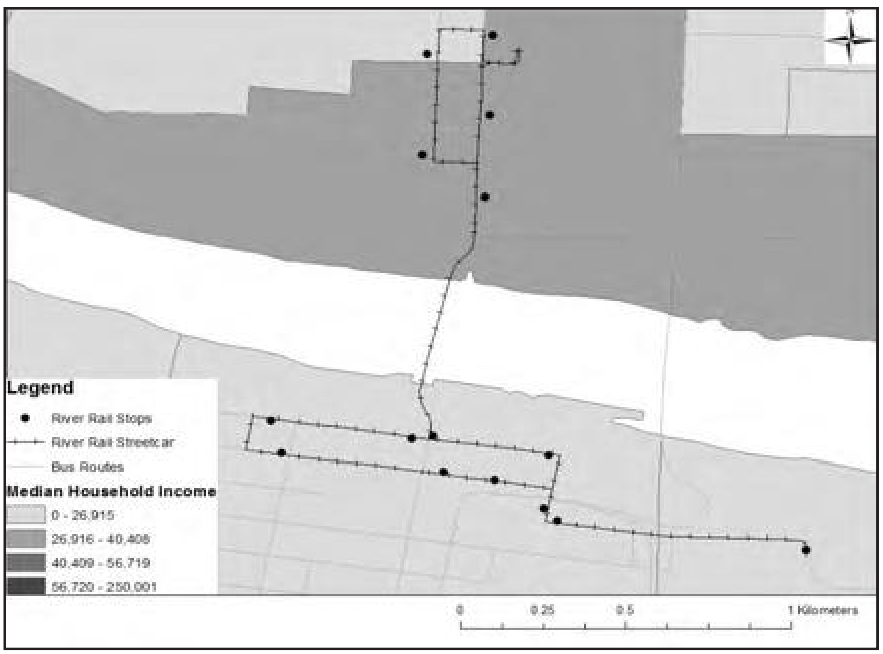

Figure 34. Median Household Income by Block Group in Core of Little Rock (2010)[89]

The spatial pattern of vehicle ownership is similar to that for household income and is also closely linked with the transit commute share. Figures 35 and 36 depict the spatial pattern of vehicle access, mapped as vehicles per housing unit. The maps indicate higher numbers of vehicles per housing unit the further one moves out from the downtown cores. The downtown areas served by River Rail tend to fall into the lower vehicle-access categories. The transit commute share follows a similar spatial pattern as shown in Figures 37 and 38. The areas near the core have higher transit commute mode shares, while the areas further away tend to have lower transit commute shares.

Figure 35. Vehicles per Housing Unit by Census Tract in Little Rock (2010)[90]

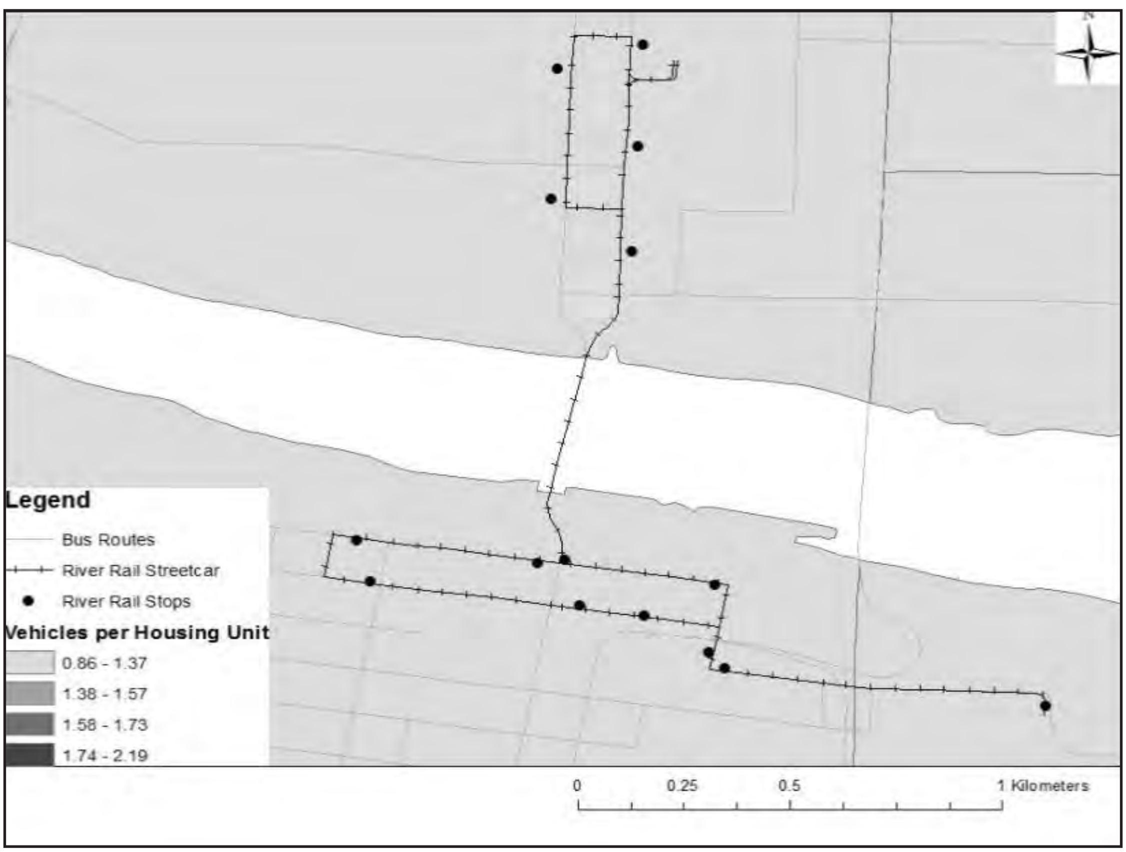

Figure 36. Vehicles per Housing Unit by Census Tract in Core of Little Rock (2010)[91]

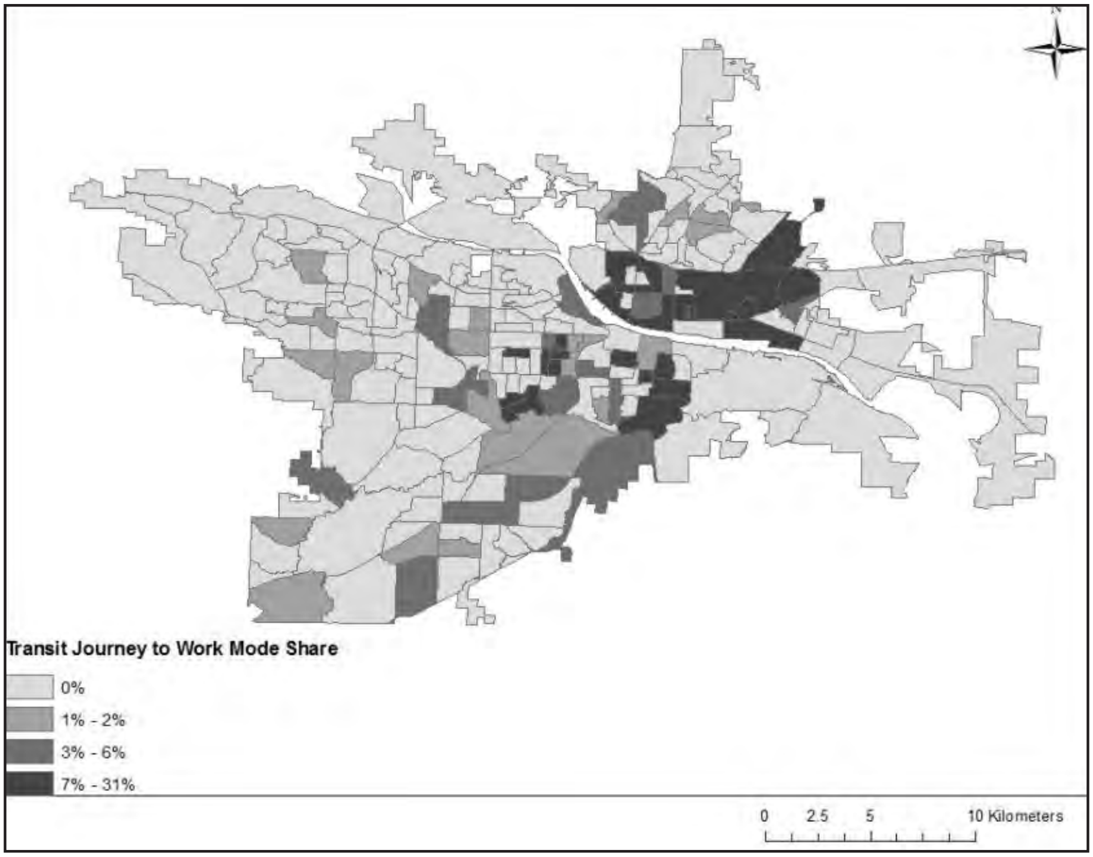

Figure 37. Transit Commute Share by Block Group in Little Rock (2010)[92]

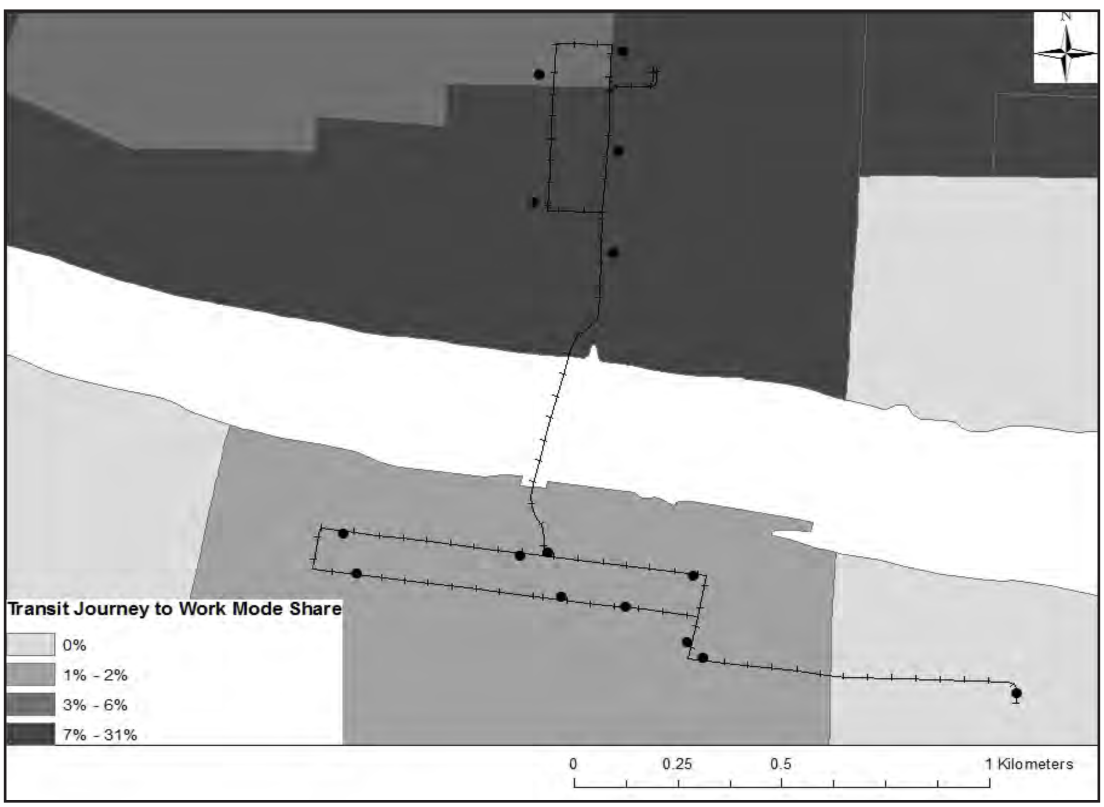

Figure 38. Transit Commute Share by Block Group in Core of Little Rock (2010)[93]

In summarizing the socioeconomic conditions in Little Rock and North Little Rock, the two downtowns do not emerge as major population centers and are modest employment centers within the context of local employment patterns. The downtowns do have lower levels of household vehicle access and high levels of transit commute usage. Overall, the downtowns thus possess some of the attributes that scholars have linked to high transit use but are deficient in some others.

However, the two downtowns do possess a large number of special activity centers, including museums, hotels, and historic sites, that cater to visitors. The River Rail lines provide access to many of these locations in the two downtowns, and the largest site, the Clinton Presidential Library, sits at the eastern end of the line. All of this seems to indicate a River Rail planning strategy of catering toward a visitor rider market as opposed to traditional transit-dependent riders or even resident-choice riders. The authors explore this issue in more detail later in this profile.

The authors also considered the built environment context within which River Rail operates. The streetcar alignment lies in areas where larger footprint structures exist, which suggests venues that might host higher-intensity activities or events. Figure 39 shows the building footprints on both North Little Rock and Little Rock, together with the alignment of the River Rail streetcar and 400m [one quarter mile] pedestrian service area. Structures in Little Rock seem to be larger than those of North Little Rock, although North Little Rock accommodates two large sport venues and a hotel at walkable distances from streetcar alignment and stops: Verizon Arena and Dickey Stephens Park (baseball), and the Wyndham Little Rock Hotel. On the other hand, North Little Rock accommodates a variety of activities – cultural, commercial, and recreational, among others – that could complement the entertainment/assembly type activities on the north bank of the Arkansas River. As such, the link across the river potentially expands the number of potential activities riders could reach within the streetcar-serviced areas.

Figure 39. Building Footprint and Urban Morphology, Little Rock (2014)[94]

In both North Little Rock and Little Rock, vacant parcels and large parking lots are noticeable along the streetcar alignment. However, transit commute share for North Little Rock (shown earlier in Figures 37 and 38) exhibit larger values as compared with Little Rock, although the specific modal split of transit is not specified (i.e., bus vs. streetcar). Both North Little Rock and Little Rock exhibit traditional orthogonal grid street network with similar block size (2.53 acres [1.02 hectares]). Based on aerial images in both North Little Rock and Little Rock, sidewalks are provided along the streetcar alignment and at least one block away from alignment. Trees populate some street segments along Little Rock's East-West alignment and North Little Rock North-South alignment. These physical characteristics would make a favorable walking environment for potential River Rail streetcar patrons, although the existing quality of the infrastructure was not assessed as part of this study.

Figure 40 exhibits land value ranges for a wide area surrounding streetcar alignment in North Little Rock and Little Rock (1:35000 scale). It is apparent that the River Rail trolley has been deployed in areas within or adjacent to medium-to-high land value areas relative to the Pulaski County sample (upper quintile; >$30.65/sq. meter). A downtown revitalization effort was put forward by the City of Little Rock in 1995, of which the streetcar formed part. A recent economic development report prepared by transit agency staff claims that one billion dollars in capital investments occurred within the streetcar-serviced areas between 2000 and 2012.[95] The purported effect of this revitalization initiative and streetcar re-implementation might then be reflected as higher land values in downtown and streetcar-served areas.

Figure 41 provides a more detailed view (1:15000 scale) of land value patterns within the two downtowns. The map indicates that the parcels adjacent to the streetcar in North Little Rock tend to have more consistently high land values than those in Little Rock, which is undoubtedly a reflection of the different land uses in each case.

In summary, the areas within which the streetcars operate tend to possess the types of attributes one would expect from a visitor- and tourist-oriented service as opposed to a traditional transit service catering to transit-dependent riders. The downtowns are not the highest density centers for population or employment, although employment levels are moderately high. Land values are in the moderate-to-high range, although the downtowns are not the only major clusters of high land-value parcels. The downtowns do possess a large number of special activity centers, including historic sites, museums, libraries, hotels, and arena and convention facilities that visitors might wish to access. The streetcar appears to do a good job of physically connecting many of these locations.

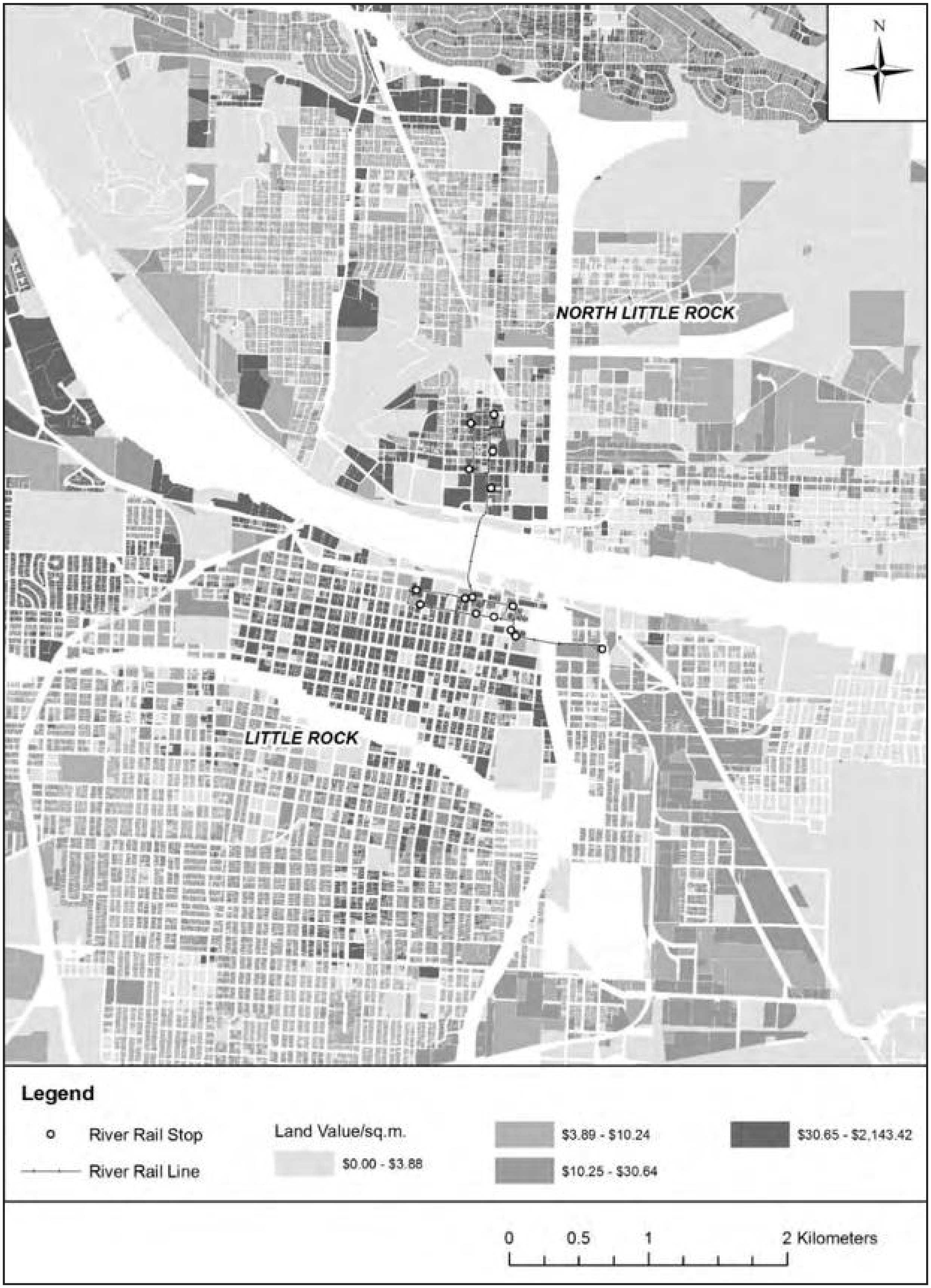

Figure 40. Land Values in Little Rock and North Little Rock Downtowns[96]

Figure 41. Land Values in Little Rock and North Little Rock Downtown Cores[97]

HISTORICAL BACKGROUND ON STREETCAR DEVELOPMENT

Little Rock, Arkansas, like many cities in the late 19th and early 20th centuries, supported an urban streetcar system. Arkansas Power & Light owned the electric Birney streetcars, which were originally horse cars in 1876 and then upgraded to steam-powered cars in 1888, and the rail system. This streetcar system was quite influential for Little Rock, as it helped catalyze growth that allowed the residents to live outside of downtown, but it still granted them the privilege of being connected to the urban environment.[98] It is no surprise that Little Rock expanded, developing new residential areas like Pulaski Heights and North Little Rock and increasing its population from around 13,000 to almost 26,000 during the 1880s alone.[99] However, despite the streetcars' early popularity and urban influence, Little Rock's streetcar system soon faced declining ridership as a result of the rapid increase of automobile use in the early to mid-20th century. By December 24, 1947, the Little Rock streetcar system had become obsolete and was shut down.[100]

Fast-forward 48 years to 1995, the Central Arkansas Transit Authority (CATA) planned to bring streetcars back to Little Rock as part of a downtown revitalization. CATA planned to use a new streetcar system, the River Rail, as a means of attracting tourists. The plan was not only to use the streetcar itself as an attraction, but also to transport streetcar riders to other important landmarks and venues throughout Little Rock.[101] CATA's leadership and other downtown interest group leaders believed the streetcar would encourage downtown living, help spur economic development (job/business growth), and attract more visitors. Other advocates believed the streetcar would be a better transportation option for the urbanizing city. One supporter told reporters "we simply cannot afford to build all the roads and highways or expand enough to move the number of cars needed to come in."[102] Supporters also pointed to possible air quality improvements spurred by the streetcar reducing automobile usage. The streetcar plan received legislative backing in 1996.[103]

A year later, a feasibility study was completed for the River Rail, and in 1998, CATA applied for funding through the Federal Transit Administration's (FTA) New Starts/Small Starts Section 5309 grant program. The original proposal was for a 1.9-mile [3.05 kilometer] overhead-cable electric streetcar system, including seven vintage streetcars and seven stations that would connect North Little Rock, along with its Alltel Arena, with the key areas of downtown Little Rock such as the River Market.[104] The plan was to utilize some part of Little Rock's existing streetcar track along with several existing terminals. CATA estimated the total cost for the project to be $7.6 million. However, the FTA approximated total costs of $8.28 million, of which 80 percent would be federally funded under Section 5309.[105] The remaining amount of capital cost, as well as all future operating costs, was to be split among the three major beneficiaries of the grant: Little Rock, North Little Rock, and Pulaski County. Estimated annual operating costs were approximately $500,000, and daily projected ridership was between 1,000 and 1,200, with a possible high of 1,800 on special event days.[106]

The proposal was spared the burden of undertaking a Major Investment Study (MIS) because of the project's limited scale. It also was exempt from meeting certain New Starts criteria due to its relatively low cost.[107] In January 1998, upon Central Arkansas' Metropolitan Planning Organization (Metroplan) decision to include the River Rail project in its long-range transportation plan Metro 2020, the proposal was approved, despite its low FTA project ratings. Under TEA-21 Section 3030 (a)(36), the final design of the River Rail was approved, and CATA was granted $2.98 million for the 1999 fiscal year. Preliminary engineering was set to start in May 1998 and end a year later.[108] Problems arose in March, however, when the Amalgamated Transit Union held up the money for preliminary engineering because it was trying to secure the right to use existing employees for the new jobs that would be generated by the River Rail. However, by August, with the help of the U.S. Department of Labor, the Union was not given its employee protection rights, and the money was approved.[109]

Following up the 1998 proposal, in November 1999 and 2000, the FTA and CATA made several changes to the River Rail construction and financing plan. The revised plan included 0.2 miles [0.32 kilometers] of extra streetcar rail, one more terminal station, and also a proposal for an additional 0.4-mile [0.64 kilometers] double-track extension and two more streetcars.[110] As a result of these additions, the FTA estimated the project to cost approximately $13.2 million, of which it would be responsible for $8.6 million.[111] Accordingly, annual projected operating costs rose to $700,000. CATA received authorization to spend $5.94 million through the 2001 fiscal year, and regular River Rail service was forecasted to begin in late 2002.[112]

By early 2001, CATA began reviewing bids for the first River Rail construction phase and began receiving bids for the 0.4-mile [0.64 kilometers] second construction phase, which would bring the entire line out to 3.4 miles [5.47 kilometers] and connect it to the Clinton Presidential Library. The City of Little Rock would be responsible for the majority (around 42 percent) of the funding for the second phase because the loop would run only within its city limits.[113] Throughout the second half of 2001 and the beginning of 2002, other bids were advertised that included building the streetcar maintenance barn, completion of a traction power system, and "modifying the Main Street Bridge to carry trolleys."[114] Gomaco Trolley Co. had been retained to provide vintage streetcars for the line and reported the first one to be complete by December 2001.

Midway through 2002, CATA encountered several issues that slowed construction progress and inflated project costs. Among these issues was difficulty with the local utility company, the inaccurate estimation of the trolley barn expenses, and prolonged negotiations with the Arkansas Highway and Transportation Department over the Main Street Bridge modifications.[115]

CATA experienced other problems during this time, as well. One major problem was that city funding for public transit was being reduced for the upcoming year – 2003. This would put CATA more than $200,000 over the estimated budget, not including the revenue loss. To retain the streetcar, CATA proposed cutting several bus routes. This proposal received intense opposition from those who used the bus system to travel to and from work. Many of these same people were upset that the streetcar project would continue, as they believed the money to fund its development should go to save the bus routes. Other users offered to pay higher fares to save the major bus routes.[116] Eventually, a compromise that included a fare increase, some staff layoffs, and reduction of other services saved the bus routes from elimination.[117]

By the time it came to choosing a contractor for final construction in early 2003, Little Rock officials hesitated to move on with the streetcar development. With the recent increases in total projected costs, the officials were not ready to commit to the project until they discovered more precisely how much the streetcar system would cost and whether or not they, along with the other contributors, would find the revenues necessary to fund it. One city director stated, "I cannot see us moving forward until we know what kind of liability we have."[118] After some time reviewing the plan, Little Rock officials became comfortable enough to move on, and on April 17, 2003, CATA finally agreed to a contract with Mobley Contractors to begin construction on the streetcar track and its power supply.[119] Gomaco completed three, not the originally envisioned eight, vintage streetcars just four months later.[120] The first phase of streetcar track was completed in August 2004, and testing started in September.[121]

As of July 2004, just four months before the River Rail opening, CATA operated 73 buses that serviced 7,805 miles during the weekday; the service miles for Saturday and Sunday were 5,648 and 1,576 respectively.[122] The bus service had an average fixed route daily passenger ridership of 7,000 to 8,000 trips. A number of Little Rock citizens and leaders questioned the River Rail investment instead, advocating bus service expansion as a more effective means of increasing ridership. Nevertheless, the CATA leadership remained committed to streetcar development. A number of new concerns also emerged at about this time, including the large size of the streetcars and the possible elimination of parking to accommodate this size. According to *The Arkansas Times*, however, only 12 parking spots were eventually removed, and these were replaced with a new parking structure of more than 250 spaces. Some observers complained about the final price tag of $19.6 million for the first construction phase, which was approximately $6 million over original estimates that included the extensions.[123] Nevertheless, on November 1, 2004, the River Rail streetcar system officially began service with operations on the first phase of the system.[124]

During the year following its opening, streetcars on the first phase of the River Rail carried nearly 200,000 riders. However, many people complained about the streetcar not generating even half of its expected fare revenue, and they noted that the streetcars usually were void of riders.[125]

Supporters mobilized to defend the system. According to an *Arkansas Times* article written later in 2006, "…the River Rail project has met and exceeded all local goals regarding ridership, supporting economic development, supporting convention and concert events… and other intangible and tangible benefits alike."[126] Other supporters pointed to the increasing development activity along the line. These development-related arguments were used to justify the funding of the second phase extension to the federal government. After receiving this additional federal funding, construction for the second phase of the River Rail, which would cost an additional $9.2 million, was under way in January 2006.[127] This would bring the total streetcar system cost to $28.8 million. One of the two new streetcars arrived in April, with the other on its way.[128] A year later, on April 17, 2007, the second phase of the River Rail began service.[129]

Since the new phase's opening, additional plans have emerged for streetcar extensions. In October 2007, Metroplan unveiled plans to connect the River Rail to the Little Rock National Airport.[130] This idea had been discussed since the inception of the original River Rail line. After a lengthy feasibility study that ended in mid-2009, Metroplan's consulting group presented its findings to the MPO's officials. The consultants identified several possible streetcar routes and estimated the project to cost anywhere from $70 million to $105 million.[131] The MPO officials quickly realized that the new streetcar line was too expensive, and according to a local judge, "'the economic development it created was not going to be enough…to warrant an investment of these kinds of dollars."[132] The plan to have the River Rail connect to the airport was not completely abandoned, but those involved in streetcar promotion began looking to other projects that were regarded as having greater potential economic benefits. Among these other projects was an extension of the River Rail in North Little Rock.[133]

In April 2010, North Little Rock's mayor submitted a request for "a feasibility study for a northern extension of the River Rail."[134] The study would also include plans to replace an old viaduct that was located along where the new River Rail line was designed to run. The request was approved. In May 2010, the North Little Rock City Council began to apply for federal funding, for both the River Rail extension and the viaduct replacement, from the TIGER II grant program.[135] Costs were projected to be around $70 million. During this same time, Little Rock initiated a study to extend the River Rail along its Main Street. Some critics believed it was not the right time for further streetcar investment, especially considering the lack of ridership on the current lines. They again advocated spending additional funds on bus services as a better ridership attraction strategy.[136]

In late 2011, CATA officials gathered to generate ideas on how to increase people's interest in the River Rail. After seven years of River Rail service, local residents tended to have a predominantly negative attitude toward the streetcar, which was considered a tourist attraction and not a transit service for area residents. According to many critical observers, the streetcar was usually empty, had slow service, and was "a waste of money."[137] Some critics proposed that streetcar service stop during the weekdays and that the service run only on the weekends as a means to save costs. Advocates of the River Rail, which largely included city and CATA officials, thought these feelings were misguided, and they did not think people understood how influential the streetcar was in the growth of the downtown area. This disconnect between their view and the predominant public sentiment led to CATA attempting to create a better marketing strategy for the River Rail.[138]

Nevertheless, despite the negative local public sentiment, plans for future extensions have continued to materialize. A second study that focused on extending the streetcar in either Little Rock or North Little Rock was completed in September 2011. The *River Rail Airport Study: Phase Two* listed the goals of providing efficient transportation alternatives, promoting transit-oriented development, continuing studies for expanding the River Rail within central Arkansas, and exploring possible travel demand for the airport extension of the streetcar.[139] No specific action was taken on this plan, and as of January 2014, River Rail expansion options still remain in the planning stages with no specific plan option ready for approval.

STREETCAR RIDERSHIP AND SERVICE PERFORMANCE

As noted earlier, Little Rock's transit system consists of River Rail streetcar service and local and express bus service operated by CATA. The authors examined ridership, service, and performance characteristics, and they looked for trends in these indicators, for both the River Rail (streetcar) and bus modes from River Rail's opening in 2004 through 2012. The following analytic focus is solely on fixed-route service operated by CATA.

The authors began by considering ridership trends, using data obtained from the NTD. Table 17 reports mode-level annual ridership using unlinked passenger trips (boardings) and passenger miles as different measures of transit usage. Ridership data are reported for River Rail (streetcar), bus, and total (which here represents the total of streetcar and bus). Whether using unlinked passenger trips or passenger miles as the ridership measure, the table clearly indicates that streetcar ridership has generally declined from its high point in the years immediately following the opening of the first line in 2004, even as bus ridership has experienced a steady increase over the same time period. Over most of the time period reported in the table, streetcar ridership has accounted for between 5 and 6 percent of total transit patronage on a boardings basis and between 1 and 2 percent of total transit patronage on a passenger-miles basis. The significant difference between these two numbers is a function of the sizeable differences in the average trip lengths (passenger miles divided by unlinked passenger trips) for streetcar versus bus trips. The average trip length by streetcar over this time period is typically between 1.5 and 1.6 miles, whereas the average bus trip is three times that distance. These trip length differences reflect the very different functions the two modes play locally, with the streetcar playing a downtown circulator role and the buses providing longer-distance service predominantly destined from outer areas into the downtowns.

Table 17. Annual Ridership by Mode in Little Rock (2004-2012)[140]

	Unlinked Passenger Trips			Passenger Miles		
Year	Streetcar	Bus	Total	Streetcar	Bus	Total
2004	44,457	1,954,394	1,998,851	62,723	7,284,202	7,346,925
2005	154,745	2,127,711	2,282,456	249,060	7,882,839	8,131,899
2006	154,432	2,202,262	2,356,694	248,950	8,158,462	8,407,412
2007	154,644	2,243,697	2,398,341	249,052	8,311,218	8,560,270
2008	134,204	2,452,572	2,586,776	206,752	13,371,780	13,587,352
2009	119,758	2,343,232	2,462,990	183,751	12,752,928	12,936,679
2010	107,088	2,369,500	2,476,588	165,718	12,890,930	13,056,648
2011	136,380	2,581,334	2,717,714	240,083	14,420,147	14,660,230
2012	104,868	2,823,614	2,928,482	162,616	15,788,380	15,950,996

The authors also obtained monthly NTD ridership data for 2012, which is the primary focus year for the study. Monthly ridership data are available only for unlinked passenger trips; these data are shown in Table 18 for streetcar, bus, and total fixed-route (streetcar plus bus) modes. The table clearly indicates that streetcar ridership on River Rail has a seasonal pattern that is not evident in bus patronage. River Rail patronage is much higher from March to July than it is during the remainder of the year; River Rail ridership reaches its peak in May. By contrast, bus patronage is remarkably consistent from month to month over the course of the year. These data tend to support the idea of River Rail playing, at least to a significant degree, a tourist- and visitor-serving role in the local transit system.

Table 18. Monthly Unlinked Passenger Trips by Mode in Little Rock (2012)[141]

	Unlinked Passenger Trips		
Month	**Streetcar**	**Bus**	**Total**
January	5,236	228,516	233,752
February	5,049	229,539	234,588
March	13,650	235,754	249,404
April	11,506	224,623	236,129
May	16,536	231,605	248,141
June	10,420	228,591	239,011
July	10,221	232,505	242,726
August	7,310	264,866	272,176
September	5,915	241,047	246,962
October	5,855	264,784	270,639
November	5,589	236,160	241,749
December	7,531	205,626	213,157

While River Rail ridership has declined in recent years from its earlier peak, its service levels have been relatively stable. Table 19 reports annual service characteristics for streetcar, bus, and the total for fixed-route modes (streetcar plus bus) from 2004-2012. Service is reported on a revenue-hours and revenue-miles basis, which also allows average modal speeds to be calculated for each of the fixed-route modes operated by CATA. The table clearly shows an increase in streetcar service with the extension of the streetcar line in 2007, but since then service has been stable. Bus service levels have also been relatively stable throughout this time period. The far panel of the table highlights the much lower average speed of the streetcar versus the typical bus in Little Rock. The streetcar's downtown location undoubtedly explains some of this difference in average speeds between the modes.

Table 19. Annual Service Characteristics by Mode in Little Rock (2004-2012)[142]

	Vehicle Revenue Miles			Vehicle Revenue Hours			Average Speed (VRM/VRH)		
Year	Streetcar	Bus	Total	Streetcar	Bus	Total	Streetcar	Bus	Total
2004	6,353	2,242,987	2,249,340	1,322	157,294	158,616	4.81	14.26	14.18
2005	37,041	2,243,292	2,280,333	8,072	157,056	165,128	4.59	14.28	13.81
2006	37,475	2,261,395	2,298,870	8,107	157,311	165,418	4.62	14.38	13.90
2007	52,256	2,262,758	2,315,014	11,866	157,419	169,285	4.40	14.37	13.68
2008	53,000	2,270,240	2,323,240	11,992	157,936	169,928	4.42	14.37	13.67
2009	53,903	2,317,039	2,370,942	12,087	161,616	173,703	4.46	14.34	13.65
2010	52,702	2,288,542	2,341,244	11,848	158,732	170,580	4.45	14.42	13.73
2011	54,901	2,343,053	2,397,954	12,535	162,409	174,944	4.38	14.43	13.71
2012	54,668	2,307,906	2,362,574	12,436	162,174	174,610	4.40	14.23	13.53

Inflation-adjusted operating expenses for both transit modes have increased slightly over the recent time period, as shown in Table 20. These operating expense increases are a function of increased streetcar service at the time the 2007 extension was opened and the general cost increases associated with transit operation.

Table 20. Annual Operating Expense by Mode in Little Rock (2004-2012)[143]

	Streetcar		Bus		Total	
Year	Unadjusted $	2012 $	Unadjusted $	2012 $	Unadjusted $	2012 $
2004	$224,289	$272,614	$8,917,040	$10,838,287	$9,141,329	$11,110,901
2005	$547,066	$643,146	$9,649,901	$11,344,686	$10,196,967	$11,987,832
2006	$552,363	$629,080	$10,479,779	$11,935,304	$11,032,142	$12,564,384
2007	$708,625	$784,854	$10,385,409	$11,502,604	$11,094,034	$12,287,459
2008	$818,119	$872,445	$11,108,147	$11,845,773	$11,926,266	$12,718,219
2009	$898,802	$961,908	$11,427,069	$12,229,383	$12,325,871	$13,191,291
2010	$1,007,510	$1,060,848	$11,358,249	$11,959,561	$12,365,759	$13,020,409
2011	$942,933	$962,472	$12,187,047	$12,439,577	$13,129,980	$13,402,049
2012	$1,007,601	$1,007,601	$12,564,460	$12,564,460	$13,572,061	$13,572,061

The combination of declining River Rail ridership over a period characterized by stable service levels and modestly increasing service expenditures has resulted in a deterioration of the streetcar's performance on both cost effectiveness (operating expense per passenger trip) and service productivity (passenger miles per vehicle miles) measures, as shown in Table 21. Streetcar cost effectiveness was at its best in the years immediately after the River Rail's opening, as was service productivity. Since then, both measures have experienced steady declines. In contrast to the deteriorating streetcar performance, local bus service has become more cost effective and more productive over the same time period. Thus, transit in Little Rock presents a tale of two modes heading in different directions. The authors' local informants suggest that the decline in streetcar ridership results largely from the effects of the recent recession on convention and visitor activity in the community. They believe that the bus service is not as sensitive to these same phenomena due to its focus on a traditional local transit riding market.

Table 21. Service Performance by Mode in Little Rock (2004-2012)

	Cost Effectiveness (Operating Expense per Passenger Trip, 2012$)		Service Productivity (Passenger Miles per Vehicle Mile)	
Year	Streetcar	Bus	Streetcar	Bus
2004	$6.13	$5.55	9.87	3.25
2005	$4.16	$5.33	6.72	3.51
2006	$4.07	$5.42	6.64	3.61
2007	$5.08	$5.13	4.77	3.67
2008	$6.50	$4.83	3.90	5.89
2009	$8.03	$5.22	3.41	5.50
2010	$9.91	$5.05	3.14	5.63
2011	$7.06	$4.82	4.37	6.15
2012	$9.61	$4.45	2.97	6.84

Note: Values calculated from Tables A-4, A-6, and A-7.

Tables 22 and 23 summarize the ridership and performance information for the River Rail streetcar on an annual basis from 2004-2012 and on a monthly basis for 2012, respectively. Summarizing the information discussed earlier and recapitulated in these tables, the River Rail experienced an early surge in ridership that has since declined even as service levels and expenditures have stabilized at higher levels due to the expansion of the streetcar service in 2007. Productivity has declined and cost effectiveness has diminished as a result. River Rail ridership is seasonal in nature, with much ridership concentrated during the peak tourist months. This fact, combined with the relatively short trip lengths on this relatively slow system, supports the notion that the system's primary market likely consists of tourists and others who are visiting the city, as opposed to a market consisting of local residents and/or regular riders. This suggestion cannot be confirmed through any rider surveys, as River Rail does not collect much data on its users, but it is in accord with information learned during the authors' discussions with River Rail staff.

Table 22. Summary of Streetcar Ridership, Service, and Performance by Year in Little Rock (2004-2012)[144]

Year	Unlinked Passenger Trips	Passenger Miles	Vehicle Revenue Miles	Vehicle Revenue Hours
2004	44,457	62,723	6,353	1,322
2005	154,745	249,060	37,041	8,072
2006	154,432	248,950	37,475	8,107
2007	154,644	249,052	52,256	11,866
2008	134,204	206,572	53,000	11,992
2009	119,758	183,751	53,903	12,087
2010	107,088	165,718	52,702	11,848
2011	136,380	240,083	54,901	12,535
2012	104,868	162,616	54,668	12,436

Year	Productivity (PM/VM)	Cost Effectiveness	Speed (VRM/VRH)	Average Trip Length (PM/UPT)
2004	9.87	$6.13	4.81	1.41
2005	6.72	$4.16	4.59	1.61
2006	6.64	$4.07	4.62	1.61
2007	4.77	$5.08	4.40	1.61
2008	3.90	$6.50	4.42	1.54
2009	3.41	$8.03	4.46	1.53
2010	3.14	$9.91	4.45	1.55
2011	4.37	$7.06	4.38	1.76
2012	2.97	$9.61	4.40	1.55

Table 23. Summary of Streetcar Ridership and Service by Month in Little Rock (2012)[145]

Month	Unlinked Passenger Trips	Vehicle Revenue Miles	Vehicle Revenue Hours
January	5,236	4,618	1,050
February	5,049	4,122	938
March	13,650	4,832	1,098
April	11,506	4,438	1,028
May	16,536	4,636	1,054
June	10,420	4,569	1,042
July	10,221	4,524	1,028
August	7,310	4,814	1,094
September	5,915	4,383	996
October	5,855	4,777	1,086
November	5,589	4,477	1,018
December	7,531	4,383	996

INSIGHTS FROM KEY INFORMANT INTERVIEWS

In addition to collecting and analyzing quantitative data and documentary evidence, the authors conducted one-hour semi-structured telephone interviews with key informants in the Little Rock region who provided their perspectives on streetcar goals, performance, and future prospects. Informants representing a diverse set of perspectives, including regional planning, transit planning, and the local tourism promotion industry, participated in the interviews. These informants were identified through documents or were suggested by other interviewees as pertinent informants, given the nature of the questions the authors hoped to address.

The authors sought to use the interviews to complement the insights developed from their quantitative assessment discussed earlier and to identify hard-to-quantify phenomena that might impact people's perceptions of the streetcar and impact its performance. Each informant was provided a set of 12-24 questions in advance of the interviews, including a set of questions asked of all informants and specific questions asked of that individual, given the role they play in the community. A set of typical interview questions can be found in Appendix F.

For Little Rock, the authors conducted three semi-structured interviews with three key informants. Several key themes emerged from the interviews, including: the streetcar's perception as a development catalyst, its role as a visitor-oriented service, its status as an icon of the city, and the efforts by streetcar advocates to shape public attitudes about the streetcar in more favorable directions. The three informants included a transit planner who is also a member of both the River Rail Marketing Committee (which promotes local events) and River Rail Economic Development Committee (which works to promote economic development); a regional planner involved in long-range transportation and land use planning; and an individual involved in marketing and promoting the convention and visitors industry (Table 24). Each individual is identified by his or her role within the narrative that follows.

Table 24. Key Informants Interviewed for Little Rock Study

Informant	Role
1	Transit Planner
2	Regional Planner
3	Marketing Expert

Streetcar Goals

The key informant interviews identified two sets of goals for streetcar implementation in Little Rock. The first goal is to promote downtown development, which is a goal shared by all the case-study cities. The second goal is to promote tourism and visitorship. This goal is reflected in planning and operational decisions, which tend to neglect the local commuter ridership market.

The regional planning informant spoke about the development goals of the streetcar plan. The informant noted the streetcar's emergence as part of a downtown development strategy in a study undertaken by local businesses and developers with the Urban Land Institute. Both mayors (Little Rock and North Little Rock) were engaged in this effort, as well. The streetcar was seen as a potential catalyst for development. The MPO regarded it as a tool that could bring transportation and land use planning together and advance the agency's goals of promoting higher density development. The informant observed that these goals were part of a vision articulated in the MPO's Metro 2020 Plan, which was prepared after passage of TEA-21.

The regional planning informant recalled that the streetcar was selected because its size seemed most appropriate for a downtown context. The informant observed that this view was supported by a "few big players" that included a group of local developers and key elected officials who were interested in downtown revitalization. These key figures were helped secure federal funding earmarks to aid in streetcar construction. Major entities such as the Clinton Presidential Library and Heifer International participated in the second phase of streetcar construction, with the Library designing, building, and maintaining its own stop. The transit planning informant thought that former President Clinton's position and influence helped the community obtain the funding for the second streetcar phase that included service to the library.

The regional planning informant noted that the MPO recognized that the streetcar's downtown alignment meant that it would serve primarily visitors, at least until the line might be extended into neighborhoods. The regional planning informant also observed that MPO officials regarded the streetcar as a first step toward a future regional LRT system. The transit planning informant concurred with the primarily tourism and visitor orientation of the service. He explicitly stated that the service was tourism oriented and not transit oriented. This informant observed that promoting tourism and visitorship is indeed an important goal of the service. This goal is reflected in policy decisions, such as starting service on weekday mornings at 8:20 a.m., after much of the morning commute, to avoid streetcar conflicts with motor vehicle congestion. The streetcar does not have its own right-of-way and is often hindered by congestion as well as vehicles parked within its right-of-way.

The marketing expert, who promotes tourism and convention activity in the community, spoke of the streetcar's role in connecting the two downtowns and particularly in enabling people to easily reach the major attractions located there. Thus, tourism promotion figured prominently in this informant's assessment of the streetcar's goals. The informant noted that the local convention and visitors bureau has worked with the other agencies involved in streetcar planning and operations to develop and promote events around the streetcar that are focused on visitors.

Assessment of Streetcar Goal Attainment

The informants offered a mixed assessment of the streetcar's attainment of its original goals, with two informants more favorable and one more pessimistic in the assessment. The marketing expert characterized the streetcar as playing a good role as an "amenity" of the city, indeed as an attraction itself for visitors because of the nostalgia associated with it. This individual noted the economic development that had occurred in the downtowns, although the person conceded that it was hard to know whether the streetcar was responsible. Indeed, the individual's comments seemed to point toward the Clinton Presidential Library as more of a driving factor than the streetcar. Nevertheless, the individual's assessment was largely favorable.

The transit planning informant focused his assessment on the streetcar's economic development effects and on its performance as a tourism and visitorship promotion device. With respect to economic development outcomes, the informant pointed to its "outstanding development effects" as documented in a local study that found about $1 billion in development activity within one-quarter mile [400 meters] of the streetcar line. Although the informant conceded that other factors were undoubtedly also important, he still viewed the streetcar as a critical catalyst for development.

With respect to the tourism and visitorship goals, the transit planning informant thought the streetcar had been very successful as well. As evidence, he pointed to the streetcar's strongest ridership months (April and May) as being tied to visitors and tourists. The patronage has a strongly seasonal pattern and is closely tied to major visitor-focused events, including conventions, fairs, school events, and other major public gatherings. He also noted the streetcar's role as an icon of the city that is featured prominently in media coverage of the community.

The regional planning informant agreed that the streetcar had been embraced as an icon of the city, but he also focused on a number of frustrations he had about the streetcar's performance. He was frustrated by what he regarded as the service's "underutilization" even as a streetcar service, let alone a service that served the larger community. He expressed frustration with local decisions that undercut the streetcar's ability even to attract visitor riders, such as the City of Little Rock's decision to suspend service for "safety" reasons during major public events. He thought this decision was an example of "shooting themselves in the foot" due to the ridership it meant they would forego. The transit planning informant thought these decisions were often made to increase the supply of on-street parking, which would certainly echo the "shooting themselves in the foot" criticism raised by the other informant.

Finally, he expressed frustrations with the process of trying to move the streetcar beyond the visitor-serving market. He noted that CATA and the MPO have studied extending the streetcar alignment into neighborhoods north and south of the current alignment, as well as to the airport. He believes the extensions would increase the ridership for the service. But he noted that efforts to pursue funding to permit these extensions to go forward have not been well handled. He pointed to CATA's two failed efforts to pass a local sales tax to support transit investments. He believed that CATA leadership had failed to articulate a vision for how the tax revenue would be used to supplement what they are able to do with their regular, locally-appropriated revenue sources. Nevertheless, he also recognized that CATA has its hands full in simply upgrading and maintaining a long neglected bus system. The most positive assessment of this informant was simply that the streetcar had been built.

Public Attitudes Toward the Streetcar

The key informants expressed generally favorable public attitudes about the streetcar, but their comments also noted that the streetcar has been the target of increased criticism about the low ridership and the cost of the system. These criticisms have resulted in much more promotional activity around the streetcar, and they led to a local development study to provide evidence of the streetcar's development effects, as noted earlier. Among the criticisms noted by the informants were the cost, low ridership, and slow speed of the streetcar. The marketing expert also noted the sense among some streetcar skeptics that the money spent on the streetcar might have been better used on some other transit service.

The transit planning informant spoke a great deal of efforts to counter the increased criticism that the streetcar is receiving from some quarters, particularly from "naysayers" who do not live or work near the streetcar. He noted that CATA has undertaken more public outreach and marketing as a result of these criticisms. For example, CATA has sponsored public activities around the streetcar, including events catered to schoolchildren, to help boost the streetcar's image. He also pointed to the economic development study that CATA commissioned that found $1 billion of economic development located within one-quarter mile [400 meters] of the streetcar alignment in the two downtowns. The informant believes that pointing to economic development has brought some developers and businesses on board as more supportive of the streetcar. He also observed that the economic development study has been used to help recruit new developers and businesses to the area. He thinks these efforts have been successful in "calming things down."

The regional planning informant observed that generally the community supports the streetcar; he noted that while the criticism about low ridership is certainly present, it is not organized or formalized. He noted that the "criticism (is) not too loud." He thought the fact that the streetcar "has its own identity" as an icon for the community helped to explain its "broader appeal." He referred to the streetcar as "symbolic" and as an "intangible" that "enhances the quality of life." His more detailed explanations for why this "broad appeal" was present related to the streetcar's role as a community icon and as a part of tourism and visitor promotion for the community.

Rider Markets and Ridership Trends

The key informant interviews emphasized the primarily tourist and visitor rider market for the streetcar service. The transit planning informant spoke in the greatest detail about these aspects of the streetcar in Little Rock.

The transit planning informant's comments focused first on the differences between streetcar and local bus riding markets. The informant noted that bus riders are primarily transit-dependent people. This informant noted that CATA permits free transfers from bus to streetcar (but not in the reverse direction due to fare differences: $1.35 for bus and $1.00 for streetcar), but that there is little transfer activity due to the different rider markets. He pointed to a bus service that focuses on utilitarian riders that emphasizes speed and reliability. By contrast, the transit planning informant noted that streetcar operators also serve as tour guides who point out key destinations as the streetcar passes them; this role slows the streetcar operating speeds. However, this is not a major concern for CATA due to the primarily visitor rider market being served by the streetcar.

The transit planning informant attributed the decline in streetcar ridership in recent years to a decline in visitors to Little Rock. He reported that ridership is down (as of 2014) from 2012 levels and is below 100,000 riders per year. Ridership in the usually busy May was down significantly due to much lower attendance at River Fest, a major local event. The inability of the streetcar to effectively serve local riders, due to its service location and operating characteristics, makes it especially sensitive to the health of the local visitor and convention markets, which have declined in Little Rock since the recession began.

Other Transit and Transportation Issues

The interviews also touched on transit-related issues affecting the streetcar, such as the selection of vehicle types, possible changes to the bus system that might have occurred as a result of streetcar implementation, and possible streetcar expansion plans. The interviews also touched briefly on parking policy in Little Rock and how it relates, if at all, to the streetcar. The transit planning informant was the key informant on these issues. The regional planning informant spoke briefly about the implementation of some streetscape improvements, funded partially by the MPO, around the River Market and the Arena just prior to the streetcar opening. The marketing expert noted that the slow streetcar speed and its role in downtown traffic congestion are among the service's challenges.

The transit planning informant noted that CATA operates replica vintage trolleys, as opposed to true vintage trolleys, and that the agency has had no serious problems with these vehicles. They feature heating and air conditioning. They are easily reparable, and if necessary, replaceable. The present vehicles are only about ten years old, and they have a regular maintenance cycle.

The transit planning informant noted that there were no changes to the local bus system when the streetcar first opened or when the Phase II segment was completed. The bus system had not been changed for decades until February 2013, when the transit share of some tax revenue allowed CATA to add two new routes and make smaller changes to a number of other routes. The informant noted that the bus service changes have been effective, with positive ridership results save for one route that was implemented largely for political reasons to serve a previously unserved location. The favorable condition of the bus system thus stands in some contrast to the current state of the streetcar system. In fact, the positive view of the bus systems now means that CATA receives "more compliments than complaints" from the riding public.

The transit planning informant also observed that, while there have been studies about possible streetcar expansion (as noted earlier), there is "no groundswell of support" to fund any expansions. The informant noted that the CATA and MPO are focusing their attention and resources on making bus service improvements, and no organizations are taking a lead role to advocate streetcar expansion in their absence.

Finally, the transit planning informant spoke briefly about parking policy issues. He noted that he would like to eliminate on-street parking in the streetcar right-of-way due to the interference of this parking with streetcar operations. He noted that there might be some potential support for such a strategy due to the recent adoption of "complete streets" policies in Little Rock, although he also conceded that many businesses oppose the removal of spaces because they fear that they might lose customers as a result. The informant is also trying to get parking fines raised as a means to discourage vehicle parking within the streetcar right-of-way. The informant noted that there is a new parking garage near the streetcar line, but he is unsure whether or not they use market prices for parking. In general, there was a sense that, although the informant understood how important parking policy was to streetcar operation and potential ridership, little had been done to use it in such a way.

Non-Transit Issues

The regional planning informant spoke about several non-transit issues of relevance to the streetcar in Little Rock. Most of the discussion touched on land use and development issues. The informant first characterized Little Rock as having a diversified local economy without a single dominant sector. The informant noted that this fact has allowed the region to weather economic circumstances reasonably well and to avoid booms and busts. The informant noted that in the early 2000s, around the time the streetcar came into operation, the regional economy was doing well. It subsequently slowed during the 2008 economic downturn but has continued to "plod along." This means that there are rarely significant positive or negative developments in the local real estate development market.

The regional planning informant noted that the streetcar does seem to have invigorated neighborhoods and served as a catalyst for development, anyway. Despite the lack of any local financial incentives for development in the areas served by the streetcar, the informant pointed to significant development activity. The informant observed that Little Rock and North Little Rock have reworked their land development regulations to encourage higher densities and mixed uses, particularly along the streetcar line, as part of a more coordinated land use-transportation strategy.

Downtown Rivalry

The key-informant interviews noted that a strong rivalry exists between the downtowns of Little Rock and North Little Rock. (The streetcar line connects the two downtowns.) Each of the informants spoke about this rivalry in their interviews.

The transit planning informant noted the economic basis for the rivalry between the two downtowns, which compete for tourists, events, and economic development. The informant noted that the two downtowns have mirror organizations (two chambers of commerce, two convention and visitors bureaus) to facilitate this competition. The competition often requires policymakers to strive for balance between them. For example, the informant noted that when the 20,000-seat Verizon Center was built in North Little Rock, the State Convention Center was then built in Little Rock. He noted that he frequently tries to schedule events evenly between the two cities.

The transit planning informant and the regional planning informant believed that the streetcar had helped to bring the two downtowns together by virtue of its role as a link between them. The transit planning informant noted cooperation between the downtowns on very large events, which are alternated between them, and on streetcar decisions. The regional planning and marketing informants echoed this sentiment in their interviews.

Takeaways from Key Informant Interviews

Toward the close of the interviews, the authors asked each informant for a set of final takeaways, or pieces of advice, based on the experience of Little Rock. The regional planning informant advised cities contemplating making a streetcar investment to "go for it," but to recognize that implementing it would be a long, complex process. This informant advised other communities to allow time for land use development to occur and ridership to materialize.

The transit planning informant advised other communities to be sensitive to rider markets because of important differences between services that focus on visitors and those oriented toward serving commuters. He observed that services should be tailored to the market being served. He also noted that outcome measures would likely be quite different, which might make comparisons between streetcar systems that serve one market versus the other more difficult to make.

The marketing expert advised other communities to think carefully about the purpose and goals they had in mind with respect to a streetcar. The informant also stressed that all transportation investments involve the expenditure of limited resources, and decisions should prioritize the best use of these resources. In this person's view, these issues should drive the decision making about investing, or not investing, in a streetcar or some other transit mode in any community.

CONCLUSIONS

Evaluated as a transit investment on the basis of ridership, service productivity, and cost effectiveness, the River Rail streetcar in Little Rock emerges as the poorest performer of the cases considered here. It has low and declining ridership. Its service productivity and cost effectiveness continue to deteriorate as a result of the ridership decline, which gives no indication of abating.

However, despite these challenges, the key informant interviews suggest that the River Rail streetcar continues to maintain significant public support because of its role as an amenity, or icon, of the community and its perceived roles in tourism promotion and downtown economic development. Indeed its potential ability to play these roles drove the decision to build the streetcar, where to build it, and how to operate it.

Most planners or policymakers gave little thought to any role the streetcar might play as a utilitarian transit service, so it is not surprising that the streetcar does not function as transit. It is hard to see how it could be easily adapted to play such a role, given its physical location, physical characteristics, and operating conditions. Communities planning to build a streetcar with a view toward using such a transit service to serve a primarily ridership function would thus not be advised to emulate Little Rock as a model.

APPENDIX B: PROFILE OF RIVER RAIL IN MEMPHIS, TENNESSEE

The second of the five case studies is the streetcar system in Memphis, Tennessee, which is referred to locally as The Trolley (Figure 42). The streetcar system in Memphis is the oldest of the five cases examined in this study (with the first line dating to 1993), and it is the second-most extensive system (the length of its alignment is second only to Portland). The Trolley's origins lay in local efforts to revitalize the Memphis downtown. Consisting of three different lines that connect with one another in the downtown area, the Trolley serves primarily a visitor and non-utilitarian trip-making ridership market. As of the 2012 study year, the service is the most cost effective among those examined in this study, but it has relatively low service productivity.

Figure 42. A Streetcar in Memphis[146]

BASIC CHARACTERISTICS OF THE STREETCAR SERVICE

Streetcar service in Memphis, Tennessee is branded the Trolley, and it consists of three lines: Main Street Line, Riverfront Line, and Madison Avenue Line. The three lines total 7 miles [11.27 kilometers], with 4.2 miles [6.76 kilometers] of mixed traffic operation and 2.8 [4.51 kilometers] miles of exclusive rights-of-way (Table 25). The Main Street and Madison Avenue Lines are each 2.5 miles [4.0 kilometers] long, while the Riverfront line is 2 miles [3.2 kilometers] long. The system includes a total of 25 stations or stops. The system cost more than $100 million to build. The Trolley system's public information map is shown in Figure 43.

Table 25. Physical Characteristics of Streetcar System in Memphis[147]

Characteristic		Value
Year Open		1993
Capital Cost (unadjusted dollars)		$104,000,000
Number of Lines		3 (Main Street, Riverfront, Madison Avenue)
Number of Vehicles		10
Number of Stations		25
Length		7 miles
Alignment Type	Exclusive	2.8 miles
	Mixed Traffic	4.2 miles

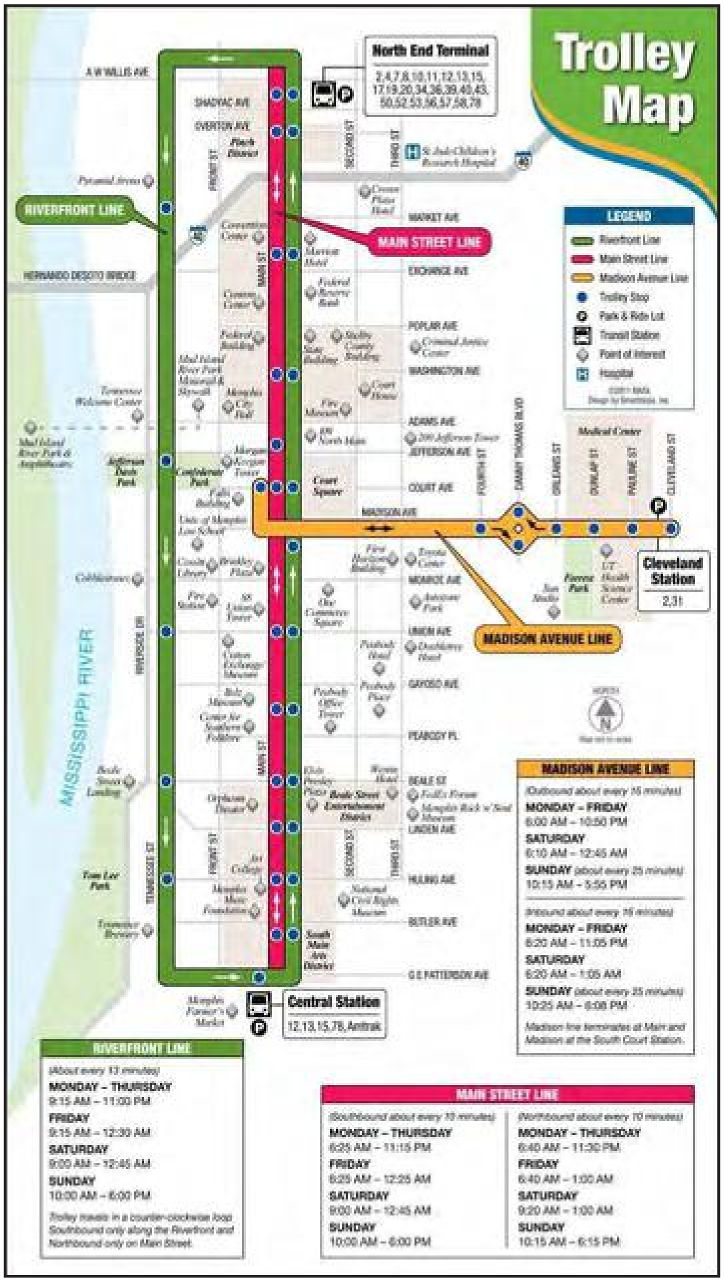

Figure 43. Map of Trolley Lines in Memphis, Tennessee[148]

Streetcar service in Memphis is operated by the Memphis Area Transit Authority (MATA), which also operates the local bus system. The MATA transit system is displayed in Figure 44. The Trolley is shown as a set of darker lines in the approximate center of the map, while local bus routes are shown in a lighter gray. The map shows that the local bus system has a very strong radial orientation, with many routes serving as links between outlying areas and the downtown. Some cross-town routes are included, but they are relatively few. The Trolley represents a very small piece of the transit network that serves a geographically small part of Memphis.

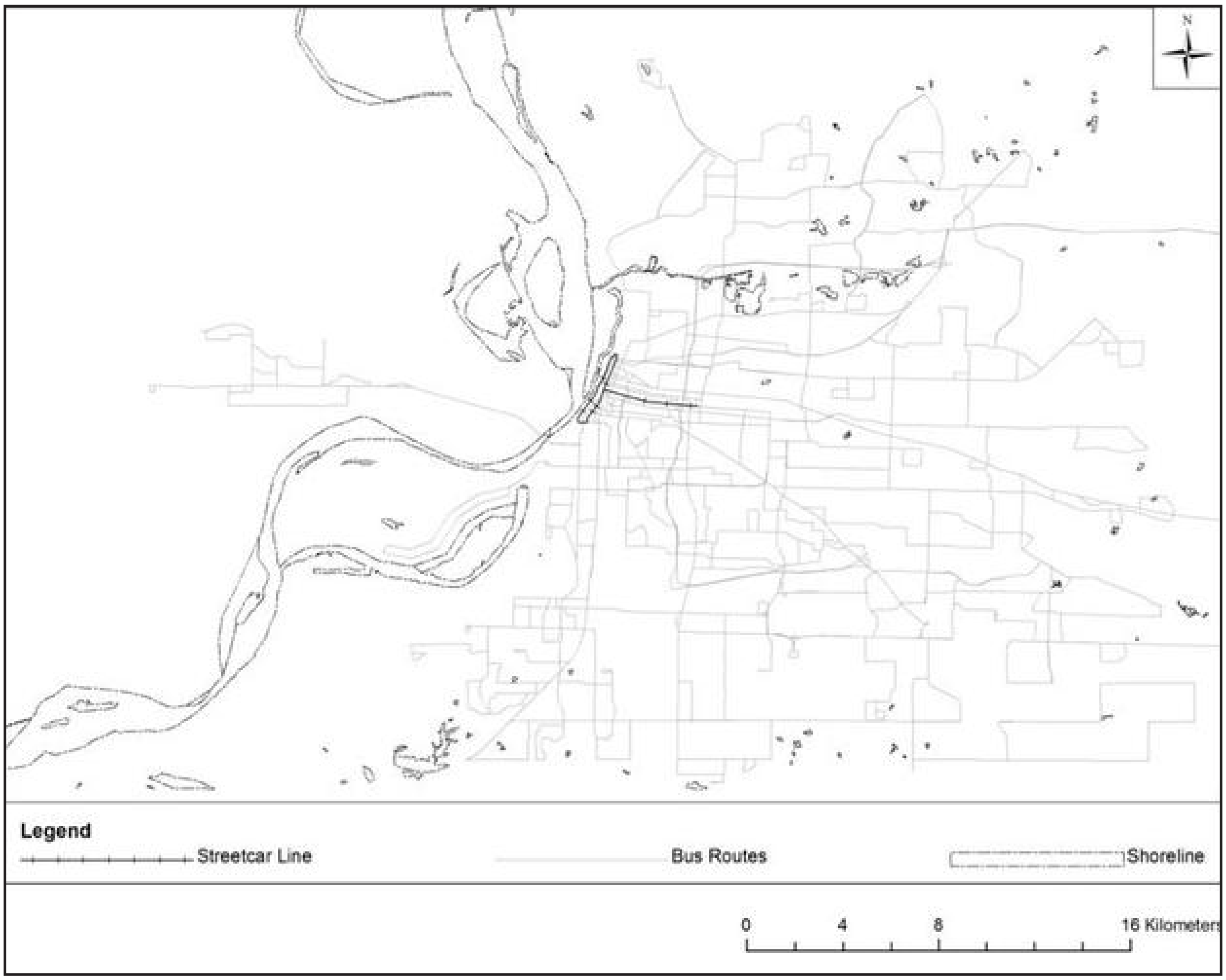

Figure 44. Map of Transit System in Memphis, Tennessee[149]

Figure 45 shows a larger-scale view of the Trolley lines, Trolley stops, and nearby bus routes. The map suggests that multiple bus routes connect with the Trolley stops, providing potential transfer opportunities between the two transit modes, while other bus routes parallel to the Trolley lines on nearby streets may take away potential riders, as their respective service areas overlap. An understanding of the potential complementarities versus competitiveness of Trolley and bus service in Memphis is one objective of the Memphis case study.

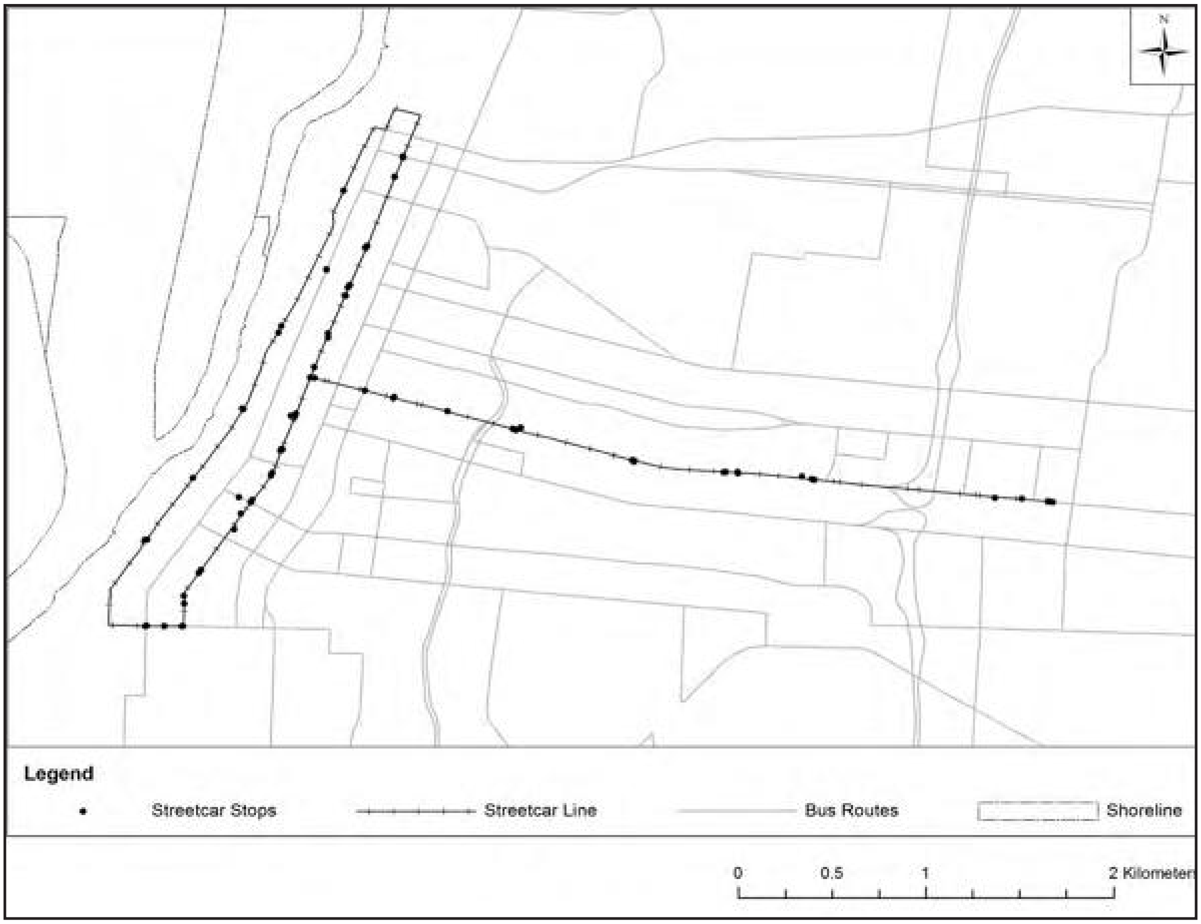

Figure 45. Large-Scale Map of the Trolley and Local Buses in the Core of Memphis, Tennessee[150]

Consultant John Smatlak observes that the original Trolley line was "conceived as part of a plan to resuscitate a failing pedestrian mall in a fading downtown; (since then) the trolley has grown into an effective transit circulator system… The 2.5 mile Madison Line … was intended as the starter line for a future light rail system."[151] The three lines serve a host of downtown Memphis landmarks. The transit agency website lists the following landmarks served by the Trolley lines. The Main Street Line serves the Main Street Mall, Pinch District, Cook Convention Center, Civic Center Plaza, Court Square, Peabody Place, Beale Street, National Civil Rights Museum, FedEx Forum, and the South Main Historic Arts District. In addition, the Riverfront Line serves the Tennessee Welcome Center, Pyramid Arena (presently inactive) and Mud Island, River Walk, and the Mississippi River Museum, plus public art at each trolley stop on the Madison Line.[152]

The Trolley provides relatively frequent service during much of the day on weekdays and on Saturdays, with limited hours on Sundays (Table 26). Fares are $1 per ride, with discounts for seniors and disabled people (Table 27). MATA also sells single-day, three-day, monthly, and six-month passes for use on the Trolley. Trolley day passes may also be used on buses. There are free transfers between the Trolley lines and buses. Trolley (streetcar) riders tend to use the different types of fare options in roughly the same proportions as transit system riders (primarily bus riders) as a whole, as Table 28 indicates.

Table 26. Service Characteristics of Streetcar System in Memphis[153]

Characteristic	Value
Headways	
Weekday Peak	10 min
Weekday Off-Peak	16 min
Weekend Average	13 min
Hours of Service	
Monday-Thursday	17 hr
Friday	18 hr
Saturday	15 hr
Sunday	8 hr

Table 27. Fare and Transfer Policy for Transit Services in Memphis[154]

Characteristic	Type	Cost ($)
Fare Type	Base Fare	$1.00
	*Reduced fare	$0.50
Pass Type	Day-Pass	$3.50
	3-Day Pass	$9.00
	*Reduced 3-Day Pass	$4.50
	Monthly Pass	$25.00
	*Reduced Monthly Pass	$12.50
	6-Month Pass	$75.00
	*Reduced 6-Month Pass	$37.50

Note: Reduced fare is available for students, seniors, and individuals with disabilities.

Table 28. Fare Media Utilization, MATA, Memphis[155]

Fare Category	MATA System %	Streetcar %
Adult (base fare)	69.5	67.6
Children (base fare)	3.2	0.3
Senior (base fare)	1.5	3.2
Pass/Discount Card	25.8	26.0
Missing	-	2.9
Total	100.0	100.0

Trolley riders do differ from riders of the transit system at large in terms of the kinds of trips they use the Trolley to serve, as the lower right panel of Table 29 indicates. While work and work-related trips account for 58 percent of all MATA rides, they account for only 9.2 percent of Trolley rides. Trolley rides are primarily taken to make hotel, shopping, entertainment, and errand-serving trips (combined total of 46.5 percent of rides). These survey results strongly indicate that the Trolley lines cater primarily to a non-utilitarian riding market that is very different from the more traditional transit market served by MATA buses. This difference has important transit planning implications in Memphis, and it also affects the relative performance of the Trolley compared to local buses.

Table 29. Customer Profiles, MATA, Memphis[156]

		MATA System %	Streetcar %
Gender	Male	49.7	not available
	Female	50.3	not available
	Total	**100.0**	
Race	White	8.2	not available
	Black	88.9	not available
	Hispanic	0.6	not available
	Asian	0.4	not available
	Other	1.9	not available
	Total	**100.0**	
Age	16 or under	0.9	not available
	16 - 18	7.8	not available
	19 - 24	19.5	not available
	24 - 34	19.0	not available
	35 - 49	35.6	not available
	50 - 64	15.6	not available
	over 65	1.7	not available
	Total	**100.1**	
Employment Status	Full Time	42.6	not available
	Part Time	18.4	not available
	Not Employed	20.5	not available
	Student	15.2	not available
	Retired	3.3	not available
	Total	**100.0**	
Income	Under $6,000	34.0	not available
	$6,000 to $18,000	31.8	not available
	$18,001 to $30,000	18.0	not available
	$30,001 to $42,000	11.2	not available
	$42,001 to $60,000	3.2	not available
	$60,001 to $90,000	1.3	not available
	$90,000 or more	0.5	not available
	Total	**100.0**	
Access Mode	Walked	81.0	not available
	Bicycle	0.8	not available
	Drove	2.0	not available
	Was dropped off	11.0	not available
	Rode with someone	1.0	not available
	Other	3.0	not available
	Missing	1.2	not available
	Total	**100.0**	
Trip Purpose	Work	52.7	7.8
	Work-related business	5.3	1.4
	School/ College	15.3	0.5
	Errands/ Restaurant	2.7	18.0
	Entertainment	0.8	5.9
	Medical/ Hospital	6.0	-
	Legal/Court	1.0	-
	Hotel/Motel	0.3	15.2
	Recreation/ Social	4.2	1.3
	Shopping	7.3	7.4
	Home	0.4	21.2
	Other	4.0	10.6
	Missing	-	10.7
	Total	**100.0**	**100.0**

The other panels of the table provide a demographic profile of MATA riders as a whole, portraying them as disproportionately black, lower-income, and working-age individuals who access transit primarily by walking. Although it is not specifically reported in the rider survey, one suspects that MATA riders disproportionately lack easy access to automobiles in their households. So, by and large, MATA transit riders tend to resemble transit-captive riders in many other communities. It is unclear the extent to which Trolley riders share these demographic characteristics, as these questions have not been asked specifically of these riders in the Trolley rider surveys. But given the different proportions of trip types served by the two transit modes, some differences are likely here as well.

LOCAL SOCIOECONOMIC CONTEXT FOR STREETCAR SERVICE

At the time of the 2010 Census, the city of Memphis, Tennessee had a population of just under 647,000 people within a metropolitan area whose population totaled about 1.3 million people.[157] The city's median household income was just under $37,000 per year, while more than one-quarter of the population lived below the poverty line. The city population was more than 63 percent black and less than 30 percent white at the time of the census; the Latino population counted for 6.5 percent of the city total.

Figures 46 and 47 display city-scale population and population density, both by census block group, at the time of the 2010 Census. The first map suggests the dispersed nature of population in the community, which becomes much clearer in the population density map, the second map, which displays people per square kilometer. Here, the core of Memphis emerges as a major center of population, along with a series of suburban or outlying population clusters. A box on both maps indicates the approximate areal extent of the Trolley lines. These city-scale maps suggest that much of the area served by the Trolley tends to have populations and population densities in the middle range of values seen in Memphis. They are neither the highest nor the lowest population centers in the community. This is not surprising given the downtown location of the Trolley lines. Figures 48 and 49 display population and population density at a larger map scale focusing on the Memphis core. The pattern of generally moderate populations and population densities suggested by the city-scale maps becomes much more evident on these maps. The highest population concentrations are located due east of the downtown core along the Madison Trolley line.

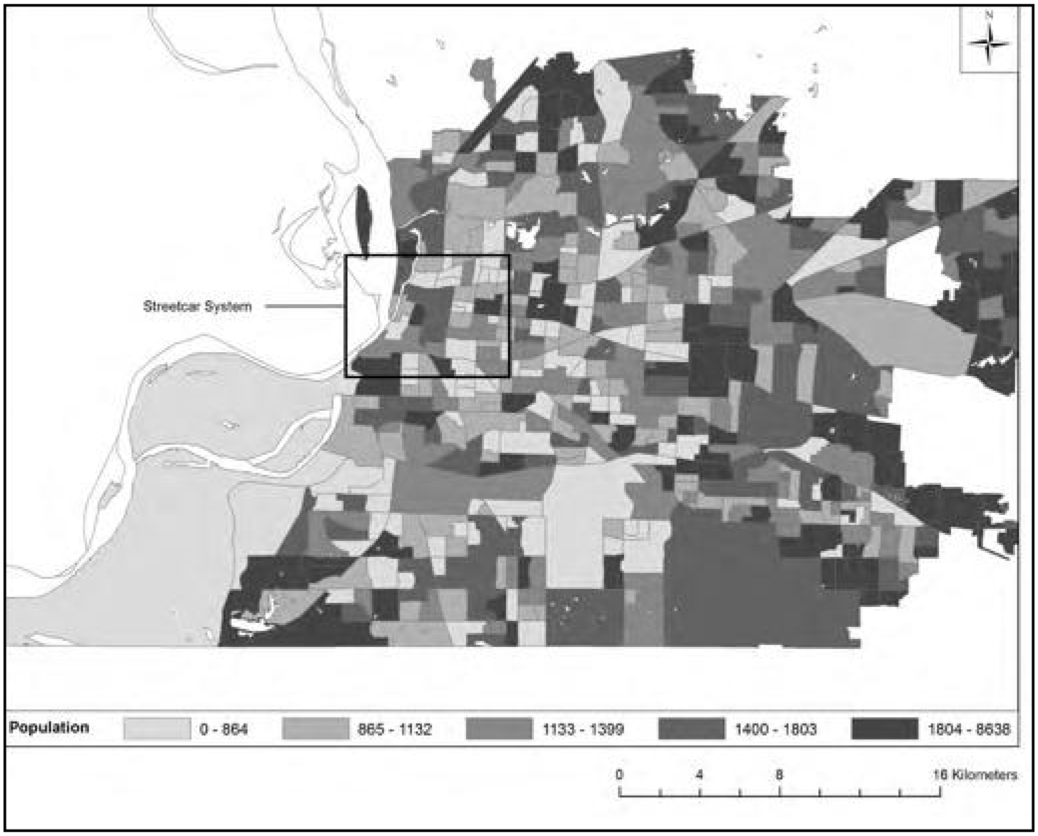

Figure 46. Population by Block Group in Memphis (2010)[158]

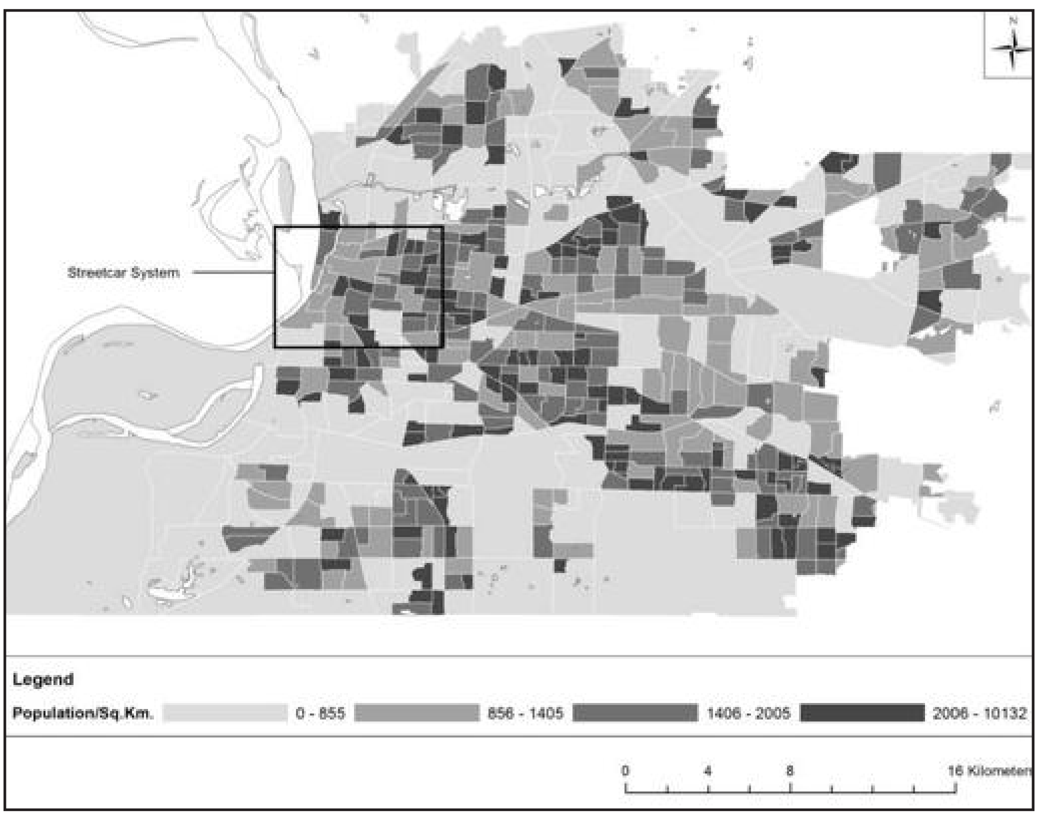

Figure 47. Population Density by Block Group in Memphis (2010)[159]

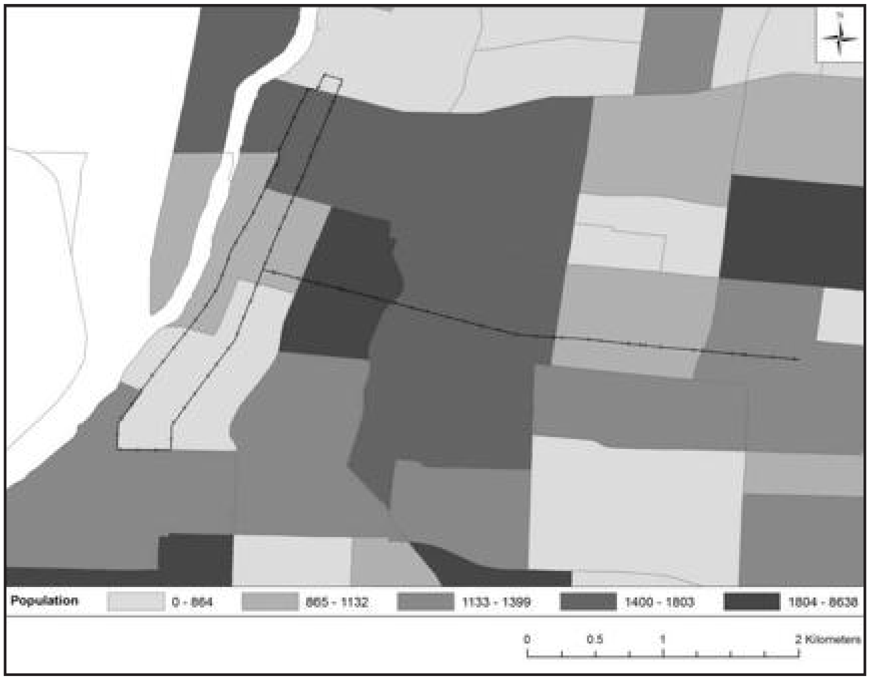

Figure 48. Population by Block Group in Core of Memphis (2010)[160]

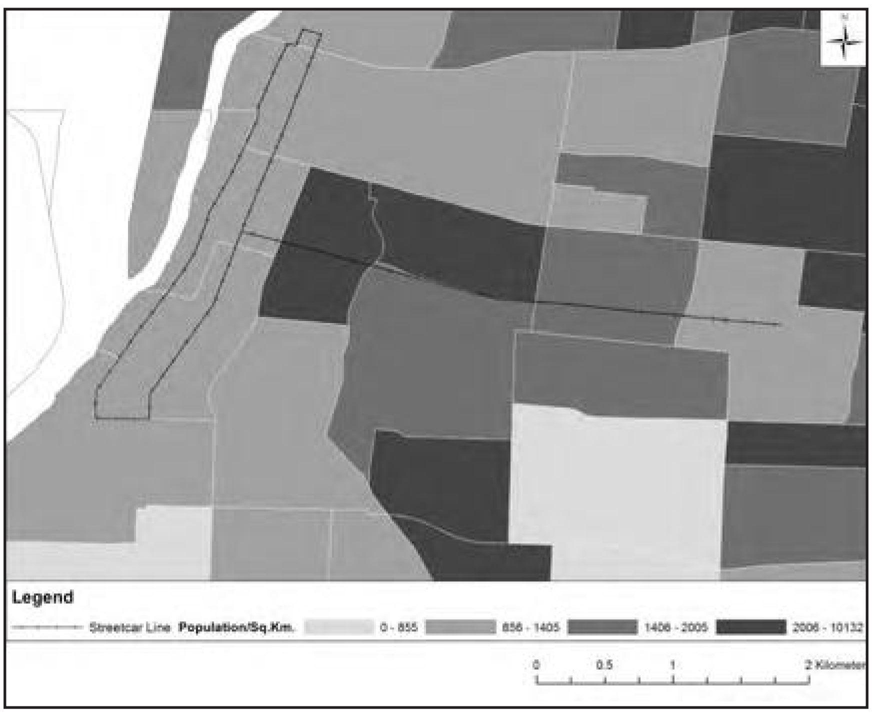

Figure 49. Population Density by Block Group in Core of Memphis (2010)[161]

While population in the Memphis area is decentralized, so is employment. Figure 50 displays city-scale employment by block group in 2010. The map does indicate sizable employment in the area served by the Trolley lines, denoted by the black box on the map, with the cluster of jobs along the riverfront clearly noticeable. However, there are also a number of major outlying employment centers in the community. The employment centers become much clearer in Figure 51, which displays employment densities as jobs per square kilometer. Here, the high employment areas in the downtown/riverfront and Madison Avenue corridors served by the Trolley lines appear as the end of a major employment corridor that stretches to the southeast. The Trolley lines extend through just a small piece of this extensive swath of employment. These patterns are also quite clear in the core area maps shown in Figures 52 and 53.

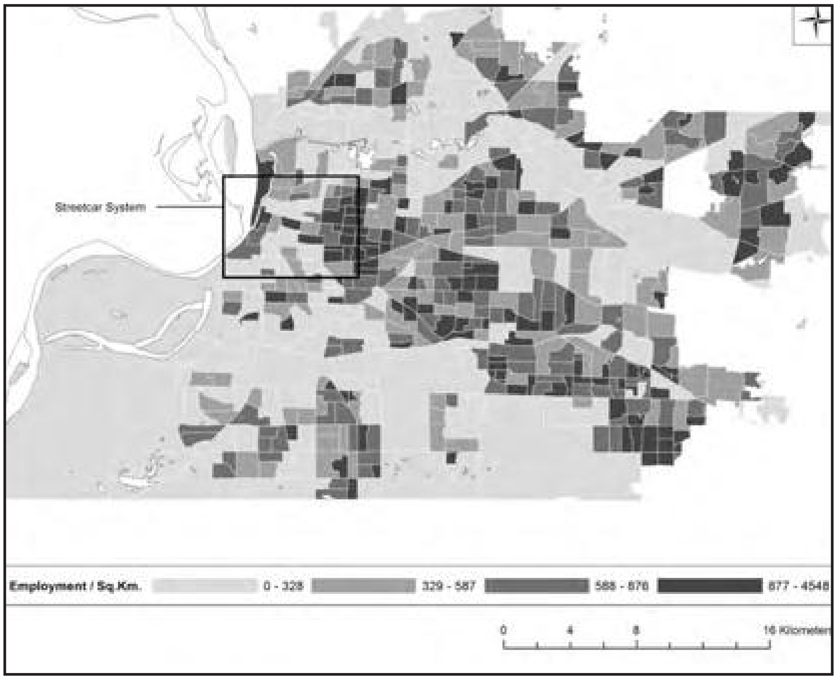

Figure 50. Employment by Block Group in Memphis (2010)[162]

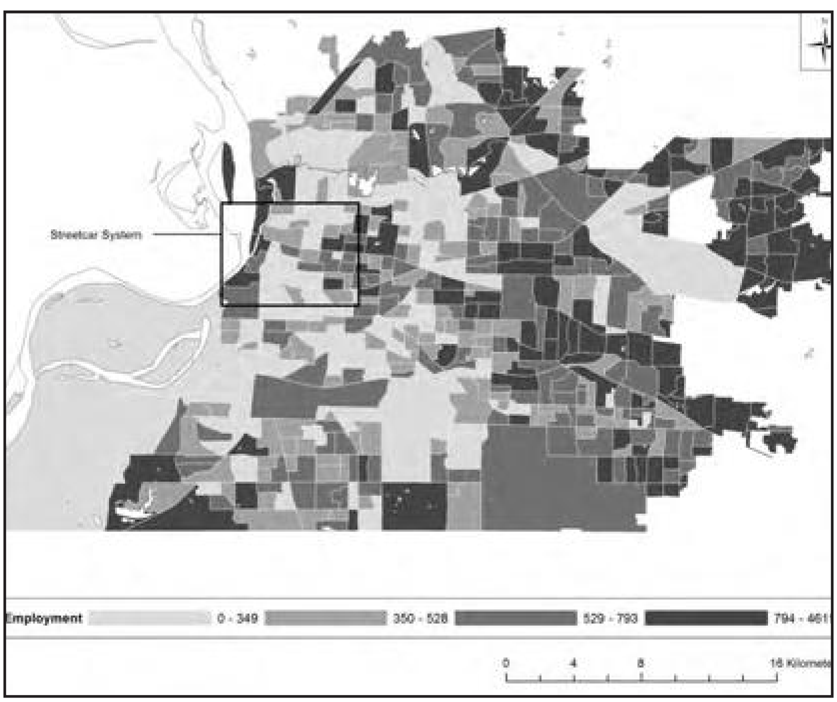

Figure 51. Employment Density by Block Group in Memphis (2010)[163]

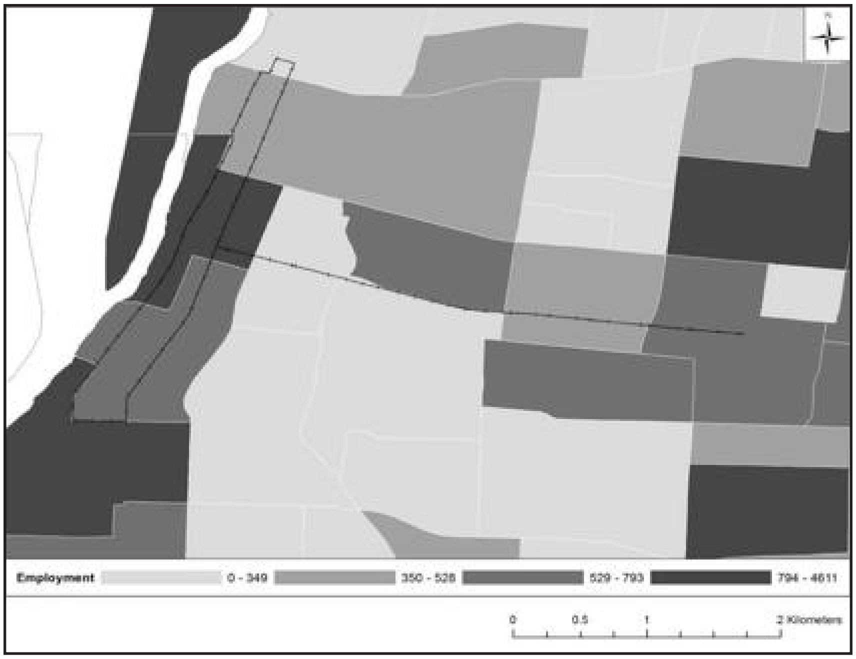

Figure 52. Employment by Block Group in Core of Memphis (2010)[164]

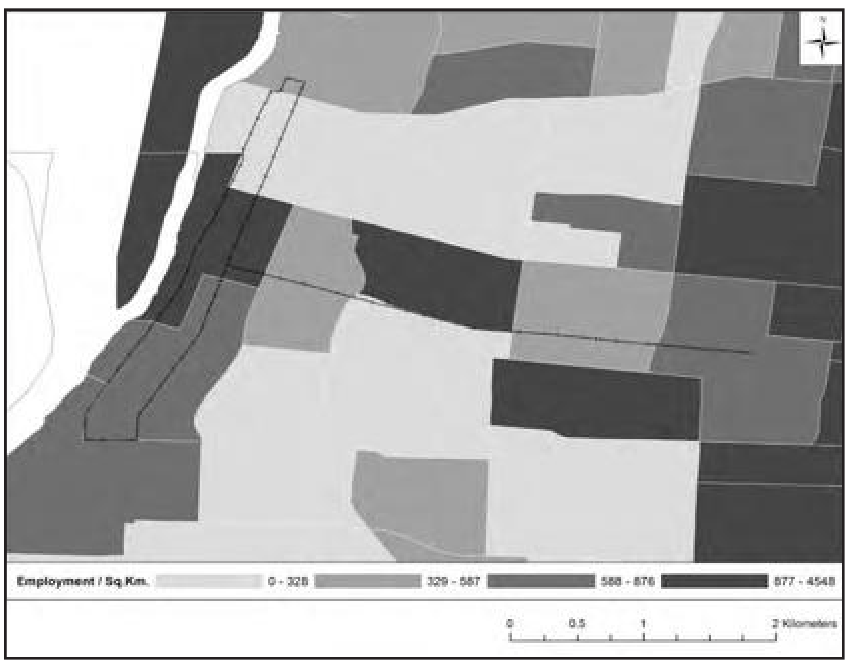

Figure 53. Employment Density by Block Group in Core of Memphis (2010)[165]

The combination of population and employment represents the set of possible trip origins and destinations in a community like Memphis. The authors decided to produce a series of maps that combine population and employment to identify areas that might be most likely to produce or attract large numbers of trips, and to determine whether the Trolley lines were located in such parts of the community that would seem to be the areas that might produce the most transit riders. Figure 54 maps the combination of population plus employment, by block group, at a city-scale, while Figure 55 is a density map for this same set of phenomena. Figures 56 and 57 map the same phenomena at a larger scale for the core of Memphis. The Trolley lines are located in areas with moderate to high levels of population plus employment, with the Madison Line operating within an area of high population plus employment densities. The Trolley thus operates in areas with moderate to high ridership generating potential.

Figure 54. Population plus Employment by Block Group in Memphis (2010)[166]

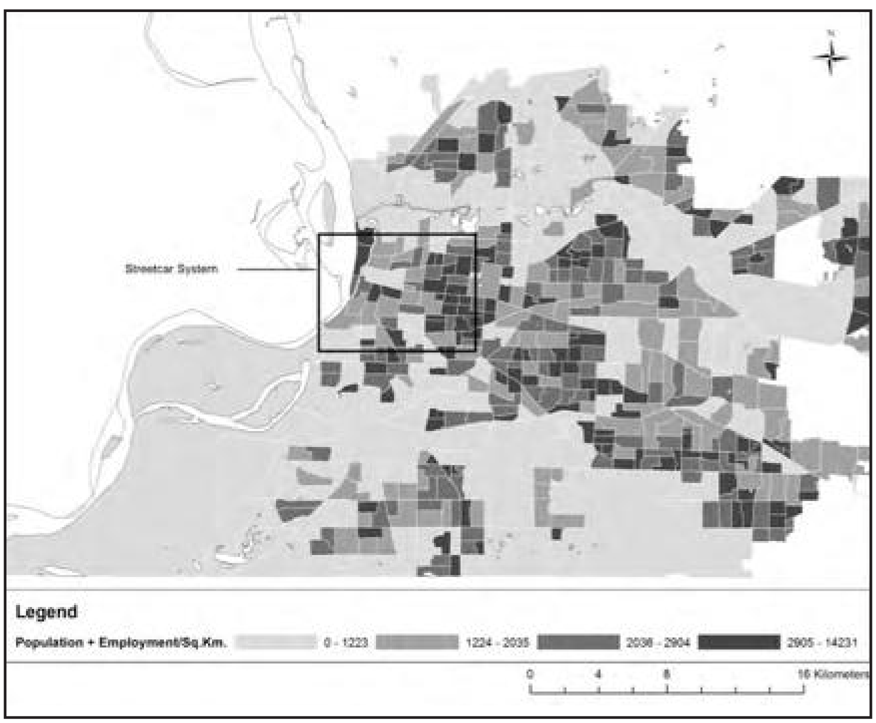

Figure 55. Density of Population plus Employment by Block Group in Memphis (2010)[167]

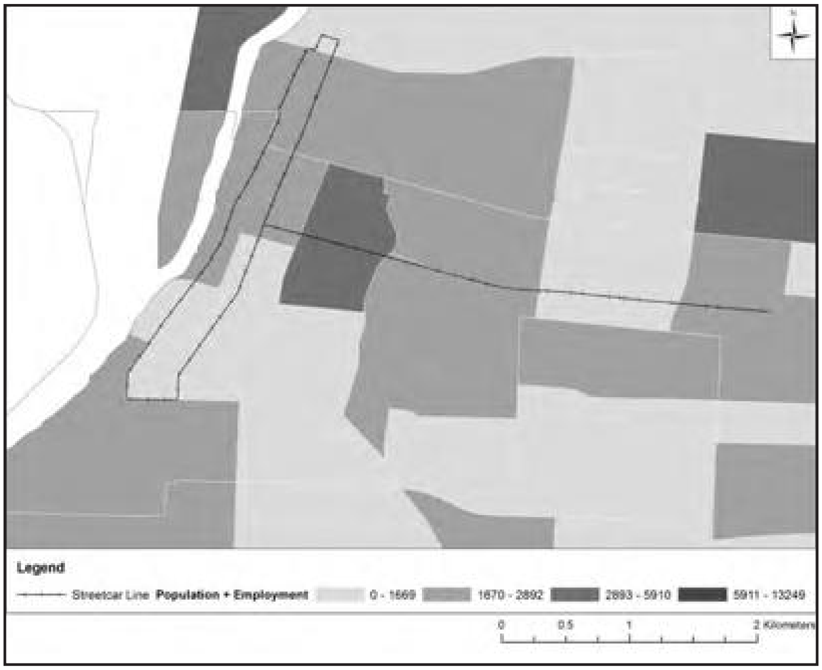

Figure 56. Population plus Employment by Block Group in Core of Memphis (2010)[168]

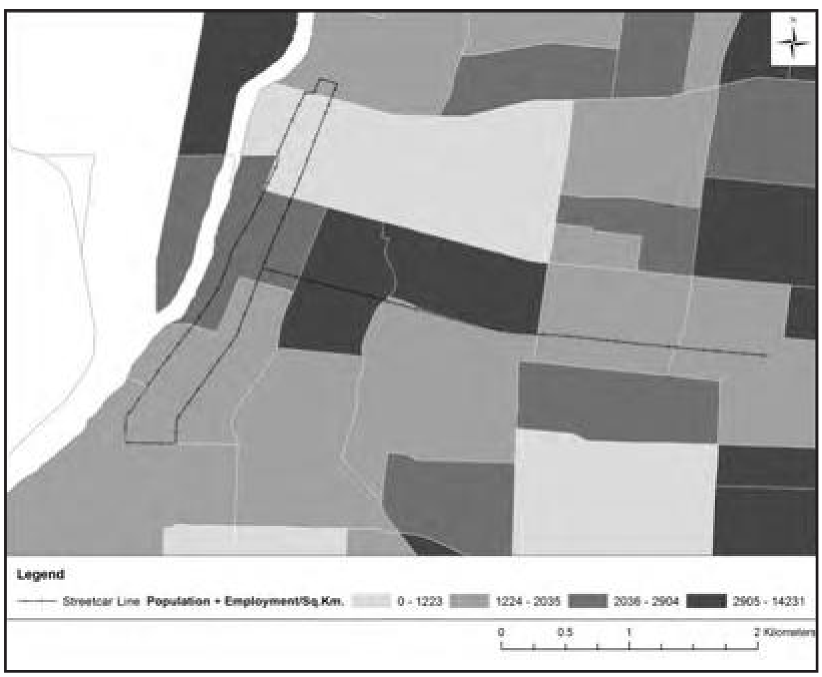

Figure 57. Density of Population plus Employment by Block Group in Core of Memphis (2010)[169]

As noted earlier, Memphis is an overwhelmingly minority community, with the black population accounting for more than three-fifths of the city total; by contrast the white population is less than 30 percent of the total city population. There are also small but growing Latino and Asian communities. Figures 58 and 59 map the distribution of the black population as a percent of block group totals on the city-scale and in the center of Memphis, respectively. The maps appear to depict a somewhat segregated city with very large concentrations of black population in block groups to the south, southwest, and immediate northeast of downtown. By contrast, the areas due east of downtown have relatively small shares (for Memphis, which is a heavily minority city) of black population. Figures 60 and 61 display the percentage of the white population by block group. The maps indicate higher percentages of white residents in the downtown area and the areas due east of downtown.

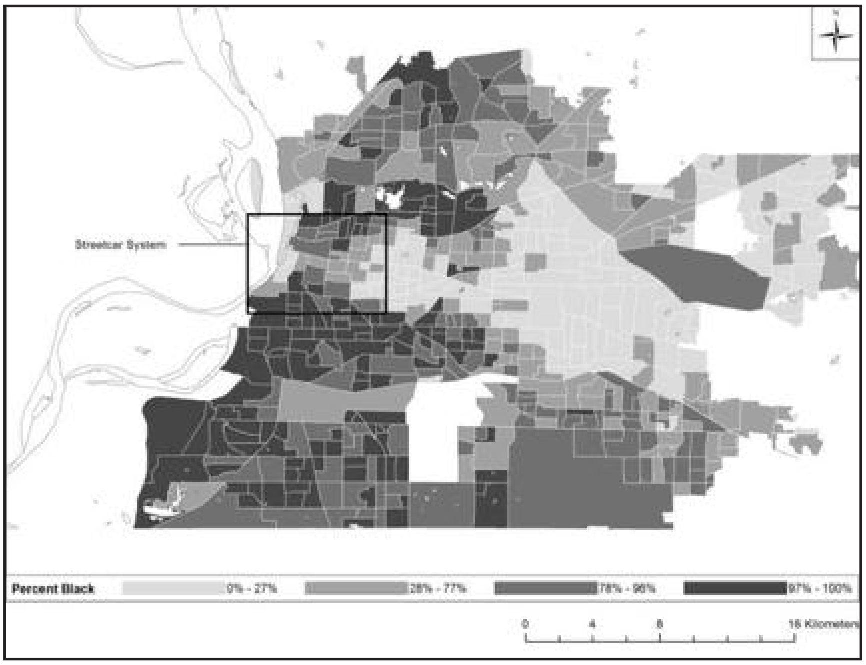

Figure 58. Black Population by Block Group in Memphis (2010)[170]

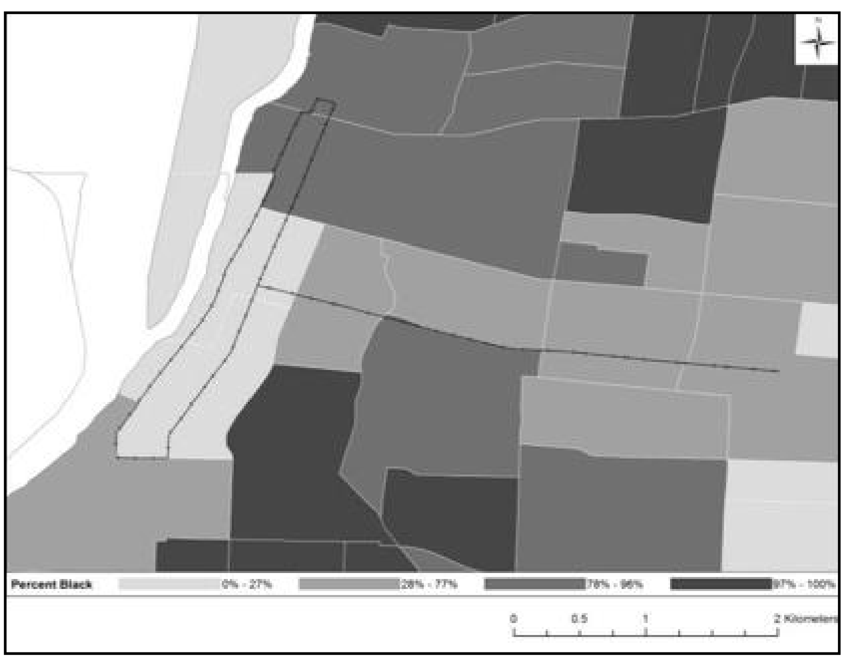

Figure 59. Black Population by Block Group in Core of Memphis (2010)[171]

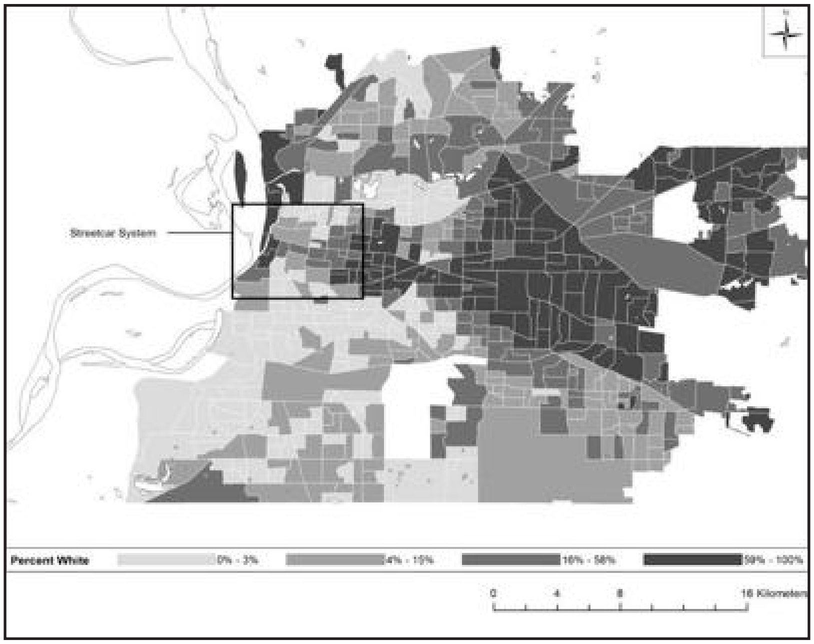

Figure 60. White Population by Block Group in Memphis (2010)[172]

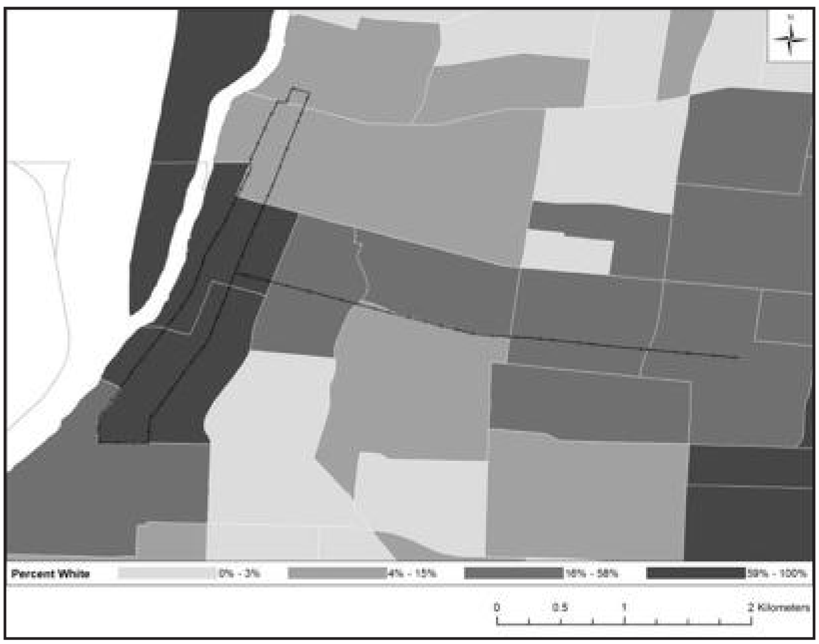

Figure 61. White Population by Block Group in Core of Memphis (2010)[173]

Memphis also has small but growing Latino and Asian populations. The distribution of the Latino population is shown in Figures 62 (city-scale) and 63 (core area). The share of the Latino population is relatively low in the area served by the Trolley, with somewhat higher percentages along the Madison Line than along either the Riverfront or Main Street Lines. The Latino population tends to be highest in the geographic middle of Memphis than on any of its outer ends. Figures 64 and 65 indicate that the share of the Asian population tends to be high along the Madison Line and due east of the line toward the eastern sections of the city.

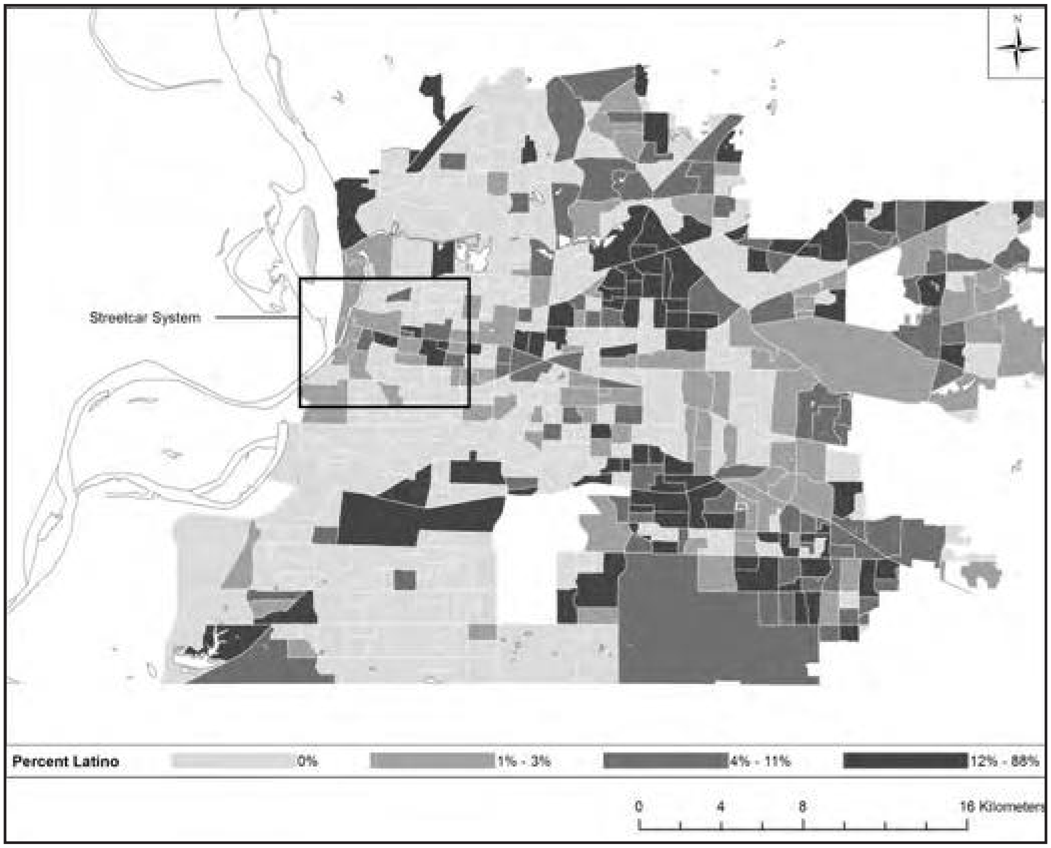

Figure 62. Latino Population by Block Group in Memphis (2010)[174]

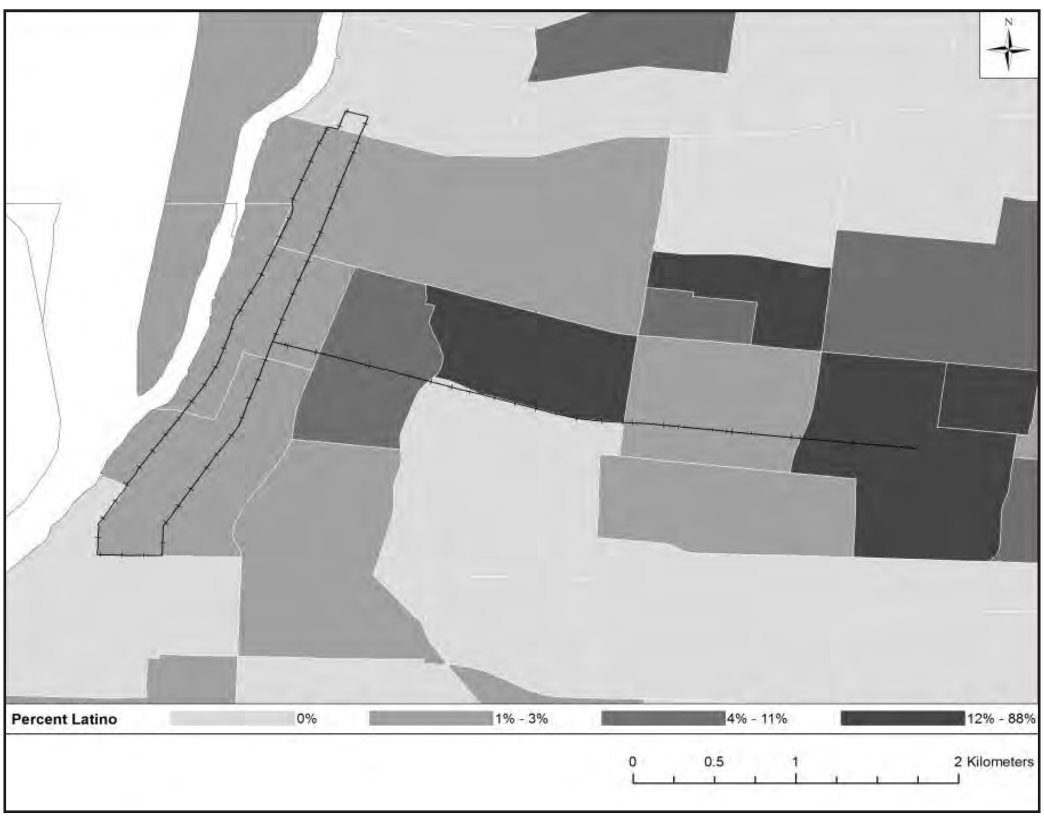

Figure 63. Latino Population by Block Group in Core of Memphis (2010)[175]

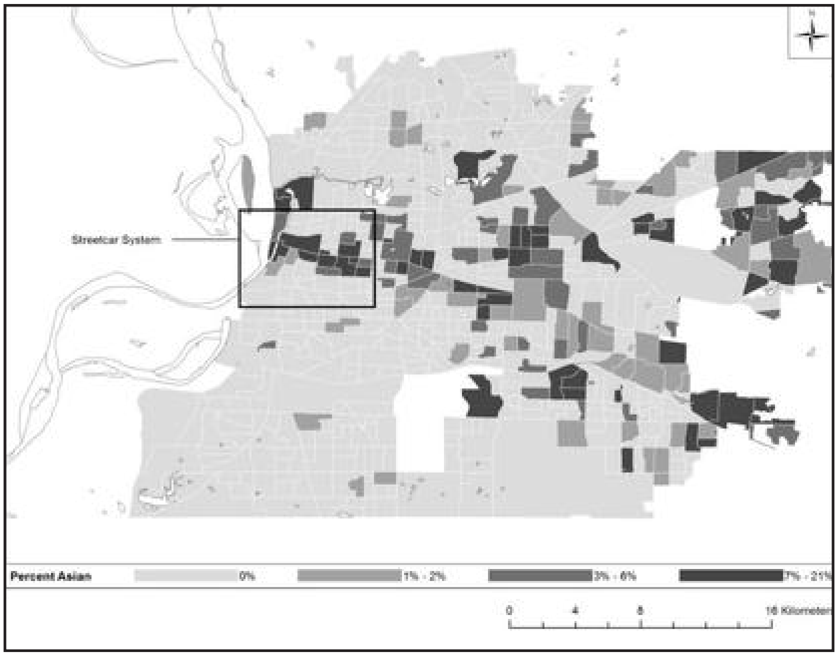

Figure 64. Asian Population by Block Group in Memphis (2010)[176]

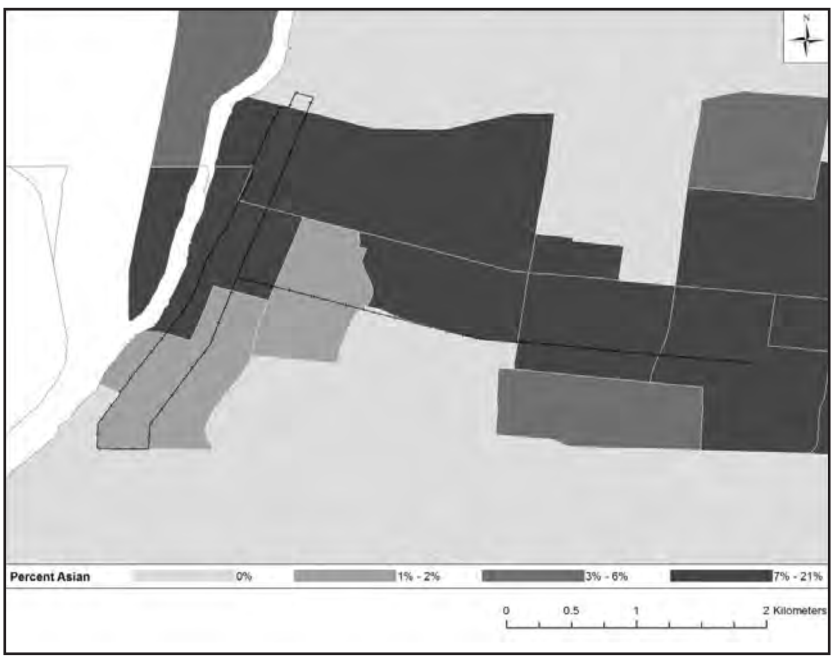

Figure 65. Asian Population by Block Group in Core of Memphis (2010)[177]

There tends to be a close connection between the spatial distributions of the different racial and ethnic groups and the spatial distributions of attributes related to income, vehicle access, and transit use. First, the authors consider the distribution of household incomes in Memphis to identify the wealthier and poorer sections of the city. Figure 66 depicts median household income by block group at a city-scale, while Figure 67 focuses on the same attribute within the downtown area served by the Trolley. Apparent in both maps is the close spatial correspondence between the household income patterns and the maps of black and white population shown earlier. Higher-income areas tend to be the locations with very high white population shares, while lower-income areas tend to be the locations with high shares of black residents. Focusing on the areas served by the Trolley lines, one sees that the Main Street corridor and riverfront district of downtown Memphis emerge as areas with high median household income that are surrounded by a lower household income ring. The Madison Avenue Line links the high-income areas in the downtown with the higher-income clusters to the east, while passing through areas with slightly lower income levels.

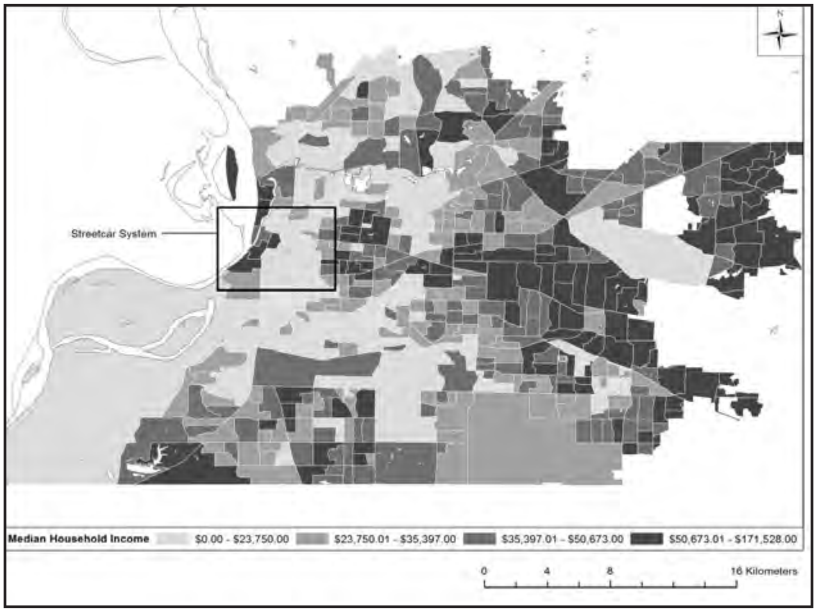

Figure 66. Median Household Income by Block Group in Memphis (2010)[178]

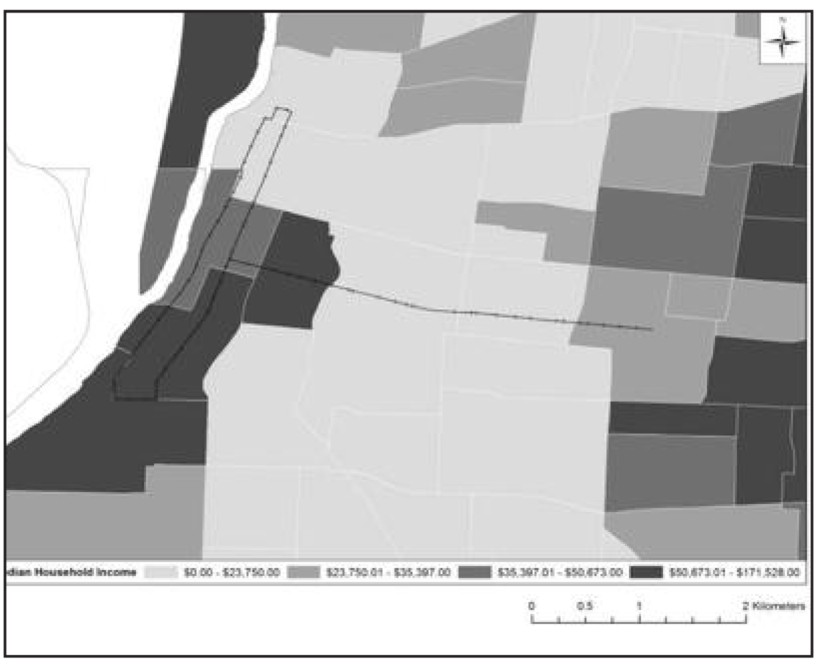

Figure 67. Median Household Income by Block Group in Core of Memphis (2010)[179]

There is a general consistency between the spatial pattern of household income and those of vehicle ownership and transit usage, with higher income areas tending to have high levels of vehicle ownership and low levels of transit use. The spatial pattern of household vehicle ownership, depicted as vehicles per housing unit, is shown at the city-scale in Figure 68 and for the core area of Memphis in Figure 69. In Memphis, as in most U.S. cities, vehicle ownership tends to be higher in the outer areas and lowest in the downtown and core areas. The Trolley lines operate in areas with very low levels of household vehicle ownership, a function primarily of their downtown location. Areas with low vehicle ownership tend to be those with the highest transit commute shares, although commute shares for transit tend to be very low in Memphis, as shown in Figures 70 and 71. The Trolleys themselves operate in an area where residents have low transit commute shares, except for the middle section of the Madison Line.

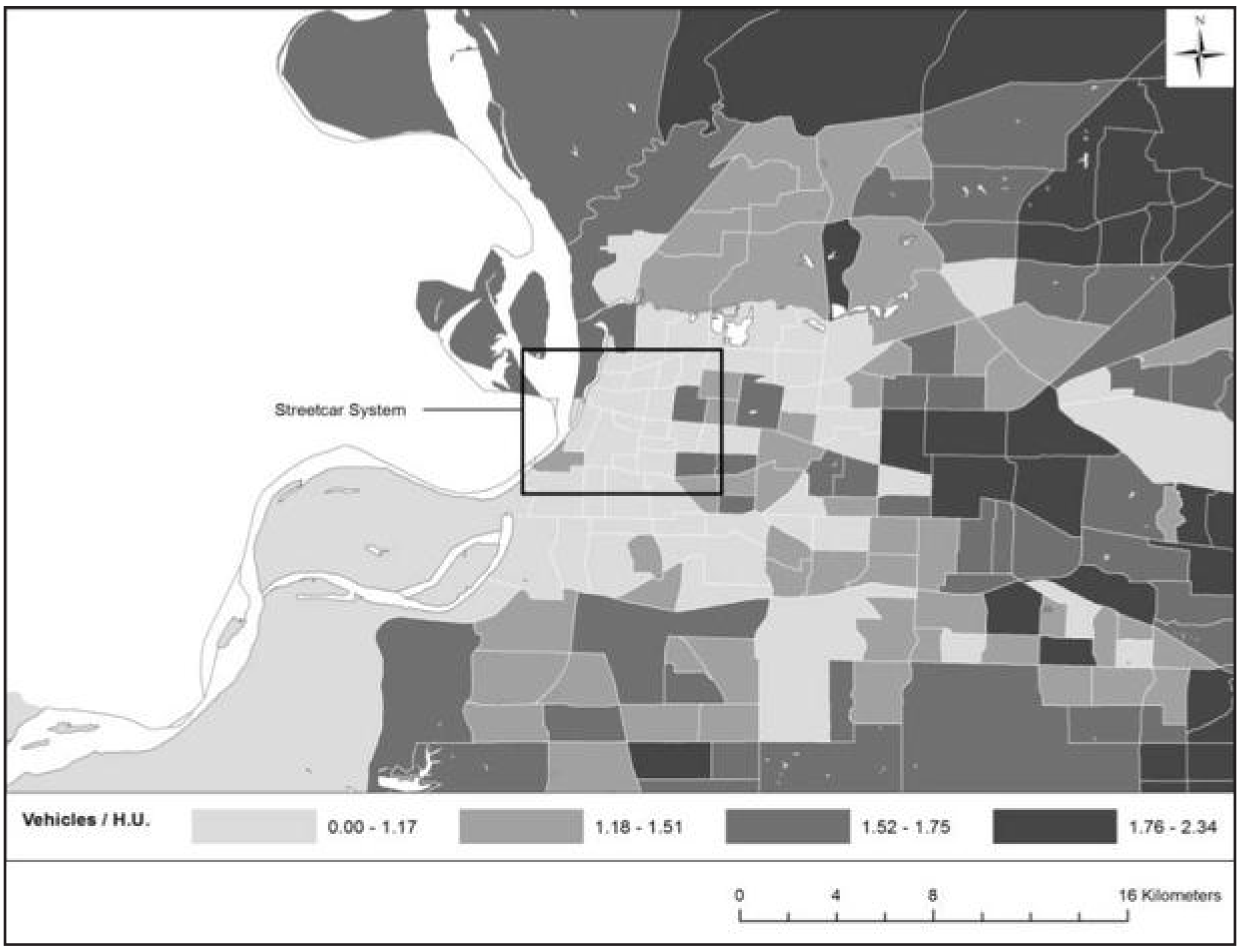

Figure 68. Vehicles per Housing Unit by Block Group in Memphis (2010)[180]

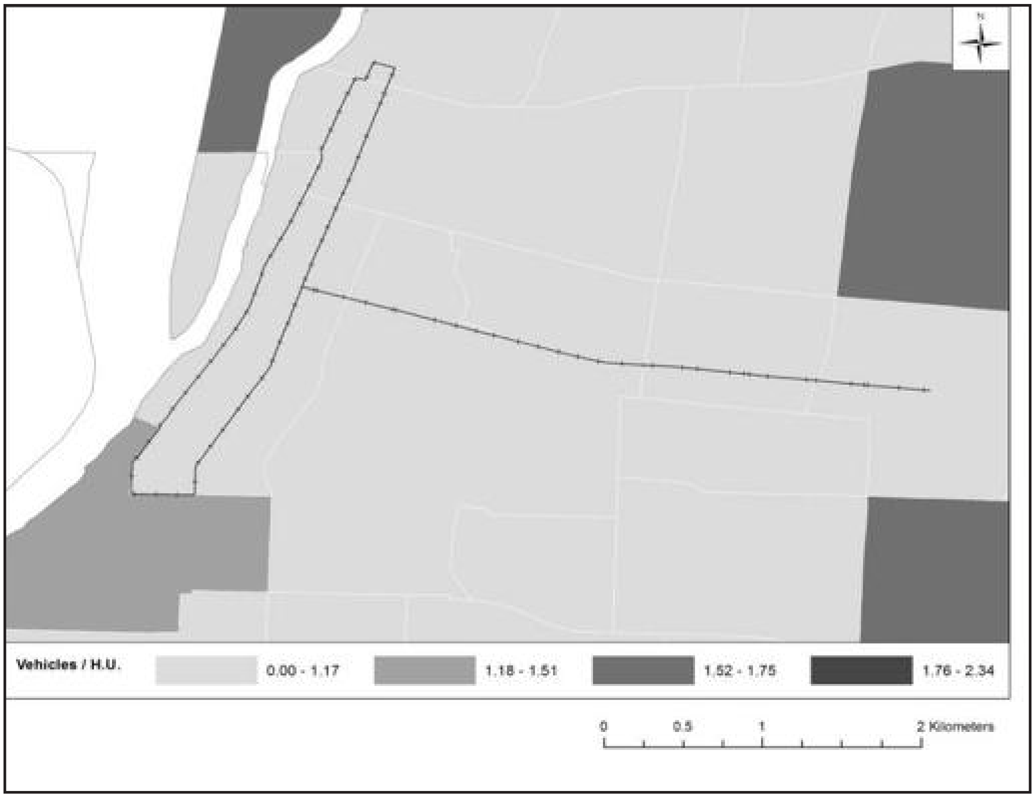

Figure 69. Vehicles per Housing Unit by Block Group in Core of Memphis (2010)[181]

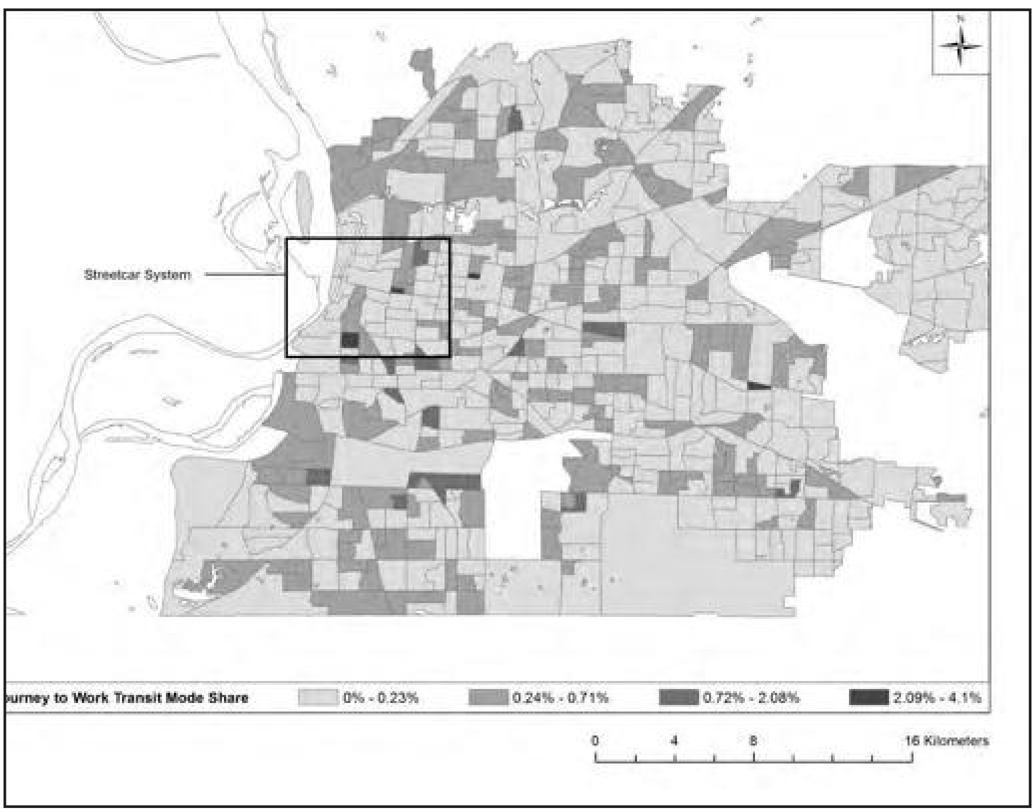

Figure 70. Transit Commute Share by Block Group in Memphis (2010)[182]

Figure 71. Transit Commute Share by Block Group in Core of Memphis (2010)[183]

To summarize, while transit commute shares are relatively low in the area served by the Trolley lines, the area served by the Trolley would seem to be a promising location based on the other socioeconomic factors just discussed. The area has sizeable concentrations of employment, moderate concentrations of population, and low levels of vehicle ownership, compared with Memphis as a whole.

LAND USE AND DEVELOPMENT CONTEXT FOR STREETCAR SERVICE

In addition to exploring the socioeconomic context in Memphis within which the Trolley is situated, the authors also obtained data from the local planning department to better understand land use patterns and the nature of the built environment within the area served by the Trolley lines, given the connections between the built environment and transit usage cited in the transit literature. The first map in this series depicts land uses in the area served by the three Trolley lines (Figure 72). The map indicates that local planners have designated this area as primarily commercial and/or mixed-use zones. This is not surprising, given the downtown location within which the lines are situated. The map also indicates that immediately beyond the downtown area, land uses tend to follow more typical segregated patterns. Average block sizes within the areas served by the Trolley lines are relatively small (3.26 acres [1.32 hectares]), which indicates a more traditional street pattern in the area.

Downtown Memphis tends to have fairly high land values (dollars per square meter), as shown in Figure 73. The area also tends to be heavily developed with structures, as shown in Figure 74. This last map provides an interesting, and ultimately counterintuitive, perspective on the relationship between the physical environment and route planning. The map shows building footprints and average weekday ridership by Trolley stop within the core area of Memphis. From the figure, one sees that the Main Street trolley line traverses an area characterized by intensive built development, and the stops located here register the highest stop level boarding counts. The Madison Avenue corridor is much less built out, and stops along that line register much lower boarding counts. The map also depicts the locations of special generators such as hospital complexes, retail clusters, and convention centers that might serve as important trip origins or destinations. At best, an inconsistent spatial pattern seems to exist between the location of these activity sites and ridership. The authors discuss ridership in much more detail later in the profile.

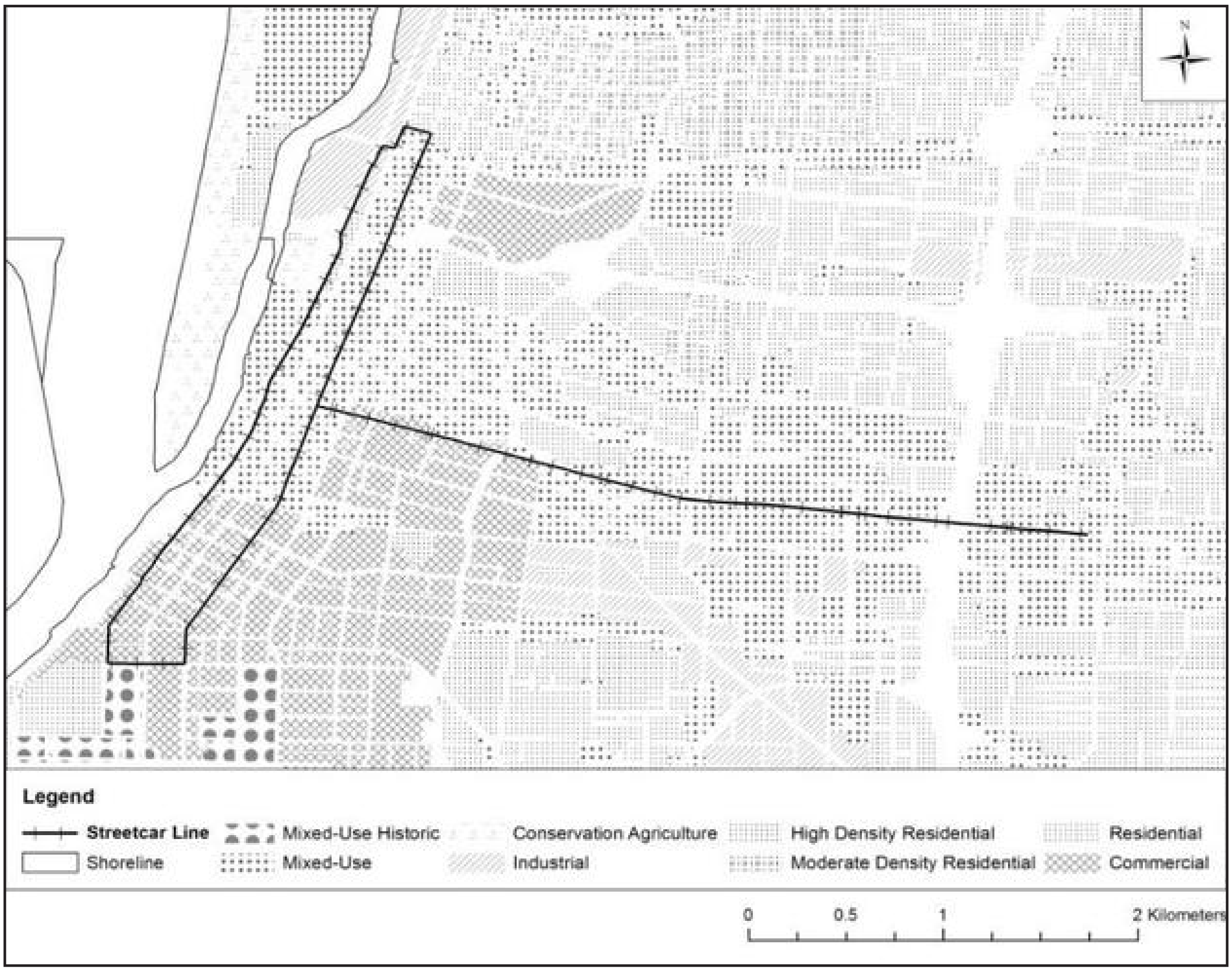

Figure 72. Land Use Map for Core of Memphis[184]

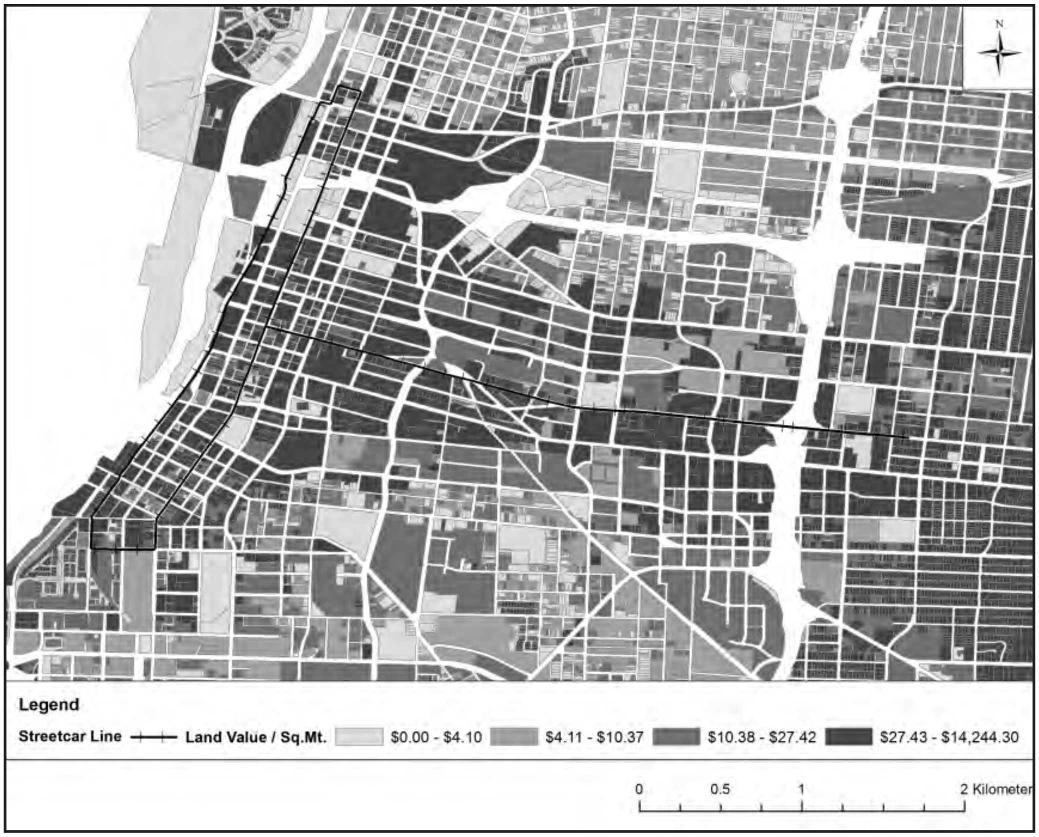

Figure 73. Land Values in Core of Memphis ($ per square meter)[185]

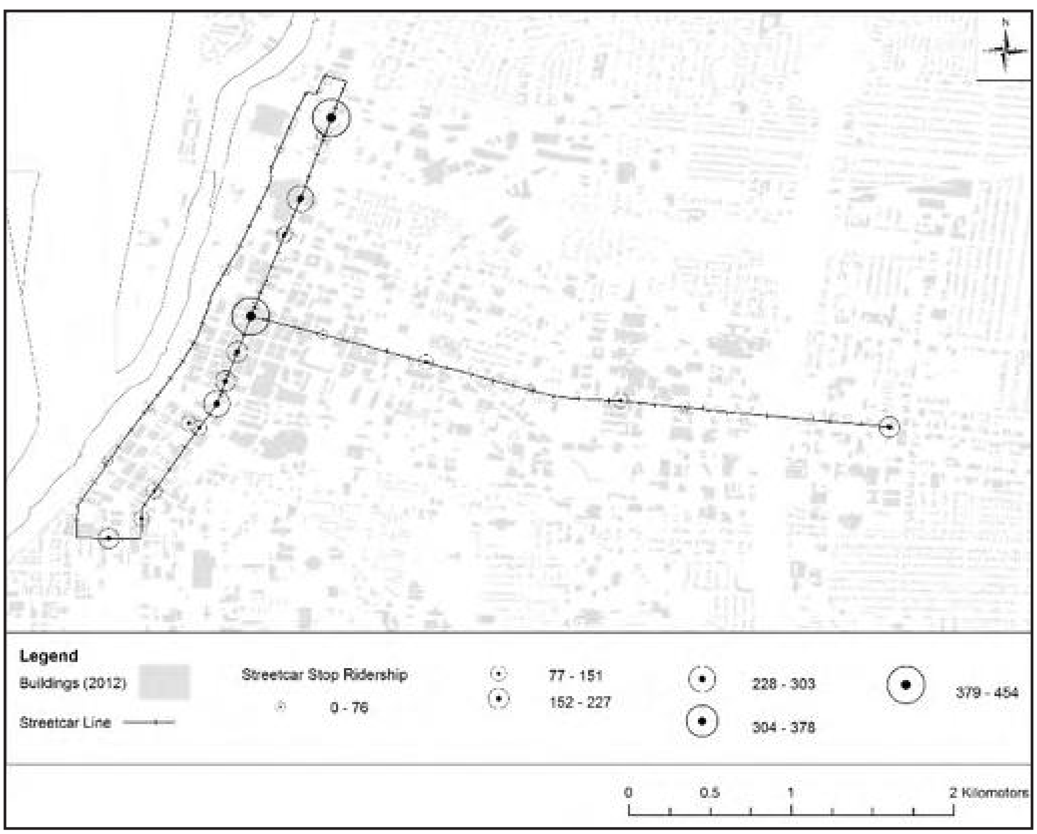

Figure 74. Built Structures and Ridership in Core of Memphis (2012)[186]

HISTORICAL BACKGROUND ON STREETCAR DEVELOPMENT

Streetcar service in Memphis dates originally to the 1880s, when the Citizens' Street Railroad Company (CSRC) ran a system that covered over 40 miles [64.37 kilometers] of track and was powered by more than 600 mules. During the late 1880s, the East End Railway Company (EERC) developed and operated a steam-powered system that ran on 11 miles [17.70 kilometers] of track. Memphis featured a number of streetcar companies at the time the electric streetcar was introduced, and the Memphis Street Railway Co. (MSRC) was created in 1895 to merge the many streetcar operators into one system. During its heyday, the MSRC operated more than 300 streetcars on approximately 78 miles [125.53 kilometers] of single and double track. At one of the main downtown intersections during rush hour, a streetcar would pass every 15 seconds.[187]

However, during the early 1900s, Memphis' streetcar system, like those in many other cities, began to be phased out as ridership declined with the mass adoption of the automobile. In 1931 the first trackless, electric trolley bus line was implemented, and by 1947 the entire streetcar system was converted to electric trolley bus. This new electric bus system operated for more than a decade before it, along with the last remnants of the old streetcar system, was finally replaced by a motorized bus system in April 1960.[188]

In 1970, Memphis tried to bring life back to its downtown area by launching a Main Street revitalization plan that included a pedestrian mall corridor called the Mid-America Mall.[189] The plan was considered a failure as a result of many issues: walking distances were too long, no transportation was provided along the mall, not enough parking was available near the mall, and decaying buildings, crime, and deteriorating pavement made the environment an unattractive one to visit.[190] By late 1980, the city officials decided that the mall area itself needed complete redevelopment. They soon turned to the reintroduction of the streetcar as a strategy for revitalizing the area. "Following a number of studies and public hearings, it was decided that a trolley [streetcar] line would enhance the mall by providing transportation for trips too far for walking."[191] However, not much happened over the years that immediately followed.

At the start of the 1990s, however, officials began to take action. In January 1990, the Memphis City Council approved a $33 million, 4.9-mile [7.89 kilometer] streetcar system plan, allowing the Memphis Area Transit Authority (MATA) to begin with the project design. MATA and the city hoped to have the streetcars ready for service by the opening of the Great American Pyramid, a downtown arena that was once home to the NBA's Memphis Grizzlies. Financing the streetcar project was to be split three ways, with $25 million from federal funding, $5 million from city/state funding, and $3 million in private sponsorship of the streetcars. In July 1990, the Urban Mass Transportation Administration (UMTA) released $7 million to start the project, and an appropriations bill was presented to Congress to approve an additional $12.4 million for the 1991 fiscal year. These funds were to be reprogrammed from Memphis' large Interstate 40 highway project.[192]

The state legislature required environmental evaluations and an assurance that the city would be able to match its proposed cost share before it passed its own bill. Just two weeks after the state bill was evaluated, and with assurance from Memphis mayor Dick

Hackett that the city would contribute its share and find investors for the ten streetcars, the state appropriations bill was passed to provide the state share of project funding.[193]

With federal and state funding in place, city officials and MATA began dealing with the many issues surrounding the streetcar system's physical development. One of the first matters to surface was the creation of a multi-modal regional transportation hub, which also would house the streetcar maintenance facility, in downtown Memphis' Central Station. The refurbishing of Central Station was Mayor Hackett's answer to the federal government's insistence on integrating different transportation services through the project, and it was also a convenient way to reduce the costs associated with building a separate streetcar facility/station.[194]

Another topic of serious discussion was how the city would pay for the expected annual operating costs of more than $1 million. City officials proposed ideas such as specialized downtown taxing districts, city government subsidies, and passenger fares as different options for raising the operating costs. The taxing district strategy ran into opposition quickly, as downtown business owners were still roiling over taxes paid for the original downtown mall revitalization plan. Until the operating cost problem was solved, however, the Memphis City Council would not vote to approve construction. Nevertheless, this did not stop local officials and planners from setting a starting construction date in early December 1990.[195]

Although many downtown businesspeople were worried about losing business during streetcar construction, the city was optimistic about the economic stimulus that could come from the downtown redevelopment due to the streetcar. A study at Memphis State University's Regional Economic Development Center claimed that "the trolley would be instrumental in helping the city create 1,817 jobs and would account for $110 million in annual tourism sales."[196] This same study also predicted that downtown Memphis would see $648 million in new construction as a result of the streetcar and associated redevelopment. This would bring in nearly $20 million in additional property taxes and $2.5 million in additional sales taxes. However, to satisfy the short-term transportation needs in the area, MATA planned to operate shuttles near Main Street to connect visitors of the Great American Pyramid to nearby parking and local businesses.[197] This response muted some of the business opposition to the plan.

In late September 1990, the first $4.3 million in federal funds came in to aid in the preliminary engineering and design of the streetcar. The rest was held back by the Urban Mass Transit Administration (UMTA).[198] One month later, Mayor Hackett presented the final design plans for a 2.5-mile [4.02 kilometer] Main Street streetcar line, along with its associated cost estimates, to a City Council transportation committee. The committee unanimously supported the design plans, and a final City Council vote to release funds for construction was slated to take place in December.

However, raising operating revenue still proved a challenge. The proposed strategy of expanded special taxing districts still encountered fierce opposition from the affected areas. The councilmembers found the tax unfair, and they planned to further discuss the operating cost funding problem before the December vote.[199] Despite these ongoing controversies over operating expenses, capital costs seemed to be secured. So on December 11, 1990, the Memphis City Council approved construction of the Memphis Trolley, with nine out of 11 “yes” votes. Construction was set to start the beginning of February 1991.[200]

With everything in place to begin construction on the trolley line, the first big barrier for the streetcar system arose. In late January, the president of the Memphis Development Foundation (MDF), the group responsible for fundraising for the trolley cars, revealed that only three out of the ten streetcars had sponsorships. Close observers believed that the poor economy had led many assumed sponsors to back out of their pledges. Mayor Hackett, who had earlier assured the City Council and UMTA that the project would attract enough sponsors, responded publicly, saying that he had solid backing for six streetcars. Subsequently, the City informed UMTA that the “funds will either be raised privately or [the City] would use local funds.” Without appropriate funding, the UMTA would not allow further construction to continue, and the city would have to pay back the federal funds it received to that point.[201]

As a result of ongoing negotiations among UMTA, the city, and MATA, in February 1991, MATA released nearly $300,000 of its reserve money to make a payment on ten antique streetcars in addition to the $400,000 the agency used as a deposit to hold the streetcars. Another final payment was due when the streetcars arrived, and money was still needed to renovate them. At this point, no money had been received from any of the sponsors. Mayor Hackett requested all sponsors to sign contracts that would bind them to their commitments. He also asked the Center City Development Corporation (CCDC) to replace the MDF and take over streetcar funding efforts.[202]

Another barrier was the difficulty of selecting an acceptable bid offer for the largest construction contract. Although most of the other bid agreements had been reached, MATA’s first round of bids for this contract disintegrated due to calculation errors and very low bid proposals. The process of receiving new bidders was expected to delay the construction about two months.[203]

Despite the lingering issues with the original streetcar plan, MATA began, in April 1991, preparing a plan to extend the system with another $36 million project.[204] MATA and Mayor Hackett had proposed this plan several times before. The plan included adding a loop to the trolley line, creating more parking spaces, and finally renovating Central Station. MATA and Mayor Hackett expected some opposition from the City Council.[205] As expected, in May, the City Council rejected the trolley loop plan. The loop addition was to be postponed for at least a year.[206] This did not stop the congressional delegation from working on the plan’s behalf. In September, the Senate Appropriations Committee authorized $7.15 million for the streetcar loop extension.[207]

While the future of the additional loop was in limbo, MATA finally secured its last contract for the Main Street streetcar construction project. In August, several months after the original bidding failed, MATA agreed to a $16 million contract with Flintco, Inc. Completion was scheduled for the fall of 1992.[208] Construction work started in September and was on schedule throughout the latter part of 1991.[209] At the turn of the year, however, construction slowed due to the deterioration of surrounding buildings. After the collapse of a nearby building, an inspection commenced to determine if the area was safe. The inspection caused some minor delays in construction.[210]

However, this problem was minor in comparison with the other two issues that had plagued the streetcar plan since inception – the need for private streetcar sponsorship and funding for operating expenses. Mayor Hackett was now out of office and had not even raised one-third of the money needed for the streetcars and their renovation. He had also failed to reach an agreement with the City Council on how to fund streetcar operating costs. City taxpayers would be responsible for these bills, as well as the costs to pay back $26 million in federal grants, if a solution was not soon found. In March, several business leaders collaborated to have a study completed on how the city could obtain sponsors for the streetcars. The same month, the City Council proposed spending $800,000 to avoid payback of federal grants and to start renovating the streetcars that would arrive in April.[211] Regrding operating costs, MATA announced in late October 1992 that it would charge a $1 fare for a 90-minute ridership window on the Trolley.[212]

As track and mall construction came to completion at the end of 1992, restoration efforts on the streetcars lagged behind. Though MATA predicted that it would have six fully functional streetcars ready for grand opening, it was expected that only three would be available for testing.[213] A month before opening service day, the first Memphis streetcar since 1947 ran down Main Street for a test run.

On April 29, 1993, MATA's Main Street Trolley Line officially began service.[214] During the same week, city officials and Mayor W.W. Herenton, who were hoping to capitalize on the momentum and excitement generated by the Main Street Line opening, developed new plans for Trolley line expansion to propose to the City Council. Among these plans was the Riverfront Line loop, which would run along the Mississippi River and eventually connect to the Main Street Line, and the Madison Avenue Line, which would connect Main Street to a local medical center.[215] In July 1993, the City Council, which had initially opposed the Trolley, approved $2.5 million for further studies on both lines and for startup construction on the Riverfront Line. The 2.5-mile [4.02 kilometer], $8 million project, which was mostly (80 percent) federally funded, was tentatively set to open in 1996.[216]

However, final City Council approval was not granted until more than two years later in July 1995.[217] Many observers, including some local officials, believed the line, much like the Main Street Line, would serve as a tourist attraction and would have a greater percentage of tourist ridership than local ridership.[218] Nearly a full year after the final approval, in May 1996, ground broke on the MATA Trolley Riverfront Line, and on October 2, 1997, it began service.[219] Following the completion of the new line, many supporters pointed to positive development effects in downtown Memphis. More people were moving into downtown Memphis, many buildings started to be renovated, and a plethora of businesses were attracted to the area. Streetcar supporters pointed to the return of the Trolleys as a key reason for these positive developments.[220]

A week after the opening of the Riverfront Line, Memphis received $1 million from Congress to continue development of the Madison Avenue Line.[221] Around this same time, however, Mayor Herenton, who had long supported streetcar development in Memphis, surprised everybody when he told a reporter "that the trolley system was one of the worst mistakes that we made downtown."[222] This negative attitude toward the Trolley system was made worse when reports came out that the Main Street Line was attracting less than 30 percent of projected ridership. However, optimists pointed out that the Riverfront Line opening had actually caused total monthly ridership to double, and in fact, ridership on the Trolley did increase significantly in the following years.[223]

This positive outlook became more important starting in 1999, when the city, with help from a Federal Transit Administrator, applied for federal funding that would take care of 80 percent of the $30 million cost for the Madison Avenue Trolley Line project. Among the benefits presented in the application were "improved mobility for the area's residents. A more livable community. A more healthy environment. And a stronger economy."[224] The city received full funding from the Federal Transit Administration (FTA) for the now $75 million project at the beginning of 2001.[225] The line was finished $20 million under budget, and service for the Madison Avenue Line began March 15, 2004.[226]

At a 2004 year-end meeting, MATA gave a presentation on the Trolley system and pointed to the large amount of development that had occurred since the completion of the three lines. Increased housing on Main Street, AutoZone Park (baseball stadium), Peabody Place, and FedEx Forum (home of the NBA's Memphis Grizzlies) were some of the specific larger developments mentioned.[227] In 2005, the Trolley system had its highest ever ridership levels of more than 1 million annual riders. City officials pointed to the increase in downtown development and activity, which was supposedly spurred by the Trolley development, as a reason for this increase in Trolley ridership.

More critical observers were still not convinced a streetcar system was a good investment, especially the Madison Avenue Line. One Council member suggested the line was built prematurely, as many of the Trolley cars were often empty. Regarding the entire system, a think tank leader from Oregon noted the high costs of the service and its inability to decrease congestion.[228] Despite its critics, the system experienced a significant ridership increase by 2012, when it carried more than 1.4 million riders. The increase in ridership in the years preceding 2012 was attributed to promotional efforts and to local residents becoming more familiar with and reliant on the Trolley system. Observers also pointed to positive ongoing development downtown and to downtown apartment occupancy rates that were up to 93 percent.[229]

STREETCAR RIDERSHIP AND PERFORMANCE

The authors sought to understand how the streetcar performs in Memphis as a transit investment. To that end, the authors obtained and compiled data on ridership, service, and operating expenses from the National Transit Database (NTD) and agency sources that were then used to develop basic performance indicators. The authors collected the same data for the bus system to understand the trends in its performance and whether the streetcar exhibited similar or different performance characteristics or trends than the buses. For Memphis, the authors obtained the basic data from the first Trolley line's opening in 1993 to 2012, which is the primary year of interest in the study.

The authors began the study by looking at mode and system-level ridership and performance. Table 30 reports ridership statistics on a modal basis for 1993-2012. Ridership is reported for streetcar, bus, and the transit system's fixed-route service total (streetcar plus bus) in terms of unlinked passenger trips (boardings) and passenger miles. The table clearly indicates that Memphis has experienced a long-term secular decline in bus ridership since the early 1990s. And increased streetcar ridership has not made up for this lost bus patronage. Streetcar ridership, on its own, has increased over time. Streetcar trips do seem to be lengthening if the dramatic increase in passenger miles from 2011 to 2012 can be taken as reliable. Looking at passenger miles as the key ridership measure, 2012 represented a peak year in streetcar use in Memphis.

Monthly ridership data (unlinked passenger trips) for 2012 are reported in Table 31 for streetcar, bus, and the total transit system. Streetcar ridership peaks between May and August, and it is at its lowest point from November to February, while bus ridership does not appear to follow a seasonal pattern. This difference highlights the seasonal nature of streetcar usage, and is perhaps a function of the roles of the Riverfront and Main Street Lines as downtown circulators that serve a large tourist and visitor rider market.

Table 30. Annual Ridership by Mode in Memphis (1993-2012)[230]

	Unlinked Passenger Trips			Passenger Miles		
Year	Streetcar	Bus	Total	Streetcar	Bus	Total
1993	166,658	12,652,539	12,819,197	--	56,771,043	56,771,043
1994	530,919	12,115,265	12,646,184	364,226	55,323,322	55,687,548
1995	512,223	13,879,445	14,391,668	392,404	60,241,948	60,634,352
1996	519,972	11,255,111	11,775,083	472,822	62,851,553	63,324,375
1997	555,597	11,561,397	12,116,994	595,190	62,021,794	62,616,984
1998	861,576	10,592,874	11,454,450	957,356	62,027,083	62,984,439
1999	976,835	10,395,874	11,353,268	1,041,919	60,888,906	61,930,825
2000	976,835	10,395,874	11,372,709	1,032,138	60,788,610	61,820,748
2001	912,058	10,668,459	11,580,517	1,613,116	62,926,898	64,540,014
2002	925,336	10,675,294	11,600,630	1,607,242	62,926,898	64,534,140
2003	778,442	10,692,573	11,471,015	1,562,396	61,166,849	62,729,245
2004	982,467	11,452,178	12,434,645	1,010,442	68,717,606	69,728,048
2005	1,018,139	10,882,883	11,901,022	891,968	61,333,620	62,225,588
2006	959,269	10,519,005	11,478,274	919,638	57,568,539	58,488,177
2007	1,031,168	10,542,407	11,483,575	873,928	60,788,190	61,662,118
2008	1,014,777	10,245,458	11,260,235	820,185	55,634,988	56,455,173
2009	1,113,809	10,358,212	11,472,021	940,028	56,019,024	56,959,052
2010	1,154,848	10,114,033	11,268,881	917,815	54,460,560	55,378,375
2011	1,086,125	9,287,206	10,373,331	718,468	49,985,948	20,704,416
2012	1,491,841	8,562,828	10,054,669	1,672,193	46,749,627	48,421,820

Note: Total is sum of bus and streetcar only.

Table 31. Monthly Unlinked Passenger Trips by Mode in Memphis (2012)[231]

	Unlinked Passenger Trips		
Month	**Streetcar**	**Bus**	**Total**
January	74,306	645,806	720,112
February	83,680	729,541	813,221
March	140,217	722,968	863,185
April	136,711	638,766	775,477
May	182,956	719,249	902,205
June	154,976	665,720	820,696
July	157,432	728,028	885,460
August	150,602	761,899	912,501
September	114,425	666,209	780,634
October	118,069	830,754	948,823
November	93,205	746,543	839,748
December	85,262	707,345	792,607

Service characteristics (vehicle revenue miles, vehicle revenue hours, and average speeds) are reported for streetcar, bus, and total transit (streetcar plus bus) in Table 32. The table reports long periods of relative stability in the amount of streetcar service since the lines reached full operational status in the late 1990s, with a peak in the mid-2000s, and a modest decline in service since that time. Bus revenue miles were generally between 6 million and 7 million over the entire time period, with a service decline between 2011 and 2012. The table also reports modal average speeds (vehicle revenue miles divided by vehicle revenue hours) with streetcar speeds tending to be slightly less than one-half those of the average local bus. The speed values are modal averages, and the difference between streetcar and bus is at least partially a function of the different operating environments of the average vehicle for each mode, with the streetcars operating in primarily downtown locations.

Table 32. Annual Service Characteristics by Mode in Memphis (1993-2012)[232]

	Vehicle Revenue Miles			Vehicle Revenue Hours			Average Speed (VRM/VRH)		
Year	**Streetcar**	**Bus**	**Total**	**Streetcar**	**Bus**	**Total**	**Streetcar**	**Bus**	**Total**
1993	97,175	6,064,340	6,161,515	17,947	427,787	445,734	5.41	14.81	13.82
1994	125,692	6,080,448	6,206,140	19,278	421,749	441,027	6.52	14.42	14.07
1995	130,720	5,686,499	5,817,219	20,187	417,249	437,436	6.48	23.63	13.30
1996	146,118	5,710,890	5,857,008	22,568	410,150	432,718	4.47	13.92	13.54
1997	267,789	6,051,932	6,319,721	33,406	430,399	463,805	8.02	14.06	13.63
1998	298,403	6,156,937	6,455,340	37,300	407,107	444,407	8.00	15.12	14.53
1999	313,067	6,359,816	6,672,883	39,020	414,893	453,913	8.02	15.33	14.70
2000	311,843	6,497,590	6,809,433	38,890	417,952	456,842	8.02	15.55	14.91
2001	308,104	6,607,076	6,915,180	38,410	421,897	460,307	8.02	15.66	15.02
2002	313,481	6,619,459	7,120,269	38,151	422,458	460,609	8.22	15.67	15.46
2003	318,858	6,160,600	6,479,458	46,727	381,418	428,145	6.82	16.15	15.13
2004	369,008	7,059,486	7,428,494	54,950	445,132	500,082	6.72	15.86	14.85
2005	394,837	7,003,649	7,398,486	49,804	424,388	474,192	7.93	16.50	15.60

Year	Vehicle Revenue Miles			Vehicle Revenue Hours			Average Speed (VRM/VRH)		
	Streetcar	Bus	Total	Streetcar	Bus	Total	Streetcar	Bus	Total
2006	450,852	6,432,546	6,883,398	60,380	415,478	475,858	7.47	15.48	14.47
2007	447,557	6,268,114	6,715,671	60,949	399,885	460,834	7.34	15.67	14.57
2008	374,280	6,208,772	6,583,052	57,742	425,944	483,686	6.48	14.58	13.61
2009	345,416	6,207,708	6,553,124	54,561	421,643	476,204	6.33	14.72	13.76
2010	374,280	6,000,512	6,374,492	57,742	410,069	467,811	6.48	14.63	13.63
2011	259,867	6,001,317	6,261,184	40,448	385,971	426,419	6.42	15.55	14.68
2012	332,469	5,688,257	6,020,726	43,211	385,971	429,182	7.69	14.74	14.03

Note: Total is sum of bus and streetcar only. Speed (miles per hour) is a modal average calculated from the vehicle revenue miles and vehicle revenue hours totals.

Operating expenses are reported in Table 33. Operating expenses (in inflation-adjusted 2012 dollars) for buses peaked in the early to mid-2000s before steadily declining over the years leading to 2012. Operating expenses for streetcars increased with the expansion of the system and have tended to echo the fluctuations in service levels over the years since then. A significant drop in streetcar operating expenses was reported between 2011 and 2012, although it is not clear whether this represents the start of a trend toward more cost effective service, as shown in Table 34. Cost effectiveness measures for buses deteriorated slightly between 1993 and 2012, while streetcar cost effectiveness measures demonstrated wide fluctuations from year to year. Streetcar service productivity exhibits a similarly varied trend, while bus service productivity has been less volatile and appears to be improving in recent years.

Table 33. Annual Operating Expense by Mode in Memphis (193-2012)[233]

Year	Streetcar		Bus		Total	
	Unadjusted $	2012 $	Unadjusted $	2012 $	Unadjusted $	2012 $
1993	$579,016	$920,014	$36,561,395	$28,093,400	$37,140,411	$59,013,414
1994	$1,746,219	$2,705,343	$33,480,538	$51,869,983	$35,226,757	$54,575,327
1995	$1,691,253	$2,547,977	$34,333,455	$51,725,468	$36,024,708	$24,273,445
1996	$1,670,624	$2,444,712	$32,405,807	$47,421,117	$34,076,431	$49,865,829
1997	$1,909,269	$2,731,266	$33,352,241	$47,711,368	$35,261,510	$40,442,634
1998	$2,858,027	$4,025,785	$36,539,189	$51,468,698	$39,397,216	$55,494,483
1999	$3,111,018	$4,287,453	$37,203,295	$51,271,768	$40,314,313	$55,559,221
2000	$3,217,232	$4,289,643	$38,879,564	$51,839,419	$42,096,796	$56,129,061
2001	$3,364,435	$4,361,797	$40,851,049	$52,961,044	$44,215,484	$57,322,841
2002	$3,479,137	$4,440,299	$46,821,941	$59,757,185	$50,301,078	$64,197,485
2003	$4,423,269	$5,519,470	$49,842,982	$62,195,373	$54,266,251	$67,714,844
2004	$4,373,385	$5,315,665	$47,934,808	$58,262,742	$52,308,193	$63,578,407
2005	$4,654,956	$5,472,493	$44,658,964	$52,502,295	$49,313,920	$57,974,788
2006	$4,230,666	$4,818,259	$43,369,569	$49,393,120	$47,600,235	$54,211,379
2007	$4,788,748	$5,303,891	$44,271,952	$49,034,444	$49,060,700	$54,338,334
2008	$4,253,541	$4,535,994	$42,901,365	$45,750,191	$47,154,906	$50,286,185
2009	$4,271,523	$4,571,434	$43,860,551	$46,940,073	$48,132,074	$51,511,507
2010	$4,340,918	$4,570,728	$44,811,672	$47,184,026	$49,152,590	$51,754,754

Year	Streetcar Unadjusted $	Streetcar 2012 $	Bus Unadjusted $	Bus 2012 $	Total Unadjusted $	Total 2012 $
2011	$4,796,905	$4,896,302	$43,410,309	$44,309,822	$49,106,727	$50,124,276
2012	$3,887,983	$3,887,983	$43,975,537	$43,975,537	$49,729,115	$49,729,115

Note: Total is sum of bus and streetcar only.

Table 34. Service Performance by Mode in Memphis (1993-2012)

	Cost Effectiveness (Operating Expense per Passenger Trip, 2012$)		Service Productivity Passenger Miles per Vehicle Mile	
Year	Streetcar	Bus	Streetcar	Bus
1993	$5.52	$4.59	--	9.36
1994	$5.10	$4.28	2.90	9.10
1995	$4.97	$3.73	3.00	10.59
1996	$4.70	$4.21	3.24	11.01
1997	$4.92	$4.13	2.22	10.25
1998	$4.67	$4.86	3.21	10.07
1999	$4.98	$4.89	3.33	9.57
2000	$4.39	$4.99	3.31	9.36
2001	$4.78	$4.96	5.24	9.52
2002	$4.80	$5.60	5.13	9.51
2003	$7.09	$5.82	4.90	9.93
2004	$5.41	$5.09	2.74	9.73
2005	$5.37	$4.82	2.26	8.76
2006	$5.02	$4.70	2.04	8.95
2007	$5.14	$4.69	1.95	9.70
2008	$4.47	$4.47	2.19	8.96
2009	$4.10	$4.53	2.72	9.02
2010	$3.96	$4.67	2.45	9.08
2011	$4.51	$4.77	2.76	8.33
2012	$2.61	$5.14	5.03	8.22

Note: Values calculated from Tables B-6, B-8, and B-9.

Annual mode-level streetcar performance is summarized in Table 35, while Table 36 summarizes the key dimensions of streetcar performance on a monthly basis for 2012. According to the summary table, 2012 represented a year of higher ridership, more service, and stronger performance for the Trolleys in Memphis.

Table 35. Summary of Streetcar Ridership, Service, and Performance by Year in Memphis (1993-2012)[234]

Year	Unlinked Passenger Trips	Passenger Miles	Vehicle Revenue Miles	Vehicle Revenue Hours
1993	166,658	--	97,175	17,947
1994	530,919	364,226	125,692	19,278
1995	512,223	392,404	130,720	20,187
1996	519,972	472,822	146,118	22,568
1997	555,597	595,190	267,789	33,406
1998	861,576	957,356	298,403	37,300
1999	861,650	1,041,919	313,067	39,020
2000	976,835	1,032,138	311,843	38,890
2001	912,058	1,613,116	308,104	38,410
2002	925,336	1,607,242	500,810	38,151
2003	778,442	1,562,396	318,858	46,727
2004	982,467	1,010,442	369,008	54,950
2005	1,018,139	891,968	394,837	49,804
2006	959,269	919,638	450,852	60,380
2007	1,031,168	873,928	447,557	60,949
2008	1,014,777	820,185	374,280	57,742
2009	1,113,809	940,028	345,416	54,561
2010	1,154,848	917,815	374,280	57,742
2011	1,086,125	718,468	259,867	40,448
2012	1,491,841	1,672,193	332,469	43,211
Year	**Productivity (PM/VM)**	**Cost Effectiveness (2012$)**	**Speed (VRM/VRH)**	**Average Trip Length (PM/UPT)**
1993	--	$5.52	5.41	--
1994	2.90	$5.10	6.52	0.85
1995	3.00	$4.97	6.48	0.77
1996	3.24	$4.70	6.47	0.72
1997	2.22	$4.92	8.02	0.68
1998	3.21	$4.67	8.00	0.70
1999	3.33	$4.98	8.02	0.75
2000	3.31	$4.39	8.02	0.83
2001	5.24	$4.78	8.02	0.74
2002	3.21	$4.80	13.13	0.75
2003	4.90	$7.09	6.82	0.73
2004	2.74	$5.41	6.72	1.03
2005	2.26	$5.37	7.93	0.88
2006	2.04	$5.02	7.47	0.96
2007	1.95	$5.14	7.34	0.85
2008	2.19	$4.47	6.48	0.81
2009	2.72	$4.10	6.33	0.84
2010	2.45	$3.96	6.48	0.79
2011	2.76	$4.51	6.42	0.66
2012	5.03	$2.61	7.69	1.12

Table 36. Summary of Streetcar Ridership and Service by Month in Memphis (2012)[235]

Month	Unlinked Passenger Trips	Vehicle Revenue Miles	Vehicle Revenue Hours
January	74,306	28,183	3,593
February	83,680	26,992	3,505
March	140,217	29,691	3,829
April	136,711	27,495	3,553
May	182,956	29,389	4,081
June	154,976	26,221	3,575
July	157,432	26,326	3,575
August	150,602	27,223	3,705
September	114,425	25,019	3,400
October	118,069	26,998	3,692
November	93,205	25,579	3,480
December	85,262	25,395	3,452

Table 37 presents streetcar stop-level average weekday boardings and alightings by stop, segregated for each of the three lines. There is noticeable variability in ridership among the stops within each line and in total ridership carried by each of the three lines. The Main Street Line reports higher total boarding and alighting values compared with the other two lines, but it is only slightly above that for the Riverfront Line (1406 vs. 1187). The Madison Line reports significantly lower boarding and alighting values compared to the other two (647). Table 38 presents the same data, but it is aggregated by stop for each line that serves that stop. Here, the terminal stations and those serving the Beale Street area and other important convention, hotel, and tourism serving locations clearly emerge as important stops in the Trolley system.

Table 37. Streetcar Stop Level Average Weekday Boardings and Alightings (by Line and by Stop) in Memphis, Tennessee (2012)[236]

Stop	Line	Direction	Boardings	Alightings
Central	Main	Northbound	74	2
Butler	Main	Northbound	27	7
Huling	Main	Northbound	22	3
Linden	Main	Northbound	27	3
Beale	Main	Northbound	90	24
Main/Gayso	Main	Northbound	45	17
Union	Main	Northbound	63	26
Main/Madison	Main	Northbound	103	50
Court	Main	Northbound	29	17
Poplar	Main	Northbound	35	19
Convention Center	Main	Northbound	41	88
Overton	Main	Northbound	6	7
N. Main/Overton Avenue	Main	Northbound	76	285
N. Parkway	Main	Southbound	293	13
Overton	Main	Southbound	7	3

Stop	Line	Direction	Boardings	Alightings
Convention Center	Main	Southbound	143	30
Poplar Clock	Main	Southbound	52	30
Jefferson	Main	Southbound	68	47
Main/Madison	Main	Southbound	37	44
Union	Main	Southbound	36	51
Main/Gayso	Main	Southbound	29	42
Beale	Main	Southbound	43	110
Linden	Main	Southbound	21	33
Huling	Main	Southbound	12	18
Butler	Main	Southbound	20	30
Central	Main	Southbound	7	141
Subtotal for Main Street Line			***1,406***	***1,139***
Central	Riverfront	Northbound	97	2
Butler	Riverfront	Northbound	48	24
Huling	Riverfront	Northbound	49	6
Linden	Riverfront	Northbound	42	9
Beale	Riverfront	Northbound	154	81
Main/Gayso	Riverfront	Northbound	93	36
Union	Riverfront	Northbound	124	61
Main/Madison	Riverfront	Northbound	168	93
Court	Riverfront	Northbound	39	27
Poplar	Riverfront	Northbound	53	27
Convention Center	Riverfront	Northbound	46	114
Overton	Riverfront	Northbound	3	17
N. Main/Overton Avenue	Riverfront	Northbound	21	370
N. Parkway	Riverfront	Southbound	148	12
Pyramid Stop	Riverfront	Southbound	0	0
Riverfront-Jefferson	Riverfront	Southbound	51	20
St. Louis-SF	Riverfront	Southbound	19	8
Beale Street Landing	Riverfront	Southbound	6	4
Huling	Riverfront	Southbound	17	10
Central	Riverfront	Southbound	9	92
Subtotal for Riverfront Line			***1,187***	***1,013***
Main/Madison	Madison	Eastbound	57	12
Madison/Danny Thomas	Madison	Eastbound	45	50
Madison/Hospital	Madison	Eastbound	24	24
Madison/N. Pauline	Madison	Eastbound	11	16
Madison/Cleveland	Madison	Eastbound	2	86
Madison/Cleveland	Madison	Westbound	196	7
Madison/N. Pauline	Madison	Westbound	43	11
Madison/Dunlap	Madison	Westbound	54	26
Madison/Orleans	Madison	Westbound	34	19
Madison/Danny Thomas	Madison	Westbound	51	61
Madison/Stadium Court	Madison	Westbound	41	102
Main/Madison	Madison	Westbound	89	204
Subtotal for Madison Avenue Line			***647***	***618***
Total			**6,480**	**5,540**

Table 38. Streetcar Stop Level Average Weekday Boardings and Alightings (Aggregated by Stop) in Memphis, Tennessee (2012)[237]

Stop	Line(s)	Boardings	Alightings
Central	Main, Riverfront	187	237
Butler	Main	95	61
Huling	Main, Riverfront	100	37
Linden	Main, Riverfront	90	45
Beale	Main, Riverfront	287	215
Main/Gayso	Main, Riverfront	167	95
Union	Main, Riverfront	223	138
Main/Madison	Main, Riverfront, Madison	454	403
Court	Main, Riverfront	68	44
Poplar	Main, Riverfront	88	46
Poplar Clock	Main	52	30
Convention Center	Main, Riverfront	230	232
Overton	Main, Riverfront	16	26
N. Main/Overton Avenue	Main, Riverfront	97	655
N. Parkway	Main, Riverfront	441	25
Jefferson	Main	68	47
Pyramid Stop	Riverfront	0	0
Riverfront-Jefferson	Riverfront	51	20
St. Louis-SF	Riverfront	19	8
Beale Street Landing	Riverfront	6	4
Madison/Danny Thomas	Madison	96	111
Madison/Hospital	Madison	24	24
Madison/N. Pauline	Madison	54	27
Madison/Cleveland	Madison	198	93
Madison/Dunlap	Madison	54	26
Madison/Orleans	Madison	34	19
Madison/Stadium Court	Madison	41	102
Total		**3,240**	**2,770**

These results are also depicted visually in Figure 75, where one sees that not only do the Madison corridor stops report low boarding numbers, but so do the segment of the Riverfront Line that borders the Mississippi River. It is apparent that the larger building footprint area, and most probably a higher level of economic activity that characterizes the Main Street/Riverfront corridor, results in significantly higher boarding activity at stops located along this central downtown corridor. Also suggested in the figure is the less built-out nature of the environment around the Madison Avenue Line. This could explain in part the lower ridership levels of this line. The low boarding and alighting activity along the Mississippi River segment of the Riverfront Line is most probably due to the tourism function of this part of the streetcar system, which serves more as a contemplative ride rather than a utilitarian urban transit service.

Figure 75 registers the spatial relationship between Special Activity Centers (SAC) and stop-level boardings. The spatial pattern suggests that proximity to SACs tends to result in relatively higher stop-level boarding counts along Main Street and Madison Avenue. For example, see higher ridership values adjacent to the Convention Center, Beale Street National Historic Conservation District, Emporium Shopping Center, and the two Health Complexes located at the middle and East End of the Madison corridor. This particular relationship for streetcar systems was also noted in Ramos and Brown's statistical exploration of stop-level ridership factors for streetcar systems in the U.S.[238] The North End Terminal and the Main and Madison Line stops report significantly high boarding counts but are not located in close proximity to SACs. However, these stops serve as important transfer points for bus routes, in the case of the former stop, and between the two Trolley lines, in the case of the latter stop. This inconsistent pattern is discussed in the next paragraph. The Great American Pyramid station reports zero boardings, as this large sports facility had been inactive for several years at the time of the study.

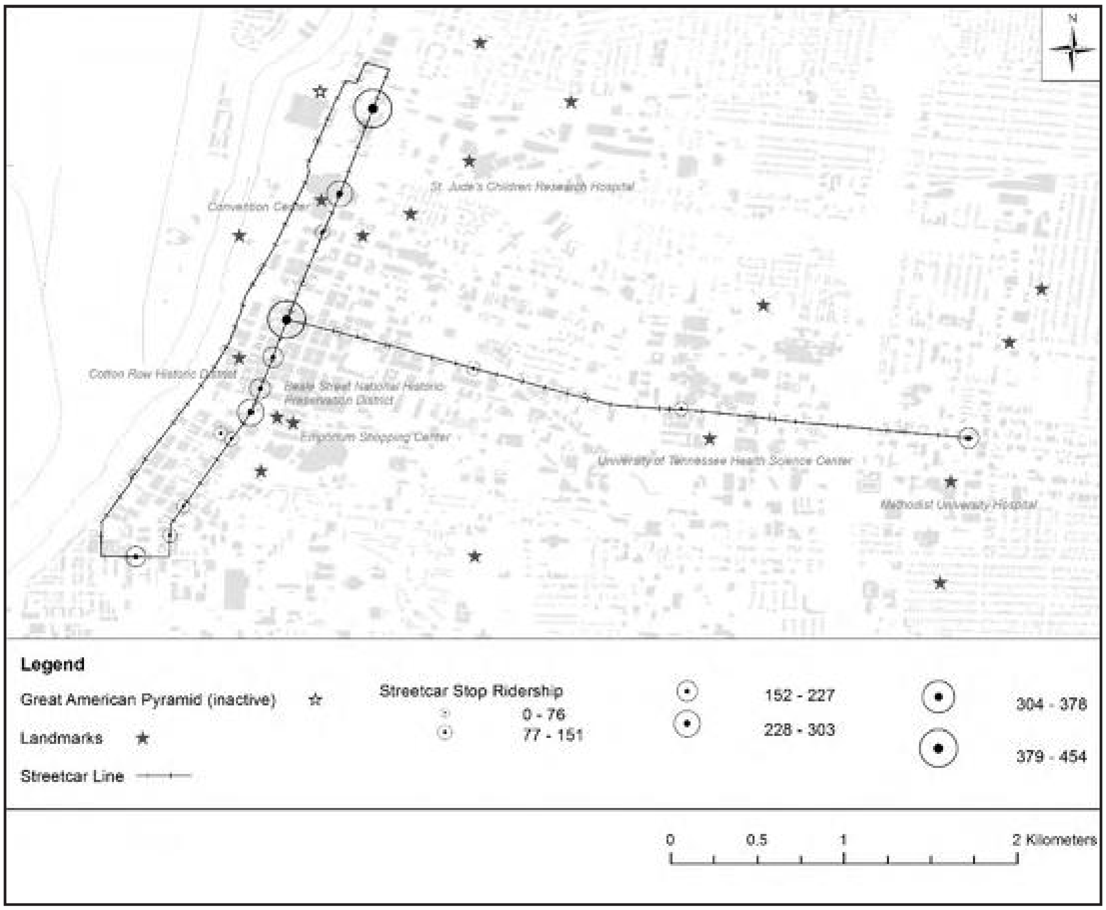

Figure 75. Special Activity Centers and Stop-Level Trolley Boardings in Memphis (2012)[239]

Figure 76 reports the relationship between stop-level boarding counts and bus connectivity, as represented by the number of bus connections available at the stop. The figure also indicates which stations offer Park & Ride facilities. The literature suggests that the number of bus route connections at a stop, a stop's terminal or transfer-hub function, and/or the presence of Park & Ride facilities at a stop are positively associated with higher boarding activity at a stop. These relationships seem to be present in Memphis' Trolley system and may help explain the inconsistency noted above in relation to the significantly high boarding counts for the North End Terminal stop and the Main/Madison stop, given the absence of nearby SACs. Not only does the North End Station stop function as a terminus for the Main Street Line, but it also offers Park & Ride spaces and features connections to 28 different bus routes. The Main/Madison stop functions as a transfer point between the Main and Madison Lines. It is also located in one the busiest intersections of downtown Memphis, which is characterized by significant high-rise office and residential development.

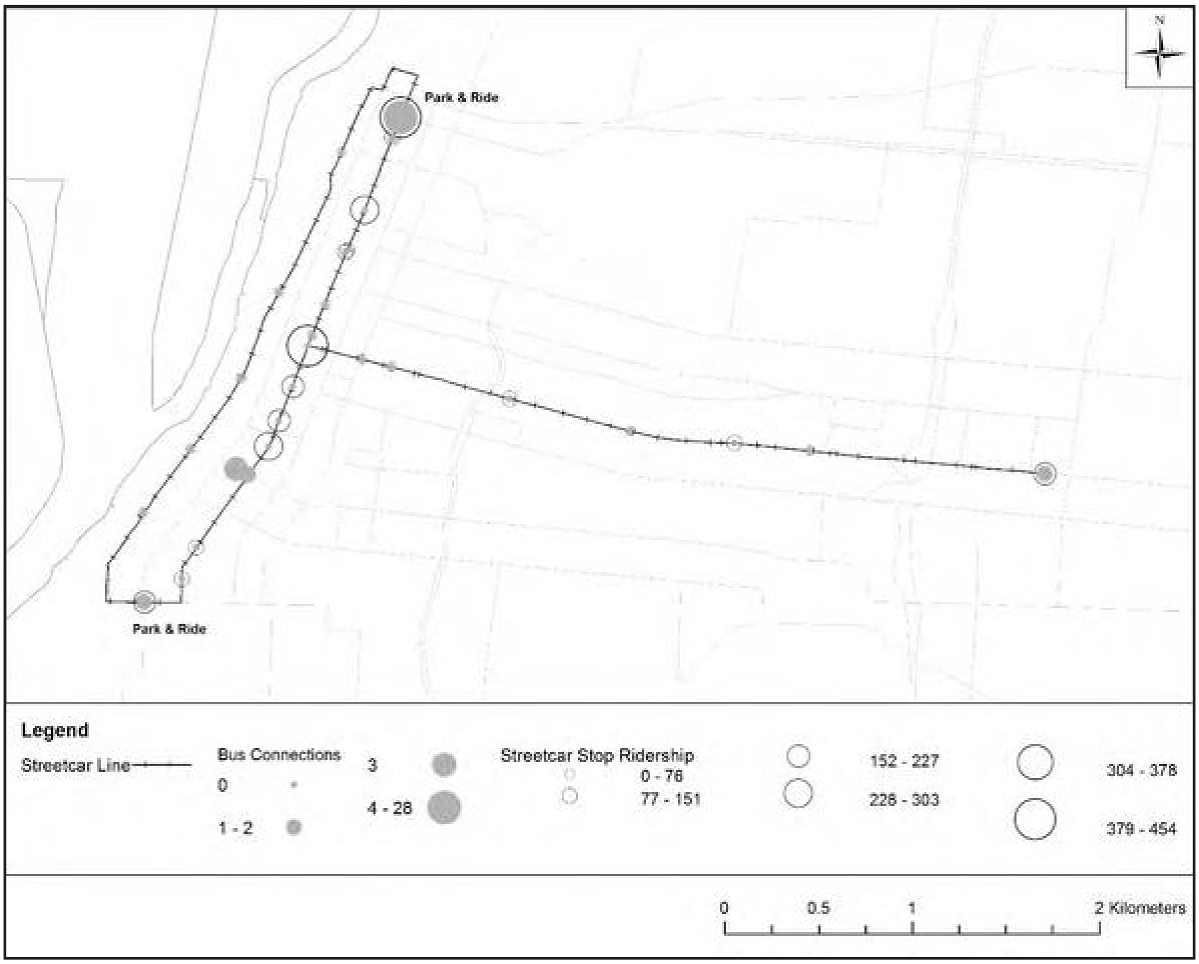

Figure 76. Bus Connectivity and Stop-Level Trolley Boardings in Memphis (2012)[240]

INSIGHTS FROM KEY INFORMANT INTERVIEWS

In addition to collecting and analyzing quantitative data and documentary evidence, the authors conducted one-hour semi-structured telephone interviews with key informants in the Memphis region who were able to provide their perspective on streetcar goals, performance, and future prospects. Informants represented a diverse set of perspectives, including transit planning, economic development, and the downtown business community. These informants were identified through documents or were suggested by other interviewees as pertinent informants given the nature of the questions the authors hoped to address.

The authors sought to use the interviews to complement the insights developed from our quantitative assessment discussed earlier and to identify hard-to-quantify phenomena that might impact people's perceptions of the streetcar and impact its performance. Each informant was provided a set of 12-24 questions in advance of the interviews, including a set of questions asked of all informants and specific questions asked of that individual, given the role they play in the community. A set of typical interview questions can be found in Appendix F.

For Memphis, the authors conducted three semi-structured interviews with four key informants. Several key themes emerged from the interviews, including the streetcar's role as a downtown development "amenity," its use in development promotion, and the role of the City of Memphis as the key driving force behind streetcar implementation. The four key informants include a senior-level streetcar planner and a senior-level transit planner, who were interviewed together, a long-time business and economic development official, and a downtown business community leader (Table 39). Each individual is identified by his or her role within the narrative that follows.

Table 39. Key Informants Interviewed for Memphis Study

Informant	Role
1	Transit Planner
2	Streetcar Planner
3	Economic Development
4	Business Community

Key Organizations and Individuals in Streetcar Development

The key informants identified several organizations or individuals who had played roles either directly or indirectly in streetcar-related issues in Memphis, although most informants agreed that the streetcar initiative was primarily driven by the city and elected officials. Most of the other actors who were identified focus on business and development concerns. Among these other actors were the Bell family, which financed one of the streetcar stops and has been engaged in redevelopment in the Beale Street area (including of the historic Peabody Hotel), Henry Turley, who has invested in a number of developments near and around the streetcar line, the Downtown Memphis Commission (DMC), which is the business improvement district responsible for promoting and enhancing the development of the Central Business District, the South Main Association of local businesses, and St. Jude's Hospital, which plays an important role in the downtown as a major institutional actor. The first four of these actors seemed to be more engaged in issues that are related in some way to the streetcar and its role in the community than the latter actor, with the DMC playing a particularly important role by virtue of its status as a public-private partnership with the ability to facilitate private development projects through loans, tax freezes, and other financial incentives. DMC is most interested in attracting people to the downtown and increasing downtown property values, and its leadership regards the streetcar lines (the Trolley) as important assets in their efforts. The South Main Association has frequently partnered with the DMC due to their shared interest in revitalizing downtown Memphis.

Goals of Streetcar Implementation

The key informant interviews emphasized the primacy of development-related goals for streetcar implementation in Memphis, whose downtown had been in serious decline for many years prior to the opening of the Main Street Line in the early 1990s. The transit planning and streetcar planning informants recalled the origins of the Main Street Line in the effort to revitalize a failed pedestrian mall; the streetcar was selected to provide better access to the mall. It was financed using federal interstate substitution funds. This line's primary function, in their view, was to serve as a downtown circulator that would provide access to development. The subsequent Riverfront Line was implemented to strengthen the connection between the downtown, the Riverfront area, and Mud Island. The City of Memphis owned land under a railroad track (i.e., the right-of-way) and acquired the remaining three-quarter mile [1.21 kilometer] of right-of-way needed to provide this connection between these areas of the city. The informants noted that the later Madison Avenue Line was built to connect the downtown area with the Medical District, which was a major employment node with between 40,000 and 45,000 jobs. The informants noted that this line was designed with modern light rail vehicles in mind but that vintage trolleys were ultimately selected for it due to cost considerations.

The informants described a bleak picture of conditions in downtown Memphis that the streetcar implementation was supposed to help turn around. The streetcar planning informant characterized the area as a "ghost town." The economic development informant agreed that downtown had been decline, and he further noted that its present turnaround began about 15-20 years ago.

The transit planning and streetcar planning informants spoke of the streetcar and related efforts to encourage downtown revitalization. These informants spoke about the implementation of new zoning and parking regulations, a new form-based development code, and a new complete streets policy as being part of a package of policy changes, along with the streetcar, to encourage new development in downtown. These changes are characterized as much more "friendly" toward transit. Generally, these informants pointed to positive developments in the area since streetcar implementation. These included the renovation of the Peabody Hotel and construction of Peabody office tower, the development of the Mud Island New Urbanist community by Henry Turley, and a number of residential, hotel, and restaurant investments in the area near the streetcar lines. However, one informant noted that the departure of a major hospital from the Madison Avenue Line area had a negative effect on the area and subsequently on streetcar ridership as well.

The economic development informant also spoke of the streetcar's role in development efforts in downtown Memphis. He observed that the streetcar lines run through mixed-use areas that are very desirable locations for development. These areas are walkable with good land values, and they are desirable "hot" development because of their attractiveness as locations for tourists and visitors. This informant emphasized Memphis' role as a cultural and entertainment center for the region and the streetcar's location in the center of most of these locations within the city. The informant also noted the streetcar's role as an anchor for other activities, including the development of the Main to Main multimodal project that will provide bicycle and pedestrian connections between Memphis and West Memphis, Arkansas across the Mississippi River, and a number of local development projects involving both commercial and residential properties.

Assessment of Streetcar Goals

The key informants generally view the streetcar as having been successful at attaining the development-related goals the city had for its implementation. The informants pointed to redevelopment activity of various types as evidence for this judgment about its performance.

The transit planning informant and streetcar planning informant offered their assessments of each of the three streetcar lines in turn. With respect to the original Main Street Line, they both characterized the line as a success as a circulator service within the downtown and by virtue of its “synergistic” relationship with redevelopment at various locations along its alignment. They pointed specifically to the Pyramid Arena (subsequently closed), a police station, new condos and retail at one stop, and the development of the South Main Arts District at south end of the line. More recently, they reported that there is some redevelopment at the Pyramid Arena location (a Bass Pro shop) and new signs of life on the pedestrian mall, as well. In addition, there is the Fed Ex Forum on South Beale Street and some hotel redevelopment. They offered similarly positive, if less detailed, assessments of the Riverfront Line as well. However, the transit planning informant and streetcar planning informant had less favorable views of the Madison Avenue Line, which was negatively affected by the relocation of a major hospital.

Overall, the transit planning informant and streetcar planning informant characterized the streetcar as “pretty successful” in attaining its goals. They observed that the streetcar lines are now an important part of the city’s identity. Although they pointed out that the lines have not met their ridership projections or overall land development objectives, they emphasized that this is largely due to the dire circumstances of the downtown when the streetcar was first implemented.

The economic development informant noted that he would grade the streetcar lines positively. He said that his organization views the lines as an amenity and asset that is important for development. He further noted that tourists and residents seem to like it. While he conceded that service quality is not consistent or reliable enough for it to serve utilitarian trips such as commuting, he believed that it was quite adequate in serving casual and visitor trips. He noted that it provides “character” and “activates the street” within which it operates by encouraging more pedestrian street activity. He further noted his impression that developers do consider it as one of the amenity factors when they make development decisions, along with more traditional economic factors.

He noted there were opportunities to improve the service, for example, by introducing modern cars and running them on a more reliable and predictable schedule that would increase its attractiveness for utilitarian trips. But he characterized this as a relatively minor issue given that the streetcar serves other purposes well.

The business community leader spoke of the streetcar's value in giving an identity, a "persona," to the South Main area, which had lacked one prior to its implementation. This individual noted that it gave an "emotional connection" or a "unique feel" to the area, and that it has become an icon of the larger city that is frequently seen on television coverage of locally-hosted events. This informant spoke a great deal about the "theatrical" nature of the streetcar with its clanging bells, creaky tracks, and vintage cars, and how other modes of transit can't provide the same sense of place. This individual pointed to the streetcar's importance for local businesses and noted that he likely would not have located his business in the area if the streetcar had not been present.

Rider Markets and Ridership Trends

The key informant interviews noted a diversity of rider markets taking advantage of the streetcar, with some variation in market by line and location. The transit planning and streetcar planning informants noted the roles of Special Activity Centers, such as Beale Street, the Peabody Place retail center, and the hospitals, as important ridership generators. These two informants noted that the north end terminal also sees significant transfer activity between bus and streetcar, due to the presence of a large number of bus connections, although these connections are not coordinated through the schedule. Nevertheless, the connections tend to result in significant use of the streetcar by transit-dependent riders. The informants also reported significant transit-dependent ridership on the Madison Avenue Line. By contrast, they report a largely tourist ridership on the Main Street and especially the Riverfront Lines.

The ridership data presented earlier in the profile reported an approximately 40 percent ridership increase between 2011 and 2012. The transit planning informant attributed this as likely a combination of a number of factors, including resurgence in tourism and convention activity, greater attendance at downtown sporting events, better enforcement of parking regulations, improved service levels, and a general improvement to the local economy's tourism sector. This increase in streetcar use came at the same time as bus ridership was in decline due to a decline in bus service levels. This study year is 2012, but informants later reported that since 2012 the budget issues that led to bus service cuts have also affected the streetcar. These cuts have led to a 25 percent decline in service and a 20 percent decline in ridership as of 2014, although the transit planning informant and streetcar planning informant insist that significant demand remains for streetcar trips.

Other Transit Issues

The transit planning informant and streetcar planning informant spoke about several other transit-related streetcar issues, including potential future expansion plans and financial issues. The two informants reported that there are presently no plans to expand the streetcar system, although MATA is working on a Midtown alternatives analysis for future transit improvements. The informants reported that bus service improvements (timed-transfers, bus rapid transit) are the focus of this analysis, although expended streetcar service was one of the considered alternatives.

The primary reason for the lack of serious consideration of rail expansion is financial. Memphis has no special assessment district for the streetcar. Instead, the city has used general obligation bonds and other local funds to finance the streetcar. The city also provides operating support from its general revenues. The transit planning and streetcar planning informants noted that the city is not planning to implement any transportation-focused assessment districts in the near term.

Challenges for the Streetcar

The key informant interviews with the transit planning and streetcar planning informants pointed to two key challenges facing the streetcar in Memphis. By far the most significant challenge is the financial one, which has necessitated a 25 percent service reduction and resulted in a 20 percent ridership decline on the streetcar lines. The informants agreed that new resources are needed to improve service to tap into what they regard as unserved demand for streetcar service.

The second challenge noted by the transit planning and streetcar planning informants results from the selection of the vintage streetcar vehicles for Memphis. The vintage vehicles were selected for nostalgic reasons and are seen as “cool,” but they also pose significant challenges for operation and maintenance. The vehicles are more difficult for disabled people to access than low-floor modern vehicles. They noted a recent reduction in ridership due to the 25 percent service drop. They are subject to frequent breakdowns. It is often difficult and expensive to obtain replacement parts for the vehicles. The unintended consequences of selecting vintage vehicles were also noted in other communities in this study. The business community leader conceded that the vintage cars have their problems but noted that it is important to keep them because the people of Memphis know and like them. They provide a unique sense of place to the area in which they operate. If the city had to replace them, then this individual prefers that they do so with new cars designed to look vintage (i.e., replica historic vehicles).

Advice for Other Communities

The business community leader offered a few words of advice to other communities. These words also serve as this individual’s final impressions of the Memphis experience. His advice was largely related to the streetcar’s iconic role as a “signature” for a city. This informant insisted that the streetcar revived downtown Memphis, brought in new investment and residents to the area, and has been an asset for tourism promotion and new development marketing. He suggested that Memphis “turned the corner” after the streetcar was built. Therefore, he suggested that it was important to balance development and transit objectives when deciding to make such an investment. However, despite his insistence that the streetcar had positive development outcomes, he suggested that other communities shouldn’t look at it as an investment that would provide a tangible return, but he alluded to it being more of an investment to create an amenity, icon, or “unique feel” within the community in which it might operate.

CONCLUSIONS

The Memphis Trolley emerges as a mid-level transit performer among the five streetcar cases considered in this study. Its ridership is second to that of Portland, and its cost effectiveness ranks first among the five cities. It also possesses the second-longest alignment and the largest number of lines operated. The Trolley suffers from relatively low service productivity, which means a great deal of the provided service is underutilized. In fact, the Trolley's service productivity is only about two-thirds that of the average bus operated by MATA. The Trolley's slow speed and the location of its alignment undoubtedly help explain these performance results, as they reduce its attractiveness for utilitarian trips and lead to a more tourist rider profile.

The interviews emphasized that the primary rationale for the Trolley's implementation was to stimulate redevelopment in downtown Memphis, and the informants offer a highly positive assessment of its role in this regard, despite the lack of any specific studies of these development effects. The informants believe that the Trolley has played a catalytic role in downtown redevelopment, by virtue of its role as an amenity and a potential anchor for development activity. Further, the informants highlighted the role it plays as an icon or symbol of Memphis.

Despite their generally upbeat assessment, the informants recognize that significant challenges face the streetcar system, particularly financially. The vintage cars are expensive to operate and maintain, and financial pressures have led to significant service reductions recently. Ridership has fallen as a result. Additional resources would be necessary to restore these service cuts, but obtaining these additional resources appears to be problematic at present.

In summary, the Trolley emerges from the study as a mediocre transit performer but as a service that seems to enjoy a significant level of local support due to its role in promoting other local objectives related to development and tourism promotion.

APPENDIX C: PROFILE OF STREETCAR LINES IN PORTLAND, OREGON

The streetcar system in Portland is perhaps the exemplary case among the modern-era streetcar systems operating in the U.S. The Portland streetcar lines are frequently pointed out for their strong role in promoting adjacent urban development, their relatively high ridership, and their relatively strong service performance.[241] Most observers focus primarily on their role as urban development tools and point to hundreds of millions of dollars of development activity for which the streetcar is assigned a large responsibility.[242] According to transit consultant John Smatlak, the streetcars in Portland are seen as “a unique public/private strategy to link investment in high-quality transit service with major development”[243] (Figure 77).

Figure 77. A Streetcar in Portland[244]

BASIC CHARACTERISTICS OF STREETCAR SERVICE

Portland’s streetcar system consists of two lines: the original north-south (NS) line through downtown Portland on the west side of the Willamette River and the central loop line (CL) (Figure 78). The original NS line dates to 2001, while the CL line is a late-2012 addition to the system. The now 7.35-mile [11.83 kilometer] double-track alignment (14.7 miles [23.66 kilometers] of single track) cost more than $250 million to build, operates primarily in mixed-traffic operation, and includes 76 stops (Table 40).

Streetcars provide relatively frequent service during peak and off-peak travel periods, and the services operate during most of the day on weekdays and weekends (Table 41). The Portland streetcar system is operated by Portland Streetcar Inc., which is a non-profit organization. However, service is actually provided by employees of Tri-Met, the primary local transit agency in the region, under contract. Because of this institutional arrangement, passengers are permitted to transfer between the streetcar and local buses without paying an additional fare during a two-hour time window. A complete listing of fares is provided in Table 42. Prior to fall 2012, streetcar rides were free within Portland's fare-less square in the downtown, but this fare-free zone was abolished at that time.

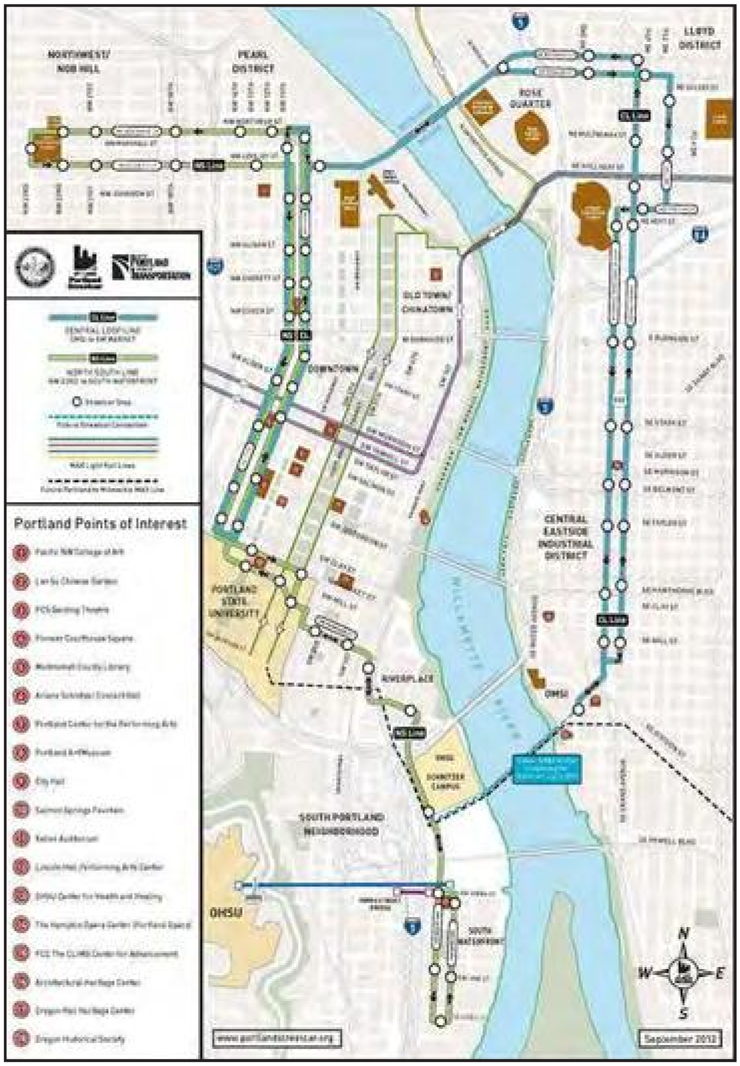

Figure 78. Map of Streetcar Lines in Portland, Oregon[245]

In 2005, Tri-Met conducted a detailed rider survey that allowed the agency to break out streetcar riders from its general ridership to develop a profile of these individuals.[246] Although the survey is now nearly ten years old, and it predates the recent opening of the CL line, it still provides an interesting snapshot of the streetcar users. The results also enable a comparison between streetcar riders and Tri-Met users as a larger group. The survey results are shown in Table 43. Streetcar riders tend to be similar to Tri-Met riders as a group with respect to age, while streetcar riders include more very low-income and very-high income riders than the transit system as whole. Its riders are less likely to use the service for home-to-work trips and more likely to have accessed the service by walking than their counterparts in the larger transit system. These differences are undoubtedly a function of the original NS line's downtown Portland location.

Table 40. Physical Characteristics of Streetcar System in Portland[247]

Characteristic		Value
Year Open (line 1 NS, line 2 CL)		2001, 2012
Capital Cost (unadjusted dollars)		$251,420,000
Number of Lines		2 (North-South, Central Loop)
Number of Vehicles		11*
Number of Stations		76
Length		7.35 miles** (11.83 km)
Alignment Type	Exclusive	0.15 miles
	Mixed Traffic	7.20 miles**

Notes:
* They operate eleven vehicles with a total inventory of 12 at present, but plan to increase the number in operation to 14 by September 2015, which requires an inventory of 17 vehicles. (email communication with Rick Gustafson on February 5, 2014).
** The alignment is 7.35 miles of double track, or 14.7 miles of single track. (email communication with Rick Gustafson on February 5, 2014).

Table 41. Service Characteristics of Streetcar System in Portland[248]

Characteristic	Value
Headways	
Weekday Peak	14-17 min
Weekday Off-Peak	15-22 min
Weekend Average	17 min
Hours of Service	
Monday-Friday	18 hr
Saturday	16 hr
Sunday	15 hr

Table 42. Fare and Transfer Policy for Transit Services in Portland[249]

Characteristic	Type	Cost ($)
Fare Type	Streetcar fare	$1.00
	TriMet All Day Fare	$5.00
	TriMet Falt Fare	$2.50
	TriMet Honored Citizen Fare	$1.00
	TriMet Youth Fare	$1.65
Pass Type	Streetcar Only Annual Pass	$200.00
Transfer Fee	Bus/Streetcar	--

Note: TriMet Fares will be valid on Streetcar and TriMet for 2 hours; Adult: 18-64; Honored Citizen: 65+, and people on medicare and people with a disability; Youth: age 7-17 and students in high school or pursuing a GED.

As noted earlier, Portland's streetcar lines are operated under the aegis of Portland Streetcar, Inc. (PSI), although employees of Tri-Met, Portland's primary transit agency, actually handle day-to-day operations under contract. The two streetcar lines are thus part of a multimodal transit system consisting of bus, light rail, and streetcar services. Tri-Met's multimodal transit system is shown in Figure 79. The streetcar lines lie at the core of the transit system, operating on both sides of the Willamette River since the fall 2012 opening of the CL line. The downtown area is also served by numerous bus routes and light rail transit, which provide connecting service at a number of streetcar stops (Figure 80). The system appears to be well integrated.

Table 43. Customer Profile, Tri-Met, Portland[250]

		TriMet System (%)	Streetcar (%)
Age	19 or under	9	4
	19 - 24	19	21
	25 - 34	27	33
	35 - 44	17	14
	45 - 54	16	13
	55 - 64	7	8
	over 65	5	7
	Total	**100**	**100**
Income	Under $10,000	17	22
	$10,000 to $19,000	14	13
	$20,000 to $29,000	14	13
	$30,000 to $39,000	12	13
	$40,000 to $49,000	6	7
	$50,000 to $59,000	4	5
	$60,000 to $69,000	17	3
	$70,000 or more	7	17
	Don’t know	9	7
	Total	**100**	**100**
Access Mode	Walked	76	88
	Automobile	10	4
	Transit Transfer	12	7
	Other	2	1
	Total	**100**	**100**
Trip Purpose	**Home-based Trips**	**82**	**68**
	Work	45	21
	School	11	15
	Recreation	3	9
	Personal Business	8	8
	Shopping	5	9
	Visiting friends/relatives	4	2
	Medical	2	3
	Other	4	1
	Non-home-based Trips	**18**	**32**
	Total	**100**	**100**

Note: Categories reported as defined in source materials.

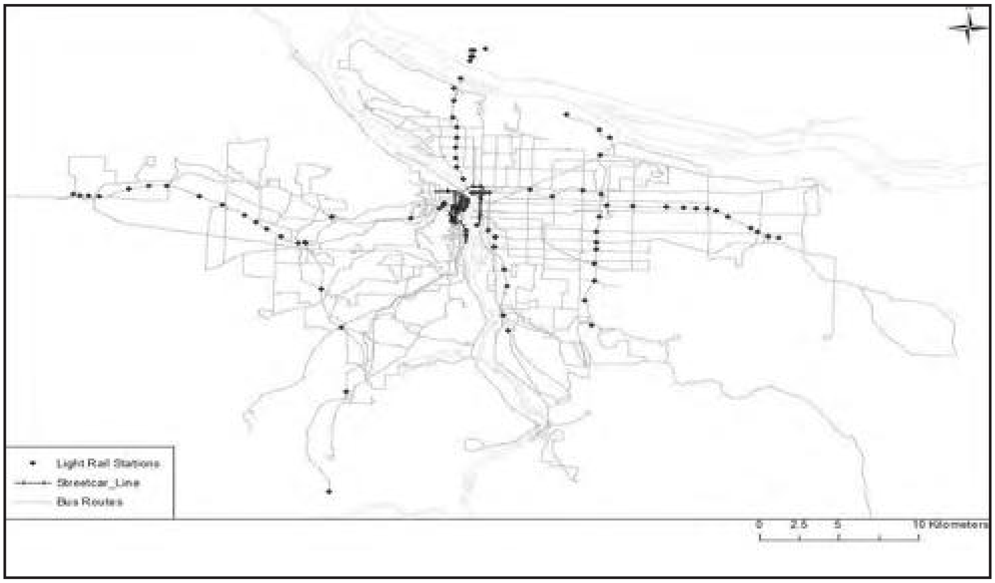

Figure 79. Map of Transit System in Portland, Oregon[251]

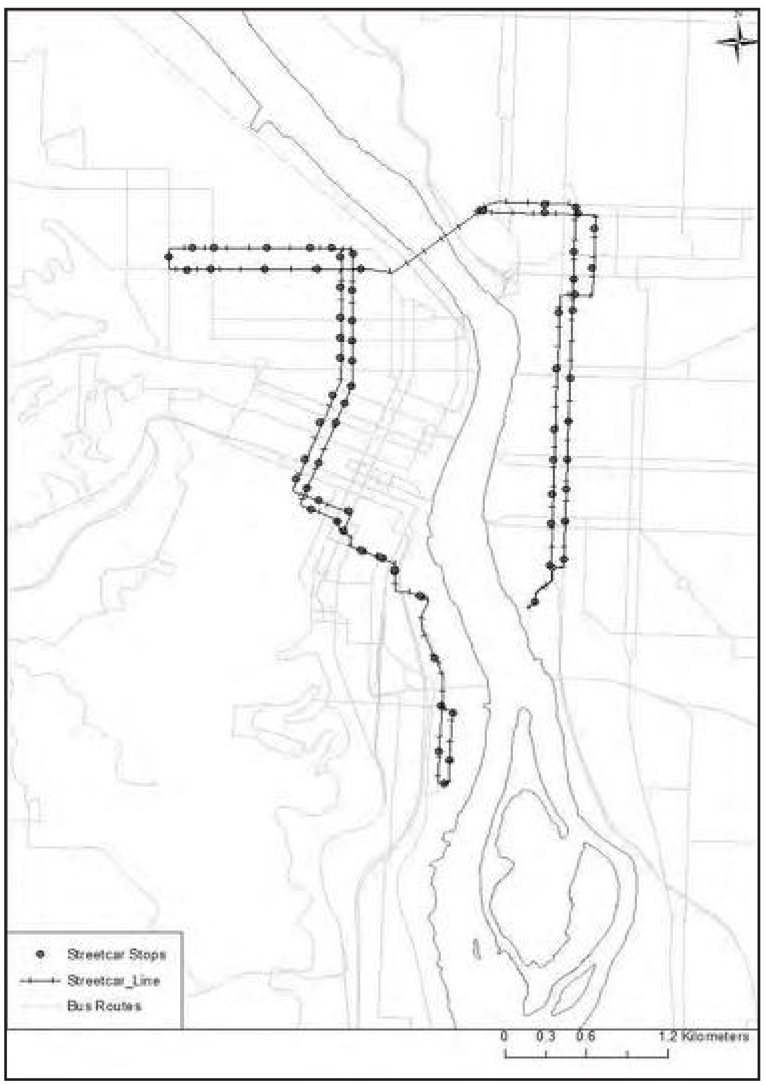

Figure 80. Map of Transit System in Downtown Portland, Oregon[252]

SOCIOECONOMIC CONTEXT FOR STREETCAR SERVICE

The Portland streetcar lines operate within the downtown area on both sides of the Willamette River. The authors examined the socioeconomic characteristics and built environment contexts within which the streetcar lines operate as part of the study, given the importance of these factors for transit ridership in other communities. The authors believed that a consideration of these factors would provide some explanation for the level of ridership on the streetcar lines and the particular rider markets being served. A discussion of these issues follows in the next several pages.

At the time of the 2010 Census, the city of Portland, Oregon had a population of just under 584,000 people within a metropolitan area whose population totaled about 2.2 million.[253] The city's median household income was just over $51,000 per year, while about 17 percent of the population lived below the poverty line. The city population was more than 75 percent white, with a 6 percent black population and small but growing Asian and Hispanic populations (7 percent and 9 percent, respectively).

As transit ridership is closely related to population (trip productions or origins) and employment (trip attractions or destinations), the authors began by mapping the spatial distribution of population and employment in Portland. As the streetcar lines, and the Tri-Met transit system within which they are situated, are constrained within the Oregon counties that make up the Portland-Vancouver metropolitan area, the maps depict the Oregon side of the Columbia River, with a focus on the city of Portland itself.

Figures 81 and 82 display city-scale population and population density, both by census block group, at the time of the 2010 Census. The maps indicate that within the city of Portland, population totals by block group are much higher in the outer areas than within the inner parts of the city. However, the shift to population density in the second map points to some high population concentrations in inner area neighborhoods, including in the downtown area served by the streetcar lines on the west side of the Willamette River. This pattern becomes even clearer when one examines the larger scale maps focused on downtown Portland (Figures 83 and 84). The block groups within the streetcar service area on the west side of the river have moderate to high densities, particularly in the northern section, while densities are much lower on the east side of the river, where the recent streetcar line extension opened in fall 2012.

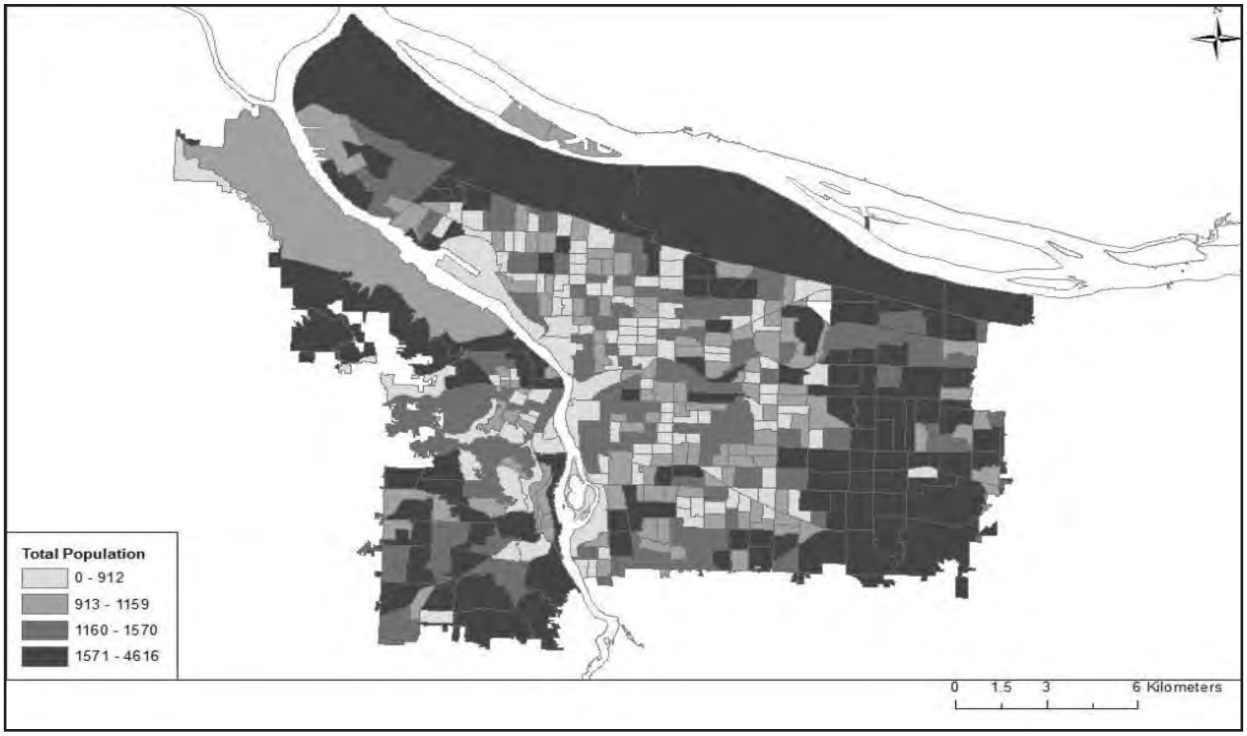

Figure 81. Population by Block Group in Portland (2010)[254]

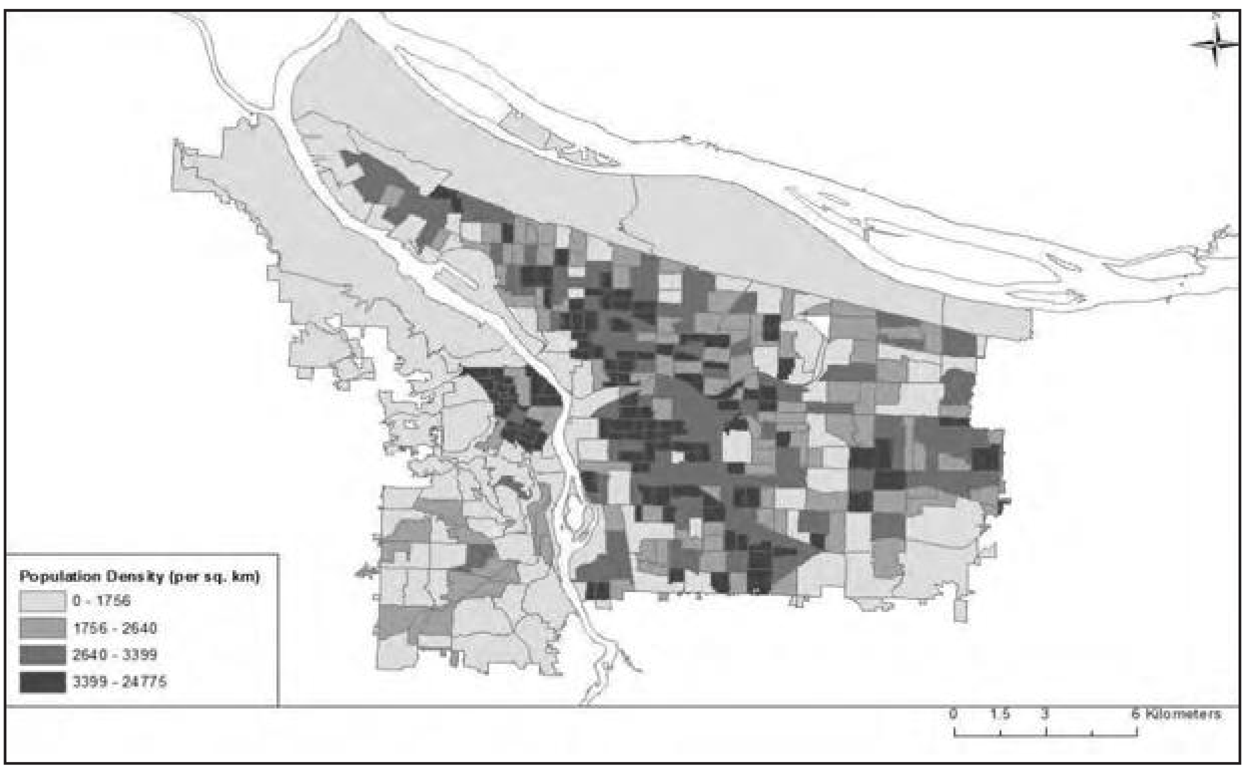

Figure 82. Population Density by Block Group in Portland (2010)[255]

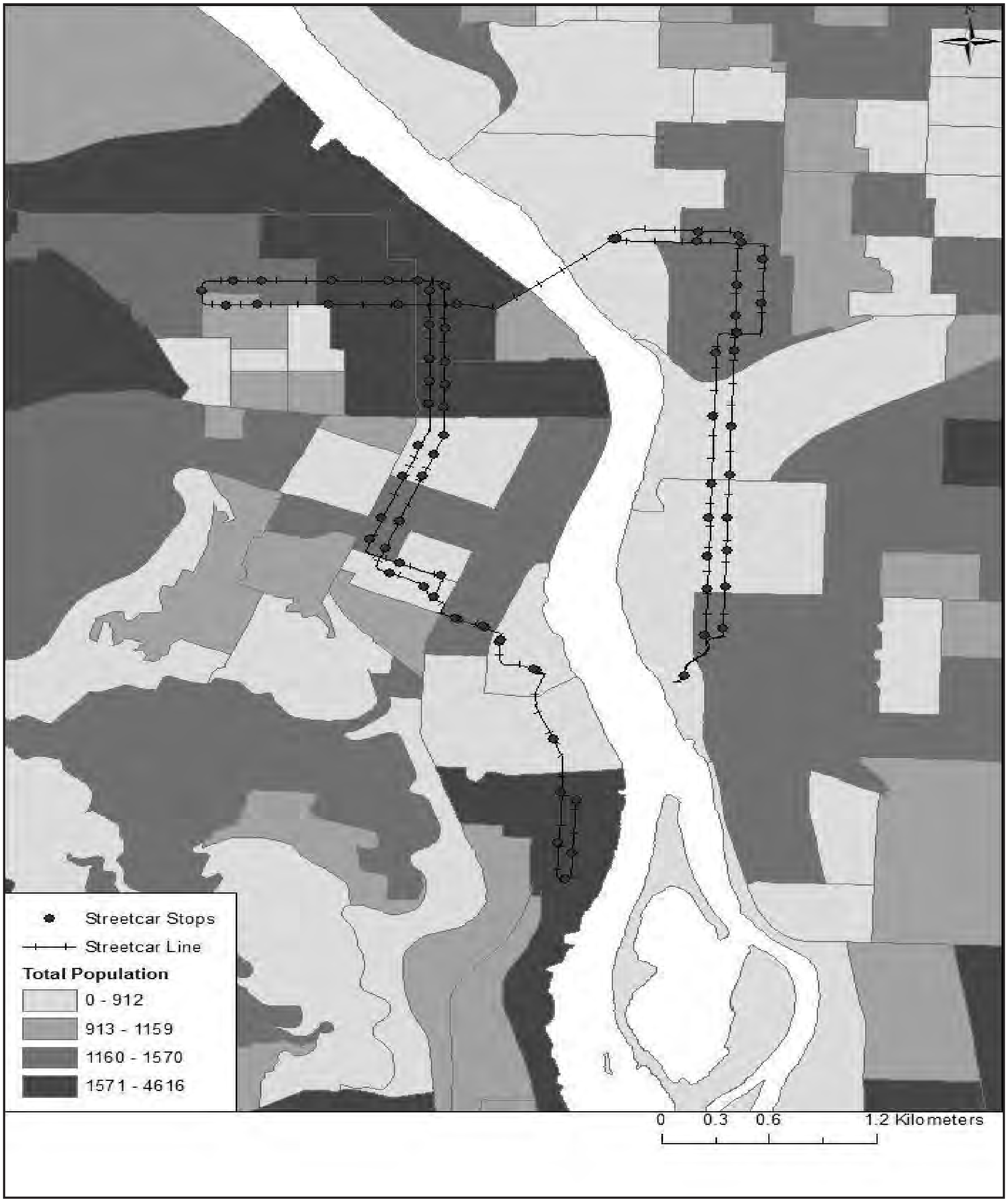

Figure 83. Population by Block Group in Core of Portland (2010)[256]

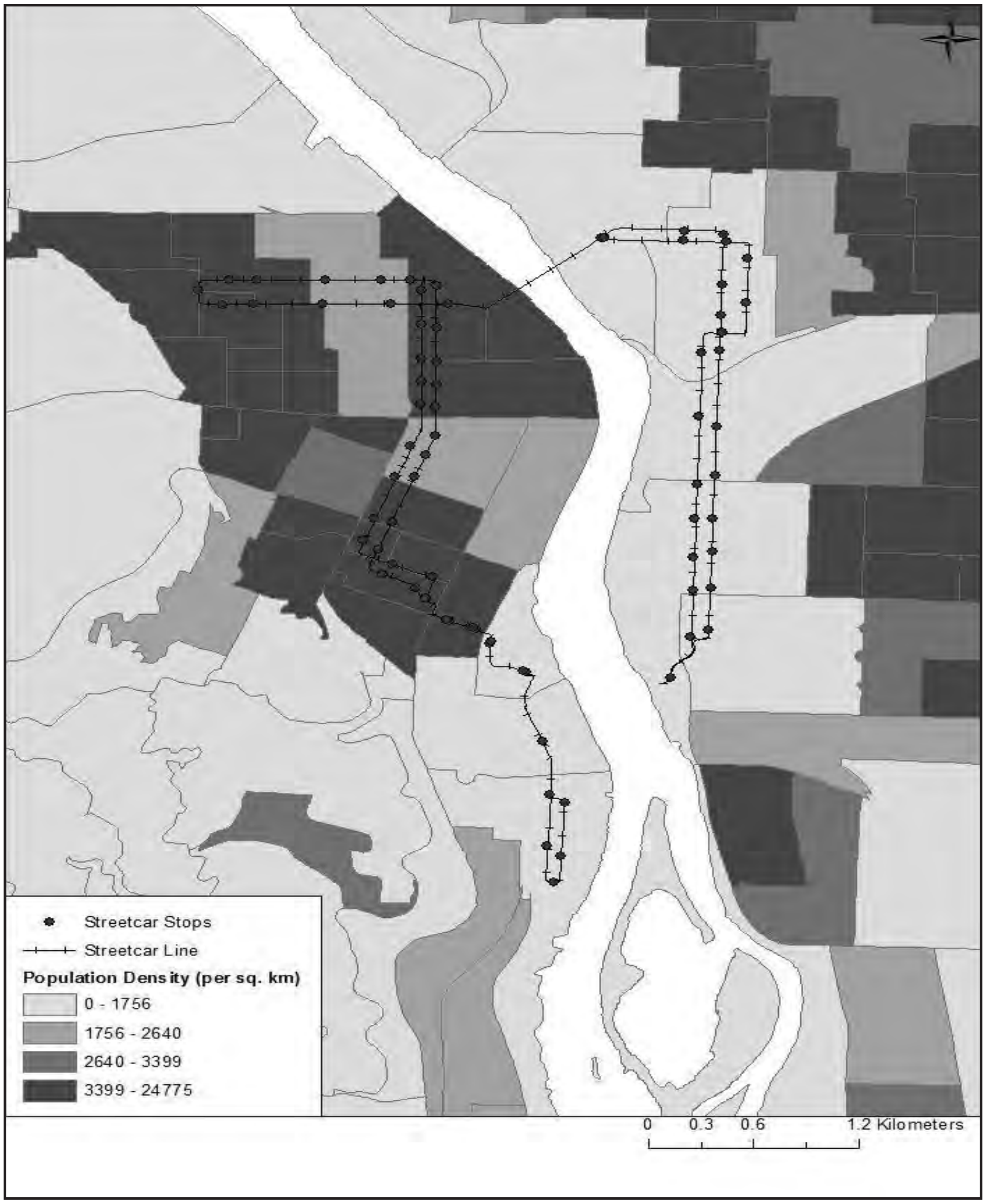

Figure 84. Population Density by Block Group in Core of Portland (2010)[257]

Employment represents potential attractors for trips. Figures 85 and 86 depict the spatial distribution of employment and employment density, respectively, on a city scale. The employment pattern is quite dispersed, with a number of employment clusters visible on the maps. The employment density map is the most telling, as it clearly depicts the downtown as a high density center, as well as several higher density centers on the east side of the river but not along its shoreline, where the new streetcar line is in service. Figures 87 and 88 serve as downtown-focused counterparts to the prior two maps, focusing on the areas in the immediate vicinity of the two streetcar lines. These maps clearly point to the moderate to high densities of employment along the older line on the west side of the river, in Portland's downtown, particularly to the northwest of the streetcar alignment. Much lower densities are shown along the east side of the river, which is a focal point of current local redevelopment efforts.

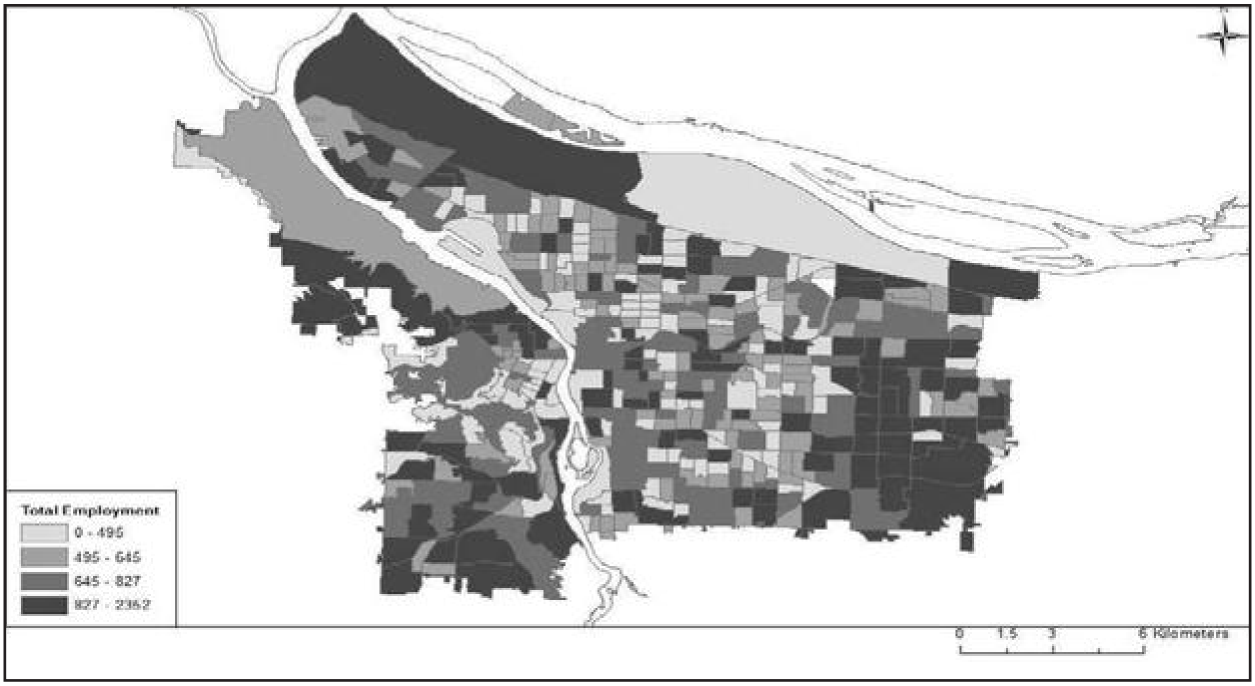

Figure 85. Employment by Block Group in Portland (2010)[258]

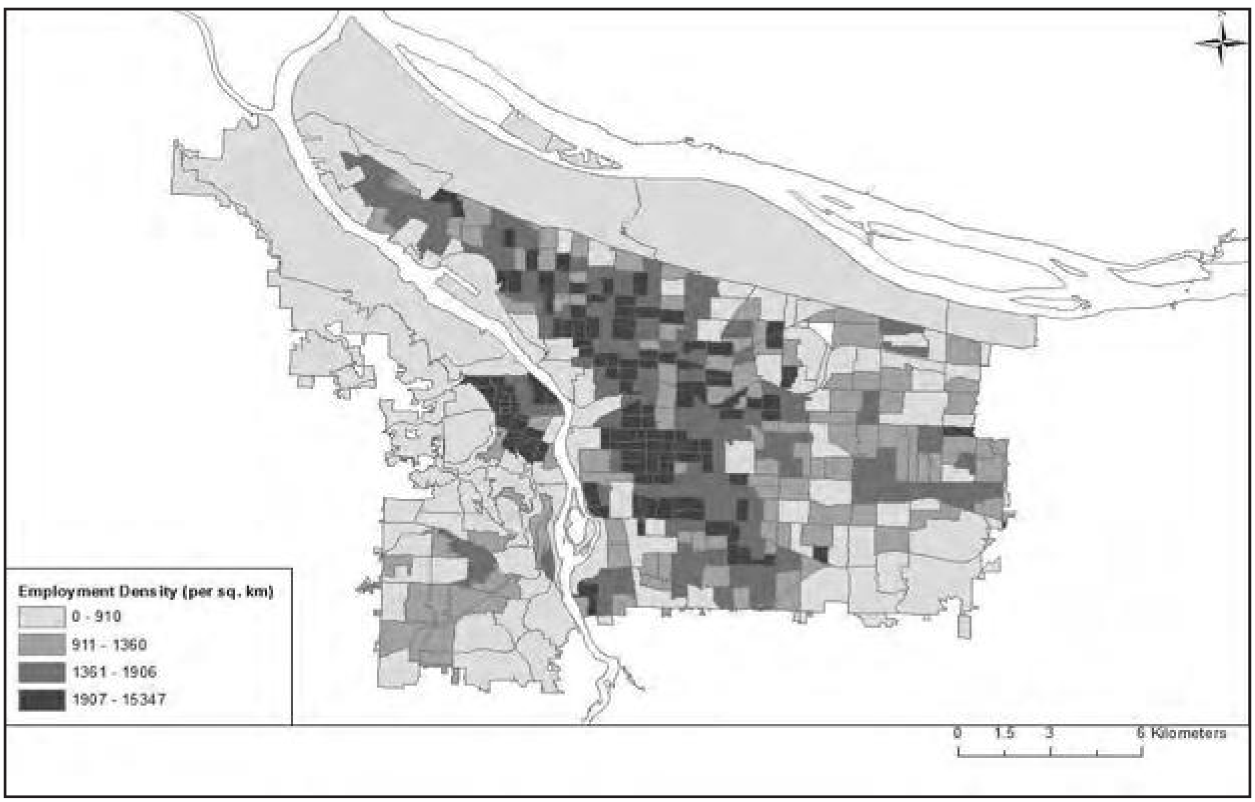

Figure 86. Employment Density by Block Group in Portland (2010)[259]

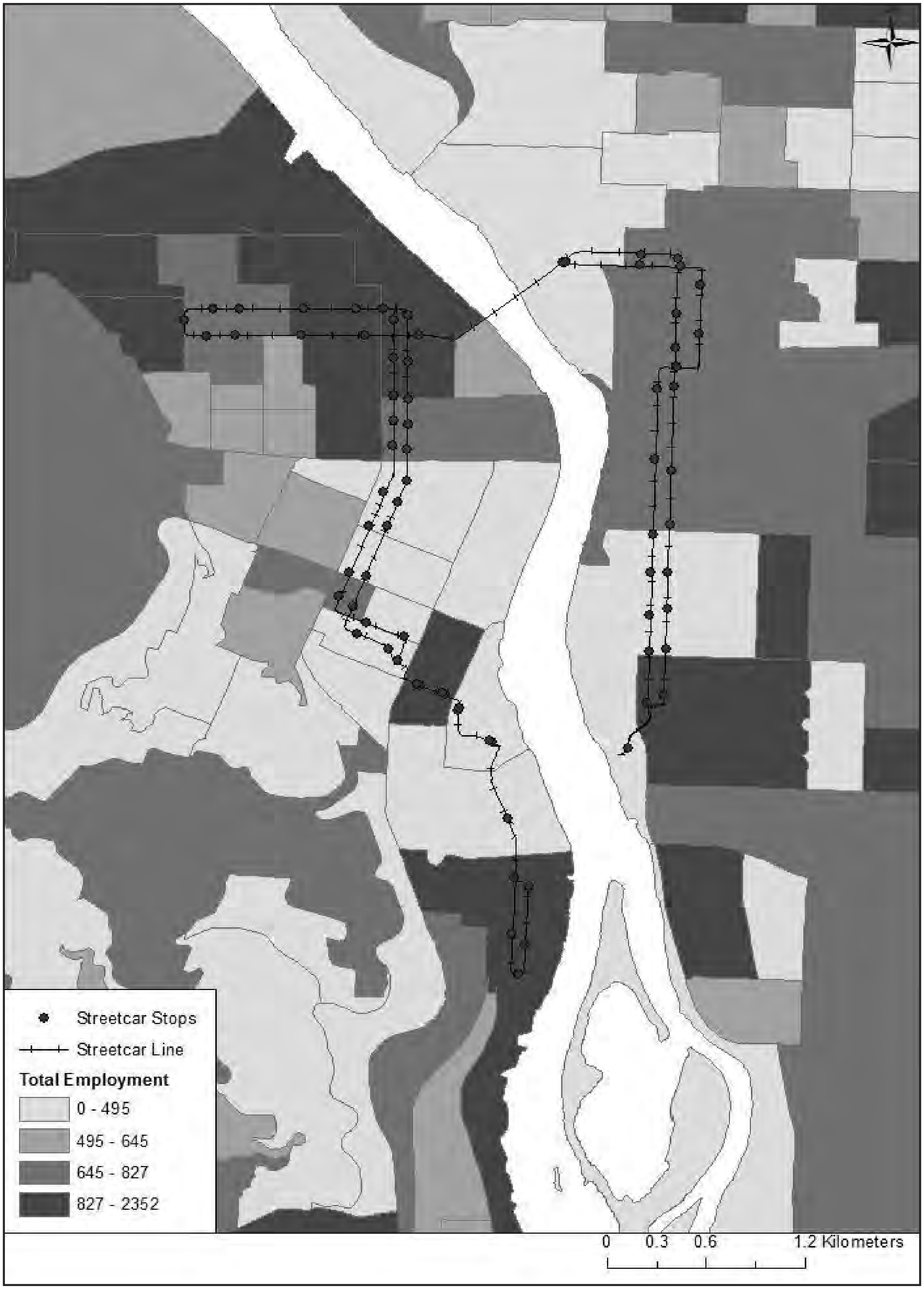

Figure 87. Employment by Block Group in Core of Portland (2010)[260]

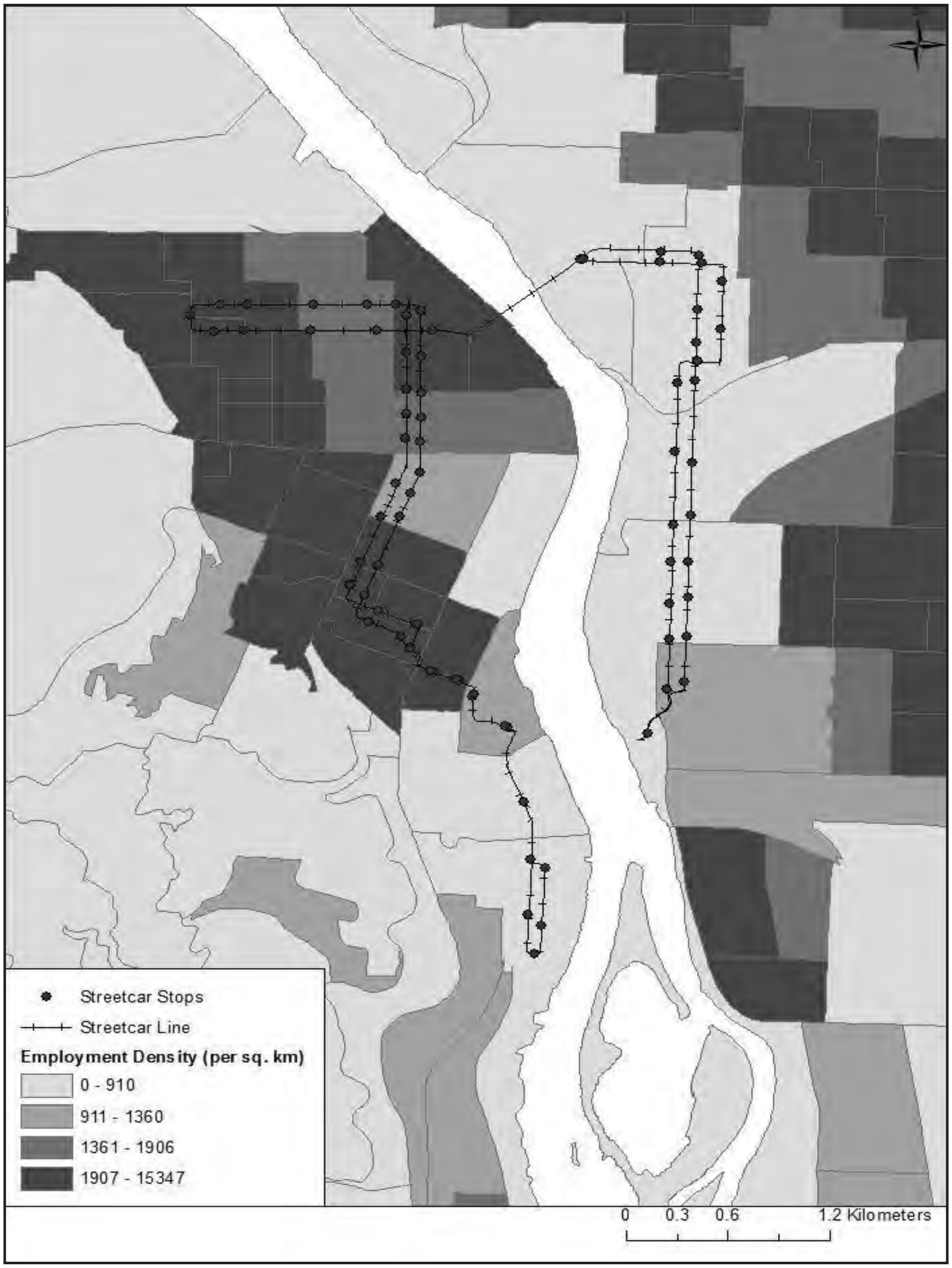

Figure 88. Employment Density by Block Group in Core of Portland (2010)

Earlier it was noted that Portland is an overwhelmingly white city but one with growing minority populations. The next several figures depict the spatial distribution of the city's different racial and ethnic groups. Figures 89 and 90 focus on the black population, which is smaller than either the Hispanic or Asian populations in the city. The figures clearly indicate larger black populations in the city's northern areas, particularly on the east side of the Willamette River. Larger black populations also are situated within the downtown area, on both sides of the river, and in scattered locations throughout the community. However, compared with the other racial and ethnic groups, the actual sizes of these communities, in numbers of people, tend to be relatively modest.

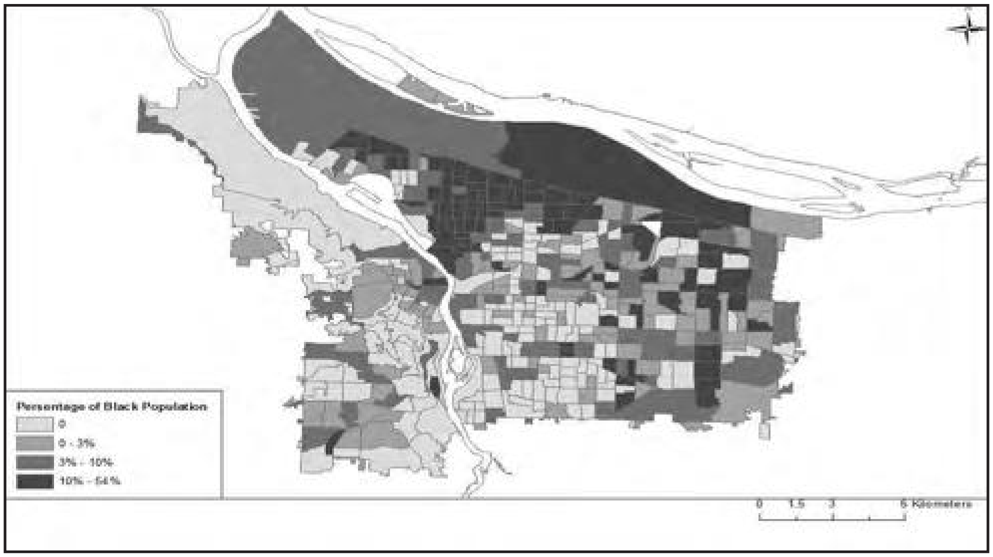

Figure 89. Black Population by Block Group in Portland (2010)[261]

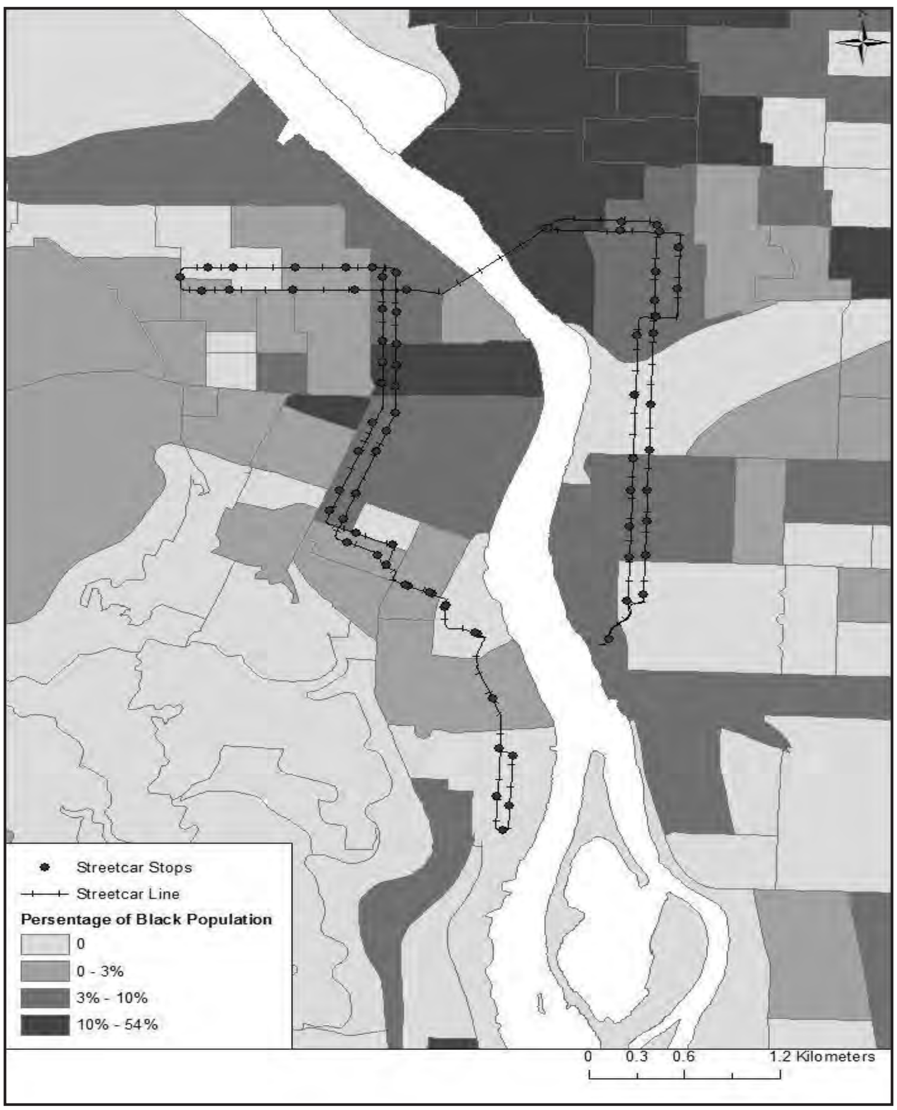

Figure 90. Black Population by Block Group in Core of Portland (2010)[262]

The spatial distribution of the white population, which represents the largest group in the city, is shown in Figures 91 and 92. This population is present in large numbers throughout the city, but it is greatest in the center of the city and in areas to the southwest of the downtown core. Most block groups in the downtown areas served by the streetcar lines have very large white population shares.

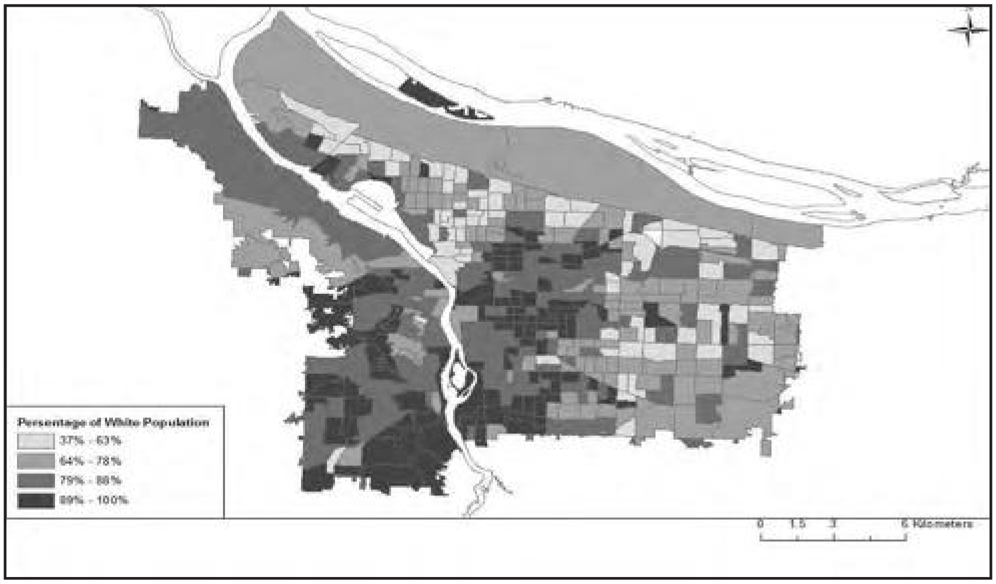

Figure 91. White Population by Block Group in Portland (2010)[263]

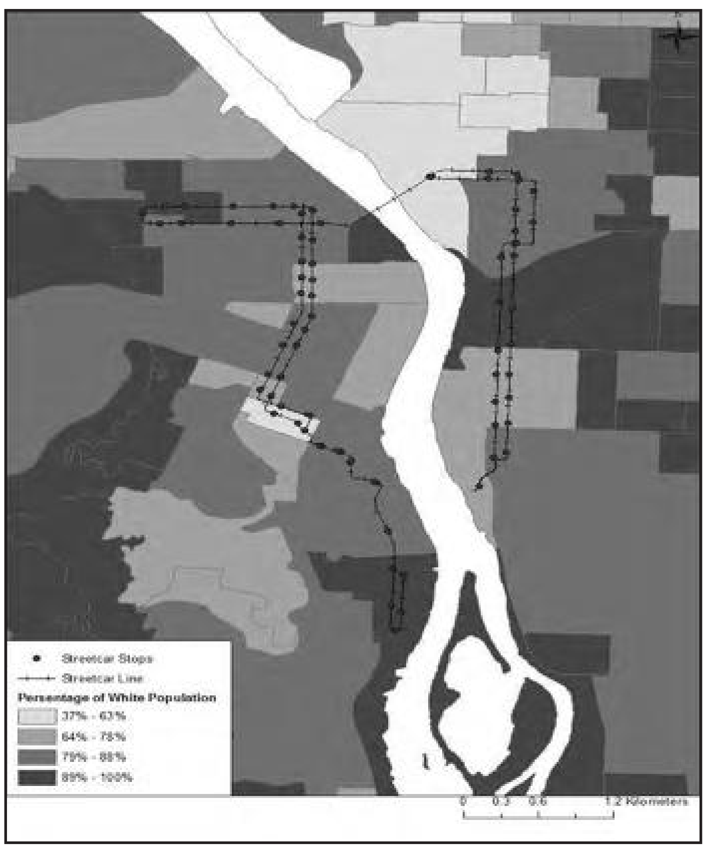

Figure 92. White Population by Block Group in Core of Portland (2010)[264]

The various exhibits suggest that among the different racial or ethnic groups, the spatial distribution of the Hispanic population is most dispersed (Figures 93 and 94). Hispanics are present in significant numbers across different parts of the city, although slightly higher Hispanic population shares exist in the eastern portions of the city and on the east side of the Willamette River in northwest Portland. The Asian population share is highest in the block groups in northwest Portland and in the city's eastern sections (Figures 95 and 96).

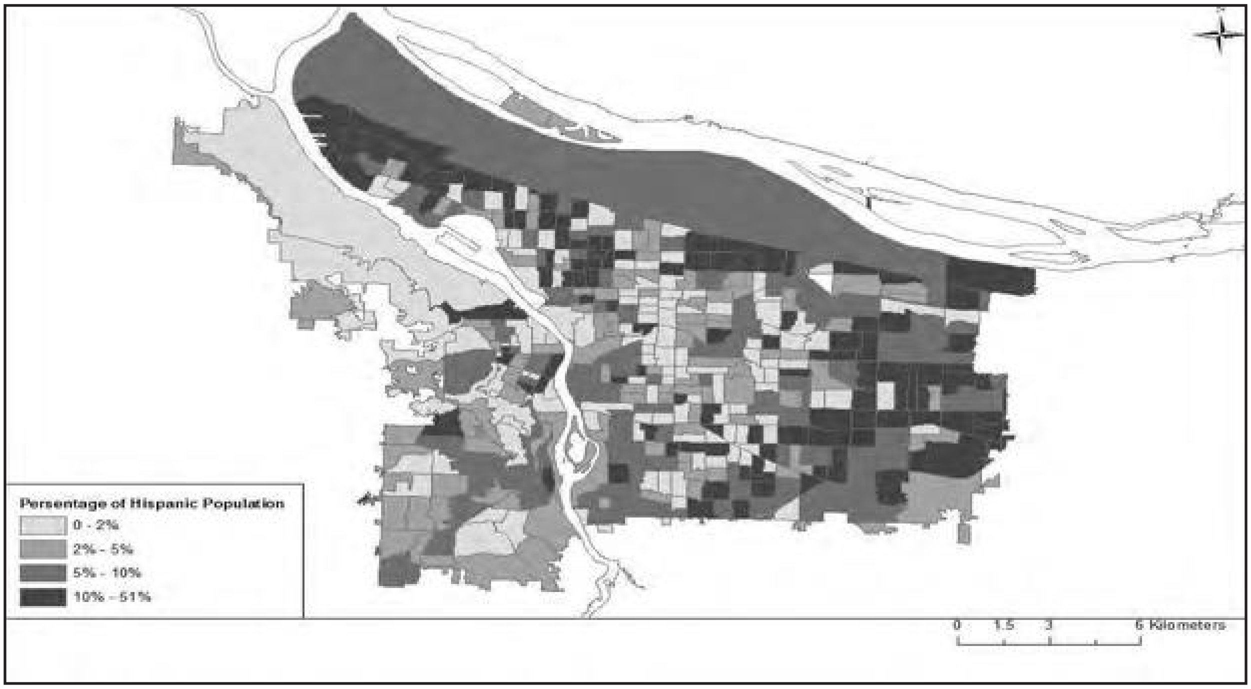

Figure 93. Hispanic Population by Block Group in Portland (2010)[265]

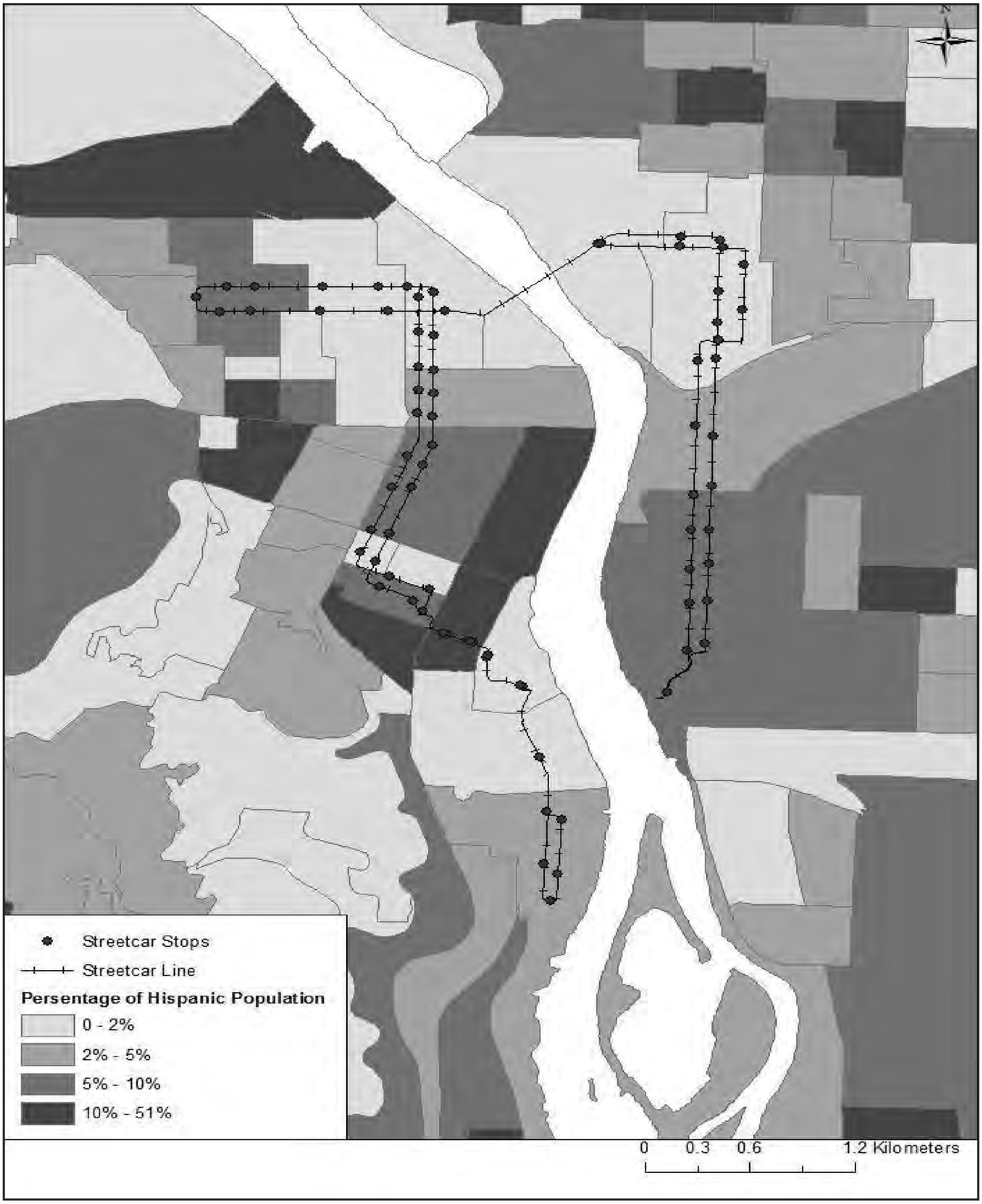

Figure 94. Hispanic Population by Block Group in Core of Portland (2010)[266]

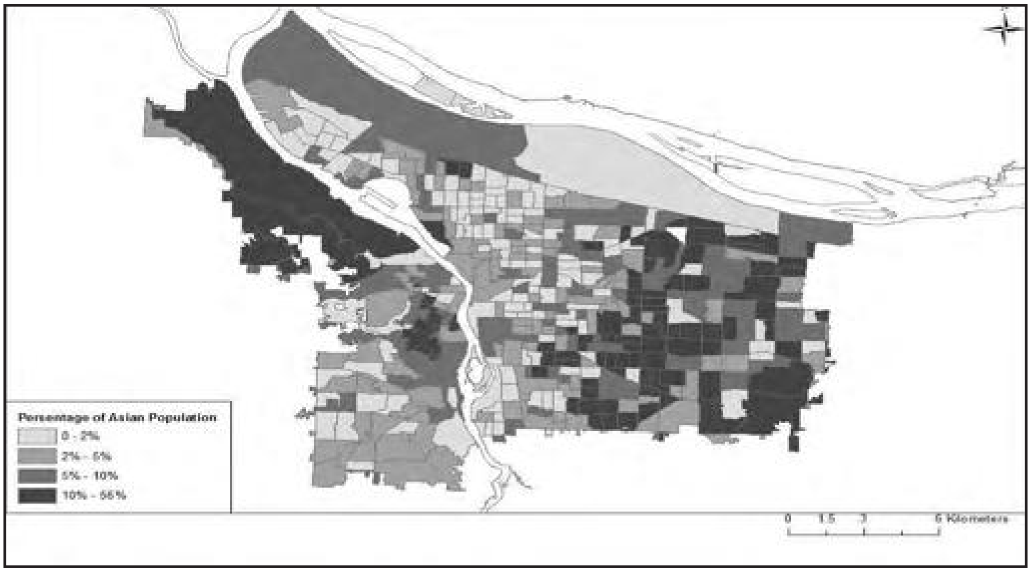

Figure 95. Asian Population by Block Group in Portland (2010)[267]

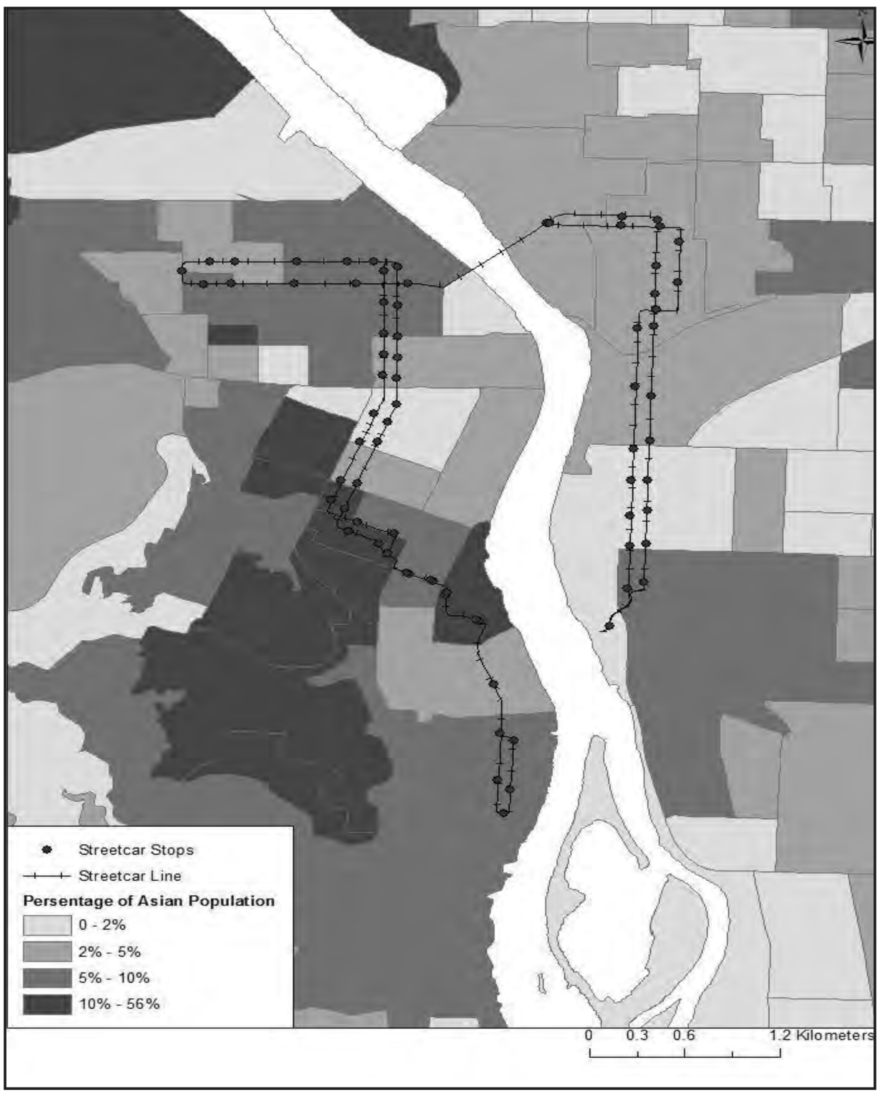

Figure 96. Asian Population by Block Group in Core of Portland (2010)[268]

The literature suggests that transit use is closely tied to household income and vehicle access, which are also related to one another.[269] The spatial pattern of median household income for Portland is shown in Figures 97 and 98. The pattern of household income is strikingly similar to the spatial distributions of white and Asian population shares seen in preceding maps. In general, block groups with high white and/or Asian population shares tend to have high incomes. The center of eastern Portland has a cluster of higher income block groups, and a long string of higher income block groups is situated along the city's western boundary. The core areas served by the streetcar lines fall into the lower median household income categories, although higher income zones appear in the northern and southern reaches of the line on the west side of the river.

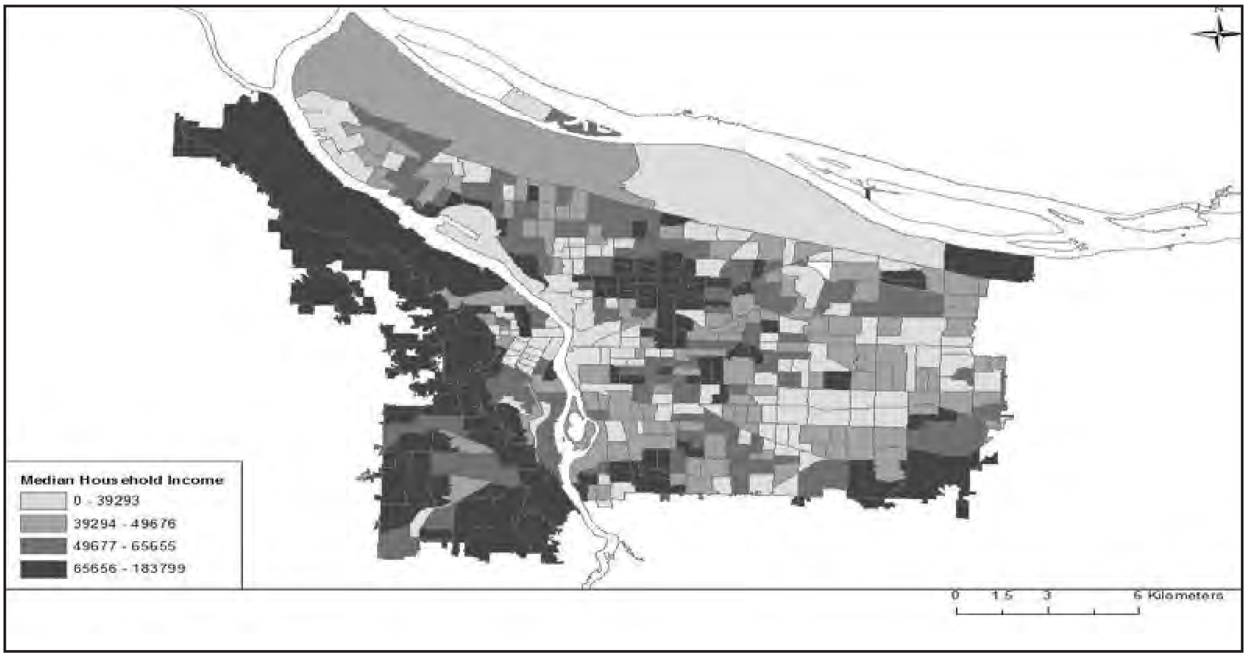

Figure 97. Median Household Income by Block Group in Portland (2010)[270]

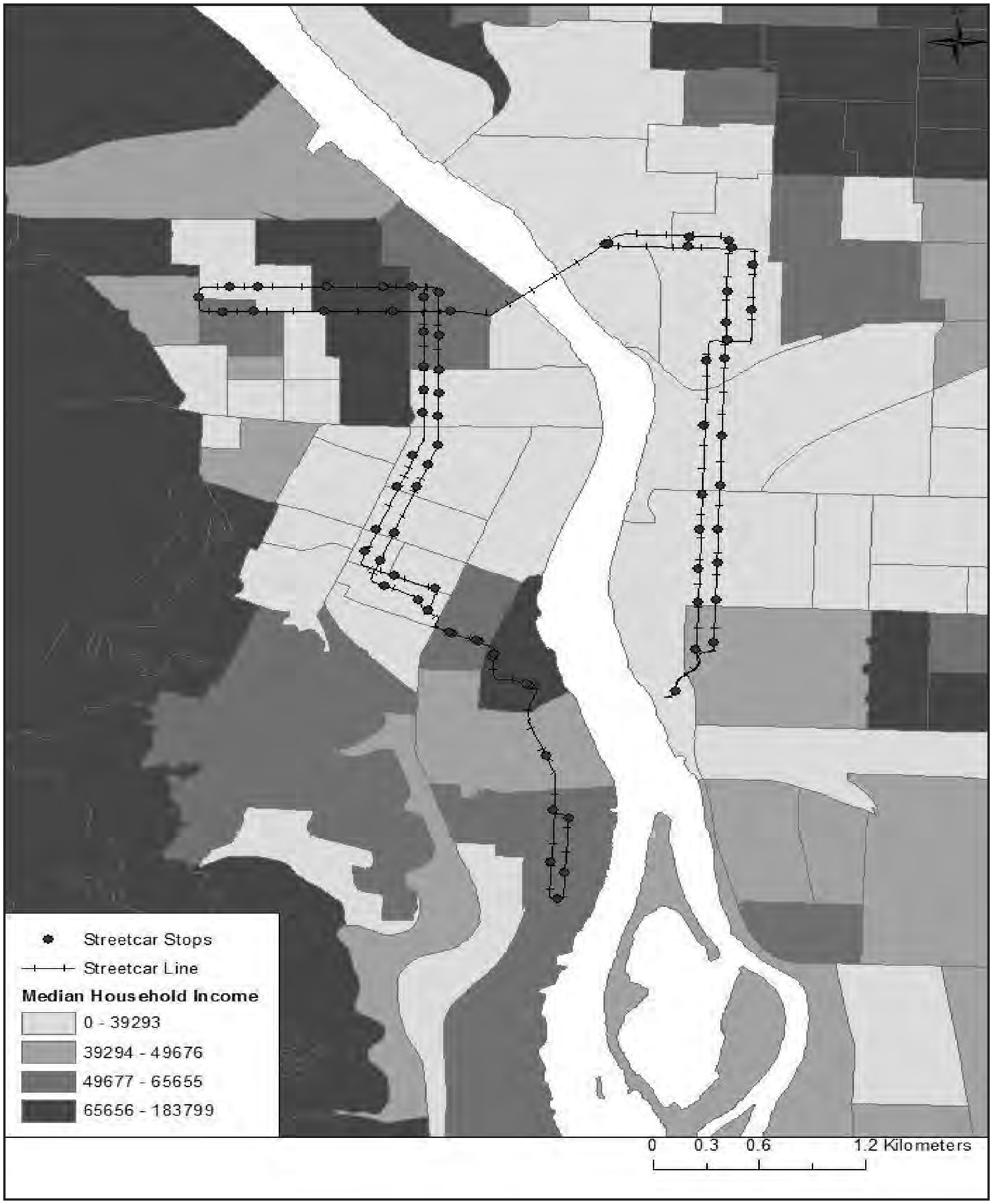

Figure 98. Median Household Income by Block Group in Core of Portland (2010)[271]

A general correspondence tends to appear between the spatial distribution of household income and that of vehicle access, with lower income block groups generally tending to have lower levels of vehicle access per housing unit. Indeed, the outer areas and western areas, with higher household incomes, tend to have higher levels of vehicle access (Figures 99 and 100). The downtown areas around the streetcar lines are almost entirely in the lowest category on vehicles per housing unit, which suggests they are promising locations from which to attract transit users.

Figure 99. Vehicles per Housing Unit by Block Group in Portland (2010)[272]

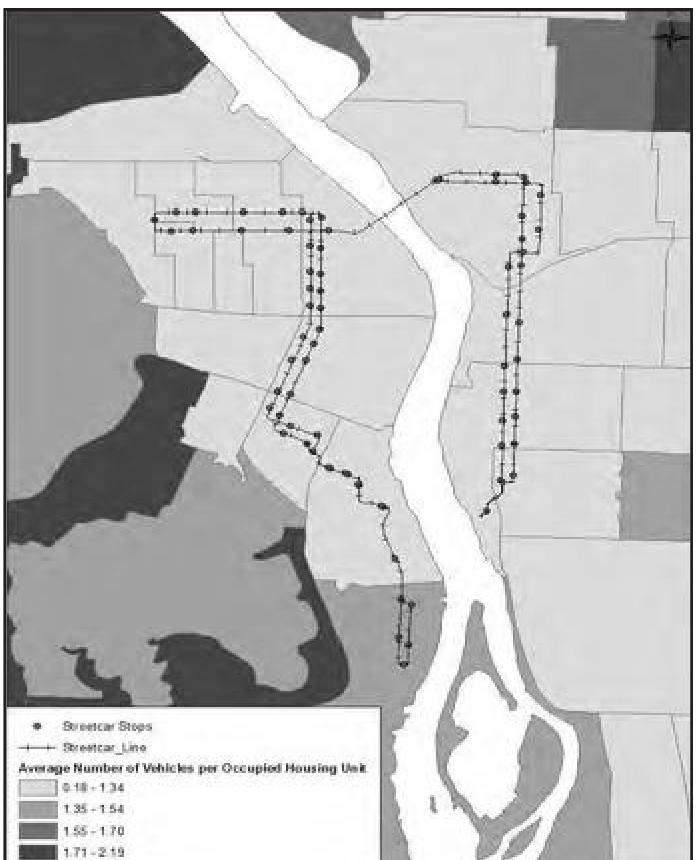

Figure 100. Vehicles per Housing Unit by Block Group in Core of Portland (2010)[273]

The final set of socioeconomic maps depicts the spatial pattern of transit commute mode share by block group in Portland (Figures 101 and 102). The maps indicate that the transit share is highest in the core areas, including in the area served by the streetcar line, and in scattered locations elsewhere in the city. It should be emphasized that the mode share reflects use of any transit mode for commuting only, and it is not clear whether trips are being made by bus or one of the rail modes, including streetcar. Nevertheless, it is apparent from this map that many residents in different parts of the city are taking advantage of the well-regarded local transit system to serve their work trips, and undoubtedly to serve other types of trips also. The authors focus on ridership patterns in much more detail later in the profile section.

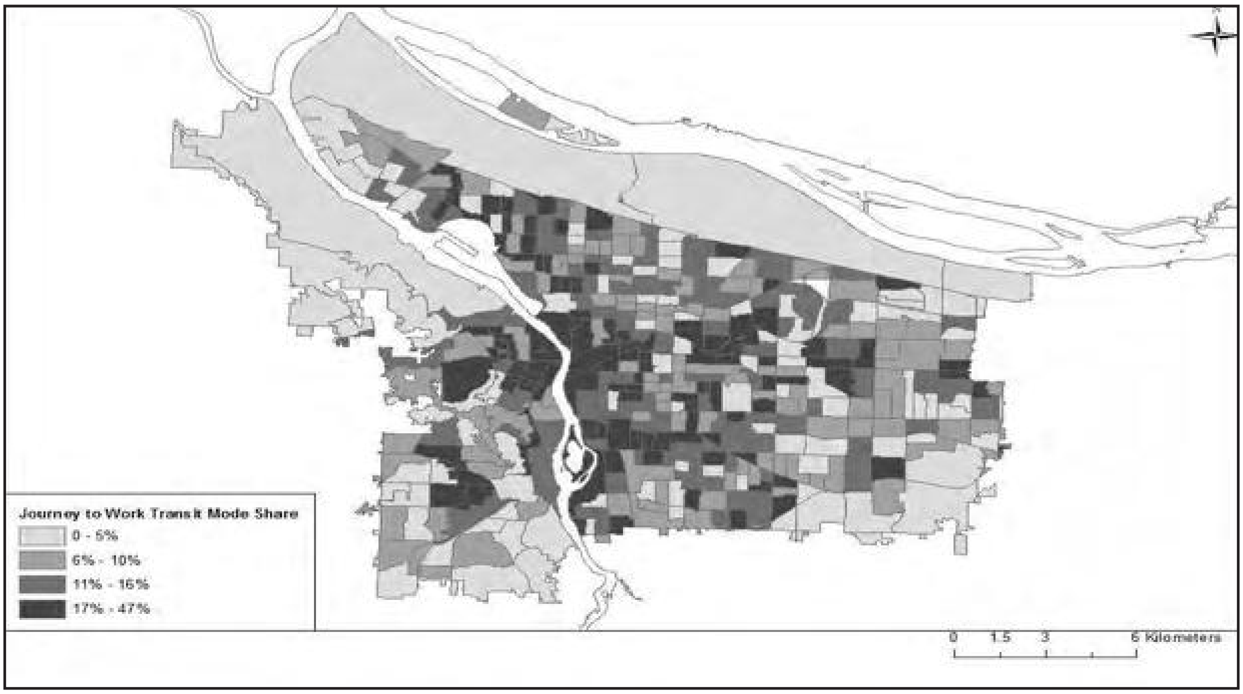

Figure 101. Transit Commute Share by Block Group in Portland (2010)[274]

Figure 102. Transit Commute Share by Bock Group in Core of Portland (2010)[275]

Summarizing across the set of socioeconomic maps, Portland's downtown areas, and particularly those on the west side of the Willamette River, emerge as promising locations to produce and attract transit trips. Population and employment are present in large numbers. Household incomes and/or levels of vehicle access tend to be lower than elsewhere in the city. The area is well served by the entire multi-modal transit system consisting of bus, light rail, and streetcar, and there are relatively high transit commute shares as a result. It is perhaps not surprising then that Portland emerges as by far the most successful modern-era streetcar system when assessed on purely ridership and other transit performance measures. In addition, the city is well known for its transit-supportive land use and development policies. The authors briefly describe the local land use and development context for the streetcar lines in the section that follows.

LAND DEVELOPMENT CONTEXT FOR STREETCAR SERVICE

Portland is well known for its transit-supportive land use policies, and one would suspect the area in which the streetcar operates to be zoned in such a way as to support transit use. As shown in Figure 103, the downtown core features a mixture of uses, but it is primarily commercial and employment in its land use designation. The employment density maps shown earlier suggest that high intensity developments are located within these land use categories, but with a notable difference in density between the west and east sides of the Willamette River where the NS Line and the CL Line operate, respectively. The west side of the river, Portland's downtown and adjacent areas, exhibits much higher employment and population densities than the east side of the river. This pattern is also visible in the higher average stop-level boarding counts for stops on the west side of the river.

All of this indicates that the downtown area on the west side of the river is already a major trip destination for transit and other trips, whether by residents or community visitors, and the east side is an area that might become a major center for trip attraction if higher-intensity employment and residential development were to occur. The downtown is also a heavily built-up area, as shown in Figure 104. This map depicts the streetcar alignment and stops against the building footprint. Also depicted on this map are special activity centers such as universities, museums, hospitals, libraries, transit centers, and other important destinations likely to attract disproportionate numbers of trips by all modes. Many of these kinds of locations are either along the NS Line or easily accessible via a short walk or connecting bus ride. Figure 105 indicates that many such uses are located along the NS Line near stops with large numbers of daily boardings. The presence of hospitals and educational centers in promoting higher boarding is particularly salient in Portland's streetcar system.

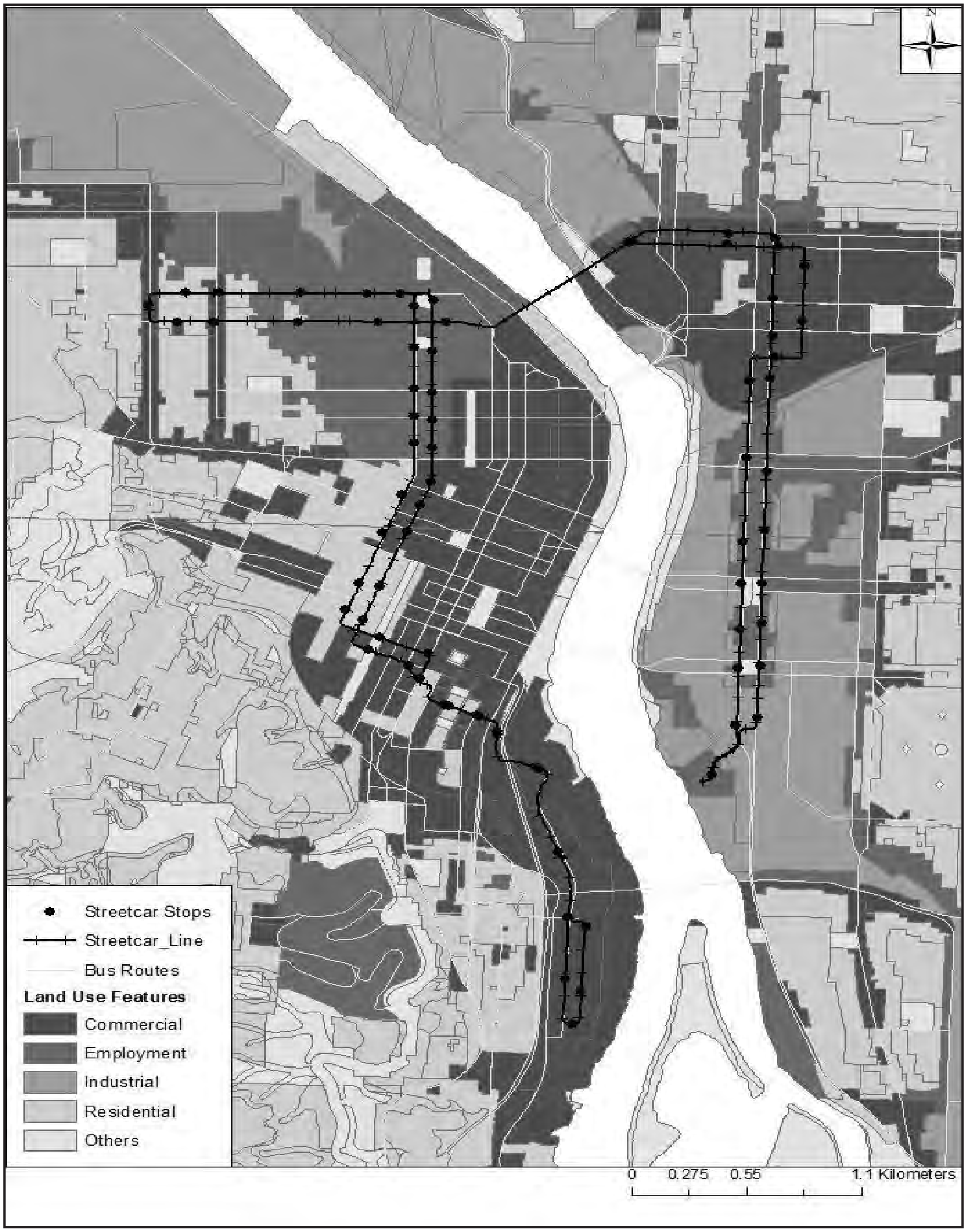

Figure 103. Zoning Around Streetcar in Portland[276]

On the other hand, the areas around the CL Line have fewer special activity centers, and the streetcar stops register lower boarding levels. Employment and residential land-use intensity is also much lower on the east side of the river than on the west side, a characteristic that reduces the relative potential for trip generation and attraction along the CL Line. However, the lower ridership level on this line may also be a result of fact that the CL Line only opened in 2012, while the older NS Line has been in operation since 2001.

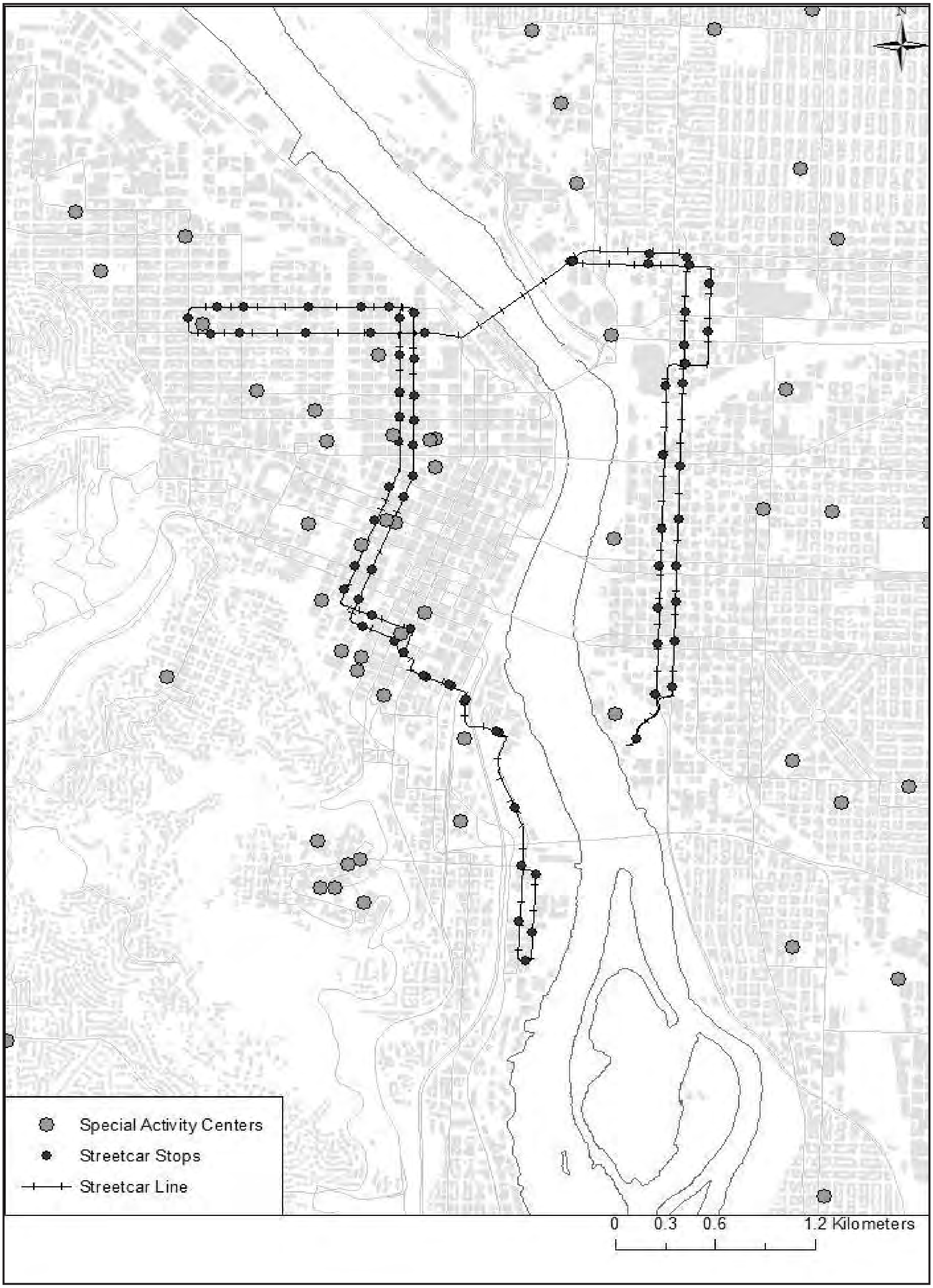

Figure 104. Special Activity Centers Around Streetcar in Portland[277]

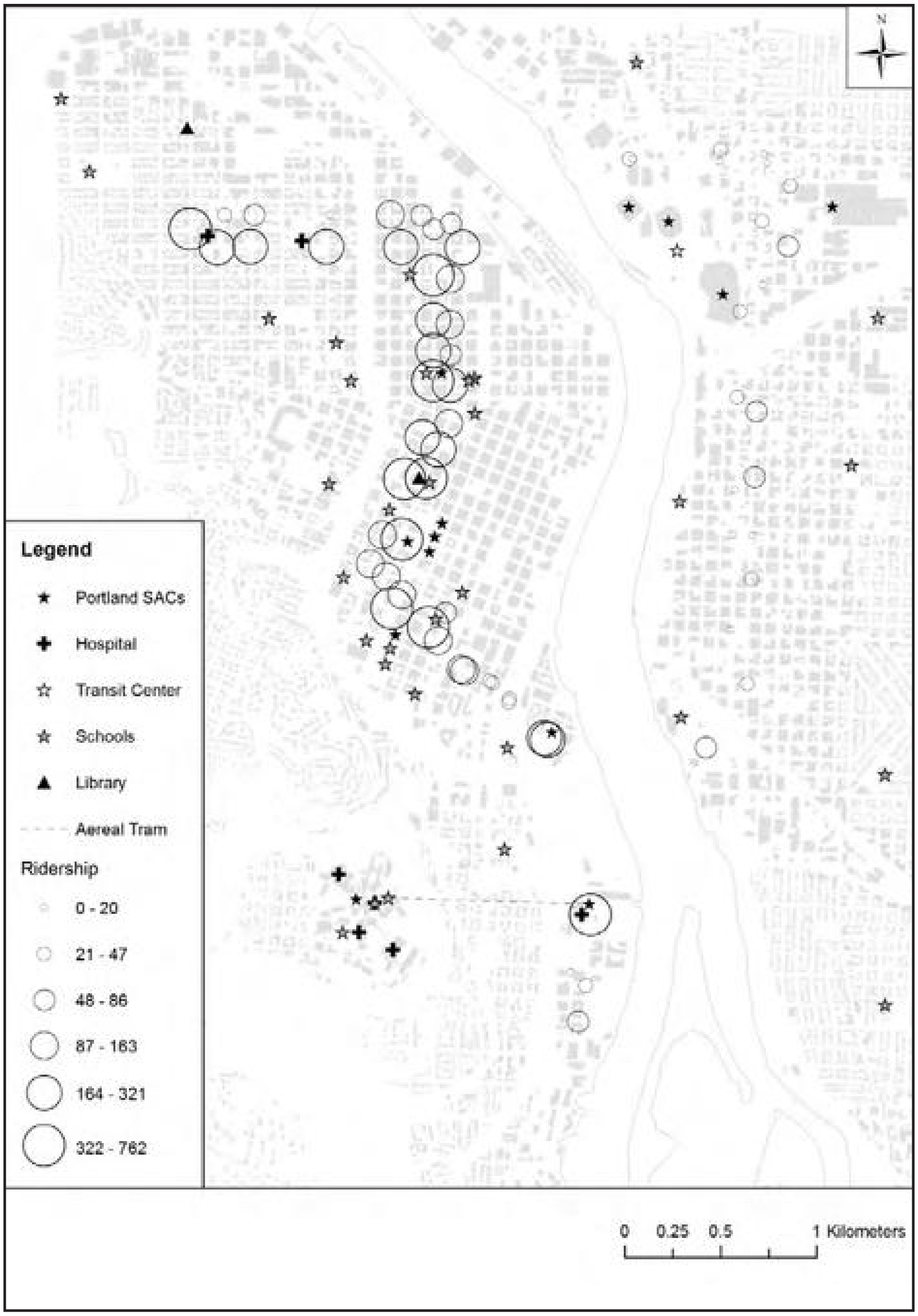

Figure 105. Special Activity Centers and Streetcar Boardings in Portland (2012)[278]

Portland's streetcar system traverses a set of diverse urban landscapes characterized by traditional orthogonal street networks but with distinct land-use compositions, development intensities, functions, and building typologies. Figure 106 reports the location and building footprint of the eight neighborhoods within which the streetcar lines operate: Northwest District, Pearl District, Old Town, Downtown Portland, PSU (Portland State University), Lloyd District, Central Eastside Industrial District, and South Waterfront. The Northwest District and Central Eastside Industrial District are the two neighborhoods in which the total built area appears to be smaller when compared with the other districts. Mid-rise and low-rise structures primarily populate these districts, and the average block sizes within a 400-meter [one quarter mile] radius of streetcar stops are 2.58 acres [1.04 hectares] in Northwest district and 1.42 acres [0.57 hectares] in Central Eastside Industrial District. Another difference between these two districts is the combined population plus employment densities, which are much higher in the Northwest district than in the other district.

These differences in density reflect the different functions these areas perform within the overall metropolitan structure and their different histories, in which the Northwest accommodates a significant number of residents and employment along the streetcar corridor, and the Central Eastside Industrial District historically accommodates more light-industrial activities and less resident population. According to the regional transit planner informant, this latter district, however, has been targeted by the city administration to accommodate more mixed-use developments. As part of a comprehensive Complete Streets program in Portland, both areas are provided sidewalks and pedestrian facilities. In part as a result of these key land-use and development-intensity differences, total stop-level boardings in the Northwest district are substantially higher than those in the Central Eastside Industrial district.

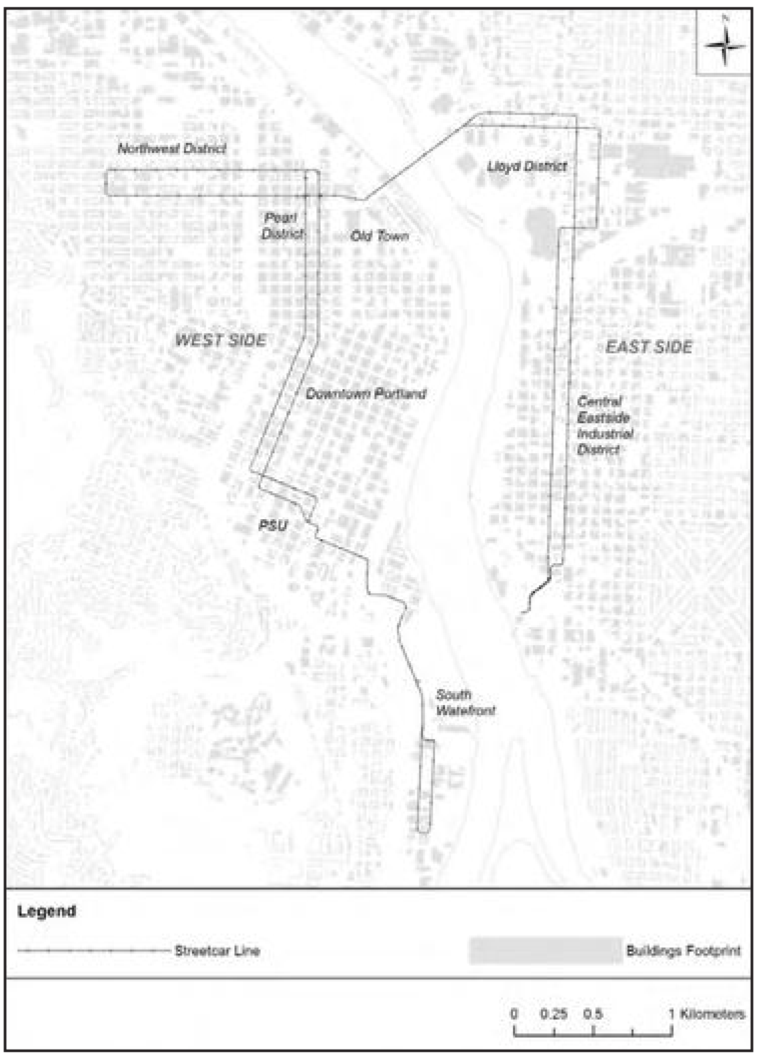

Figure 106. Neighborhoods Around Portland's Streetcar Corridors[279]

The Lloyd District is the most heterogeneous area when compared with the other seven neighborhoods. A variety of activities are in the area, along with a notable presence of large assembly building typologies including the Oregon Convention Center, the Mode Center (home of the Portland Trail Blazers), and the Veterans Memorial Coliseum. In contrast with the other neighborhoods that compose the streetcar service area in Portland, a notable number of parcels in the Lloyd District are vacant and/or presently used as parking facilities for local businesses and some high-rise office buildings. Combined employment plus population densities register low values as compared with other neighborhoods served by the streetcar, and the average block size in areas surrounding streetcar stops is 2.17 acres [0.88 hectares], which is in the medium range of values for all the neighborhoods. Despite the presence of several large assembly occupancy buildings, stop-level boarding counts in this district are low, probably reflecting the low population and employment densities and the ample supply of parking throughout the district.

The Downtown Portland district represents one of the highest intensity areas populated by high-rise office buildings and a diversity of cultural, retail, and institutional destinations. It reports a relatively high combined population plus employment density and the lowest average block size value among all the neighborhoods. Stop-level ridership is high when compared with the CL Line corridor but within the medium-high range for the NS Line.

In addition to the Northwest district, the PSU (Portland State University) district and the Pearl district report the highest combined average population plus employment density among the different neighborhoods and very similar average block size. However, they perform distinct functions within the larger city structure. PSU is eminently an educational and cultural complex with a significant number of residents, students, and faculty. The Pearl district is a relatively recent development from the 1990s that grew together with the first NS streetcar line and is characterized by mixed-use and high-rise condominiums. These land-use and development intensity characteristics are considered conducive for transit patronage. These two areas also report high stop-level boardings when compared with the CL Line and other modern-era streetcar systems in the U.S.

The South Waterfront district is a new mixed-use high-rise development on the edge of the Willamette River and somewhat geographically detached from the other districts. It is located in a relatively narrow strip of land between the Willamette River and Highway 5. Despite the presence of some high-rise investments, it currently reports a low combined average population plus employment density and the largest average block size. As this district is currently undergoing redevelopment, and significant portions are still underdeveloped, this area can be considered in a transitional stage in which higher densities could be expected in the future. As such, it currently reports some of the lowest stop-level ridership counts on the NS Line, with the exception of the South Aerial Tram Station, which links to the nearby Oregon Health Sciences University (OHSU) complex. Interestingly, this station reports the highest boarding of all NS Line stops (762), undoubtedly due to significant transfer activity between the streetcar and the aerial tram.

In summary, the locations served by the streetcar lines are diverse in terms of their land uses, development levels, roles they play in the city, and even to an extent their socioeconomic characteristics and demographics. However, those areas located on the west side of the

Willamette River tend to possess many of the attributes traditionally associated with higher transit use, and the stop-level boarding counts are undoubtedly higher in these areas as a result. The authors consider streetcar ridership and performance in more detail later in the narrative.

HISTORIC BACKGROUND ON STREETCAR DEVELOPMENT

Portland's first streetcar line was a horse-powered system that began operating down First Avenue in 1872. The two-mile line was built and operated by the Portland Street Railway Company founded by Ben Holladay. The streetcar quickly became a popular transportation service in the area, and by 1888, Holladay had expanded his line, and at least four other companies began operating their own lines. This expansion of the horse-powered Portland streetcar system was quite strenuous on the horses that drew the streetcars, and quite expensive as well. As a result, Willamette Bridge Railway began operating the first electric streetcar in 1889. In 1890, the Portland Cable Railway Company introduced its first steam-powered cable car system.[280]

As the streetcar system continued to evolve and expand because of the increased capabilities of the new electric streetcar technology, many Portland suburbs, such as Council Crest, Hawthorne, and Irvington, began to rapidly develop along the lines outside of the city center. During the start of the 1890s, many struggling streetcar companies began mergers that resulted in the Portland Consolidated Street Railway Company, the largest western streetcar company at the time. In 1893, the "first interurban railway" was developed between Oregon City and Portland.[281]

By the early 1900s, the majority of streetcar lines had been converted to electric overhead systems. Most of the larger streetcar companies struggled financially due to their heavy debt burdens. This led to several buyouts and a final consolidation of the systems under the Portland Railway, Light and Power Company.[282]

Between 1906 and 1920, Portland Railway, Light and Power Company "operated 40 lines over 300 miles [482.80 kilometers] of track with 583 streetcars."[283] Although ridership levels were high and many streetcar improvements and investments occurred, streetcar line expansion soon stopped almost entirely. After World War I, there were few changes to the lines, and by the start of the Great Depression, the streetcar had begun to give way to the bus and personal automobile. The last Portland streetcar to begin operation was purchased in 1932. Despite a brief comeback of streetcar transit caused by World War II gasoline rationing, many streetcar lines were converted to bus routes, and the cars themselves were used for scrap metal. The last intra-city electric streetcar operation was shut down in 1950, and the last interurban streetcar service was halted in 1958. At this time, the Oregon Electric Railway Historical Society was organized and commissioned to preserve the handful of remaining streetcars and their history.[284]

It was almost 30 years before electric rail ran through Portland again, but this time it was in the form of a regional light-rail system called MAX (Metropolitan Area Express) that made stops throughout downtown Portland. At the same time, in 1987, Vintage Trolley Inc. was established to pursue the development of a vintage streetcar system. In 1991, Vintage

Trolley succeeded in its mission and began providing a privately-funded heritage streetcar service from downtown Portland to the Lloyd Center shopping mall on the east side of the Willamette River. The system utilized pre-existing MAX tracks and operated four Council Crest replica trolleys that ran on weekends, holidays, and special event days. The Oregon Electric Railway Historical Society started operating a tourist-oriented Willamette Shore Trolley service running down the old Jefferson Street Line to Lake Oswego. At about this time, the City of Portland began discussing plans to develop a new, more modern downtown streetcar line.[285]

The idea for a new modern streetcar was first introduced in Portland's 1988 Central City Plan.[286] The streetcar was originally planned to help bring development to the downtown area, which expected to see significant population growth in the next half-century.[287] Also, with increasing population densities and housing development in the downtown area, there was a need for more transportation options that did not require use of the automobile.[288] In 1990 city officials started a Streetcar Feasibility Study and created the Streetcar Citizens Advisory Committee.[289] However, progress was slow on these efforts. At the beginning of 1994, in the midst of further light-rail system development, Portland City Council and city planners began preliminary engineering and data gathering for the streetcar project that they believed "could [pull] together inner-city neighborhoods and [foster] new business and housing development along its way."[290]

More than a year later, in April 1995, the city finally called for design bids for a line that ran from Northwest Portland, through downtown, to Portland State University (PSU). Estimated construction costs were approximately $30 million, and the goal for completion was in September 1997.[291] Unfortunately investors and developers weren't confident in the city's backing of the service, and the city received only one incomplete bid. It wasn't until July 1996 that funding for the streetcar was again considered. The city of Portland and Tri-Met, the Portland metro area's mass transit provider, included a $6 million request along with its light-rail appropriations request to the U.S. Congress.[292]

It was a at a U.S. Senate meeting in July 1996 that streetcar development took off when $6 million in funding was approved. By August, preliminary engineering for a 2.1-mile [3.38 kilometer] line was completed, and Portland Streetcar, Inc. had developed a plan to fund the estimated $42 million project through a mix of private investment, local funds, and federal grants.[293] At year's end, the streetcar project made another stride forward when the City Council agreed to re-allocate $5 million of Federal Transit Administration (FTA) funds to Tri-Met for what was to be called the Central City Streetcar.[294] As momentum was picking up, Portland City Commissioner Charlie Hales proposed a more expanded streetcar system that would consist of six streetcar lines. However, this idea was considered too ambitious, and it was shelved until the original line's issues, such as lack of operating funds, were addressed.[295]

On July 30, 1997, Portland City Council approved the use of a $5 million grant and another $1 million from city parking facility reserves to pay for further engineering of the newly-dubbed Portland Streetcar. The Council was persuaded by a presentation that suggested the streetcar was cheaper and easier to build than light rail.[296] Nearly a year later, the City Council convened again to consider streetcar issues, this time approving the proposed 2.4-mile [3.86 kilometer] design and budget plan of the Portland Streetcar. Included in this plan was a property tax increase for property owners along the line route and issuance of $27 million in city bonds, along with several other minor fundraising activities and the previously mentioned financing options.[297] Furthermore, Tri-Met agreed to cover the estimated $1.6 million of annual operating costs.[298] Although the Portland Streetcar had attracted significant support, there was still some opposition to streetcar development. This resistance stemmed from the proposed increases in parking fees and suspected parking troubles in general, as well as from property owners located in the new taxing district.[299]

By September 1998, Portland awarded contracts to M.F Wirth Rail Corp for the tracks and Stacy & Witbeck for construction.[300] By the beginning of 1999, a streetcar manufacturer was selected from the Czech Republic to provide five streetcars for a total of $12 million.[301] Crews began groundbreaking on April 5, 1999 and construction in May.[302] While construction was underway, plans for expanding the line were already being discussed. Some of the proposed expansions included bus and light-rail connections and an extension of one-and-a-half miles of track from PSU.[303] Ideas to connect the Portland Streetcar to the Willamette Shore Trolley were also presented.[304] By August 2000, nearly 90 percent of the streetcar track construction and utility relocation was completed. A maintenance facility, which had minor connectivity issues, was also coming close to completion. Construction was pegged to finish in May 2001, and opening date was set for July 20.[305]

The Portland Streetcar ran into only minor issues during its construction period. Some of these issues included Tri-Met contract disputes for providing service, the ordering of two more streetcars, complications at MAX line crossings, and a dispute with consultants over released information.[306] On April 5, 2001, the first streetcar, sponsored by PSU, arrived in Portland.[307] Throughout May and June, the remaining four streetcars arrived, and testing/training ensued. On July 20, 2001, Portland Streetcar service between Legacy Good Samaritan Hospital and PSU began.[308]

Over the next decade, the Portland Streetcar system experienced four major expansions. The first two extension projects had been proposed back in December 1999, more than a year before the original line was complete.[309] The plans originated from the desire of the city to connect the streetcar to Portland's waterfront and spur development in the area along the Willamette River.[310] After receiving little federal aid for either project, the City Council approved the use of $15.6 million in local funds for the first expansion.[311] Construction on the 0.6-mile [0.97 kilometer] extension, which ran from PSU southeast to the neighborhood of Riverplace, began January 2004.[312] On March 11, 2005, the line extension opened for service.[313]

The second streetcar line expansion continued on from Riverplace south to South Waterfront and an urban renewal district (North Macadam), where it could potentially service Oregon Health and Science University via an aerial tram. This projected $15.5 million plan utilizing old right-of-way was approved in August 2004.[314] As with the first extension, local funds were used with nearly one-third of them coming from Portland Metro's Metropolitan Transportation Improvement Program.[315]

Track construction began early in 2005 and was completed by August. However, the new streetcars' arrival had been delayed, pushing back opening day to October 20, 2006.[316] Plans for the next extension, that would bring the streetcar line to the southern part of the South Waterfront District, were approved by the City Council in July 2006. Council members hoped the streetcar would encourage redevelopment as it had been perceived to have done in previous projects. Half of the funding for the $14.5 million loop extension was to come from property owners and a state grant.[317] Construction on what was being called the Lowell Extension started a month after the City Council vote and was completed in December 2006.[318] A year after construction began, in August of 2007, the extension became an operating part of the streetcar line.

Lobbying for the biggest of the four Portland Streetcar extensions, which would cross the Willamette and serve the eastside area, had been going on since at least 2000. The first prospective plans for the loop were presented in June 2003 and included estimated costs of upwards of $100 million. The plan called for a streetcar bridge crossing from Northwest Portland to the Lloyd District, track running south through the Central Eastside Industrial District to the Oregon Museum of Science and Industry, and another crossing over another bridge where it would connect to the original line near South Waterfront.[319] The 3.3 mile project was expected to calm traffic, make streets safer, and entice development in the area.[320] Funding for the extension, unlike the previous ones, was to use a mix of federal and local funding- with local funds coming from "property owners on the route, state lottery proceeds and urban renewal money."[321] Another main funding source was expected to be a grant from the Federal Transit Administration's (FTA) Small Starts program.[322]

In October 2009, two months after the official ground-breaking, the Portland Streetcar Loop Project, estimated to cost $150 million, received a pre-approved grant of $75 million from the FTA.[323] Track work began at the start of 2010.[324] As construction moved along, problems regarding the streetcars themselves arose. Part of the grant agreement required the streetcars be made locally, and new streetcar manufacturer Oregon Iron Works was having difficulty engineering the propulsion system. As a result, date of completion for the streetcar was set back to late 2012, and the number of streetcars was reduced to five.[325] Although the track was mostly completed at the end of 2011, it wasn't until September 22, 2012 that the Portland Streetcar Central Loop Line began operating.

The track extensions were not the not the only major changes to the Portland Streetcar system; the fare system also went through a significant transformation. Prior to September 2012, most rides on the streetcar were free, and there was minimal monitoring to ensure tickets were purchased when necessary. Originally, Tri-Met, with Portland Streetcar piggy-backing, had utilized a "Free Rail Zone" in which riders did not have to pay a fare for either the MAX or Portland Streetcar while riding in this area.[326] Considering the vast majority of streetcar rides happened within this zone, only $179,000 in fare revenue was being generated, with most revenue coming from riders traveling from just outside the northwest part of the zone who had to purchase $2.10 all day streetcar passes. A 2011 proposal to end the fare-free zone and begin charging an additional smaller fare instead had faced resistance from several parties including the Downtown Neighborhood Association and PSU.[327]

However, in June 2012, Tri-Met officially ended the Free Rail Zone.[328] And by September, Portland Streetcar followed suit and also began charging what was known as a streetcar circulator fare. Although customers could still buy the all day passes, which were also valid for two hours on other Tri-Met transit systems, this new $1 fare would be valid for two hours on the streetcar with no transfer included. This fare was targeted to riders traveling within the old Free Rail Zone who did not wish to purchase the more expensive day pass. Annual streetcar-only passes were raised from $100 to $250 as well. The revenues from this fare increase were estimated to bring in nearly $1 million annually and help reduce budget deficits.[329] Subsequently, a slew of new ticket machines were set up at streetcar stations to make it easier for riders to buy tickets, as opposed to buying them upon entering the streetcar as before. To appease constituents at PSU who felt the fare would not be affordable for some riders, Portland Streetcar agreed to a five-year contract that would allow students and faculty to ride the streetcar for free in exchange for a monetary sponsorship.[330]

STREETCAR RIDERSHIP AND PERFORMANCE

Among the modern-era streetcar systems in the U.S., the Portland streetcar system is by far the most successful transit investment, as the authors discuss in the sections that follow. The authors first examined ridership trends in Portland at the modal level on an annual basis from the opening of the first line in 2001 through 2012, the primary year of analysis in this study. All the data are presented here with the caution that prior to 2011, streetcar data were combined with light rail data for National Transit Database reporting purposes. Therefore, it is more difficult to identify longer-term trends for many measures for Portland than for the other cases in which there was no light rail operation in existence, and Portland's light rail data pre-2011 actually reflect streetcar statistics.

Table 44 reports the annual ridership data for Portland for streetcar, light rail, bus, and the total fixed-route services operated by Tri-Met. Ridership data are reported, when available, on an unlinked passenger trip (boardings) and passenger miles basis. The table reports that streetcar ridership has increased steadily, as has light rail ridership, while bus ridership has fallen. Streetcar ridership accounts for about three percent of Tri-Met boardings versus more than 40 percent for light rail, and the remainder for bus. Dividing the passenger miles column by the unlinked passenger trips column results in an average trip length of a little over one mile for streetcar riders, which indicates the system's function as a downtown circulator. By contrast, the average bus trip is just under four miles and the average light rail trip just over five miles.

Table 44. Annual Ridership by Mode in Portland (2001-2012)[331]

	Unlinked Passenger Trips				Unlinked Passenger Miles			
Year	Streetcar	Bus	Light Rail	Total	Streetcar	Bus	Light Rail	Total
2001		65,427,872	24,976,610	90,404,482	not available	216,054,689	144,023,605	360,078,294
2002	1,467,228	71,120,321	28,253,547	100,841,096	not available	239,044,998	167,554,612	406,599,610
2003	1,787,202	66,434,912	31,149,038	99,371,152	not available	237,345,046	169,571,618	406,916,664
2004	1,935,653	65,938,456	31,516,208	99,390,317	not available	241,598,358	181,760,354	423,358,712
2005	2,517,310	68,764,832	34,755,147	106,307,289	not available	245,065,287	178,499,147	423,564,434
2006	2,733,856	65,933,541	34,591,510	34,591,510	not available	247,565,590	179,875,394	427,440,984
2007	3,375,699	63,430,058	36,123,810	102,929,567	not available	223,265,805	186,540,535	409,806,340
2008	3,880,079	64,114,973	38,931,646	106,926,698	not available	222,676,178	193,574,421	416,250,599
2009	3,785,553	68,033,035	39,306,691	111,125,279	not available	252,790,287	206,106,550	458,896,837
2010	3,950,860	60,508,249	42,452,640	106,911,749	not available	231,580,852	208,779,167	440,360,019
2011	3,788,400	58,248,403	41,172,344	103,209,147	3,652,854	219,728,219	215,384,677	438,765,750
2012	3,664,538	59,509,235	42,227,665	105,401,438	3,732,743	233,601,992	223,788,159	461,122,894

Ridership does not exhibit any strong seasonal pattern (Table 45). Monthly unlinked passenger trips data for all modes seem to follow a generally consistent pattern, with weather and perhaps differences in the number of days in a month responsible for much of the variation from one month to another.

Table 45. Monthly Unlinked Passenger Trips by Mode in Portland (2012)[332]

	Unlinked Passenger Trips			
Month	**Streetcar**	**Bus**	**Light Rail**	**Total**
January	275,340	4,993,600	3,258,900	8,527,840
February	264,540	4,956,600	3,266,400	8,487,540
March	334,810	5,113,200	3,502,200	8,950,210
April	318,980	5,202,300	3,579,100	9,100,380
May	330,530	5,392,600	3,753,000	9,476,130
June	308,650	4,943,000	3,605,480	8,857,130
July	312,300	4,847,900	3,721,500	8,881,700
August	320,100	4,947,200	3,720,100	8,987,400
September	315,680	4,796,200	3,188,400	8,300,280
October	338,040	5,570,600	3,457,600	9,366,240
November	322,000	4,983,700	3,016,600	8,322,300
December	294,750	4,636,200	2,805,700	7,736,650

Annual service statistics for vehicle revenue miles and vehicle revenue hours are reported in Table 46. Streetcar statistics are available only from 2008, as prior to that time they were folded into the light rail statistics. Looking at streetcar service from 2008 to 2012, one notes the decline in service in 2010 and the increase in service in the two years since then. While streetcar service increased during this time, service on light rail and bus declined. One can divide vehicle revenue miles by vehicle revenue hours to calculate average modal speed. For 2012, the resulting values are 5.7 miles [9.17 kilometers] per hour (streetcar), 11.8 miles [18.99 kilometers] per hour (bus), and 14.6 miles [23.50 kilometers] per hour (light rail). The slower streetcar speeds are the result of its downtown location and predominantly mixed-traffic operating environment.

Table 46. Annual Service Characteristics by Mode in Portland (2001-2012)[333]

	Vehicle Revenue Miles				Vehicle Revenue Hours			
Year	Streetcar	Bus	Light Rail	Total	Streetcar	Bus	Light Rail	Total
2001	not available	22,957,607	5,051,406	28,009,013	not available	1,856,166	286,115	2,142,281
2002	not available	23,576,663	5,664,277	29,240,940	not available	1,879,205	337,073	2,216,278
2003	not available	23,776,175	5,823,757	29,599,932	not available	1,882,890	351,764	2,234,654
2004	not available	24,013,628	6,023,056	30,036,684	not available	1,887,608	356,708	2,244,316
2005	not available	23,980,719	6,671,716	30,652,435	not available	1,873,568	415,713	2,289,281
2006	not available	23,137,816	6,377,513	29,515,329	not available	1,800,848	408,715	2,209,563
2007	not available	22,535,520	6,564,411	29,099,931	not available	1,830,709	428,990	2,259,699
2008	216,308	22,518,199	6,658,955	29,393,462	38,047	1,843,670	416,565	2,298,282
2009	210,362	22,669,862	7,111,025	29,991,249	37,001	1,878,880	453,871	2,369,752
2010	173,714	21,187,725	7,971,861	29,333,300	30,555	1,778,961	535,728	2,345,244
2011	199,075	19,396,640	7,808,150	27,403,865	35,241	1,636,603	533,157	2,205,001
2012	209,283	19,169,232	7,744,290	27,122,805	36,739	1,625,650	529,180	2,191,569

Annual operating expenses by mode are reported in Table 47. Looking at the inflation-adjusted dollars columns, one sees steady increases in operating costs that appear to be a function of increased service, in some cases, increasing unit costs, and the opening of the newer CL line in Portland. In 2012, the primary focus of the authors' inquiry, streetcar accounted for about 3.5 percent of total transit operating expenses in the community.

Table 47. Annual Operating Expense by Mode in Portland (2001-2012)[334]

	Streetcar		Bus		Light Rail		Total	
Year	**Unadjusted $**	**2012 $**	**Unadjusted $**	**2012 $**	**Unadjusted $**	**2012 $**	**Unadjusted $**	**2012 $**
2001	not available	not available	$153,860,151	$199,470,868	$40,035,484	$30,881,029	$193,895,635	$251,374,578
2002	not available	not available	$170,037,154	$217,012,399	$56,257,767	$44,080,019	$226,294,921	$288,812,195
2003	not available	not available	$171,402,358	$213,880,334	$55,295,890	$44,313,779	$226,698,248	$282,879,988
2004	not available	not available	$183,577,437	$223,130,649	$56,965,750	$46,867,727	$240,543,187	$292,370,120
2005	not available	not available	$200,999,113	$236,300,032	$67,590,404	$57,493,057	$268,589,517	$315,761,153
2006	not available	not available	$203,266,221	$231,497,641	$69,990,063	$61,454,689	$273,256,284	$311,208,543
2007	not available	not available	$207,701,265	$230,044,431	$73,656,174	$66,502,286	$281,357,439	$311,624,062
2008	not available	not available	$223,177,624	$237,997,531	$84,120,139	$78,882,048	$307,297,763	$327,703,592
2009	not available	not available	$230,412,162	$246,589,784	$96,777,187	$90,428,081	$327,189,349	$350,161,858
2010	not available	not available	$239,080,000	$251,737,022	$106,374,746	$101,026,357	$345,454,746	$363,743,303
2011	$7,695,125	$7,854,577	$222,887,559	$227,506,051	$93,399,347	$91,503,291	$323,982,031	$330,695,319
2012	$11,868,085	$11,868,085	$230,726,059	$230,726,059	$99,710,015	$99,710,015	$342,304,159	$342,304,159

Note: Prior to 2011, streetcar expense data were reported as part of light rail data.

The authors combined the ridership, service, and operating expense data to develop two measures of service performance: cost effectiveness and service productivity. Both measures are reported on an annual modal-basis in Table 48, with the caution that prior to 2011 streetcar and light rail statistics for many of the input measures are combined, making the ratios unavailable for streetcar. In the most recent years, both streetcar and light rail have become less cost effective and bus slightly more cost effective. With respect to service productivity, light rail and bus have improved in recent years, while streetcar has deteriorated, perhaps as a result of the recent line expansion in 2012.

Table 48. Service Performance by Mode in Portland (2001-2012)

	Cost Effectiveness (Operating Expense per Passenger Trip, 2012$)			Service Productivity (Passenger Miles per Vehicle Mile)		
Year	**Streetcar**	**Bus**	**Light Rail**	**Streetcar**	**Bus**	**Light Rail**
2001	not available	$3.05	$1.60	not available	9.41	28.51
2002	not available	$3.05	$1.99	not available	10.14	29.58
2003	not available	$3.22	$1.78	not available	9.98	29.12
2004	not available	$3.38	$1.81	not available	10.06	30.18
2005	not available	$3.44	$1.94	not available	10.22	26.75
2006	not available	$3.51	$2.02	not available	10.70	28.20
2007	not available	$3.63	$2.04	not available	9.91	28.42
2008	not available	$3.71	$2.16	not available	9.89	29.07
2009	not available	$3.62	$2.46	not available	11.15	28.98
2010	not available	$4.16	$2.51	not available	10.93	26.19
2011	$2.07	$3.91	$2.27	18.35	11.33	27.58
2012	$3.24	$3.88	$2.36	17.84	12.19	28.90

Notes: Prior to 2011, streetcar expense data were reported as part of light rail data.Values calculated from Tables C-5, C-7, and C-8.

Tables 49 and 50 compile the streetcar-only mode-level statistics on an annual basis for 2001-2012 and on a monthly basis for 2012 only, respectively. As noted earlier, Portland's streetcar ridership is much higher, certainly on an unlinked passenger trip basis, than any of the other cities.

Table 49. Summary of Streetcar Ridership, Service, and Performance by Year in Portland (2001-2012)[335]

Year	Unlinked Passenger Trips	Passenger Miles	Vehicle Revenue Miles	Vehicle Revenue Hours
2001	not available	not available	not available	not available
2002	1,467,228	not available	not available	not available
2003	1,787,202	not available	not available	not available
2004	1,935,653	not available	not available	not available
2005	2,517,310	not available	not available	not available
2006	2,733,856	not available	not available	not available
2007	3,375,699	not available	not available	not available

Year	Unlinked Passenger Trips	Passenger Miles	Vehicle Revenue Miles	Vehicle Revenue Hours
2008	3,880,079	not available	not available	not available
2009	3,785,553	not available	not available	not available
2010	3,950,860	not available	not available	not available
2011	3,788,400	3,652,854	199,075	35,241
2012	3,664,538	3,732,743	209,283	36,739
Year	**Productivity (PM/VM)**	**Cost Effectiveness (2012$)**	**Speed (VRM/VRH)**	**Average Trip Length (PM/UPT)**
2001	not available	not available	not available	not available
2002	not available	not available	not available	not available
2003	not available	not available	not available	not available
2004	not available	not available	not available	not available
2005	not available	not available	not available	not available
2006	not available	not available	not available	not available
2007	not available	not available	not available	not available
2008	not available	not available	not available	not available
2009	not available	not available	not available	not available
2010	not available	not available	not available	not available
2011	18.35	$2.07	5.65	0.96
2012	17.84	$3.24	5.70	1.02

Note: Prior to 2011, streetcar data were reported as part of light rail data.

Table 50. Summary of Streetcar Ridership, Service, and Performance by Month in Portland (2012)[336]

Month	Unlinked Passenger Trips	Vehicle Revenue Miles	Vehicle Revenue Hours
January	74,306	17,628	3,086
February	83,680	16,605	2,923
March	140,217	17,748	3,124
April	136,711	17,067	3,005
May	182,956	17,666	3,110
June	154,976	17,149	3,019
July	157,432	17,611	3,100
August	150,602	17,804	3,135
September	114,425	22,489	3,793
October	118,069	29,620	4,894
November	93,205	28,378	4,679
December	85,262	29,007	4,774

Source: Federal Transit Administration. 2013. “National Transit Database: Monthly Module Adjusted Data Release for May 2013.” http://www.ntdprogram.gov/ntdprogram/pubs/MonthlyData/May_2013_Adjusted_Database.xls (Accessed July 29, 2013).

Table 51 reports average stop-level average weekday boarding counts separated for Portland’s NS Line and CL Line. The NS Line reports significantly higher total average weekday boarding counts than the CL Line (8537 vs 3192). There is also a noticeable variability between stop-level boarding in which the NS Line registers an average 186 boardings per stop, and the CL Line reports an average 69 boardings per stop. As mentioned earlier in the narrative, differences in land-use patterns and development intensities, plus the relative newness of the CL Line, might explain some of the differences in boarding counts between both lines.

Table 51. Streetcar Stop Level Average Weekday Boardings (by Line) in Portland (2012)[337]

Stop	Line	Direction	Boardings	Alightings	Stop	Line	Direction	Boardings	Alightings
NW Lovejoy & 21st	NS Line	E	171	59	SE Grand & E Burnside	CL Line	N	63	44
NW Lovejory & 22nd	NS Line	E	208	70	NE Grand & Hoyt	CL Line	N	23	29
Art Museum	NS Line	N	365	237	SE Grand & Mill	CL Line	N	47	0
NW 23rd & Marshall	NS Line	S	445	0	NE Grand & Pacific	CL Line	N	21	145
NW 23rd & Marshall	NS Line	S	0	635	NE M L King & E Burnside	CL Line	S	41	38
SW 11th & Alder	NS Line	S	281	510	NE M L King & Hoyt	CL Line	S	28	13
SW 11th & Taylor	NS Line	S	355	381	SE M L King & Mill	CL Line	S	1	51
NW Lovejoy & 18th	NS Line	E	203	42	Art Museum	CL Line	N	155	34
NW Lovejoy & 13th	NS Line	E	321	118	NE Grand & Multnomah	CL Line	N	46	23
NW 11th & Johnson	NS Line	S	338	56	SW 11th & Alder	CL Line	S	131	193
NW 11th & Glisan	NS Line	S	170	55	SW 11th & Taylor	CL Line	S	104	137
NW 11th & Everett	NS Line	S	216	75	NW 11th & Johnson	CL Line	S	206	26
NW 11th & Couch	NS Line	S	454	214	NW 11th & Glisan	CL Line	S	130	33
SW 11th & Jefferson	NS Line	S	148	387	NW 11th & Everett	CL Line	S	110	31
SW 11th & Clay	NS Line	S	102	261	NW 11th & Couch	CL Line	S	199	90
SW 5th & Market	NS Line	E	74	207	SW 11th & Jefferson	CL Line	S	54	238
SW 5th & Montgomery	NS Line	S	155	238	SW 11th & Clay	CL Line	S	58	209
PSU Urban Center	NS Line	N	578	326	SW 10th & Clay	CL Line	N	0	267
SW 10th & Clay	NS Line	N	163	151	SW 10th & Clay	CL Line	N	195	0
SW Park & Mill	NS Line	W	406	127	Central Library	CL Line	N	164	84
Central Library	NS Line	N	355	463	SW 10th & Alder	CL Line	N	155	65
SW 10th & Alder	NS Line	N	321	179	SW 10th & Stark	CL Line	N	65	42
SW 10th & Stark	NS Line	N	130	99	NW 10th & Couch	CL Line	N	92	132
NW 10th & Couch	NS Line	N	199	352	NW 10th & Everett	CL Line	N	45	61
NW 10th & Everett	NS Line	N	76	148	NW 10th & Gilsan	CL Line	N	38	74
NW 10th & Gilsan	NS Line	N	89	178	NW 10th & Johnson	CL Line	N	66	125
NW 10th & Johnson	NS Line	N	103	309	SE Grand & Taylor	CL Line	N	45	10
NW Northrup & 14th	NS Line	W	107	127	SE Grand & Belmont	CL Line	N	76	11
NW Northrup & 18th	NS Line	W	20	193	SE M L King & Morrison	CL Line	S	4	30
NW Northrup & 21st	NS Line	W	73	247	SE M L King & Taylor	CL Line	S	3	35

Stop	Line	Direction	Boardings	Alightings	Stop	Line	Direction	Boardings	Alightings
NW Northrup & 22nd	NS Line	W	40	191	SE Grand & Stark	CL Line	N	86	28
SW Park & Market	NS Line	E	154	365	NW 10th & Northrup	CL Line	N	23	97
SW 3rd & Harrison	NS Line	E	120	263	NW 9th & Lovejoy	CL Line	E	182	93
SW 1st & Harrison	NS Line	E	46	41	N Weidler & Ross	CL Line	E	8	63
SW Harrison Street	NS Line	S	3	15	NE Weidler 7 2nd (Streetcar)	CL Line	E	4	44
SW River Pkwy & Moody	NS Line	E	53	164	NE Weidler & Grand	CL Line	E	12	67
SW River Pkwy & Moody	NS Line	W	206	42	NE 7th & Halsey	CL Line	S	37	60
SW Harrison Street	NS Line	N	44	23	NE 7th & Holladay	CL Line	S	55	83
SW 1st & Harrison	NS Line	W	85	54	NE Oregon & Grand	CL Line	W	18	8
SW 3rd & Harrison	NS Line	W	160	82	SE M L King & Stark	CL Line	S	8	48
SW Moody & Gibbs	NS Line	S	6	196	SE M L King & Hawthorne	CL Line	S	4	71
NW 12th & Northrup	NS Line	W	64	107	SE Water/OMSI (Streetcar)	CL Line	S	70	0
SW Moody & Gaines	NS Line	S	0	164	SE Water/OMSI (Streetcar)	CL Line	S	0	83
SW Lowell & Bond	NS Line	E	0	114	SE Grand & Hawthorne	CL Line	N	102	6
SW Lowell & Bond	NS Line	E	50	0	NE Grand & Broadway	CL Line	N	92	69
SW Bond & Lane	NS Line	N	47	10	NE Broadway & 2nd (Streetcar)	CL Line	W	47	20
OHSU Commons	NS Line	N	762	71	NE Broadway & Ross (Streetcar)	CL Line	W	29	30
NW 10th & Northrup	NS Line	N	71	130	NW 11th & Marshall	CL Line	S	50	61
Total			**11,729**	**11,677**					

Table 52 aggregates the boarding totals by stop, and thus accounts for the fact that many stops are served by both streetcar lines. The table shows that the highest boarding count of 762 belongs to the OHSU Commons station of the NS Line in the South Waterfront district, where the streetcar connects to the South Aerial Tram Station.

Table 52. Streetcar Stop Level Average Weekday Boardings and Alightings (Aggregated by Station) in Portland, Oregon (2012)[338]

Stop	Line	Boardings	Alightings	Stop	Line	Boardings	Alightings
Air Museum	NS, CL	520	271	SW Lowell & Bond	NS	50	114
Central Library	NS, CL	519	547	SW Moody & Gaines	NS	0	164
NW 10th & Couch	NS, CL	291	484	SW Moody & Gibbs	NS	6	196
NW 10th & Everett	NS, CL	121	209	SW Park & Market	NS	154	365
NW 10th & Glisan	NS, CL	127	252	SW Park & Mill	NS	406	127
NW 10th & Johnson	NS, CL	169	434	SW River Pkwy & Moody	NS	259	206
NW 11th & Couch	NS, CL	653	304	SE Grand & E Burnside	NS	63	44
NW 11th & Everett	NS, CL	326	106	NE Grand & Hoyte (Convention Center)	CL	23	29
NW 11th & Glisan	NS, CL	300	88	SE Grand & Mill	CL	47	0
NW 11th & Johnson	NS, CL	544	82	NE Grand & Pacific	CL	21	145
NW 12th & Northrup	NS	64	107	NE M L King & E Burnside (Couch)	CL	41	38
NW 23rd & Marshall	NS	445	635	NE M L King & Hoyte (Convention Center)	CL	28	13
NW Lovejoy & 13th	NS	321	118	SE M L King & Mill	CL	1	51
NW Lovejoy & 18th	NS	203	42	NE Grand & Multnomah	CL	46	23
NW Lovejoy & 21st	NS	171	59	SE Grand & Taylor	CL	45	10
NW Lovejoy & 22nd	NS	208	70	SE Grand & Belmont	CL	76	11
NW Northrup & 14th	NS	107	127	SE M L King & Morrison	CL	4	30
NW Northrup & 18th	NS	20	193	SE M L King & Taylor	CL	3	35
NW Northrup & 21st	NS	73	247	SE Grand & Stark	CL	86	28
NW Northrup & 22nd	NS	40	191	NW 10th & Northrup	CL	94	227
OHSU Commons	NS	762	71	NW 9th & Lovejoy	CL	182	93
PSU Urban Center	NS	578	326	N Weidler & Ross (Larabee)	CL	8	63
SW 10th & Alder	NS, CL	476	244	NE Weidler & 2nd (Streetcar)	CL	4	44
SW 10th & Clay	NS, CL	358	418	NE Weidler & Grand	CL	12	67
SW 10th & Stark	NS, CL	195	141	NE 7th & Halsey (Clackamas)	CL	37	60
SW 11th & Alder	NS, CL	412	703	NE 7th & Holladay	CL	55	83
SW 11th & Clay	NS, CL	160	470	NE Oregon & Grand	CL	18	8
SW 11th & Jefferson	NS, CL	202	625	SE M L King & Stark	CL	8	48
SW 11th & Taylor	NS	459	518	SE M L King & Hawthorne	CL	4	71

Stop	Line	Boardings	Alightings	Stop	Line	Boardings	Alightings
SW 1st & Harrison	NS	131	95	SE Water/OMSI (Streetcar)	CL	70	83
SW 3rd & Harrison	NS	280	345	SE Grand & Hawthorne	CL	102	6
SW 5th & Market	NS	74	207	NE Broadway & 2nd (Streetcar)	CL	47	20
SW 5th & Montgomery	NS	155	238	NE Broadway & Ross (Streetcar)	CL	29	30
SW Bond & Lane	NS	47	10	NE Grand & Broadway	CL	92	69
SW Harrison Street	NS	47	38	NW 11th (10th) & Marshall	CL	50	61
Total		**11,729**	**11,677**				

Figure 107 shows the relationship between the location of Special Activities Centers (SACs) and streetcar stop ridership levels. In a recent study, SACs were found to have a significant effect on streetcar stop-level ridership, multiplying ridership several times what would otherwise be expected at the stop.[339] Thus, the higher number of SACs and their proximity to NS Line stops on the west side of the Willamette River is likely related to the higher boarding levels reported. The east side of the River, where the CL Line primarily operates, is much less populated by SACs, and it reports lower boarding levels. Interestingly, despite the large assembly facilities in the Lloyd district on the East side, the CL Line streetcar stops most proximate to them do not report significantly higher ridership. Also apparent from the Figure, hospitals and educational facilities proportionately dominate along the NS Line, together with other institutional, tourism, and cultural destinations. The stops with the highest numbers of boardings in the Northwest district terminal and in the South Waterfront district are located near health care and health research/educational facilities. The other dominant SAC is the PSU campus, where stops also have high numbers of boardings.

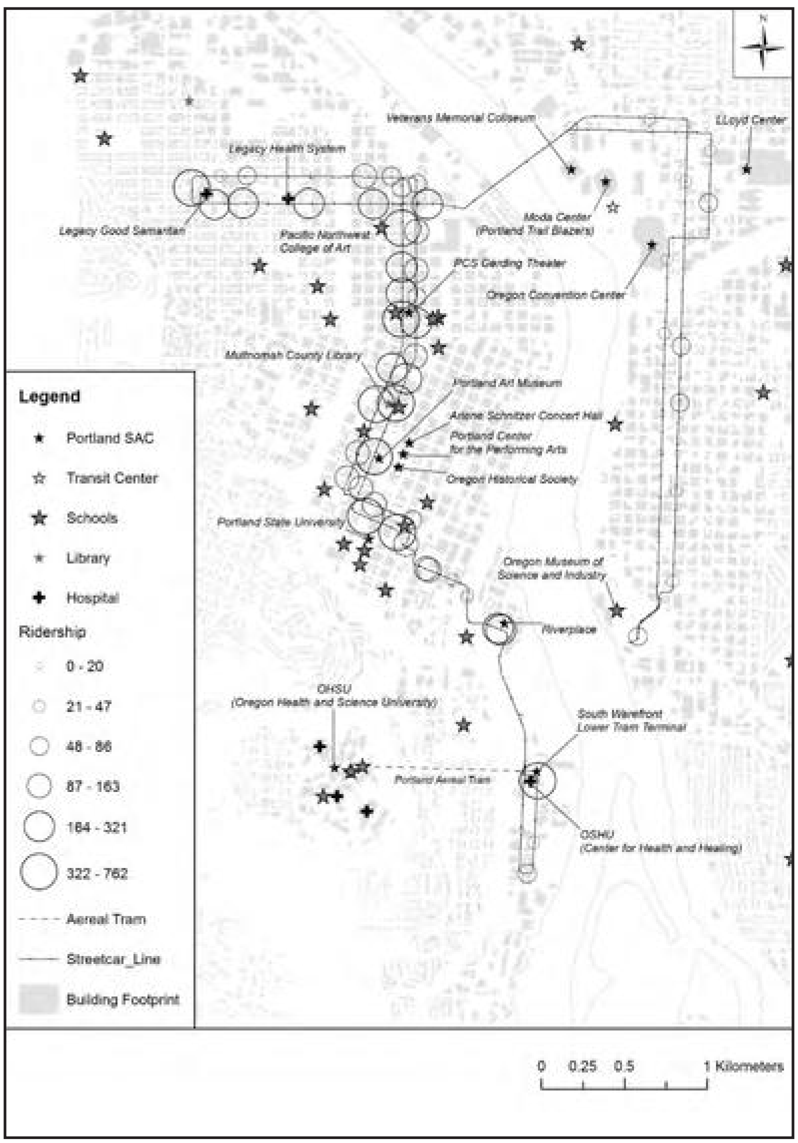

Figure 107. Stop-Level Average Weekday Boarding and Special Activity Centers (SACs) in Portland (2012)[340]

Figure 108 displays the number of bus routes (depicted as graduated grey circles) located in proximity to or directly linked to streetcar stops and stop-level boardings (depicted as graduated hollow circles). No discernible pattern emerges from the figure other than the clustering of bus services in the PSU district and adjacent areas. That is, high stop-level ridership counts occur at stops with high levels of bus connectivity and at stops with low levels of bus connectivity. The lack of any discernible relationship would seem to suggest that many streetcar riders do not use local bus transit services.

Figure 109 displays the relationship between streetcar stops and stops for the light rail and aerial tram systems. The figure suggests that where a connection exists between the streetcar and the light rail/tram systems (represented with grey circles), relatively high ridership counts occur. This is particularly true in the case of the South Waterfront Tram Terminal and at the stops where the MAX light-rail systems and streetcar overlap in the PSU district. This figure suggests the possibility of transfer activity between the various rail systems and a combination of potential riders, including light-rail commuters and non-resident riders using the streetcar as a “last-mile” transportation service to the City, or vice-versa, and/or Portland residents using the streetcar to connect to light-rail to access peripheral suburban destinations and possible “reverse” commuting.

The Portland streetcar stands out among the case studies as the streetcar with the highest ridership. Given the relative short length of average streetcar trips (1 mile; 1.6km), it seems to function primarily as a downtown circulator. The average speed of Portland’s streetcars is relatively low compared with bus and light-rail, but its downtown location, close stop spacing, and mixed-traffic operating environment undoubtedly help to explain the low speed. However, Portland’s streetcar reports better cost effectiveness (operating expenses/passenger trip) and higher service productivity (passenger miles/vehicle miles) than the average bus route in the transit system (as shown earlier in Table 48). Light-rail transit has stronger performance than either bus or streetcar.

The fact that Portland’s NS Line operates in a downtown context characterized by high intensity mixed-use development, serves nearby special activity centers such as hospitals and a university campus, provides long service hours and relatively short headways, and appears to be well connected to other transit modes undoubtedly help to explain its relatively strong performance, particularly compared with the other streetcar cities. The city also has a history of strong land use regulation, coordinated transportation-land use planning, and making public investments to support non-automobile travel that also aid transit ridership in general and streetcar use in particular. The attention that local officials pay to the combination of land use planning, urban design, and streetcar supportive automobile parking policies undoubtedly contribute to the overall performance of Portland’s streetcar. These topics are further discussed in the Key Informants Interviews section that follows.

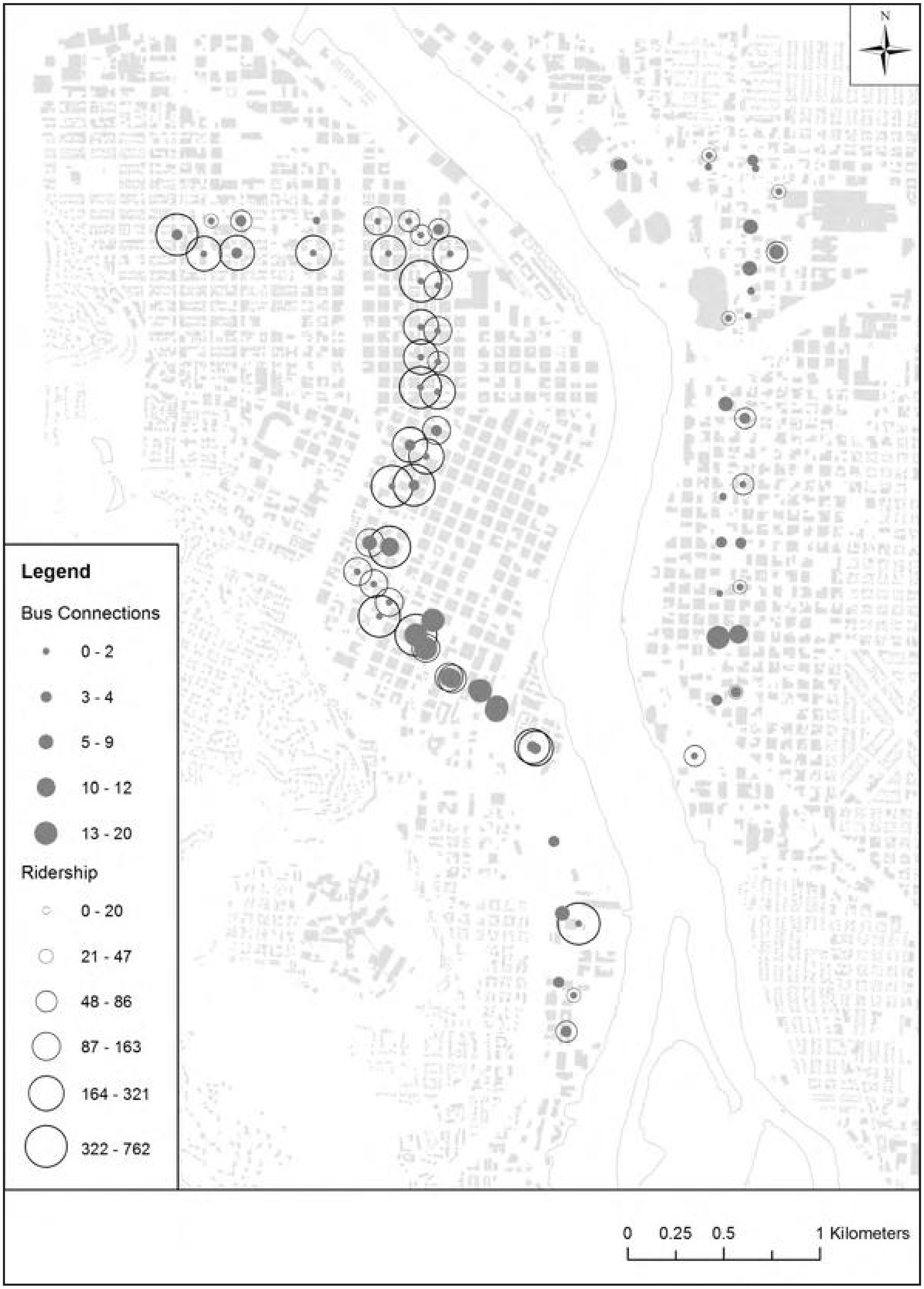

Figure 108. Stop-Level Average Weekday Boardings and Bus Connections by Stop in Portland (2012)[341]

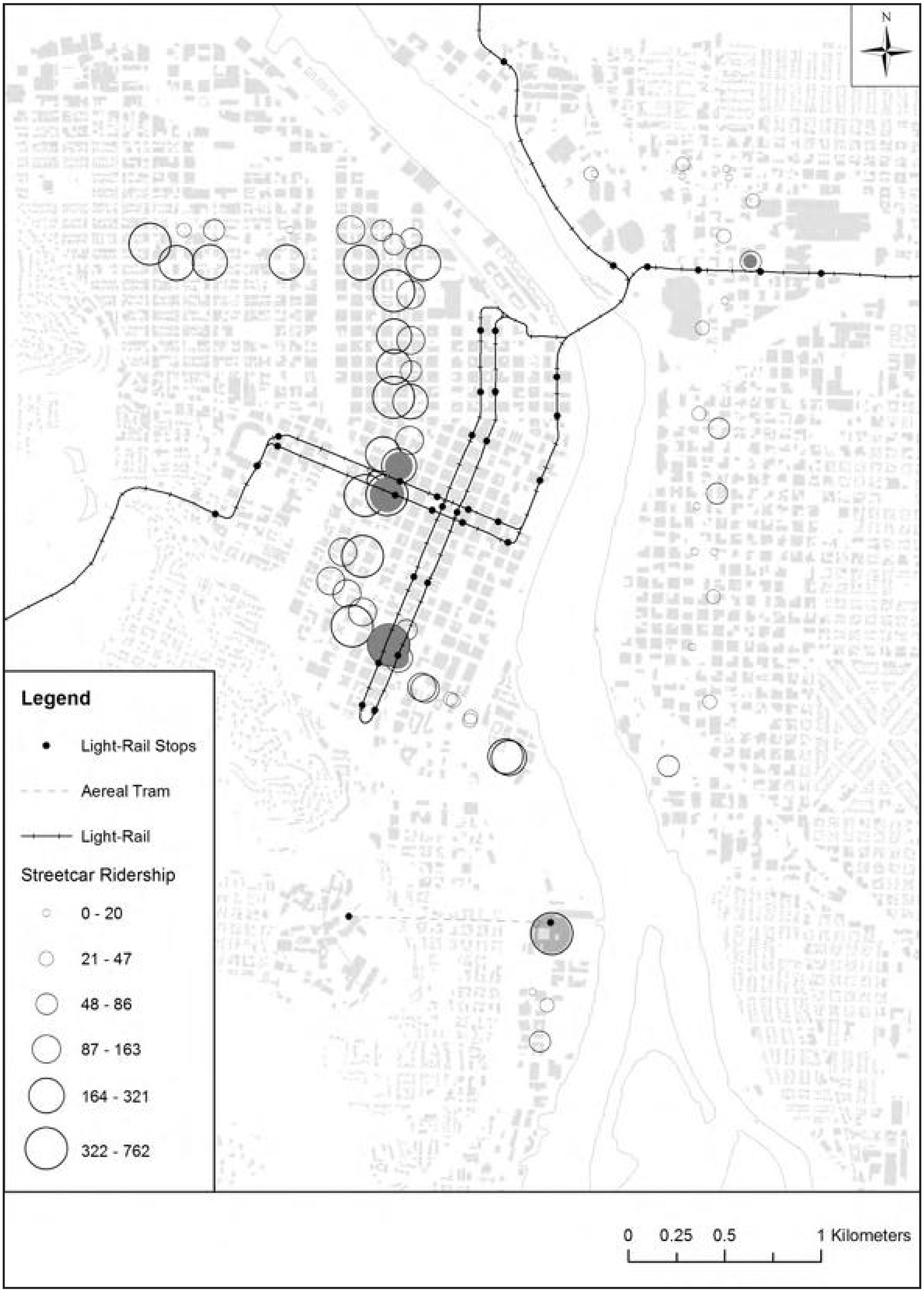

Figure 109. Stop-Level Average Weekday Boarding and Light-Rail/aerial Tram Connections in Portland (2012)[342]

INSIGHTS FROM KEY INFORMANT INTERVIEWS

In addition to collecting and analyzing quantitative data and documentary evidence, the authors conducted one-hour semi-structured telephone interviews with several key informants in the Portland region who provided their perspectives on streetcar goals, performance, and future prospects in the region. Informants representing a diverse set of perspectives, including the local business community, local land use and transportation planning, the streetcar operator, and regional transit organizations, participated in the interviews. These informants were identified through documents or were suggested by other interviewees as pertinent informants, given the nature of the questions the authors hoped to address.

The authors sought to use the interviews to complement the insights developed from our quantitative assessment discussed earlier, and to identify hard-to-quantify phenomena that might impact people's perceptions of the streetcar and impact its performance. Each informant was provided a set of 12-24 questions in advance of the interviews, including a set of questions asked of all informants and specific questions asked of that individual, given the role they play in the community. A set of typical interview questions can be found in Appendix F.

For Portland, the authors conducted four semi-structured interviews with five key informants. The authors interviewed the local land use planning and local transportation planning informants during the same interview. Several key themes emerged from the interviews, including: the role of private sector actors, the importance of supportive land use and transportation policies, the importance of institutional relationships, the use of the streetcar as a development tool and a marketing tool, and the role of the streetcar within the larger transportation system. The five key informants include individuals whose involvement with streetcar-related issues predates the implementation of the original North-South Line service (Table 53). These individuals included: a senior representative of the streetcar managing entity who has also been a development consultant and elected official, a senior-level regional transit planner, a local transportation planner, a local land use planner, and a business community leader with a long history of engagement in streetcar issues in Portland. Each individual is identified by his or her role in the community within the narrative that follows.

Table 53. Roster of Key Informants Interviewed for Portland Study

Informant	Role
1	Local Transportation Planner
2	Local Land Use Planner
3	Regional Transit Planner
4	Streetcar Manager
5	Business Leader

Streetcar Goals

The key informants emphasized the primacy of development goals in the creation of the first streetcar line in Portland. The streetcar manager noted that prior to streetcar implementation, the City of Portland's strategic plan had called for the redevelopment of the central city as a top local planning goal, and that streetcar service was used to facilitate redevelopment of the center city. This informant stressed that the streetcar was seen by the city planners as a tool that would allow them to bring as many as 30,000 residents into the central city over the planning time horizon. It was seen as a fixed, permanent amenity that could attract developers, residents, and businesses. This informant noted that the original planning goals were for 10,000 residential units and 3.5 million square feet [325,160 square meters] of retail in the areas around the proposed streetcar line, and for the line to carry 10,000 riders per day. He emphasized that they have exceeded these goals in all respects, with more than 12,000 residential units and nearly 17,000 riders per day on the streetcar lines.

The business community leader referred to the streetcar as a "tool to assist development." He emphasized that Portland was growing and that the streetcar was viewed as an "important catalyst" for growth in the areas it served. He noted signs of a rising real-estate market, and it was thought that the streetcar was a good catalyst for change in decayed and/or underdeveloped inner-city areas. The streetcar was seen as being different from the light-rail system that served commuters and focused on mobility goals. He observed that developers loved the streetcar because it ran on a track, which meant it was perceived as a "permanent commitment" by the city, as opposed to buses which were not seen as permanent. He stressed that 50 percent of new development has occurred within one block of streetcar alignment, with an average 92 percent floor-to-area ratio compared with 45 percent for the downtown as a whole. He observed that this result reflects the confidence of developers to develop to the maximum density allowed, and it supports the city's density and transit ridership goals.

The regional transit informant agreed that development objectives were the primary goals of the original streetcar line. This informant noted that the key public sector participants (City of Portland and Tri-Met) viewed the first streetcar line (North-South Line) as a land use project rather than a transit project. He noted that this was particularly true with respect to service within the Pearl District, where the City of Portland had a high-density vision for the community that led to a specific view of the streetcar as a "facilitator" of this vision. Speaking from the transit perspective, he noted that Tri-Met was initially skeptical of implementing a streetcar—he stated that their default option was typically to increase bus service—but that the "permanence" of the streetcar as a symbol of public investment and commitment really took hold.

The regional transit planner informant also observed that the newer Central Loop (CL) Line has had similar land use and development goals as the North South (NS) Line. The CL Line was designed to connect major trip attractors such as the high-rise Lloyd District, convention center, and arena on the east side of the Willamette River with the downtown on the river's west side. The City of Portland hopes to use the streetcar to help shape development that maintains the mixed-use character of this "funky urban area" and not to turn it into another high-rise Pearl District.

The informants disagreed on the importance of transportation goals in streetcar development in Portland. The business leader informant stated that the "(streetcar was) never primarily a transportation tool." He differentiated the land development goals of the City of Portland, which he viewed as the principal public sector driver of streetcar development, from that of Tri-Met, the regional transit agency, whose goals revolved around transportation. As a participant in the key local groups that advocated for the streetcar during the 1990s, he noted that the main goals for these groups was assisting and reviving local neighborhoods and that their interest in the streetcar was its potential use to encourage intercity development. He recognized that the streetcar was "always a transportation device," and he observed that the streetcar is now intensively used during peak times, but he still emphasizes the primacy of development as the driver in streetcar development in the city.

While the regional transit planner informant agreed on the centrality of development goals, he also stressed Tri-Met's view of it as "not a toy, but a real transportation system." He emphasized that this view affected Tri-Met's decision to operate modern vehicles as opposed to "toy-like" vintage vehicles, and to make decisions about streetcar service with a view to its role in the larger transit network. He noted that as the alignment lengthened, the streetcar took on more of a transit role in the community, and that it is now part of Tri-Met's frequent-service transit network.

The local land use planning and local transportation planning informants emphasized development and transportation goals. The local land use planning informant characterized the streetcar goals as "shaping growth and facilitating place making." But he also emphasized its important role in supporting the city's climate action plan by serving as a pedestrian extender in the downtown area that allows more people to shift to combined streetcar-walk trips instead of using automobiles.

The local transportation planning informant also emphasized these dual goals. He characterized the streetcar as a combination transportation service and development tool. He noted that with the original NS Line, the city purposely connected two key trip generators, Portland State University and a major hospital. The area between them was seen as having land development and ridership potential, which the informants viewed as having been achieved to a significant degree. The informant emphasized that as the line was extended, it continued to have this dual function.

Land Use Planning and Development Outcomes

Given the centrality of land development goals in the implementation of Portland's streetcar, the authors asked the informants for their assessments of these outcomes. As background to their assessments, it is important to note that Portland has land use regulations and development incentives in place to encourage its desired land development outcomes. The area served by the streetcar is characterized by transit-supportive attributes such as relatively high population and employment densities, small average block sizes (indicative of good street network connectivity for all travelers), and a complete-streets initiative that emphasizes walkability in all aspects of road infrastructure design. Much of this is the result of active planning by the city working in partnership with the development community.

The key informants tended to agree that the streetcar has been successful in achieving the land development goals that were part of its original plan. The informants didn't quite state that the streetcar's presence was the most important factor, or the principal causal factor, although some came close to doing so. The business community leader informant answered, "Yes absolutely" in response to our question about goal achievement. He noted that the "Pearl District is almost full," and he pointed to the streetcar's role as a development "catalyst" in the South Waterfront area and on the east side with the more recent CL Line. He said the streetcar has "proven to be an agent of change" with respect to land development in the city. The local land use planning and local transportation planning informants agreed with this assessment, particularly with respect to the NS Line and the Pearl District, although they were more cautious about the possible effects of the CL Line, given that it remains, as of the time of the report, an incomplete loop across the Willamette River that does not directly connect all key destinations. Nevertheless, in general, both informants characterized the streetcar as an "amenity" that had helped serve as an "anchor of development," given its permanent, fixed nature.

The streetcar manager informant characterized the streetcar as a "catalyst" but "not the cause" of the development that occurred. He noted the importance of the signals its presence sent developers about the city's permanent commitment to the areas it served, which reassured them when they made their own investment decisions. But he also emphasized the place of the streetcar within a package of strategies that included: supportive zoning, design regulations that encouraged the creation of an active urban environment with many people on the streets, and some financial incentives targeting certain kinds of projects, such as promoting affordable housing development. He said the primary idea had been to create good, shared public spaces and plazas, and to promote compact and mixed-use development. Developers then responded to market signals to create more mixed-use urban living opportunities in the area than people had earlier predicted.

The informants agreed that market forces and other planning initiatives beyond the streetcar played critical roles in development outcomes thus far achieved. The local land use planning and local transportation planning informants pointed to the importance of a "convergence of public investments," although they also stated that the streetcar has been responsible for an "increment of development activity." They are presently working to try to model the specific contributions of the streetcar to this activity, given the various other policy initiatives that were also in place. The streetcar manager informant emphasized the "alignment of factors" that allowed them to exceed their development goals. Particularly important in his view was a comprehensive, system-wide view to planning the area and a well-aligned public sector working together.

Transportation Role

Most of the informants agreed that the streetcar has become more of a transportation asset as the lines have been extended. The business community leader informant noted that from his perspective it appears that Tri-Met officials now view the streetcar as an integral piece of their larger public transportation strategy. The regional transit planner informant agreed by noting its role in the Tri-Met frequent service network. This transportation role has emerged despite what the business community leader informant characterized as earlier

Tri-Met opposition, particularly from the mid-level managers responsible for operating transit services, to the idea of a streetcar as the selected mode. This same informant stressed the more supportive position taken by Tri-Met senior management at the time.

The authors queried the informants about the reasons a streetcar had been selected rather than another transportation mode. The business leader informant, who has participated in streetcar issues for more than 30 years, observed that the streetcar was the chosen mode because there was “no other (transportation) option.” He recalled that bus service was considered unattractive to the middle class market they hoped to attract, the streetcar fit well within the local vision for a walkable urban environment, and the streetcar was less intrusive, as well as less expensive, than light rail transit. Other informants’ recollections supported these views.

Presently, the streetcar operates as a complement to other transit services, rather than as a substitute for them. While the business community leader informant thought that Tri-Met had removed buses when the original line was implemented, the regional transit planning informant reported that they actually did not make major service changes when either of the streetcar lines opened, because of sensitivity to community concerns about loss of local bus service. This informant noted that there are presently short overlaps of service between bus and streetcar on the NS Line, and a lengthier service overlap on the CL Line, but he did not think there have been negative effects on ridership for other either mode. This informant believes that the modes are serving different travel markets, a view supported by the rider profile discussed earlier in this narrative.

The streetcar manager informant agrees that the modes are serving different rider markets. He reported double the percent of non-home-based trips taken on the streetcar when compared with buses. He observed that the streetcar serves many short distance trips due to its role as a “walk trip extender,” with many of these being used for lunch trips, running errands, and some visitor trips due to its role as a circulator. He reported that the peak ridership on the streetcar is from 11 a.m. to 7 p.m. during weekdays, and Saturday use is as strong as weekday use. He reports many disabled riders (about 9 percent of riders), a large number of Portland State University (PSU) students, and some tourists, although not as large a proportion as on the systems in the other cities the authors examined. PSU is an important destination due to its size, while the South Waterfront area is important due to its aerial tram connection to the campus of Oregon Health Sciences University (OHSU). The regional transit planning informant also agreed that PSU and the South Waterfront aerial tram connection were key destinations for streetcar riders.

Public Attitudes

The informants generally agreed that public and policymaker attitudes toward the streetcar are positive, although one informant noted that some individuals from outlying areas are less supportive than those who reside or work in areas near the streetcar lines. The business community leader informant characterized the attitude of the business community as “positive.” He mentioned the work of the various agencies and organizations in making sure that the public has the opportunity to have their voices heard whenever there are proposals for changes involving the streetcar. He noted that occasionally “mostly elderly” absentee property owners will complain at public meetings, but he said they are usually “talked around.”

This informant emphasized the work of the streetcar advocacy group as being particularly important for keeping a favorable view in the community, as they are always careful to start early with an advisory committee and business community stakeholders, open houses for the public, and charrettes to explain, communicate, and educate key stakeholders and the larger community about any proposal. Neighborhood associations, business organizations, and the chamber of commerce have also been engaged and tend to be very supportive. This informant noted an earlier disagreement about possible business disruptions during streetcar construction with wholesalers, but he emphasized how they were brought around when it was made clear that the city had heard their concerns and was doing all it could to address them. This informant emphasized that whenever any possible disagreements seem about to emerge, he "explains the economics" to business owners or property owners, about possible additional customers attracted to the business or about potential gains in property values, and they soon come on board. He observed that "business people are not idiots."

The local land use planning and local transportation planning informants did point to some polarization of attitudes toward the streetcar. These informants noted that many people who reside in outlying areas have been vocal critics of spending public money on the streetcar rather than on other projects (such as sidewalks) in their own neighborhoods. The two informants observed that many of these people "love to hate" the streetcar. But the informants also noted that many of the funding sources used to support the streetcar (federal capital grant money, stimulus dollars, or money from downtown parking meters) would not have been available for other projects, so the concerns of these groups can be countered. These same informants also noted that some bicycle and bus advocates are critical of the streetcar because they'd rather see money used for their modes. But the informants observed that these same critics also complain about spending on the light rail system. On balance, these informants tended to view the critics as a small minority within the community.

Role of Private Sector

Several of the informants pointed to the strong role taken by private actors in the original development of the streetcar and in its ongoing activities. The informants pointed to the roles of Portland Streetcar, Inc. and the business and development communities, the role of landowners in the Pearl District and South Waterfront areas, and the use of private sector funds, through an assessment district, to finance the service. The business community leader informant emphasized the "bottom up" approach to building support for the streetcar, which this individual viewed as an important reason for its successful implementation.

The business community leader informant was one of the early key private actors in the development of the first streetcar line. He recalled reading a newspaper article about a group that was putting together a transportation proposal for downtown Portland and noticing that the alignment bordered his business. He was concerned that the city might be "trying to put me out of business" because he worried about possible negative impacts during construction leading to business interruptions and declining sales, based on prior experience during construction of Portland's light rail system. So he called the streetcar advocacy group for a meeting, and they informally invited him to join the group. He noted that they convinced him of the benefits of the streetcar, and he decided to join the group and help to convince other business owners that the streetcar project would not be as disruptive as the earlier LRT project had been. This informant noted that he had worked to convince other property and business owners of the significant financial benefits that could accrue to them because of streetcar implementation, principally a large increase in land values, which estimated had reached a four-fold increase from pre-streetcar conditions. The role of the private sector was thus critical in building support among key local constituencies.

The business community leader informant emphasized that once business and property owners recognized the potential benefits of the streetcar on customer traffic and land values, they supported the project and became willing to tax themselves to help finance it. He pointed specifically to the creation of a local improvement district (LID) that used property tax money to help finance the project. The streetcar manager informant also emphasized the role of developers, pointing specifically to “well informed” developers such as Homer Williams (owner of the Hoyt Street Yards), who agreed to a special assessment on his 40-acre property, and John Carroll, who was a “leader in understanding the relationship of quality access to the success of his projects.” The same informant characterized the River District Association (of property owners), resident-based organizations such as the Downtown Community Association and Northwest Neighborhood Association, key institutions such as PSU, OHSU, and local hospitals, and the downtown banking community as being actively engaged in the effort to implement streetcar service.

The local land use planning and local transportation planning informants also emphasized the key roles of property owners in developing the streetcar and adjacent developments. They noted that the City of Portland worked hard to come to agreements with major property owners on development packages to encourage higher-density development around the streetcar line, particularly in the Pearl District.

The city negotiated land use planning packages that included a package of public investments plus increased-density development. The informants noted that this collaborative public-private approach was used to help transform the Pearl District from an area of townhouses to condo towers.

Finance

As was true for each of the other case-study cities, the key informant interviews emphasized the importance of having an identified, stable source of funding to cover the capital expenses associated with streetcar implementation and the expenses of operating the service. The streetcar manager and the business leader informants emphasized the use of “creative financing” approaches as a critical part of the successful implementation of Portland’s streetcar and its continued operation.

The streetcar manager informant recalled that the money used for the planning and construction of the NS Line came from a combination of LID funds, based on local property tax assessments, city general funds, federal grants, and state grants. Approximately half the funding came from local funding sources. Additionally, the city raised parking rates in the downtown area and bonded the revenue stream to use it for streetcar investment. Portland officials are now discussing expanding paid parking in the central city over a wider area as part of an overall parking management strategy. Parking meter revenues also help support streetcar operations.

The same informant observed that finding operating funding had proven more challenging, particularly initially. This informant recalled that when streetcar proponents approached the regional transportation entities to help with funds, they were informed that the regional actors did not think of the streetcar as a regionally important project because of its limited system extent. He observed that he has seen similar issues in other cities, including Minneapolis. With time, however, this informant noted that Portland's regional transportation officials now understand that the streetcar provides regional benefits because it reduces and shortens vehicle trips. Vehicle trip reductions represent a vehicle "trip not taken," which thus has positive effects on congestion and emissions in the Portland region.

The streetcar manager informant noted that as of 2012, under a master agreement between Portland Streetcar, Inc. (PSI), the City of Portland, and Tri-Met, the City provides 50 percent of capital funds and 50 percent of operational funds, while Tri-Met provides the other 50 percent for operational funds. The informant also explained that as the city's development goals are achieved and mobility becomes more important as a streetcar goal, Tri-Met is expected to support up to 85 percent of streetcar operating expenses.

The local transportation planner and the local land use planner pointed out that the City of Portland relies on a transportation general fund to cover its financial responsibility for streetcar operations and that it uses payroll tax, not sales tax, as the major funding source. These informants believe that a sales tax would provide a more stable source for long-term operating funds, given their observations of other communities' experiences with these transportation revenue sources.

The business community leader informant offered a good summary of the critical financial decisions taken in Portland. This informant noted the importance of "creative financing" for capital and operations, along with the benefits of using parking fees, implemented through "progressive" parking policies, to support the streetcar because of their utility as a revenue source for transit and as a disincentive to automobile use.

Institutional Relationships

Portland's streetcar service directly involves three organizations (PSI, Tri-Met, and the City of Portland), and the informants emphasized the importance of having clear delineations of responsibilities and good working relationships to allow this complex structure to succeed. By and large, the informants viewed the institutional arrangements as operating smoothly and successfully. Informants also pointed to good working relationships with the private sector-led Streetcar Committee. One informant characterized working with these private actors as a "very satisfactory and enriching experience" because the people in that group "…are brilliant about strategy. Smart people like Mr. Gustafson (of PSI), very strategic in both public and private sectors. Easy people to be with; most are like that." Indeed, most informants had positive recollections of the relationships among all the key actors, particularly between Tri-Met and the City of Portland.

The regional transit planning informant pointed to a good long-term relationship between Tri-Met and the City of Portland as two critical organizational actors. He noted that under the institutional arrangements made between Tri-Met and City of Portland, the City makes decisions about streetcar level of service and covers operating costs of streetcar. He observed that the city has an operations manager for the streetcar and that its transportation bureau also engages in streetcar operational issues, including streetcar signal timing. He recalled that during planning of the NS Line, there were questions about how much of the operating cost would be covered by Tri-Met. Initially, he recalled that one-third of operating costs were covered by Portland and the remainder from city contributions. However, the city worked with Tri-Met to develop a signal priority system for buses. Based on the rationale that this system had saved Tri-Met some operating expense, Tri-Met officials agreed to cover another one-third of the streetcar operating cost. The informant recalled that the operating cost total was about $2.4 million, so Tri-Met covered $1.6 million. Tri-Met's policy justification for covering these operating costs is that the streetcar is now seen as a piece of the frequent service network along with the bus routes. Tri-Met then continued its two-thirds contribution to operating expenses as extensions were made to the NS Line. However, when the recession arrived, Tri-Met reduced bus service and reduced its contribution to streetcar operations. With the recent opening of the CL Line, Tri-Met renegotiated its contribution to 50 percent of the streetcar system total operating cost, with a potential to increase to 85 percent if certain development and ridership benchmarks are met (as alluded to earlier in the narrative). The informant's recollection of these negotiations was a favorable one that pointed to a good working relationship among individuals with the key organizations involved.

The informant noted that under the 2012 Master Agreement, the City of Portland and Tri-Met have worked very closely as partners in the streetcar. The informant stressed the importance of the partnership to a successful outcome. He said Tri-Met commits the time and resources necessary to actively engage with the city, and vice versa. The city and Tri-Met now work closely on planning decisions around streetcar extensions. As part of the new master agreement, the city has agreed to take on all capital costs for streetcar construction and infrastructure replacement in exchange for Tri-Met's increasing contributions to operating costs. The informant noted that the city is taking some of its prior operating cost contribution to develop a capital investment fund.

The business community leader informant suggested that the positive views of the streetcar within these two organizations have not always been present. He noted that Tri-Met's attitude tends to change as the organization's top leadership changes. He recalled that initially the agency leadership thought of the streetcar in very unfavorable terms as a "donkey trolley," and that within the agency there have been conflicts among streetcar, light rail, and bus advocates for their shares of the agency's budget. Despite these issues, the informant recalled a history of good working relationships with Tri-Met staff over the years. The same informant characterized the City of Portland as a much stronger and consistent supporter of the streetcar.

The streetcar manager informant reflected on relationships among Tri-Met, the City of Portland, and PSI. He observed that PSI is in overall charge of the streetcar but that the City of Portland manages the operators and mechanics, who actually are Tri-Met contract employees, and Tri-Met handles scheduling. PSI coordinates the different actors. Thus, good working relationships are an absolute necessity, as are clear delineations of responsibility. The informant characterized the relationships as good ones and emphasized that the streetcar service runs seamlessly from the rider perspective.

Other Policy Decisions

The Key Informant interviews identified a number of other public policies that Portland has embraced that undoubtedly support transit ridership, including by streetcar. Several informants reported that the City of Portland has increased public parking rates and implemented metered parking throughout the downtown area. Revenue raised from parking charges is then used to support the streetcar. Local employers have implemented transit-use incentive programs to encourage employees to commute by transit, whether by bus, light-rail and/or streetcar. The business leader informant implemented this policy in his downtown business. The streetcar manager informants observed that local developers offer residential units with lower parking supplies near the streetcar and use proximity to the streetcar alignment as a key marketing attribute.

The transit informants also noted the critical decision to use modern streetcar vehicles versus restored legacy vehicles. One informant noted that modern vehicles have better performance and reliability and lower recurrent maintenance costs than legacy vehicles; replacement parts are also easier to obtain. The importance of the decision about vehicles was noted in several other cities as well.

Streetcar Challenges

The Key Informant interviews noted several challenges to streetcar operation in Portland. The most important of these challenges is funding, which was also identified as an important challenge in the other case cities. Several informants noted the importance of taking a creative approach to funding and finance, given the limitations of traditional finance instruments. In Portland, local officials decided that parking would be an important source of local streetcar funding. The completion of the CL loop will require an increase in operational funding, and the transit informants emphasized the need to be even more creative to find new funding sources to cover these expenses. The transit informants noted that the use of value capture from the increased value of property in the area served by the streetcar might be a strategy to consider.

Public attitudes continue to be a challenge, particularly among those who live or do business away from the streetcar lines. One informant mentioned the concern about spending on the streetcar versus on other projects that might serve residents in outlying areas. Another informant mentioned the slow speed of the streetcar as a criticism by people who note that they are able to “walk faster than the streetcar” travels. However, our informants said that these types of attitudes seemed to be a minority and that there is widespread community and business support for the streetcar.

Advice to Other Cities

The key informants offered several suggestions to other cities that might be considering a streetcar in their communities. The first piece of advice was to focus on the importance of relationship building and management among key stakeholders. The informants believe this was a critical component of what they saw as Portland's success. They also believed that obtaining early buy-in from key stakeholders, especially private sector actors such as developers and business leaders, was particularly important, as these stakeholders could become major advocates who would also take a "sense of ownership" in the project.

A second piece of advice was to think about the streetcar investment as part of a package that included streetscape improvements, bicycle and pedestrian infrastructure, parks, and other amenities. The informants thought a comprehensive strategy that involved urban design and land use-transportation planning coordination was critical.

A third piece of advice was to focus on the transportation aspect of the streetcar. The informants emphasized the importance of considering stop spacing, signal prioritization, headways, and connections to other parts of the transportation system.

A fourth piece of advice was to pay close attention to the financial arrangements for streetcar operations. The informants emphasized the importance of having a stable, long-term funding source that provided predictability in revenues and was not as sensitive to the fluctuations of the economy as some of the instruments used in Portland. For example, the informants noted that reliance on a broad-based sales tax would likely bring significant funding stability to Portland, which presently lacks one.

CONCLUSIONS

The streetcar in Portland is by far the most successful of the cases considered in this study. The streetcar's ridership is far higher than in any of the other cities, and its performance measures (service productivity and cost effectiveness) also ranked among the best performers of the cases considered. Portland has also been widely heralded for what many regard as the successful land development outcomes associated with its streetcar lines.

The Key Informant interviews suggest that an important reason for Portland's success is the fact that early on, the streetcar was seen as a development tool and as a piece of transit infrastructure, and that local decisions were driven by both objectives. Portland's widely-noted comprehensive approach to integrated transportation and land use planning, its pro-transit public policies, and a favorable location all combined to contribute to the streetcar's performance. In short, Portland's performance as a standout among the cases is due to a combination of smart planning and policy and a favorable economic environment. Some attributes that underlie Portland's experience are potentially transferrable, including the active engagement of stakeholders in the planning process, the planning of the streetcar as a transit investment as well as a land use one, and the focus on transit-supportive streetscape and other investments, while others might be less easy to transfer, such as the especially close coordination of land use and transportation planning.

APPENDIX D: PROFILE OF SOUTH LAKE UNION STREETCAR IN SEATTLE, WASHINGTON

The South Lake Union (SLU) streetcar line in Seattle has the shortest alignment of the five cases considered in this study (Figure 110). Despite its short alignment, it has the third-highest ridership of the five cases. This is due in part to its proximity to a highly developed and growing core area of Seattle, although its northern section primarily traverses a transitional zone in which large employers have recently relocated and new public investments in the form of parks and infrastructure are being made. The role and initiative of the private sector and its collaboration with the public sector is a salient theme in this case. Streetcar ridership and productivity in Seattle have increased in recent years even as bus ridership and productivity have declined.

Figure 110. A Streetcar in Seattle[343]

BASIC CHARACTERISTICS OF STREETCAR SERVICE

The streetcar system in Seattle, Washington presently consists of one line, South Lake Union (SLU), with a round-trip length of 2.6 miles [4.18 kilometers], of which two miles [3.22 kilometers] of the alignment are in mixed-traffic operation and 0.6 mile [0.96 kilometers] is in exclusive right-of-way (Table 54). The $53.1 million line, which opened in late 2007, features three vehicles serving 11 stops (Figure 111). The streetcar is operated by King County Metro, which also operates other local transit services in Seattle.

Table 54. Physical Characteristics of Streetcar System in Seattle[344]

Characteritic		Value
Year Open		2007
Capital Cost (unadjusted dollars)		$53,100,000
Number of Lines		1
Number of Vehicles		3
Number of Stations		11
Length		2.6 miles* (4.18 km)
Alignment Type	Exclusive	0.6 miles
	Mixed Traffic	2 miles

*Note: Alignment length is for round trip. (Email communicatin from Rob Coughlin and Ethan Melone on February 4, 2014).

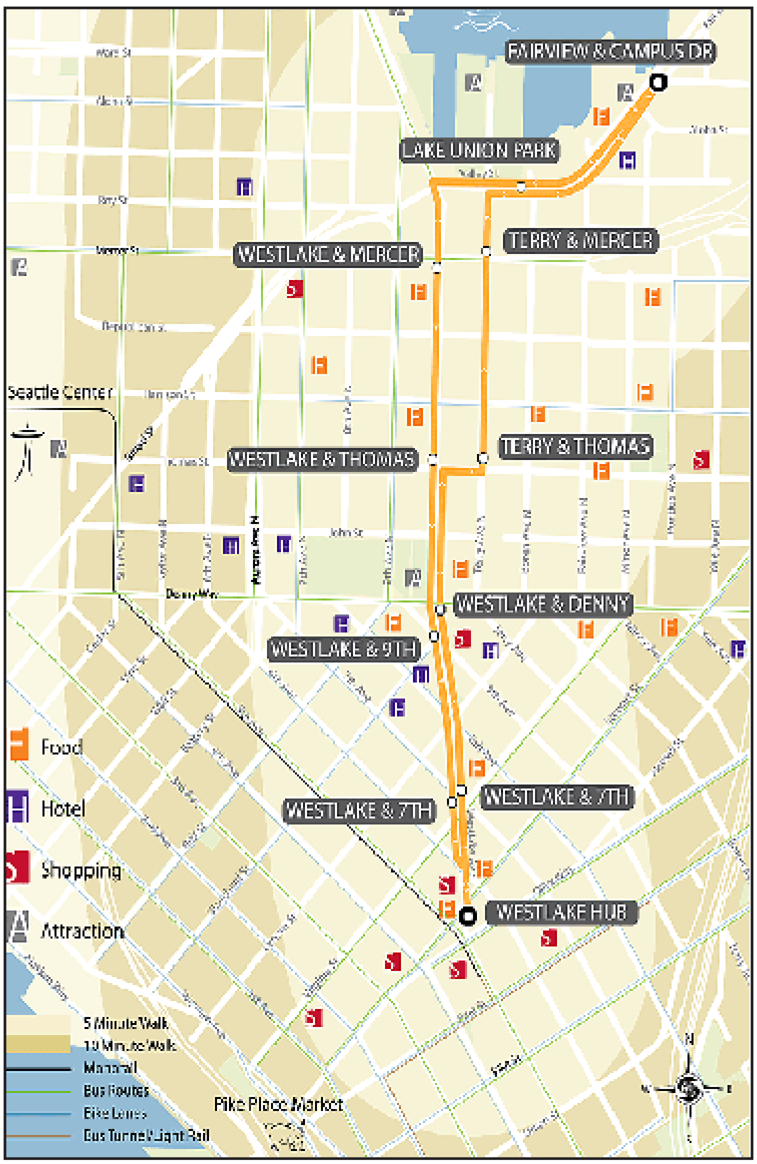

Figure 111. Map of Streetcar Line in Seattle[345]

The SLU streetcar line can be seen in relation to the larger transit network (including bus routes and ferries) in Figure 112, at a city scale, and in Figure 113, which focuses on the streetcar, its stops, and the bus routes in its near vicinity. The latter map also displays building footprints in the area, giving an indication of the very urban, built-up nature of this part of Seattle. The areas surrounding the southern section of the line are much more developed and denser than those areas surrounding the northern section of the line. The SLU streetcar connects the downtown retail area around Westlake Center to the South Lake Union neighborhood and its biotech campus, which the city has designated as an urban center that should absorb jobs and housing otherwise destined to other neighborhoods.[346]

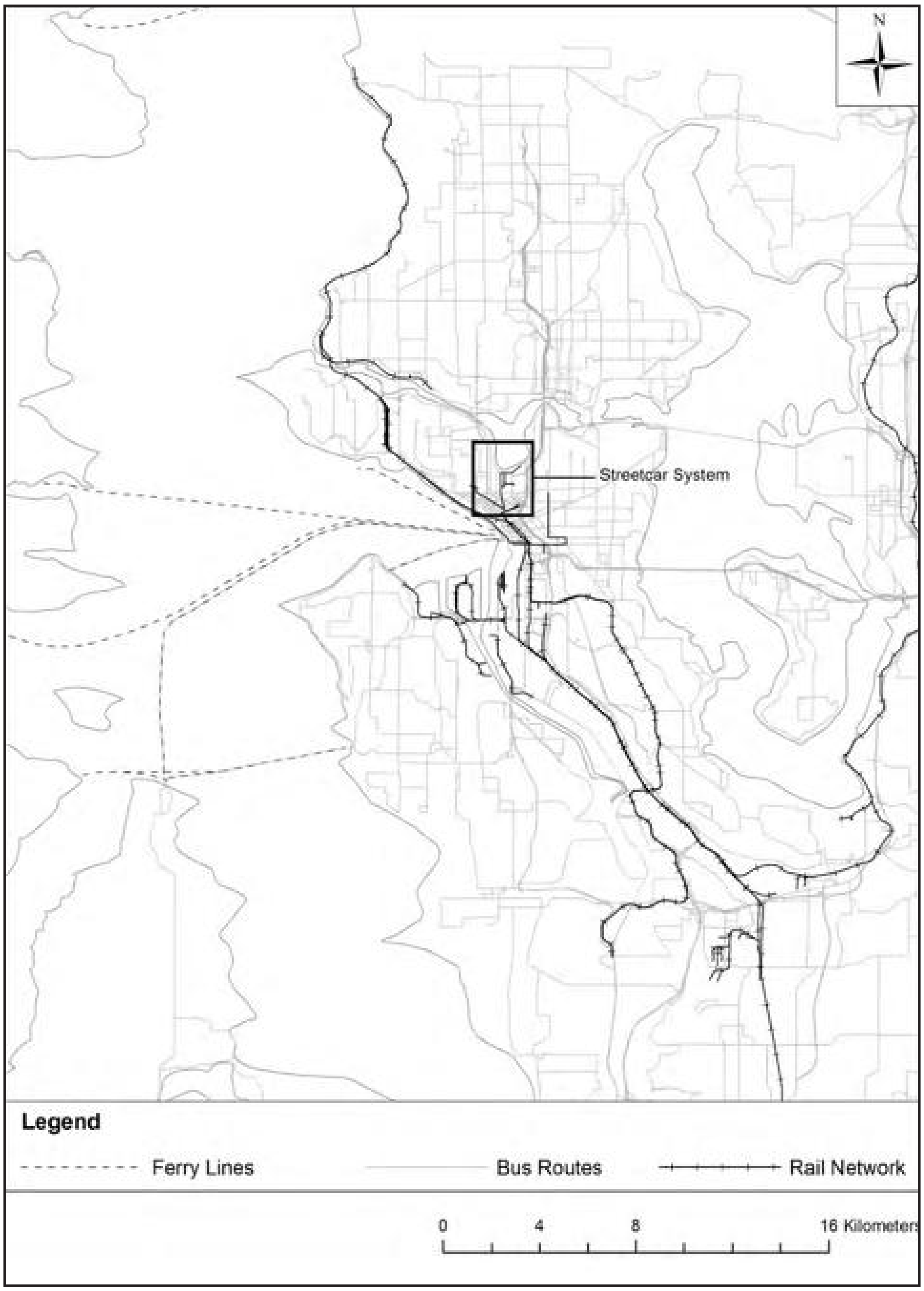

Figure 112. Map of Transit System in Seattle[347]

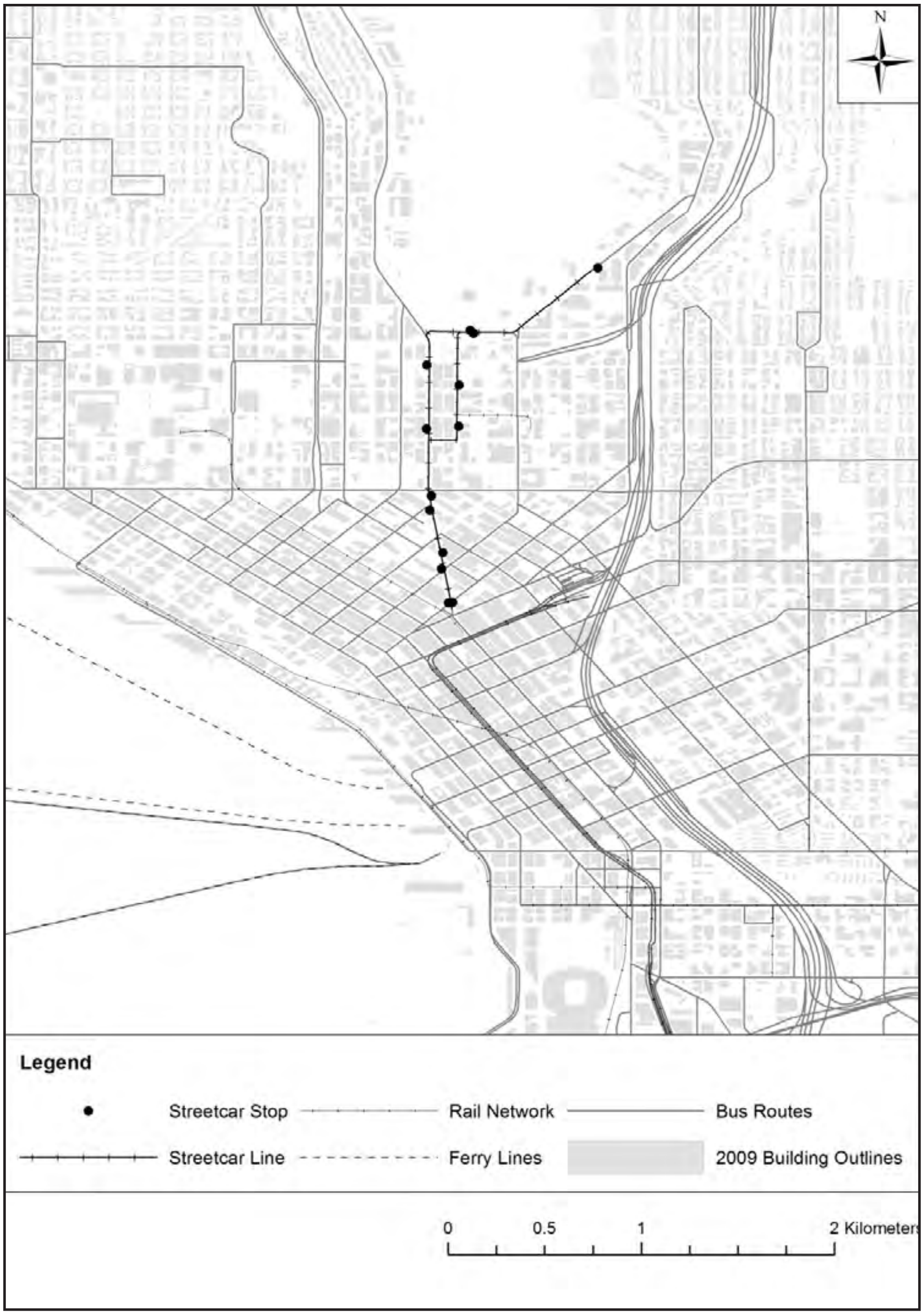

Figure 113. Large-Scale Map of South Lake Union Streetcar and Local Buses in the Core of Seattle[348]

The SLU streetcar line provides relatively frequent service during much of the day, every day of the week. Peak-period service frequencies are not much different from those available during the off-peak period and on weekends (Table 55). The base fare is relatively high, particularly given the short length of the alignment, although the fare structure includes discounts for children and elderly riders (Table 56). While fare policy permits free transfers between streetcars and buses, it is not clear the extent to which such transfers are made, as King County Metro staff has not conducted streetcar rider surveys.

Table 55. Service Characteristics of Streetcar System in Seattle[349]

Characteristic	Value
Headways	
Weekday Peak	10 min
Weekday Off-Peak	15 min
Weekend Average	12.5 min
Hours of Service	
Monday-Thursday	15 hr
Friday	17 hr
Saturday	17 hr
Sunday	9 hr

Table 56. Fare and Transfer Policy for Transit Services in Seattle[350]

Characteristic	Type	Cost ($)
Fare Type	Base fare	$2.50
	Youth (ages 6-17)	$1.25
	Children 5 and under	$0.00
	*Reduced fare	$0.75
Transfer Fee	Bus/Streetcar	--

Note: *Senior 65 years and older and people with disabilities receive fares at a reduced price.

SOCIOECONOMIC CONTEXT FOR STREETCAR SERVICE

The SLU streetcar line operates just outside downtown Seattle in the South Lake Union area, which is a growing employment center featuring biotech firms and the new Amazon facilities. The authors examined the socioeconomic characteristics and built environment contexts within which the streetcar line operates as part of the study, given the importance of these factors for transit ridership in other communities. The authors believed that a consideration of these factors would provide some explanation for the level of ridership on the streetcar line and the particular rider market being served. A discussion of these issues follows in the next several pages.

At the time of the 2010 Census, the city of Seattle, Washington had a population of just under 609,000 people within a metropolitan area whose population totaled 3.4 million people.[351] The city's median household income was $63,470 per year, with just over 13 percent of the population living below the poverty line. Seattle's household income is higher than the national average, while its poverty rate is lower than the national average. The city's population was nearly 70 percent white, with Asians accounting for just under 14 percent of the population, blacks about 8 percent of the population, and Latinos for nearly 7 percent of the population.

Figures 114 and 115 display city-scale population and population density, both by block group, at the time of the 2010 Census. Of these two maps, the latter map, which indicates people per square kilometer, is the most informative. It indicates that the population densities in Seattle tend to be highest near the water bodies and other edges of the city. Population thus tends to be relatively scattered throughout the city.

Figures 116 and 117 depict population and population density in the core area immediately surrounding the South Lake Union streetcar line. The maps clearly indicate that the area is at the lower end of population densities in the city, suggesting that this is more of an employment center than a residential one. The population densities in the area, taken without consideration of employment densities, tend to be lower than those generally recommended for the deployment of cost-effective transit service.[352] The South Lake Union urban village area exhibits lower population counts and densities compared with the adjacent downtown core located just to the south.

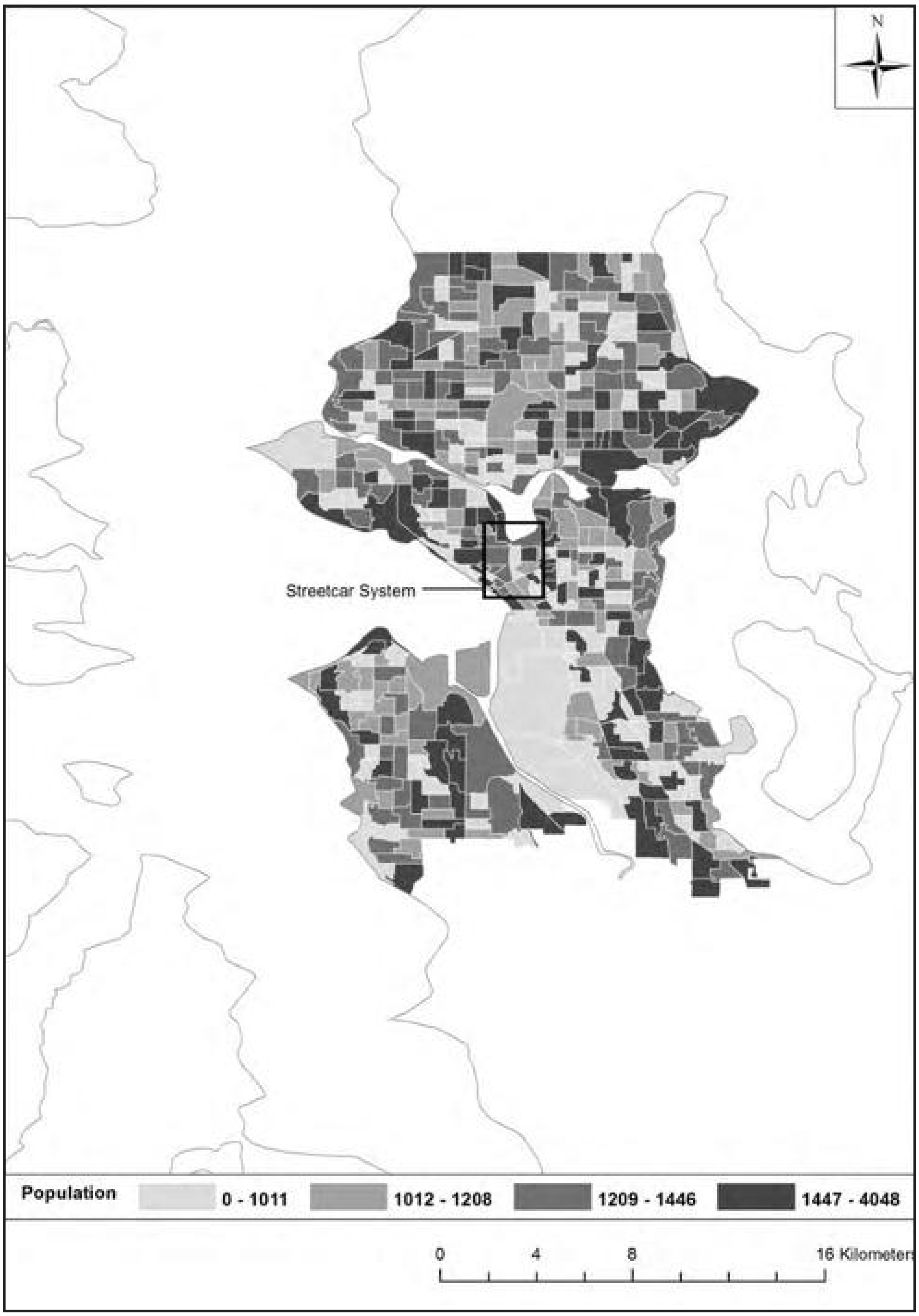

Figure 114. Population by Block Group in Seattle (2010)[353]

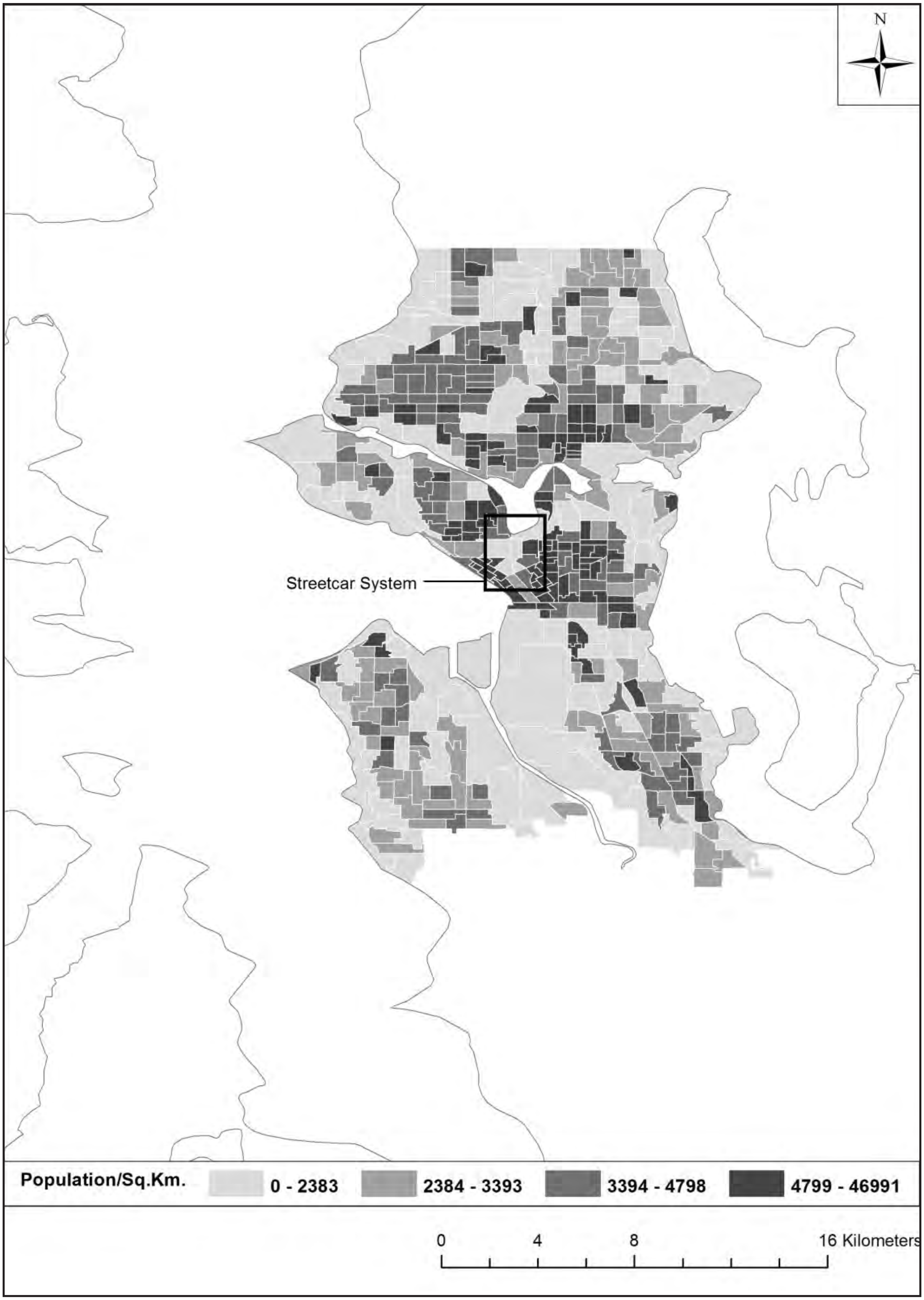

Figure 115. Population Density by Block Group in Seattle (2010)[354]

Figure 116. Population by Block Group in Core of Seattle[355]

Figure 117. Population Density by Block Group in Core of Seattle (2010)[356]

Employment and employment density (jobs per square kilometer) are indicated for the city in Figures 118 and 119, respectively. The former map suggests a scattering of employment throughout many different sections of the city, while the latter map clearly points to the existence of several major employment clusters in the city.

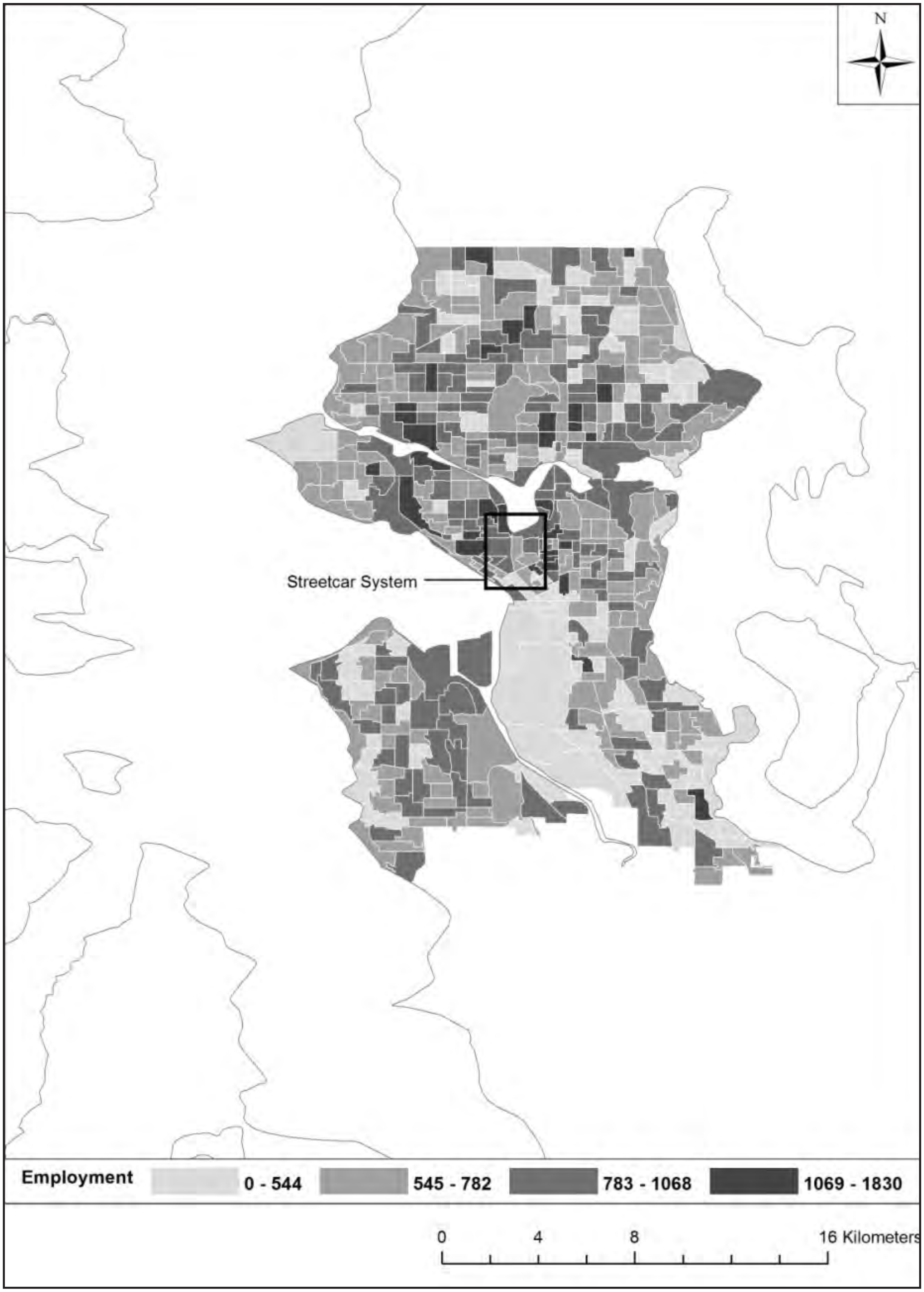

Figure 118. Employment by Block Group in Seattle (2010)[357]

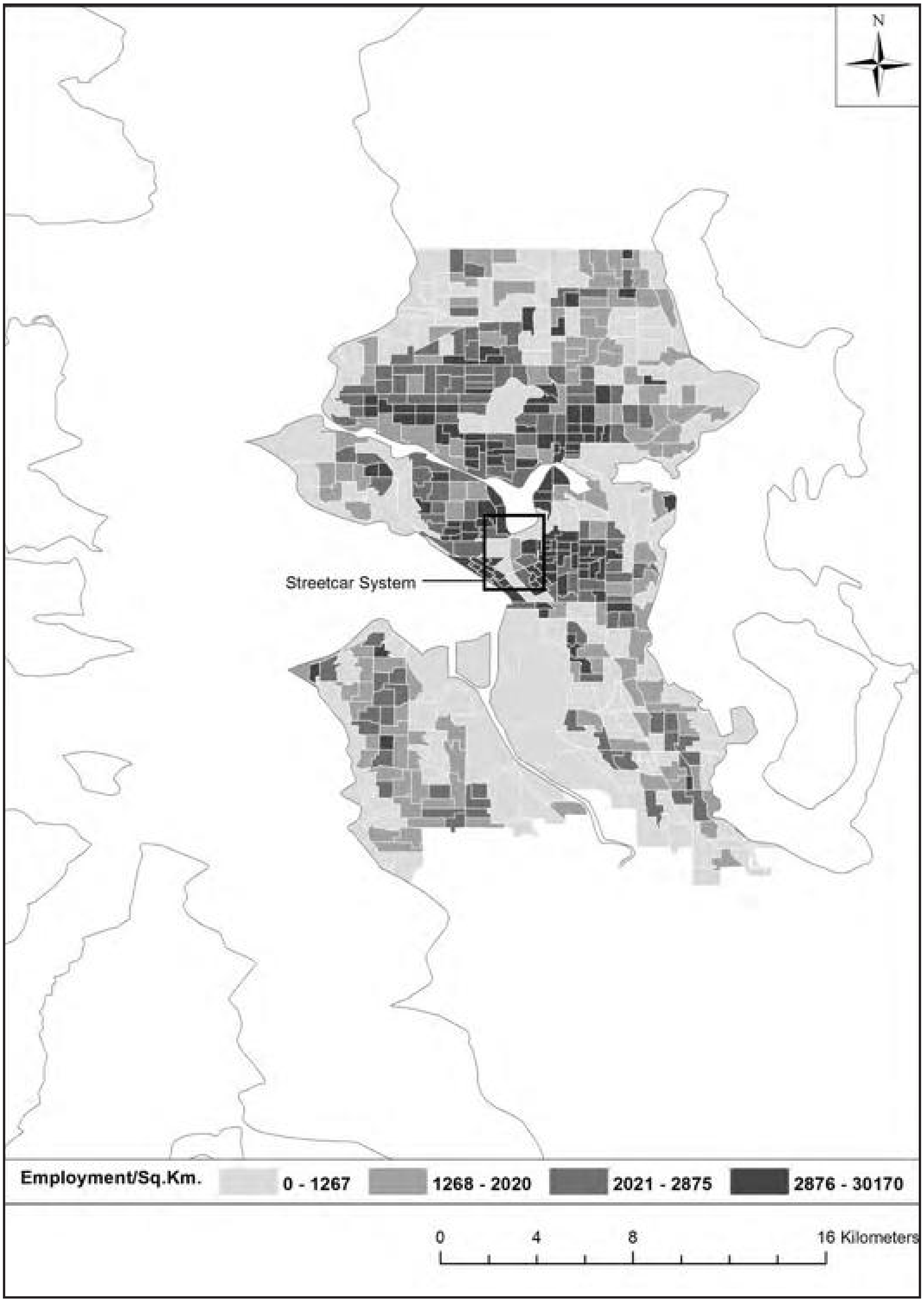

Figure 119. Employment Density by Block Group in Seattle (2010)[358]

The maps displayed in Figures 120 and 121 focus on employment and employment density, respectively, in the area immediately adjacent to the streetcar line. There are census block groups with high numbers of jobs near the streetcar, but many of the block groups through which the line actually passes are not those with the highest densities of jobs.

Figure 120. Employment by Block Group in Core of Seattle (2010)[359]

Figure 121. Employment Density by Block Group in Core of Seattle (2010)[360]

The combination of population and employment represents the set of possible trip origins and destinations in a community such as Seattle. The authors decided to produce a series of maps that combine population and employment to identify areas that might be most likely to produce or attract large numbers of trips, and to determine whether the SLU streetcar is located in parts of the community that might produce the most transit riders. Figure 122 maps the combination of population plus employment by block group at a city-scale, while Figure 123 is a density map for this same set of phenomena. Figures 124 and 125 map the same phenomena at a larger scale for the core of Seattle. The first pair of figures clearly points to the somewhat dispersed, multi-centered nature of activities in Seattle. The second pair of maps emphasizes that while the area immediately around the South Lake Union streetcar has large numbers of population plus employment, the densities of activities, as of the 2010 Census, fell in the low range amongst block groups in Seattle. These maps suggest the area as more one of transit trip production and attraction potential, assuming urban redevelopment occurs in the area, rather than an area with already established significant trip production and attraction characteristics.

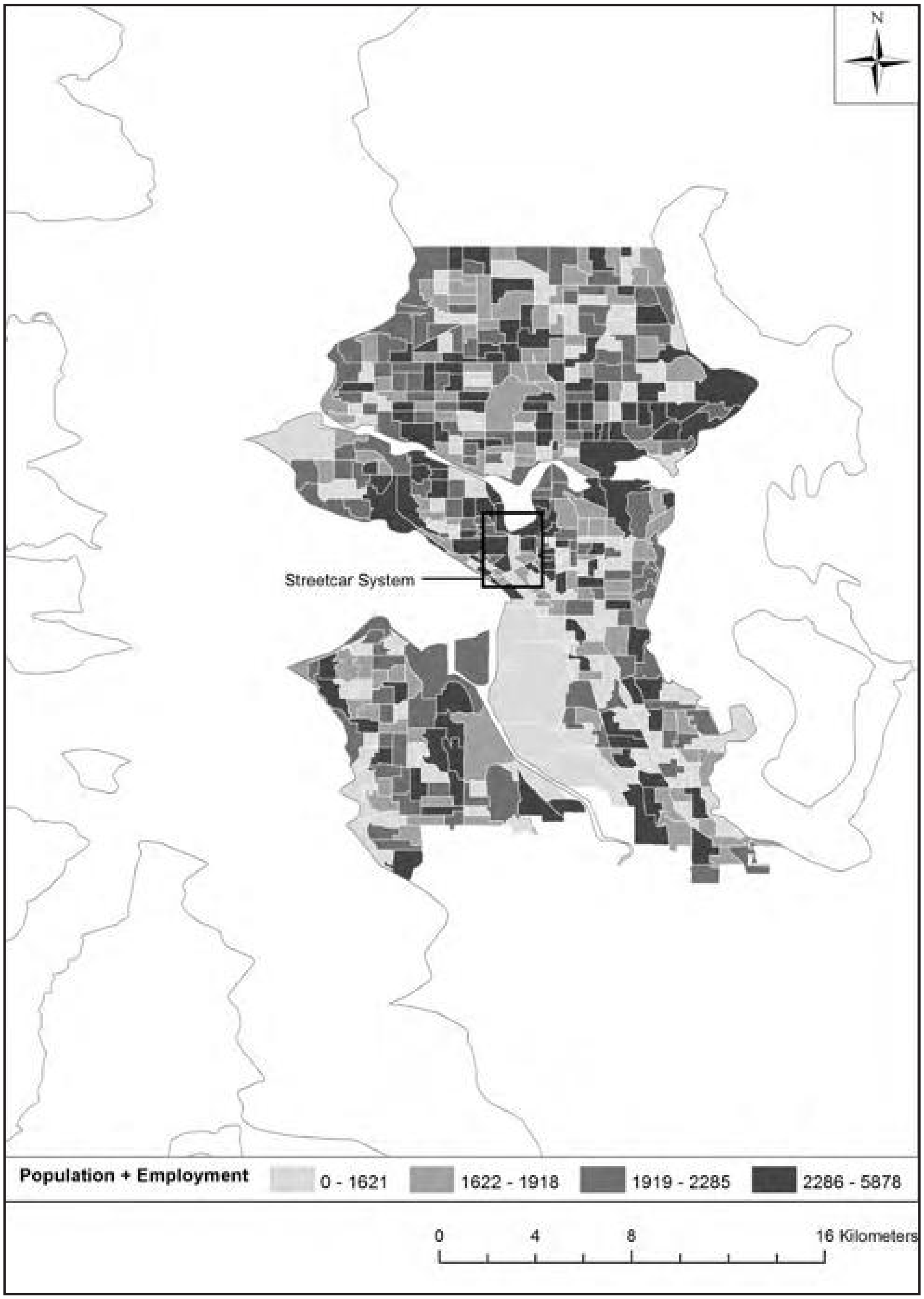

Figure 122. Population plus Employment by Block Group in Seattle[361]

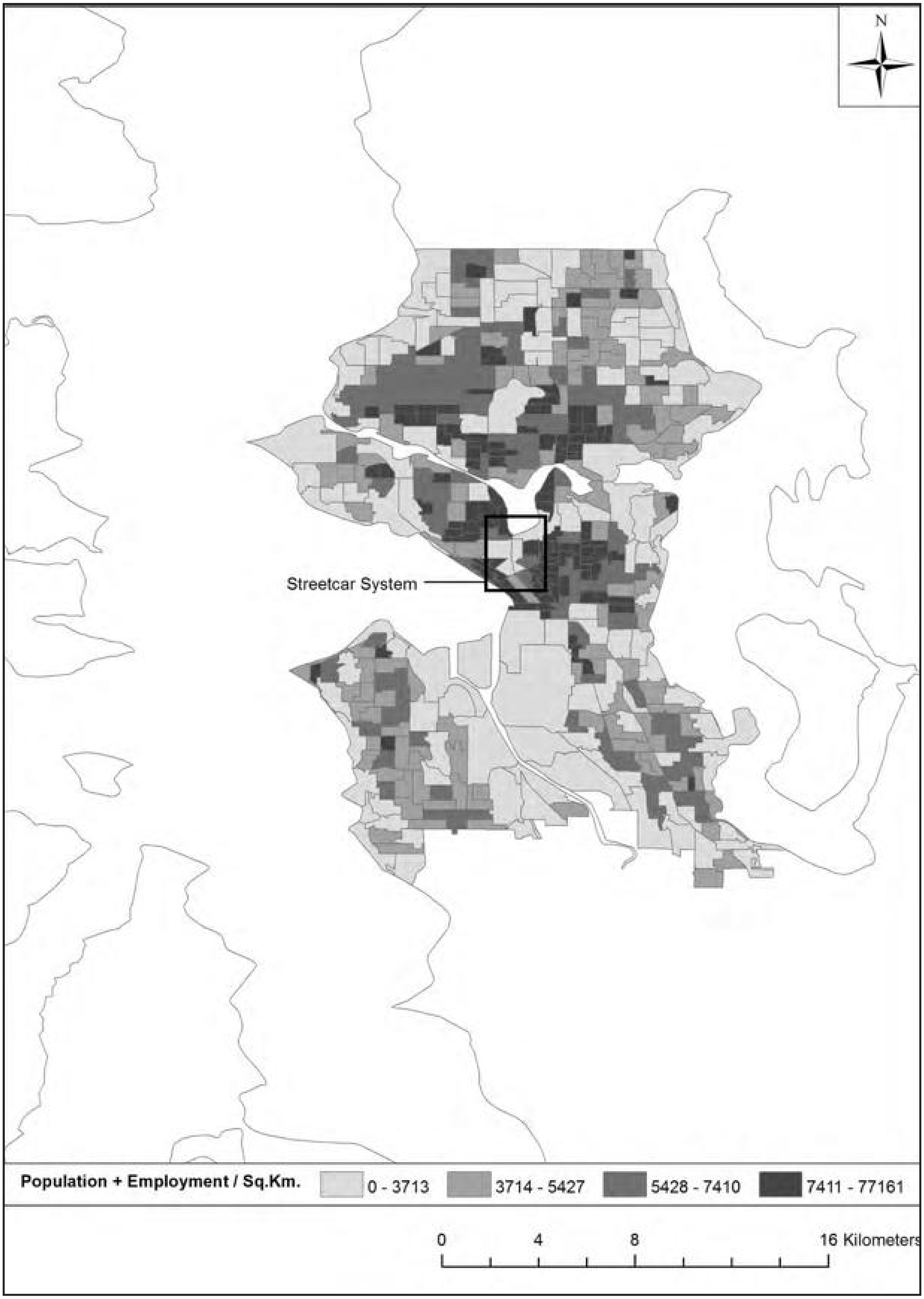

Figure 123. Density of Population plus Employment by Block Group in Seattle[362]

Figure 124. Population plus Employment by Block Group in Core of Seattle[363]

Figure 125. Density of Population plus Employment by Block Group in Core of Seattle[364]

As noted earlier, Seattle is primarily a white community, although it has significant Asian, Latino, and Black populations as well. Figures 126 and 127 depict the spatial distribution of the Black population at a city-scale and in the area around the streetcar line, respectively. The ranges of values for the legends of the two maps indicate that the percentage of Black population in Seattle is much lower than those of the other racial and ethnic groups, and the Black population is not growing as fast as either the Latino or Asian populations. The Black population tends to be located in larger numbers to the south and southeast of the area served by the streetcar line. Within the immediate vicinity of the streetcar line, the percentage Black population is in the low range of values (1-3 percent).

The spatial distribution of the majority white population is shown at a city-scale in Figure 128 and at a local scale for the core area of Seattle in Figure 129. The first map points to the stronger presence of the white population in the northern and western parts of the city. Much smaller white population shares are in the south and particularly southeast parts of the city. The white population represents a majority of the population in most of the block groups located near the streetcar line in Seattle's core.

Seattle has growing Hispanic (or Latino) and Asian populations. The spatial distribution of the Hispanic population is shown in Figure 130 at a city scale and in Figure 131 for the core of Seattle. The Hispanic population is spread throughout the city and is present in moderate numbers in the areas immediately surrounding the streetcar line. The Asian population is depicted in Figures 132 and 133. Sizable Asian populations are in the block groups located to the southeast of the streetcar line in Seattle's core.

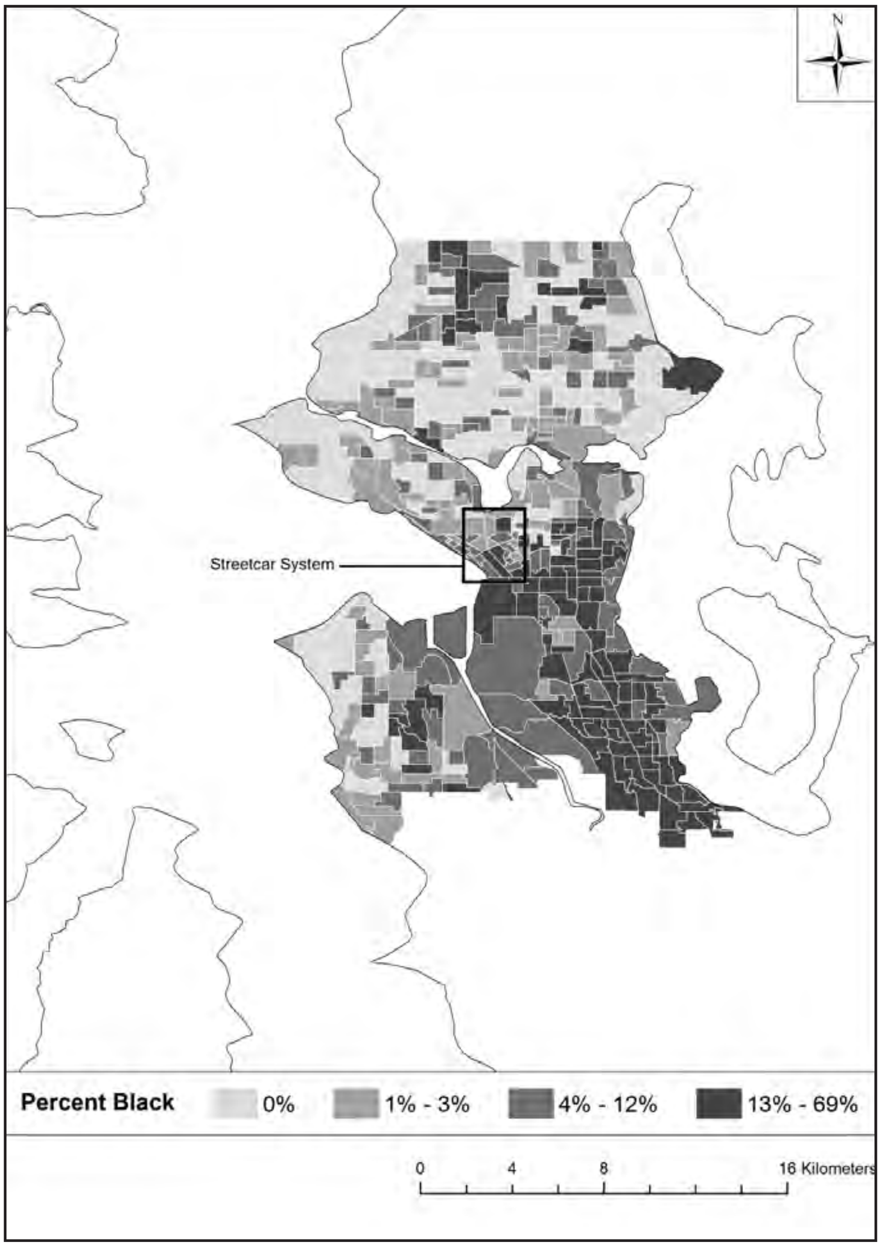

Figure 126. Black Population by Block Group in Seattle (2010)[365]

Figure 127. Black Population by Block Group in Core of Seattle (2010)[366]

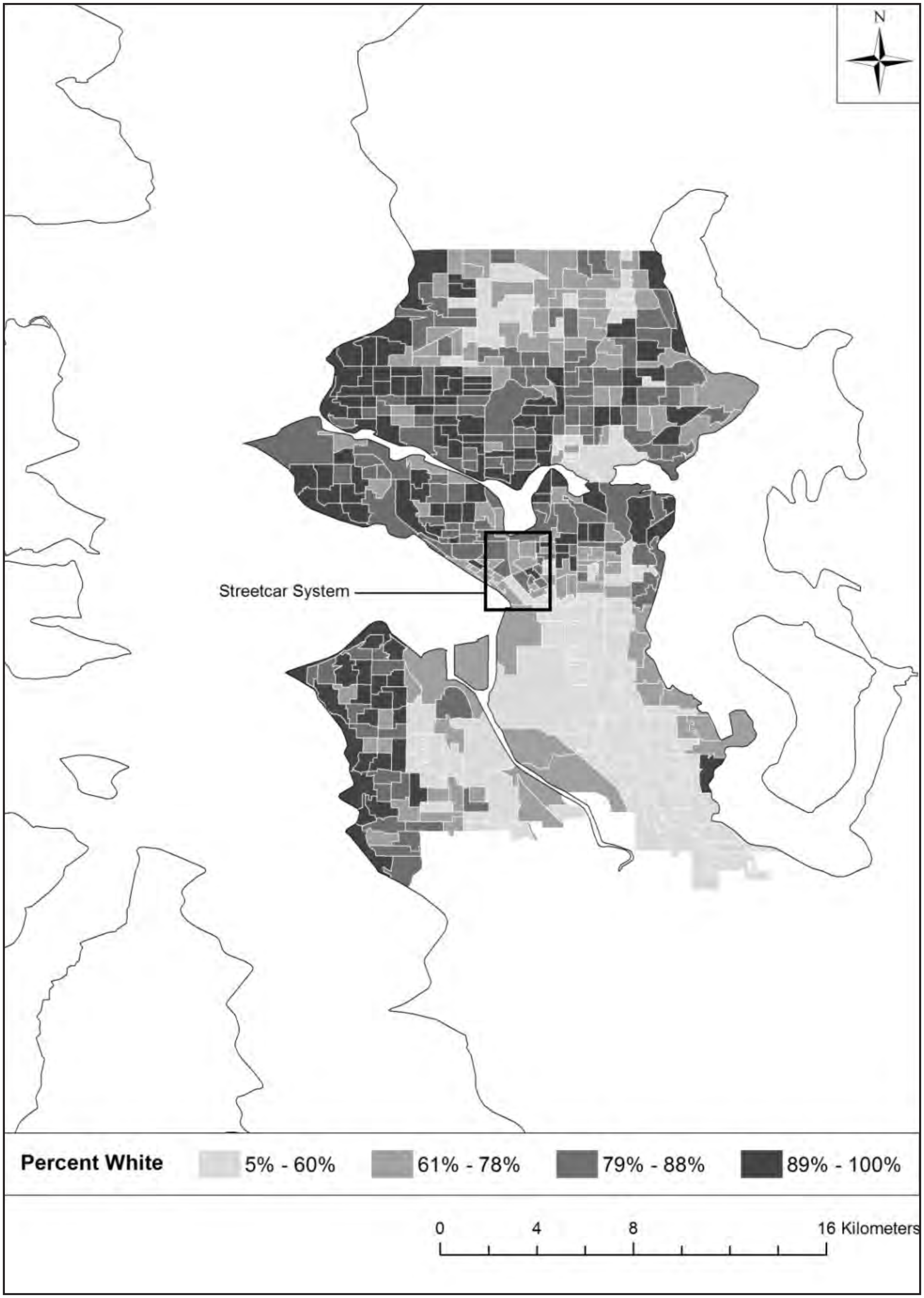

Figure 128. White Population by Block Group in Seattle (2010)[367]

Figure 129. White Population by Block Group in Core of Seattle (2010)[368]

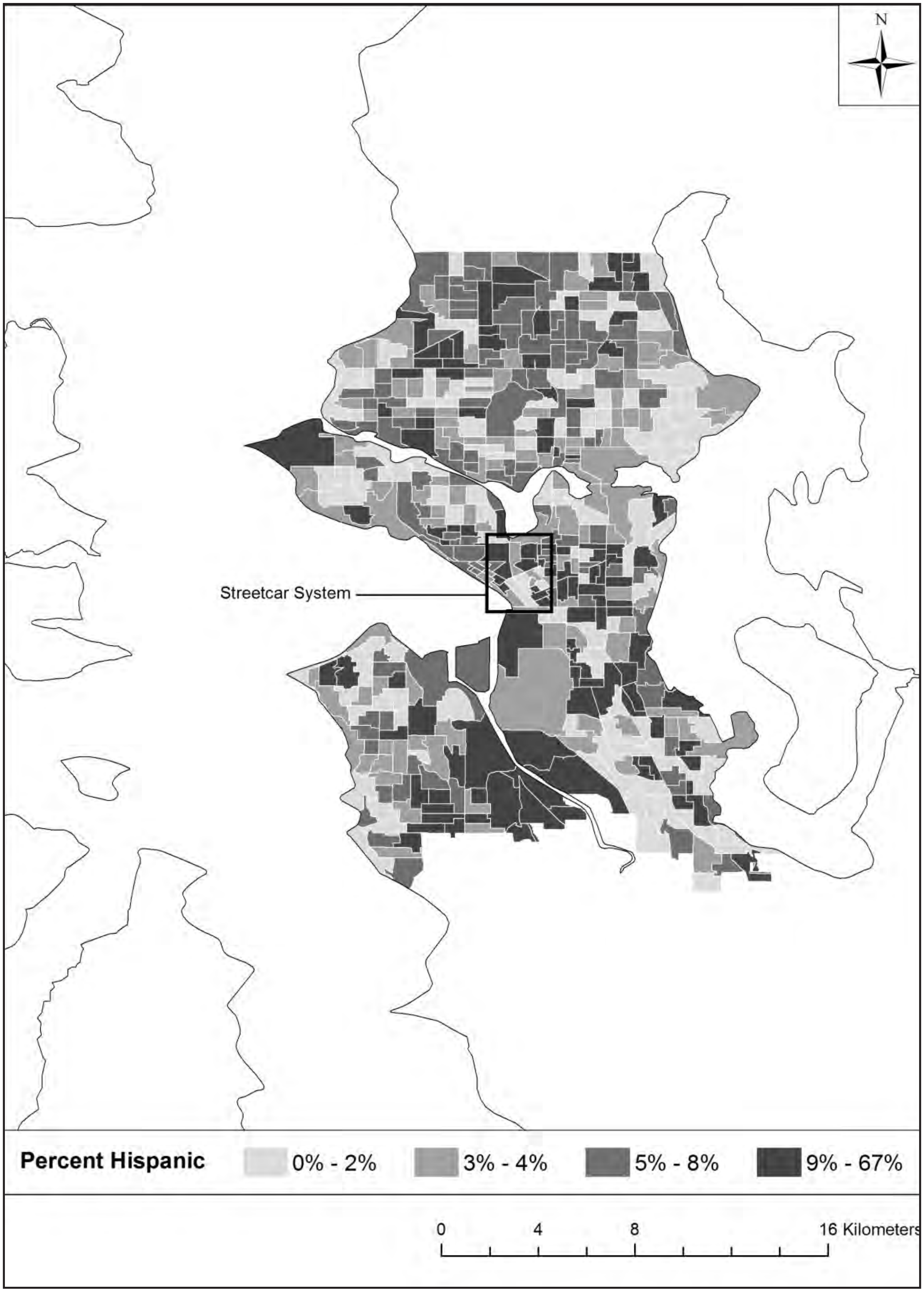

Figure 130. Hispanic Population by Block Group in Seattle (2010)[369]

Figure 131. Hispanic Population by Block Group in Core of Seattle (2010)[370]

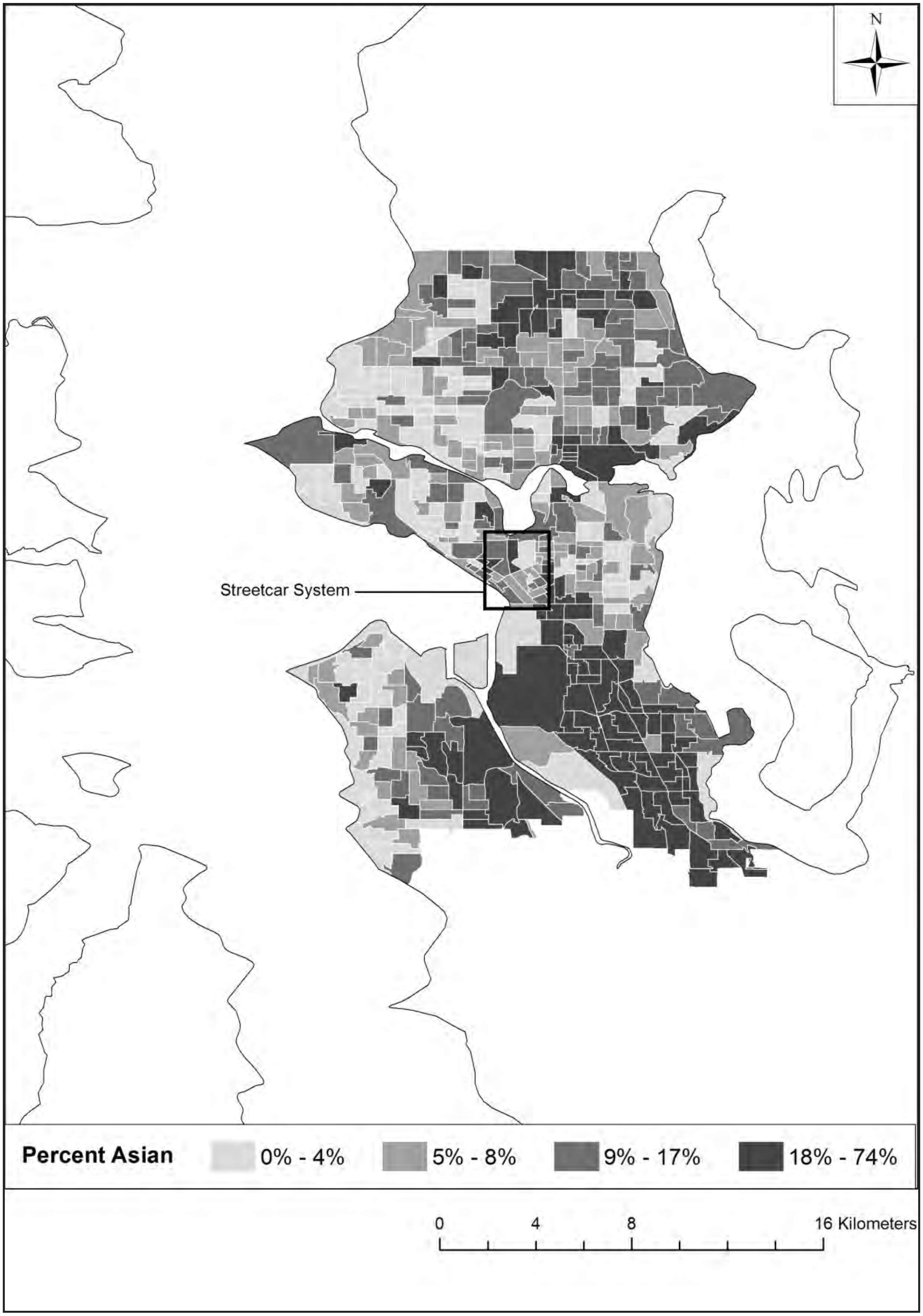

Figure 132. Asian Population by Block Group in Seattle (2010)[371]

Figure 133. Asian Population by Block Group in Core of Seattle (2010)[372]

The authors next turn to examine the spatial distributions of attributes related to income, vehicle access, and transit use. First, the authors consider the distribution of household incomes in Seattle to identify the wealthier and lower-income sections of the city. The transit literature suggests that lower-income individuals are more likely to be transit users. Figure 134 depicts median household income at a city scale, and Figure 135 maps the same phenomenon at a local scale for the block groups immediately surrounding the streetcar line. Concentrations of higher-income block groups are situated along the shorelines and in the northern part of the city. Two block groups directly served by the streetcar line have very high median household incomes, while adjoining block groups in all directions other than to the north of the line have somewhat lower median household incomes.

The spatial pattern of household vehicle access is shown in Figures 136 and 137. The maps show that vehicle access is higher in census tracts in the outer parts, and lower in the core areas of the city. The areas around the streetcar line have very low numbers of vehicles per household. And finally, the spatial pattern of transit commute mode share is shown in Figures 138 and 139. The two figures indicate considerable variation in transit mode shares across the city, with high values in the areas located immediately to the west and south of the city’s core. The areas around the lake tend to be in the more moderate range of values. The areas immediately adjacent to the streetcar line have a wide range of values, with the area directly served by the line in the lower range and those adjacent to it in the higher range of values. Taken as a group, these variables suggest that while the area served by the line is not the most promising area in the city for transit, from a purely socioeconomic or travel behavior standpoint, it does tend to fall in the middle range of values on most socioeconomic indicators and thus is an area with attributes that indicate high transit ridership potential.

Figure 134. Median Household Income by Block Group in Seattle (2010)[373]

Figure 135. Median Household Income by Block Group in Core of Seattle (2010)[374]

Figure 136. Vehicles per Housing Unit by Census Tract in Seattle (2010)[375]

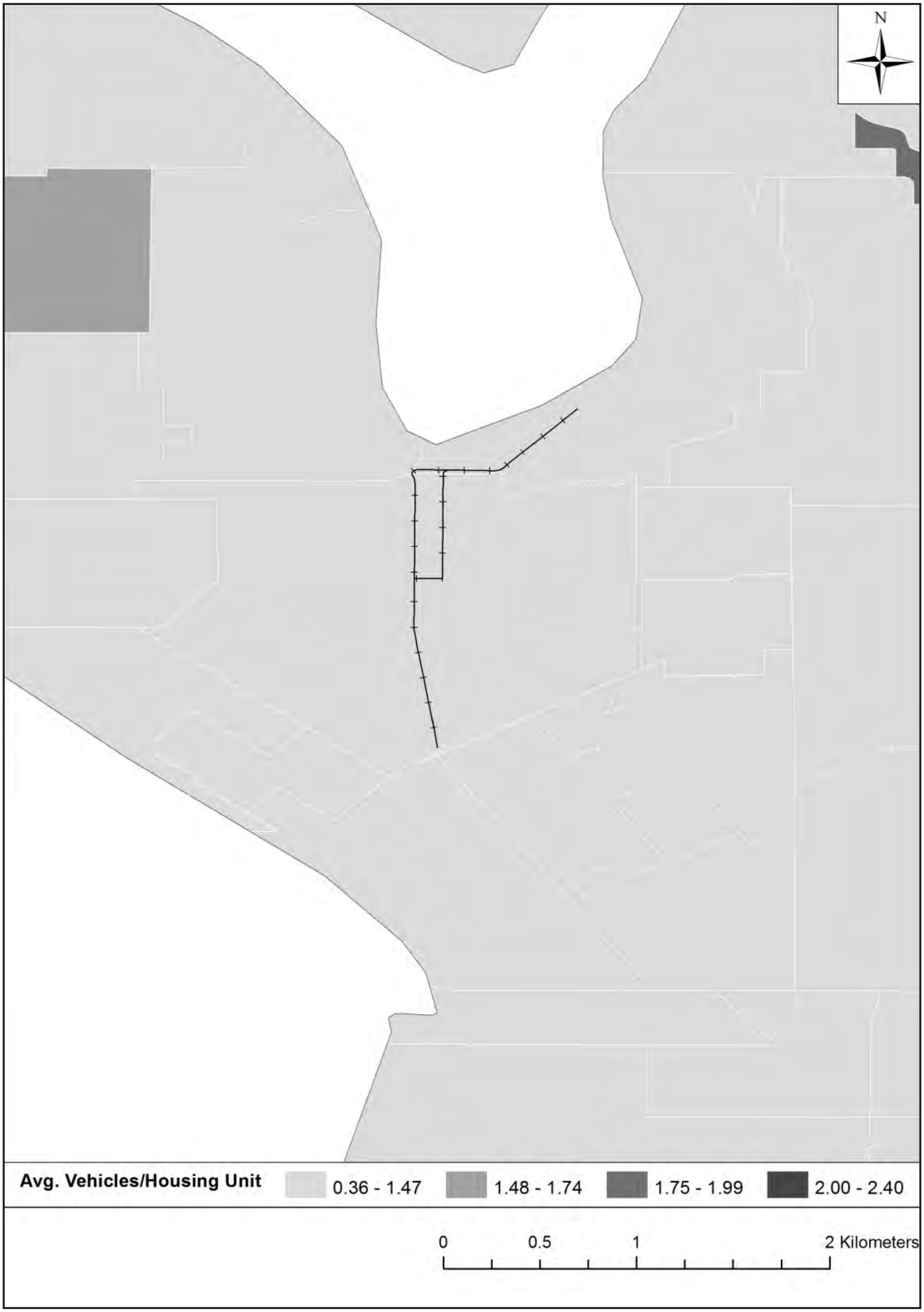

Figure 137. Vehicles per Housing Unit by Census Tract in Core of Seattle (2010)[376]

Figure 138. Transit Commute Share by Block Group in Seattle (2010)[377]

Figure 139. Transit Commute Share by Block Group in Core of Seattle (2010)[378]

LAND USE AND DEVELOPMENT CONTEXT FOR STREETCAR SERVICE

In addition to exploring the socioeconomic context in Seattle within which the SLU streetcar line is situated, the authors also obtained data from the local planning department to better understand land use patterns and the nature of the built environment within the area served by the streetcar line, given the connections between the built environment and transit usage cited in the transit literature.[379] The first map in this series depicts land uses in the area served by the streetcar (Figure 140). The map indicates that the streetcar serves a predominantly mixed-use area in Seattle's core. Commercial land use zoning is in the area at the northern end of the line, and downtown office and retail zoning are at the southern end of the line. All of these areas feature high-density zoning, with land use patterns that would support transit use. It is not surprising, given the line's downtown location, that land values are high, indeed among the highest in the city, in the area served by the streetcar line (Figures 141 and 142). This again suggests land market tendencies toward more intensive uses of the land that would be more likely to support transit use.

As noted earlier, the area around the streetcar line has experienced higher intensity development, although not as high as that located in the downtown core, as shown in Figure 143. Some empty spaces are occupied by parking lots and other non-built uses, particularly in the blocks immediately south of Lake Union Park. The figure depicts the streetcar lines, building footprints for existing structures, and a 400-meter (one-quarter mile) buffer around the streetcar stops that indicates typical maximum walking distances to access the service.

Special Activity Centers are those that would generate above average boarding counts, as they tend to attract large numbers of users. For example, large health-care and/or research institutions, college campuses, schools, museums, sports arenas, and tourism attractions are some of these types of land uses. Previous research has identified these locations as significant factors in generating above average boarding counts in modern streetcars in the U.S.[380] As such, they are considered an important component for modern streetcar landscapes.

Figure 144 illustrates that the majority of land uses and features that could be described as Special Activity Generators in Seattle are clustered in the Denny Triangle and the Commercial Core urban neighborhood, as well as along the West South-West waterfront. The Westlake & Olive Way streetcar terminal station, which serves as a gateway from and to Seattle's Commercial Core, registers the largest boarding count for the system. Not only are potential Special Activity Centers and landmarks clustered in this area, but also the station is well served by more than five bus routes, and it is just one block away from the Link light-rail station and adjacent to the monorail.

Other Special Activity Centers exists to the north along the streetcar area of influence but are less clustered when compared to the rest of the city. Some of these are the South Lake Union Park and the Fred Hutchinson Cancer Research Center, which seems to have some influence on the ridership level at the Fairview Avenue & Aloha Street station. Also the biomedical research complex and Group Health Cooperative in the South Lake Union neighborhood seems to influence ridership level at the Westlake Avenue & Harrison Street station (Figure 144). It appears that the presence of the Amazon Campus does not exert significant influence on boarding at the two stops at Terry Avenue. The relative higher boarding count at the Mercer/Westlake stop in the absence of a special activity center may be explained by the presence of several large parking lots. As such, this location may function as a park-and-ride facility for the stop and thus facilitate higher numbers of automobile-streetcar mode transfers.

Interestingly the South Lake Union Park and nearby Museum of History and Industry do not seem to exert significant influence on the stop located on the Valley Street avenue. This may be due to the vacant status of adjacent lots to the south and the possibility of undergoing construction/improvement work at the South Lake Union Park and Valley Street-Boulevard improvements during the year ridership was documented.

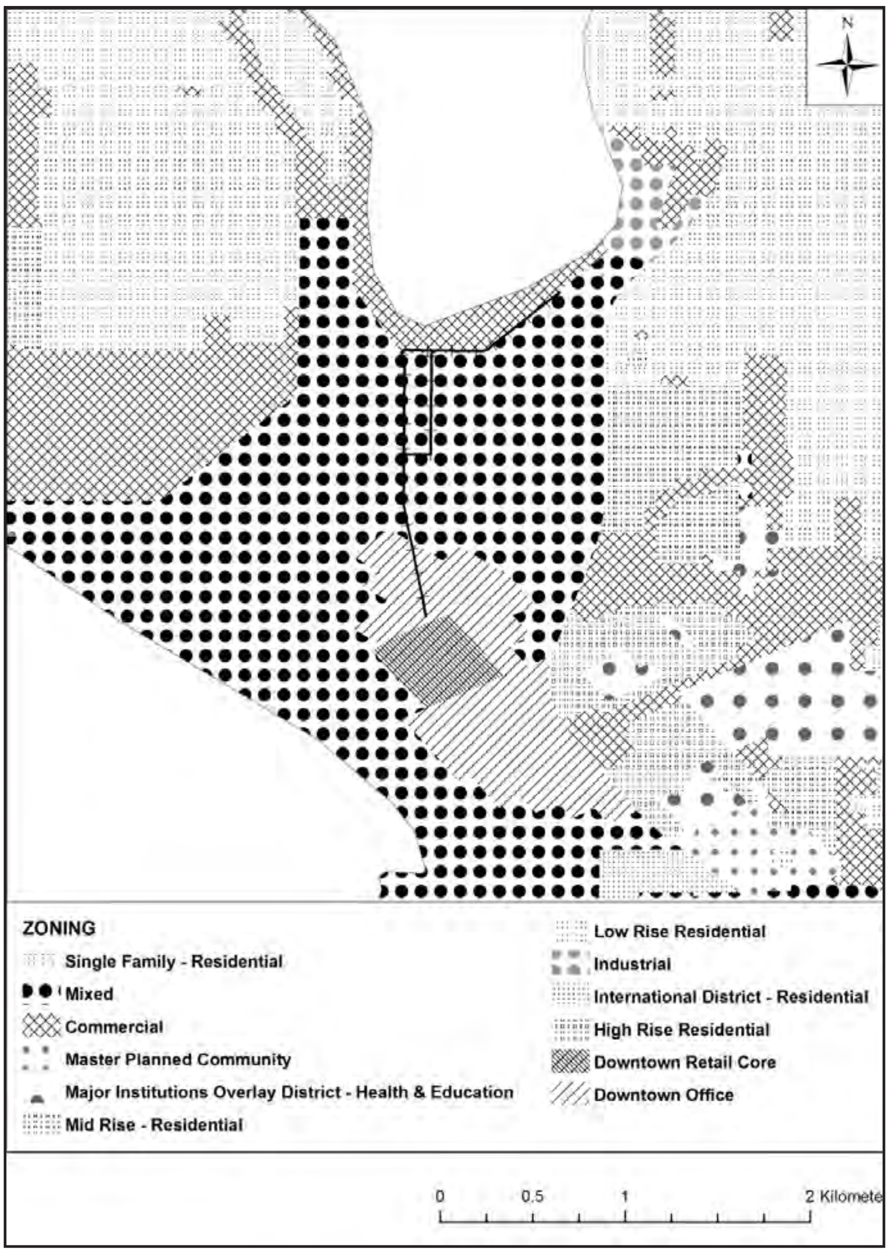

Figure 140. Land Use Map for Core of Seattle[381]

Figure 141. Land Values in Seattle ($ per square meter)[382]

Figure 142. Land Values in Core of Seattle ($ per square meter)[383]

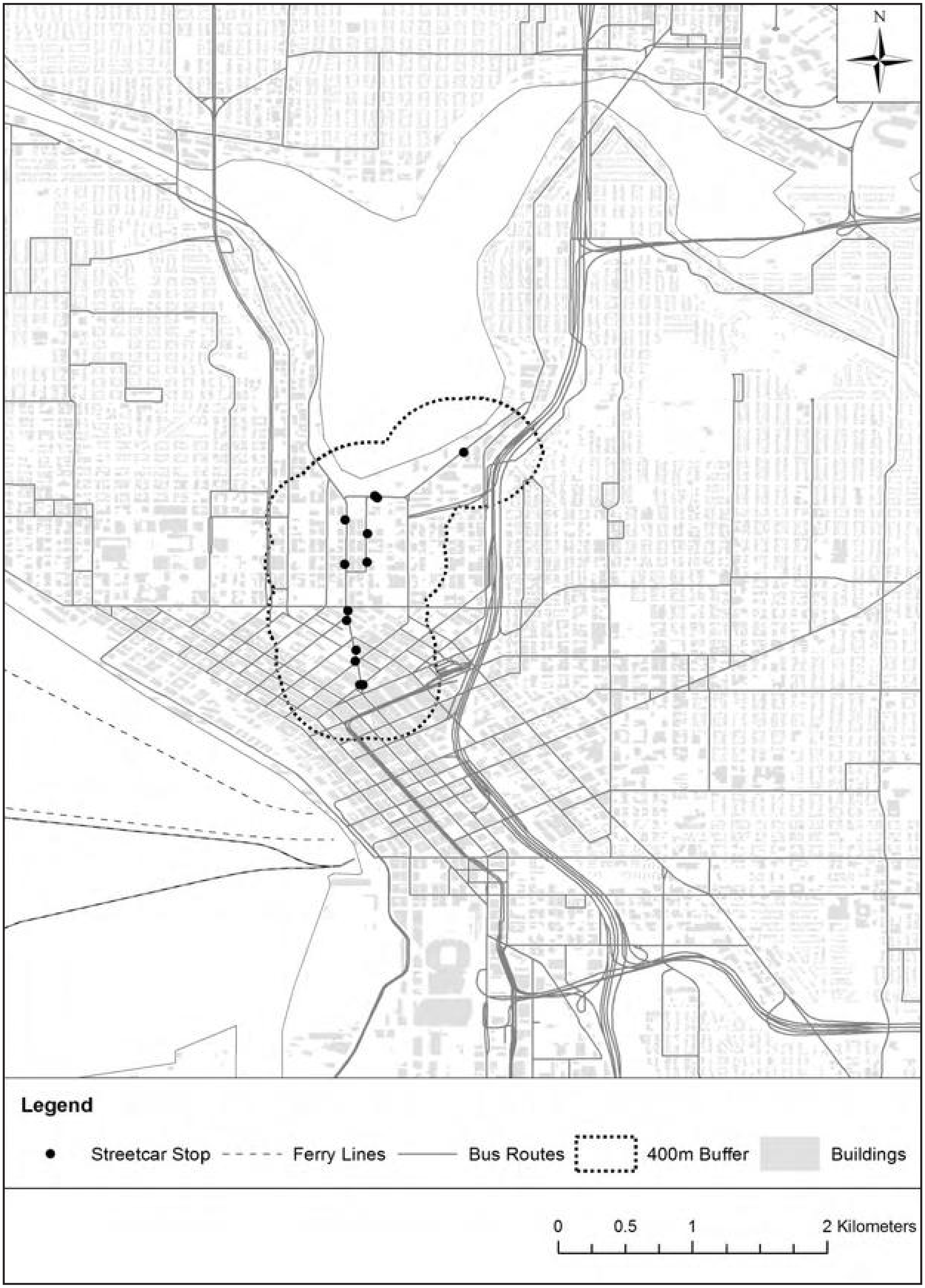

Figure 143. Building Footprints around Streetcar Line[384]

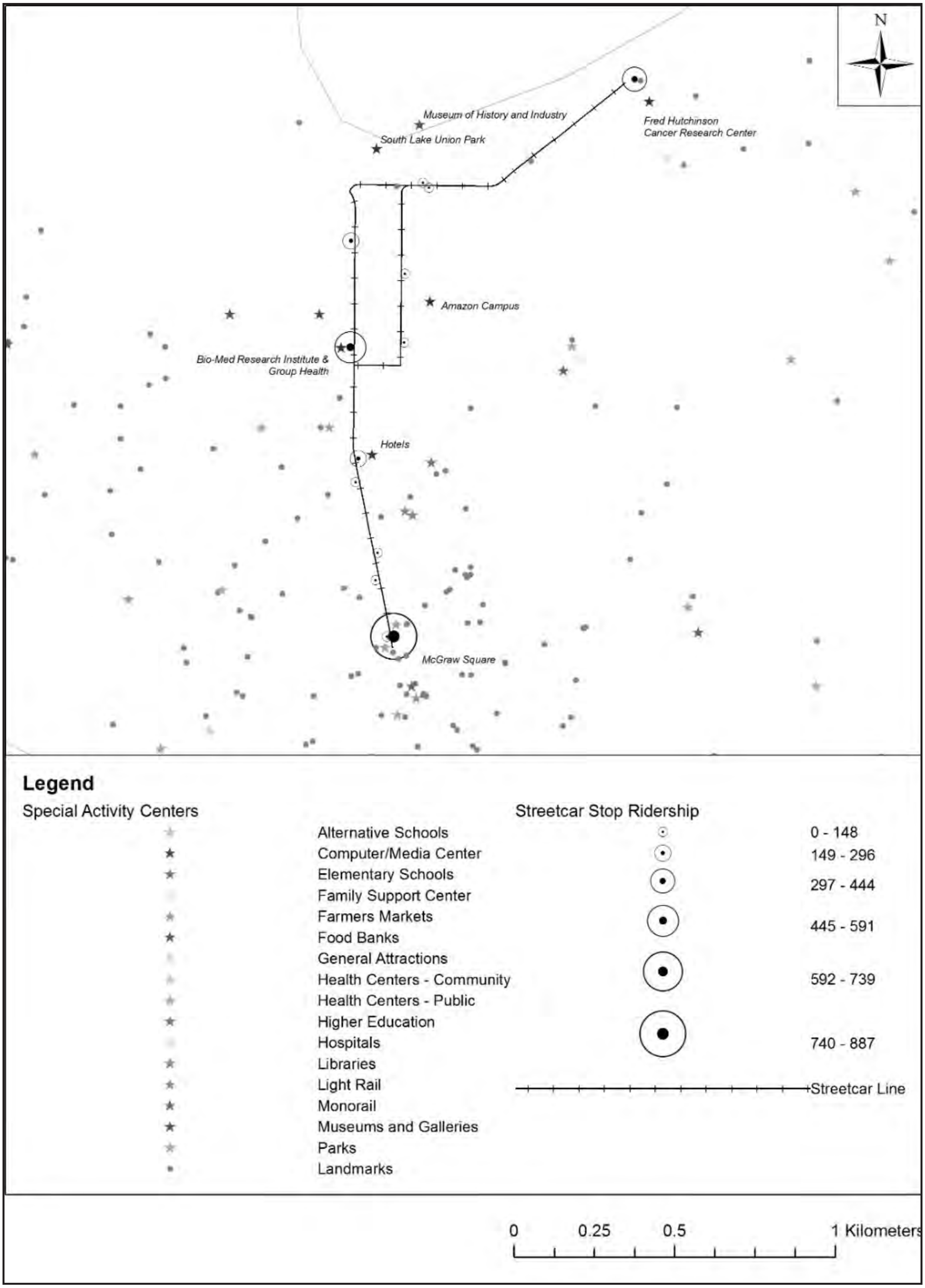

Figure 144. Special Activity Centers Around Streetcar Line[385]

HISTORICAL BACKGROUND ON STREETCAR DEVELOPMENT[1]

Seattle's first downtown horse-powered streetcar system started operations along Second Avenue on September 23, 1884. The horses, however, had a difficult time navigating the hilly Seattle landscape, and soon, in 1887, cable cars were introduced to the city. Frank Osgood, the owner of the original horse-drawn streetcar, began operating the first electric streetcar in 1889. Horse-drawn streetcars quickly became obsolete, and Seattle became the first city to have an all-electric streetcar system on the West Coast.[386]

As in many cities in the late 19th and early 20th century, new streetcar lines soon emerged in conjunction with many new housing developments outside Seattle's city center. At one point in the 1890's Seattle had over 22 distinct streetcar lines connecting the city center to outlying areas. In 1898, Seattle Electric Railway Company, subsidiary to the company called Stone & Webster, began a consolidation of Seattle streetcar companies under its ownership. By 1900, Stone & Webster received a 35-year streetcar franchise from the city.[387]

All was not well for the streetcar business though, either in Seattle or the rest of the United States. Not only had the first automobile arrived in the Seattle area, but Stone & Webster had been running a deficit due to high debt servicing charges. To get out from under the financial burden, the company sold the streetcar lines to the City of Seattle in 1918 for $15 million. However, what became the Municipal Street Railway was troubled from the start. Lack of maintenance funding, along with the emerging popularity of the automobile and bus, led local officials to shift their priorities to serving motorized modes of transport. Despite popular demand and some resistance, future transportation development did not include streetcar infrastructure, and by 1940, the Seattle streetcar line began to be broken down and its components sold off. On April 13, 1941, Seattle ended its streetcar service.[388]

Just a decade after the removal of the streetcar, the Municipality of Metropolitan Seattle (Metro) began discussions for a transit system to "combat traffic congestion and suburban sprawl."[389] Metro's many proposals, which included a Monorail running from Seattle to Tacoma and several other rail transit options, were rejected as the public did not consider congestion a major issue and favored other transportation projects, particularly highways. The expansion of the local highway system, in combination with growing vehicle ownership, led to an erosion of transit patronage. In the early 1970's, transit provider Seattle Transit System began experiencing financial difficulties as a result of these larger trends; Metro was given authority to operate Seattle's bus-only transit system in 1972. Metro remained an advocate of rail transit during this period, although its efforts rarely enjoyed any significant political support. One notable exception came in 1974 when a City Councilman proposed a new streetcar line. The proposal did not receive backing from the rest of the City Council.[390]

However, despite running into various barriers and political resistance, Metro remained committed to rail transit. In May 1982 a two-mile [3.20 kilometer] Waterfront Streetcar began operations. The system included five vintage streetcars that ran on old freight track to destinations such as Seattle's transit tunnel, an Amtrak station, and Safeco Field, the home of the Seattle Mariners.[391] Sixteen years after operations began, the streetcar system was thoroughly renovated. Starting in the early 2000s, major problems began to arise

1 The historic narrative section was researched and written by Chris Stansbury.

for the George Benson Waterfront Streetcar, named after the councilman responsible for the development of the project, when the maintenance facility was demolished before a suitable replacement was ready. Although plans were approved to briefly close the streetcar system while a new facility was established, the Waterfront Streetcar never reopened after it was closed in November 2005. The shutdown was highly controversial, and it was rumored that this unintentional shutdown stemmed from previous political opposition to the streetcar.[392]

Meanwhile, Paul Allen, co-founder of Microsoft Corporation and chairman of the investment firm Vulcan Inc., was circulating an idea for a new streetcar line that ran through downtown Seattle to the South Lake Union neighborhood, where he owned a majority of the land. The idea was first pitched in 2002 at real estate industry meeting. The presentation included design sketches, pointed to relatively low per-mile costs compared with other transit projects then on the table for the local transit agency, and mentioned Portland's new streetcar as a model for successful use of a streetcar as an urban development tool. This was part of a larger plan to develop South Lake Union into a more pedestrian-friendly biotechnology center.[393]

After months of lobbying, Seattle's mayor Greg Nickels announced plans to move on with Allen's streetcar project. Original plans called for a 2.5-mile [4.02 kilometer] line, with an estimated cost of $40 million, to begin operating in mid-2004. The primary source of funding was to be from a local improvement district tax. About 50 percent of the funds were predicted to come from Allen and property owners in the area. Other forecasts included the generation of 20,000 jobs in South Lake Union over 20 years. City officials were still unsure where the remaining $20 million would come from, but they believed it could be procured from federal, state, or regional funding sources. Early opposition to the proposal focused on parking issues, problems with congestion, possible delays for other transportation projects, and most importantly the lack of funding. Nevertheless, in January 2003, King County Metro officially added the streetcar to a project list that was to be presented to acquire funding, and the city hired Shiels Obletz Johnsen, Inc., the consulting firm for Portland's streetcar development, to direct the Seattle streetcar project.[394]

In June 2003, the City Council approved a plan for developing the South Lake Union area. At the same time, the Washington State Legislature appropriated $3 million for the streetcar project.[395] But, still unsure of the wisdom of streetcar development and its level of local support, the City Council did not allocate the full $3 million and instead approved $295,000 to be used for further streetcar studies.[396] For the next year, supporters and opponents mobilized for further conflict. The main theme for supporters was the possibility of growth and private investment in the area resulting from a permanent transit development. On the other hand, opposition believed the area would grow regardless of whether or not a streetcar was built, pointing to the large investment and development already taking place.

Other opponents pointed to $500 million of other transportation projects that could be neglected if public focus shifted to building a streetcar.[397] The President of the North Seattle Industrial Association presented this view when he asked, "Why is a city with so little money for basic transportation need, spending on this?" and, "We don't have enough police officers, we can't fix streets, but still we are going into the streetcar business."[398]

In July 2004 the city released one of its studies that forecasted $1.4 million in annual operating costs along with $45 million in total capital costs for a streetcar. The study also proposed that $25 million of funding would come from taxes on property owners along the track, $8.5 million from "secured state and federal grants," "$9 million from pending federal grants," and $2 million from unknown sources.[399] Forecasts projected the redevelopment of South Lake Union (SLU) as a whole would generate from $166 million to $333 million in additional tax revenues by 2025.[400]

Streetcar development took a big step forward in August 2004 when the City Council, after putting a ban on spending for the project, finally released $2.4 million to begin the streetcar design and engineering.[401] As the design process progressed, the updated track, now costing $47.5 million, was planned to be a 2.6-mile loop that ran from the Fred Hutchinson Cancer Research Center to the Westlake Center shopping area.[402]

In mid-May 2005, more studies were released, stirring up more controversy. One of the first releases from the study estimated property values along the line would grow by $70-80 million to nearly $5 billion.[403] Annual ridership estimates of 330,000 emerged along with the plan to cover operating costs with fares and advertisement/naming sales. Doubters criticized the accuracy of the ridership projections stating they were below the ridership numbers of the already-existing Waterfront Streetcar, and they also did not believe enough advertisement sales could be generated to fund the cars.[404]

On June 27, 2005, despite some intense public opposition, the Seattle City Council approved the streetcar plan and granted the money to pay for beginning construction. With completion set for late 2007, critics still were unsure if enough funding would be found. A councilman who voted against the plan stated, "in this case, it [the streetcar] is a luxury. I am not sure that we have seen the final price tag" and, "We need to deal with basic needs before we invest in a luxury system."[405] Just four months later, the City Council convened again and approved the implementation of a taxing district along the streetcar line.[406]

By March 2006, projected costs spiked up again to $50 million. Worried that the SLU streetcar project would have a funding shortfall, one councilman proposed the increase be offset with a tax increase in the improvement district, as the city could not afford to cover these extra costs. However, other councilmen, along with the mayor, were assured that the funds could be raised through pending grants and the sale of government land.[407] Late that March, the City Council met again for one final vote to move on with the streetcar construction. After finalizing details concerning the improvement district tax and determining an operating costs plan (75 percent King County Metro, 25 percent the city), the City Council gave its approval to continue with streetcar development.[408] Groundbreaking for the city-owned streetcar line happened on July 7, 2006.[409]

With construction halfway completed in May 2007, the streetcar, as feared, began experiencing financial problems. First, realized operating costs were higher than expected (about $2 million a year). Also, the advertisements were not selling as quickly as necessary. Mayor Nickels resorted to asking the City Council to approve a $3 million credit to finish the streetcar.[410] At the same time, skeptics raised questions about the streetcar's service characteristics, pointing to the slowness and shortness of the streetcar system. Many critics observe that the bus was a cheaper option that would take them to their destinations equally as fast as or faster than a streetcar, considering that the streetcar would be stuck in the same traffic as any other mode. Many critics also could not imagine themselves using the streetcar for short-distance trips.[411] These concerns, however, were voiced too late to have any bearing on streetcar development.

On December 12, 2007, with construction complete, the SLU line of the Seattle Streetcar, operated by King County Metro, began service.[412] Initial ridership levels were higher than expected. Early issues included several accidents along the streetcar line, accessibility problems on Mercer Street, and increased danger for bicyclists, as the streetcar ran on the outer road lanes on which cyclists traveled.[413] Despite these issues, city officials began discussing system expansion shortly following the opening of the SLU line. In February 2008, the Seattle City Council approved a study to determine the feasibility of adding up to six more streetcar lines.[414] However, many observers urged delay to see how successful the SLU streetcar line was before using public resources to expand the streetcar line – funds that could be used instead to expand less expensive bus services. There was a direct trade-off between streetcar and bus development, as the available funding was the same for both.[415]

By May 2008, the Seattle Streetcar had impressed the Seattle Department of Transportation enough for them to create a list of possible streetcar route extensions. At the same time, Seattle Streetcar Alliance began a campaign to promote further streetcar development.[416] Supporters praised the SLU line's success and argued that further streetcar development could be financed in similar fashion as previous streetcar financing. Skeptics, including Seattle Councilman Nick Licata, were worried about using resources that could be devoted to other transportation projects that they viewed as more important investments.[417] Nevertheless, in November 2008, transit agency Sound Transit approved $120 million for a new streetcar line in the First Hill neighborhood.

In December 2008, the city's transportation committee approved a $600 million plan to expand the Seattle Streetcar, including the $120 million First Hill plan.[418] Less than a week later, the full City Council approved the plan with stipulations that there must "be proof of committed funding" and "proof that the streetcar network will provide measurable improvement to transit" without affecting other transit services. The First Hill and Capitol Hill neighborhood lines were prioritized.[419] The performance of the SLU streetcar bolstered the efforts of streetcar supporters to pursue these new projects. At the end of its first year, SLU ridership exceeded expectations with approximately 100,000 more rider trips than were predicted.[420]

Throughout 2009, the City Council worked to make the First Hill streetcar line a reality. It would connect the International District and Capitol Hill rail stations. In early May 2010, the Council approved the proposed two-mile [3.2 kilometer], ten-stop First Hill streetcar line plan, with construction starting in 2011 and service starting in 2013.[421] The line would be two-way and run in mixed traffic. The primary reasoning for developing a line in this particular area was that First Hill was a dense neighborhood with three hospitals and two schools. The line would also stop near Qwest Field, making it a possible choice for those traveling to a Seattle Mariners or Seahawks game.[422] The city was responsible for building and operating the system, and Sound Transit, despite budget shortfalls, assumed responsibility for up to $132 million for construction and $5.2 million annually for operating.[423] Opponents believed the money should be spent expanding bus services.

Shortly after the approval of the First Hill line, cyclists who claimed to have been injured by riding over the SLU streetcar tracks sued the city of Seattle. In the lawsuit, the litigants claimed that Seattle officials had known about the dangers the tracks would have on cyclists, but nothing had been done to mitigate them. A judge of the King County Superior Court dismissed the lawsuit.[424] With the lawsuit behind them, the city finally started work on the First Hill line by making preparations for construction in early January 2011.[425]

In the meantime, the SLU line was deemed a success due to increased ridership. This led to more support for the streetcar, including a $65,000 contribution from local business leaders, such as Amazon, to add a third streetcar and increase service frequency.[426] In return for building permissions, Amazon would later offer the city $5.5 million to buy a fourth streetcar, pay for its operating costs, and develop more bike lanes near its headquarters.[427]

By mid-2011, two more streetcar lines were proposed. One would run from the Ballard neighborhood toward SLU, and the other, the First Avenue line, would connect the SLU line with the not-yet-completed First Hill line.[428] Opposition quickly responded, again, citing the high costs as a primary problem and pointing to the many other transportation issues the city needed to address. These issues included insufficient bus service, along with deteriorating roads and bridges.[429] In an article by Susan Kelleher, it was revealed that an estimated 400 miles of Seattle's roads needed repair, which could cost approximately $578 million (2011). Other opponents expressed concern about increasing costs of living, particularly near streetcar lines, loss of parking spaces, worse congestion, and the fact that the SLU line was operating at a financial loss.[430] However, proponents of expanding the streetcar system secured a $900,000 grant in late 2011 to begin studies and design work on the First Avenue line.[431]

On April 23, 2012, groundbreaking on the First Hill line commenced. This time, the city made sure to better accommodate bicyclists by planning to add a dedicated one-mile bike lane.[432] As construction moved forward on the First Hill line, Mayor Mike McGinn and the City Council continued to push the issue of expanding the streetcar service by constructing a Center City Connector running through downtown from SLU to First Hill, a.k.a. the First Avenue Line.[433] As of early January 2014, the Seattle Department of Transportation was developing a preferred route plan to send for approval.[434] At the same time, the First Hill Line was still under construction with an opening operation date set for some time after mid-2014. Also at this time, the city "secured funding to plan and design the First Hill Streetcar Line's Broadway Extension."[435]

STREETCAR RIDERSHIP AND SERVICE PERFORMANCE

The SLU streetcar is operated by King County Metro, which also operates Seattle's bus services. Since the streetcar line's opening at the end of 2007, streetcar ridership has increased steadily even as bus ridership has declined (Table 57). In 2012, streetcar ridership was about 80 percent higher than it was in 2008. Over this time period, the average streetcar trip length was less than one mile [1.6 kilometer], while the average bus trip length was about 4.7 miles [7.56 kilometers]. Ridership does not appear to have a seasonal pattern on either streetcar or bus services in Seattle (Table 58).

Table 57. Annual Ridership by Mode in Seattle (2008-2012)[436]

	Unlinked Passenger Trips			Unlinked Passenger Miles		
Year	**Streetcar**	**Bus**	**Total**	**Streetcar**	**Bus**	**Total**
2008	413,253	118,278,626	118,691,879	378,221	655,592,456	544,970,677
2009	451,203	111,067,940	111,519,143	414,617	495,943,360	496,357,977
2010	520,933	109,008,892	109,529,825	471,587	458,606,273	459,077,860
2011	714,461	111,995,623	112,710,084	631,655	479,295,487	479,927,142
2012	750,866	95,592,084	96,342,950	650,023	458,098,243	458,748,266

Table 58. Monthly Unlinked Passenger Trips by Mode in Seattle (2012)[437]

	Unlinked Passenger Trips		
Month	**Streetcar**	**Bus**	**Total**
January	52,257	8,761,707	8,813,964
February	53,828	9,369,439	9,423,267
March	59,118	9,763,630	9,822,748
April	59,778	9,689,969	9,749,747
May	64,337	10,264,842	10,329,179
June	66,623	9,696,258	9,762,881
July	73,888	9,568,878	9,642,766
August	72,004	9,796,624	9,868,628
September	64,966	9,155,137	9,220,103
October	66,392	10,560,455	10,626,847
November	60,077	9,466,179	9,526,256
December	57,620	8,469,567	8,527,187

Streetcar service has increased steadily since its opening in late 2007, as shown in Table 59. Revenue miles have increased by about 10 percent between 2008 and 2012. Bus service was relatively stable until 2011, but it declined between 2011 and 2012. Bus service levels in 2012 were lower than in 2008. Average streetcar speeds (vehicle revenue miles divide by vehicle revenue hours) increased slightly from just less than 5 miles per hour in 2008 to about 5.3 miles [8.53 kilometers] per hour in 2012. Average bus speeds increased slightly from about 11.3 miles [18.19 kilometers] per hour to about 12 miles [19.31 kilometers] per hour over this same time period. Slower streetcar speeds are at least partially a function of the highly urban environment within which the streetcar operates. Inflation-adjusted streetcar operating expenses have increased slightly over time even as inflation-adjusted bus operating expenses have declined by about 18 percent (Table 60).

Table 59. Annual Service Characteristics by Mode in Seattle (2008-2012)[438]

	Vehicle Revenue Miles			Vehicle Revenue Hours		
Year	Streetcar	Bus	Total	Streetcar	Bus	Total
2008	56,613	34,984,800	35,041,413	11,399	3,084,952	3,096,351
2009	60,150	35,493,795	35,553,945	11,207	3,135,871	3,147,078
2010	59,964	35,185,385	35,245,349	11,178	3,110,588	3,121,766
2011	61,727	35,866,855	35,928,582	11,509	3,105,924	3,117,433
2012	62,522	33,317,426	33,379,948	11,736	2,768,315	2,780,051

Table 60. Annual Operating Expense by Mode in Seattle (2008-2012)[439]

	Streetcar		Bus		Total	
Year	Unadjusted $	2012 $	Unadjusted $	2012 $	Unadjusted $	2012 $
2008	$2,459,635	$2,622,965	$477,108,134	$508,790,066	$479,567,769	$511,413,031
2009	$2,366,620	$2,532,784	$480,410,833	$514,141,278	$482,777,453	$516,674,062
2010	$2,318,808	$2,441,567	$490,457,567	$516,422,650	$492,776,375	$518,864,217
2011	$2,396,642	$2,446,303	$457,207,387	$466,681,260	$459,604,029	$469,127,564
2012	$2,794,211	$2,794,211	$430,144,035	$430,144,035	$432,938,246	$432,938,246

Combining data on ridership, service, and operating expense, the authors developed two performance indicators shown in Table 61. The left panel reports cost effectiveness, and the right panel reports service productivity. The table indicates significantly increased streetcar cost effectiveness (declining operating expense per unlinked passenger trip) and significantly increased streetcar service productivity (passenger miles per vehicle revenue mile). The streetcar has become a more effective transit mode over the years since it opened. For buses, the trends are much more mixed. Both measures have seen deteriorating performance for bus since 2008, although there have been some positive signs over the intervening years.

Table 61. Service Performance by Mode in Seattle (2008-2012)

	Cost Effectivness		Service Productivity	
	(Operating Expense per Passenger Trip, 2012 $)		(Passenger Miles per Vehicle Mile)	
Year	Streetcar	Bus	Streetcar	Bus
2008	$6.35	$4.30	6.68	15.57
2009	$5.61	$4.63	6.89	13.97
2010	$4.69	$4.74	7.86	13.03
2011	$3.42	$4.17	10.23	13.36
2012	$3.72	$4.50	10.40	13.75

Note: Values calculated from Tables D-4, D-6, and D-7.

Summarizing streetcar annual mode-level performance, ridership and service have increased since 2008, with the increased ridership exceeding the increases in service and operating expenses (Table 62). The net result is increased productivity and improved cost effectiveness. The streetcar's average operating speed is slightly higher in 2012 than in 2008, while the average trip length is relatively unchanged at just under 0.9 miles [1.45 kilometers] per trip. The streetcar operates year-round service, and there does not seem to be a seasonal pattern to either its ridership or service levels, based on the 2012 monthly ridership and service statistics summarized in Table 63.

Table 62. Summary of Streetcar Ridership, Service, and Performance by Year in Seattle (2008-2012)[440]

Year	Unlinked Passenger Trips	Passenger Miles	Vehicle Revenue Miles	Vehicle Revenue Hours
2008	413,253	378,221	56,613	11,399
2009	451,203	414,617	60,150	11,207
2010	520,933	471,587	59,964	11,178
2011	714,461	631,655	61,727	11,509
2012	750,866	650,023	62,522	11,736
Year	**Productivity (PM/VM)**	**Cost Effectiveness (2012$)**	**Speed (VRM/VRH)**	**Average Trip Length (PM/UPT)**
2008	6.68	$6.35	4.97	0.92
2009	6.89	$5.61	5.37	0.92
2010	7.86	$4.69	5.36	0.91
2011	10.23	$3.42	5.36	0.88
2012	10.40	$3.72	5.33	0.87

Table 63. Summary of Streetcar Ridership and Service by Month in Seattle (2012)[441]

Month	Unlinked Passenger Trips	Vehicle Revenue Miles	Vehicle Revenue Hours
January	52,257	5,117	960
February	53,828	4,462	894
March	59,118	5,140	965
April	59,778	5,120	961
May	64,337	5,370	1,008
June	66,623	5,271	989
July	73,888	5,303	995
August	72,004	5,193	975
September	64,966	5,126	962
October	66,392	5,508	1,035
November	60,077	5,317	998
December	57,620	5,295	994

Table 64 reports station-level average weekday boarding counts for the SLU Line. On average the SLU Line reports a ridership of 2,560 per average weekday, which places Seattle third among the cities studied for this report (behind only Portland and Memphis, each of which operates multiple lines). Two stops, Westlake Hub located at the commercial core of downtown and Westlake/Thomas = in the SLU urban village bio-med complex report the highest average weekday ridership counts (887 and 574 respectively). These areas are characterized by high employment concentrations and proximity to Special Activity Centers (SAC). The third-highest ridership is registered for the Fairview/Campus Drive stop, which is located adjacent to the Fred Hutchinson Cancer Research Center, one of the most notable SACs in the area. The rest of the stops exhibit lower ridership values and variability. This pattern suggests the importance of key employment centers for this particular line and reinforces previous studies that indicate the predominant role of SACs for modern streetcar patronage.[442]

Table 64. Streetcar Station Level Average Weekday Boardings and Alightings in Seattle (2012)[443]

Station	Line	Direction	Boardings
Westlake Hub	SLU	Northbound	887
Westlake & 7th (NB)	SLU	Northbound	74
Westlake & Denny	SLU	Northbound	120
Terry & Thomas	SLU	Northbound	60
Terry & Mercer	SLU	Northbound	29
Fairview & Campus Drive	SLU	Southbound	311
Lake Union Park	SLU	Southbound	97
Westlake & Mercer	SLU	Southbound	209
Westlake & Thomas	SLU	Southbound	574
Westlake & 9th	SLU	Southbound	181
Westlake & 7th (SB)	SLU	Southbound	18
Total			**2,560**

Note: Reflects a typical weekday in November 2012.

Figure 145 reports the level of connectivity of the SLU streetcar line with local bus routes and other rail transit services within a 400 meter (one-quarter mile) buffer zone. The graduated grey shaded circles represent the number of bus connections at or near the streetcar stops. These are shown with ridership levels represented by non-shaded concentric circles. A noticeable pattern emerges in which a higher number of bus route connections at a stop appears to correlate with relatively higher ridership counts at the stop. This is particularly salient at the Westlake Hub (McGraw Plaza) and at the Fairview/Campus Drive stop (Fred Hutchinson Cancer Research Center), where 19 and five bus connections occur, respectively. This pattern strongly suggests that some transfer of riders from bus to streetcar might be happening, although data are unavailable to confirm this. This reinforcing relationship had also been identified in previous studies related to station-level ridership for various rail transit modes. Where this pattern is inconsistent, as in the Westlake/Harrison stop, the clustering of employment in proximity of the stop might better explain the relatively higher level of ridership. It also appears that one or several bus routes operate on the same street as the streetcar (Westlake Street). According to one of the interviewees from Seattle's transit agency, this has had no negative impacts on either mode, as both report rising ridership trends. It seems there is sufficient demand in this area to support both modes at this time.

Rail connectivity could also be playing a role in promoting higher ridership levels at streetcar stops, especially at the Westlake Hub. As also shown in Figure 146, the monorail and the light-rail lines have stations in close proximity to this streetcar terminal. In addition to the 19 bus connections, the added monorail and light-rail connections could potentially be contributing to the significantly higher boarding counts at this location, which could be operating as a multimodal hub providing regional links to the other parts of the region as well as serving multiple trip types such as commuters, visitors, and local trips.

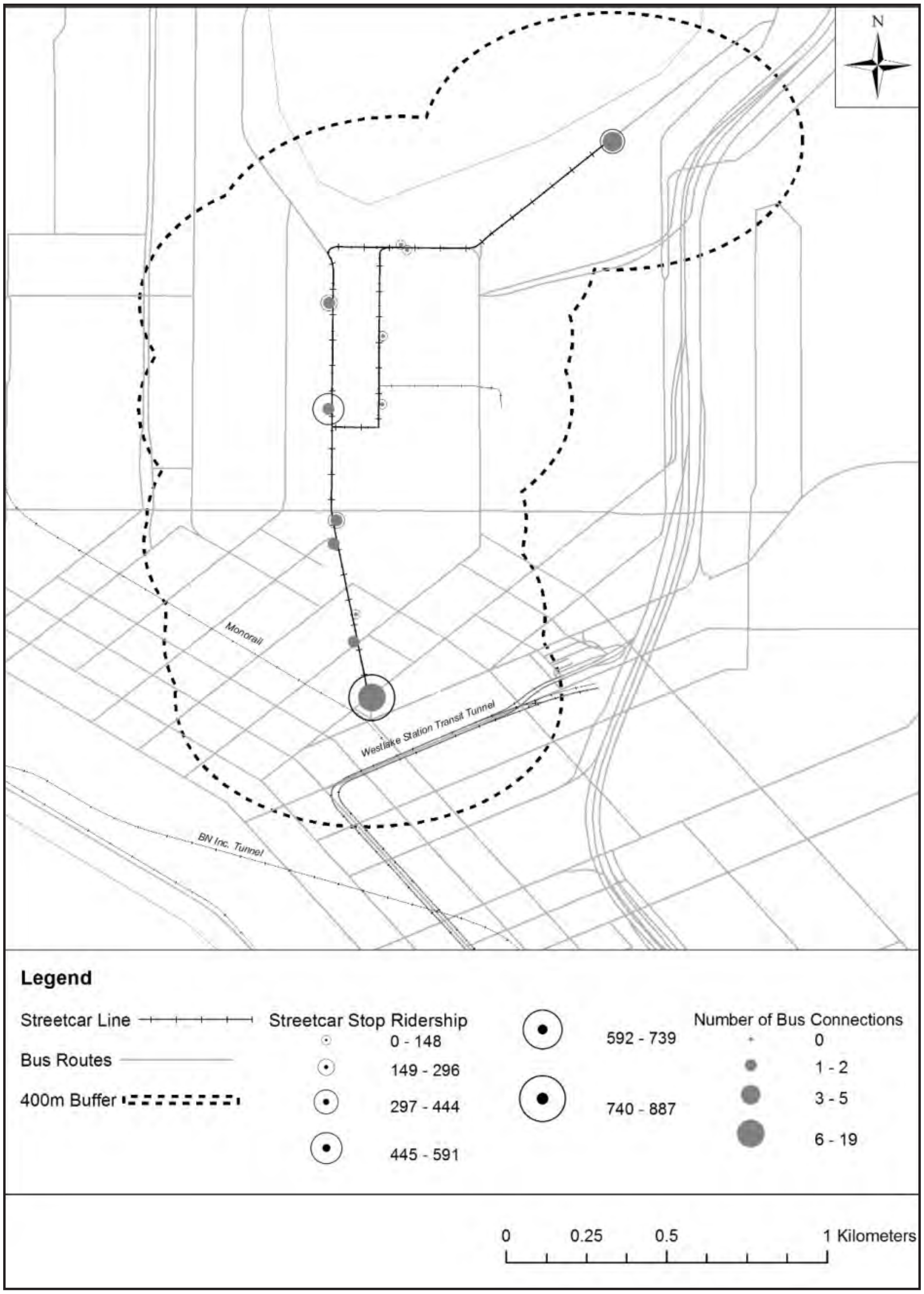

Figure 145. Bus Connectivity to SLU Streetcar Line in Seattle (2012)[444]

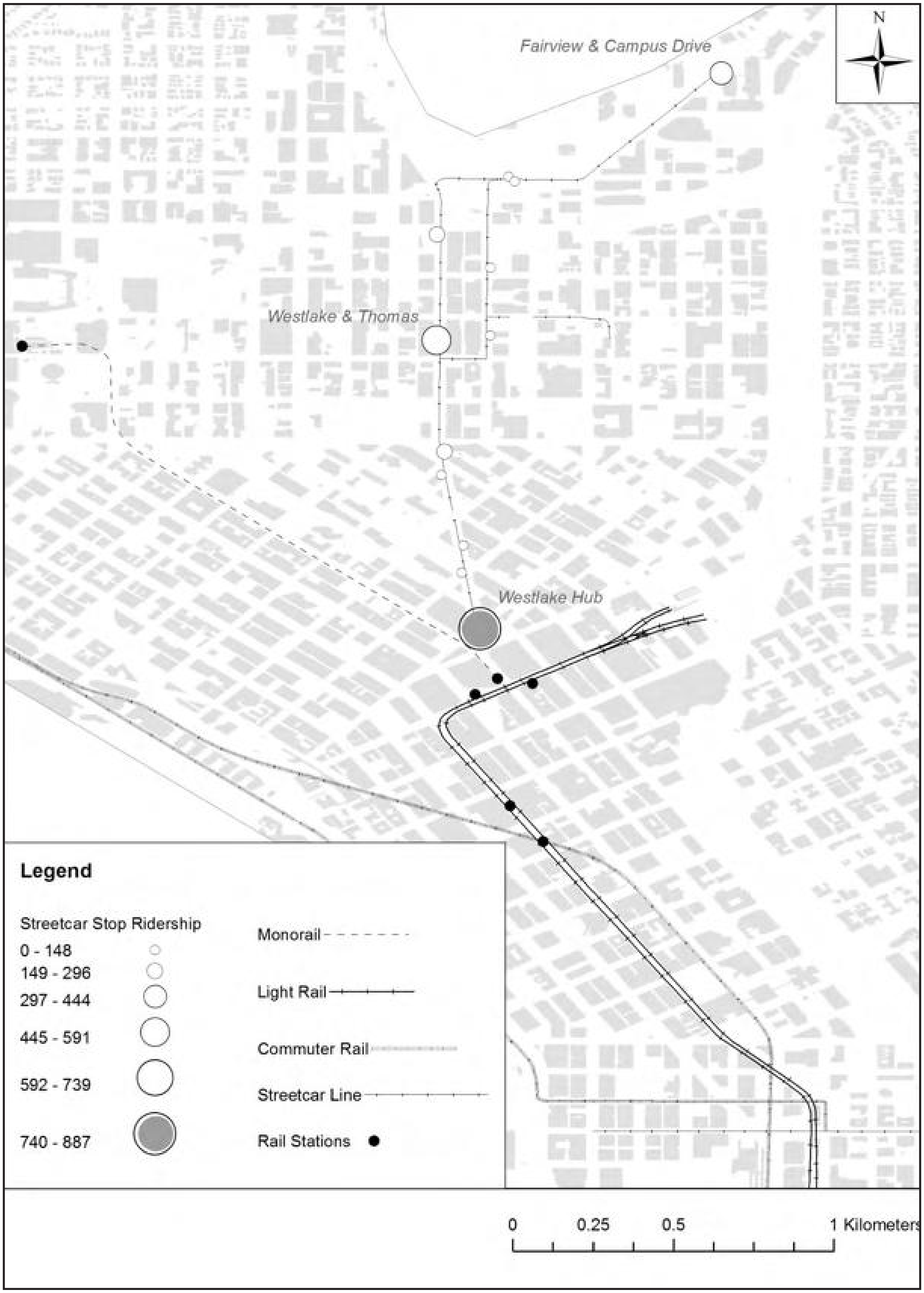

Figure 146. Rail/Monorail Connectivity to SLU Streetcar Line in Seattle (2012)[445]

INSIGHTS FROM KEY INFORMANT INTERVIEWS

In addition to collecting and analyzing quantitative data and documentary evidence, the authors conducted one-hour semi-structured telephone interviews with several key informants in the Seattle region who were able to provide their perspectives on streetcar goals, performance, and future prospects. Informants represented a diverse set of perspectives, including those of two land developers, an economic development specialist, a transit planner, and a local land use planner. These informants were identified through documents or were suggested by other interviewees as pertinent informants, given the nature of the questions the authors hoped to address.

The authors sought to use the interviews to complement the insights developed from their quantitative assessments discussed earlier, and to identify hard-to-quantify phenomena that might impact people's perceptions of the streetcar and impact its performance. Each informant was provided a set of 12-24 questions in advance of the interviews, including a set of questions asked of all informants and specific questions asked of that individual, given the role he or she plays in the community. A set of typical interview questions can be found in Appendix F.

For Seattle, the authors conducted four semi-structured interviews with five key informants. They interviewed the two private land development informants during the same interview. Several key themes emerged from the interviews, including: the role of key private sector actors, the perception of the streetcar as a development catalyst, the importance of funding stability, and the challenges of coordinating transportation and land use planning. The five key informants included multiple individuals whose involvement with streetcar-related issues predates the implementation of the South Lake Union streetcar line (Table 65). These five individuals included: an experienced local transit planner, a land use planner focused on sustainable community issues, an economic development organization representative who has also been a long-time streetcar advocate, and two representatives from a key major private land development firm. Each individual is identified by his or her role in the community within the narrative that follows.

Table 65. Roster of Key Informants Interviewed for Seattle Study

Informant	Role
1	Transit Planner
2	Land Use Planner
3	Economic Development Specialist
4	Private Land Developer 1
5	Private Land Developer 2

Streetcar Goals

Every informant who was interviewed emphasized the development goals of the SLU line. They used terms such as "catalyst" or phrases such as "economic development asset" when they discussed the streetcar. Two informants also mentioned the transportation role that the streetcar was designed to play with phrases such as “last mile transit link” and “capacity for serving additional trips.” There also seemed to be agreement that the goals of the SLU Line are different from those of the First Hill Line now being built in the city.

The land use planner informant stated that the SLU is both a local transit investment and development tool whose implementation was spurred by a desire to better connect the SLU area, which was beginning to experience a real estate boom, with downtown Seattle. This informant noted that the area was then not well served by transit. The streetcar was selected as the transit investment to serve as a connector that would also support the development momentum of the “vibrant, upcoming” SLU area with its biotech cluster and the new Amazon development. This informant emphasized that the streetcar was seen as a “permanent” investment that indicated a “long-term commitment” to the SLU area. The informant did not see the streetcar as a critical part of the city’s overall transit strategy. The line was not built as part of a larger system. The alignment is quite short, and the streetcar operating speeds are slow enough to reduce its utility for commuters.

The economic development specialist informant has also served as a longtime streetcar advocate and member of the local streetcar coalition. This informant noted that the SLU streetcar line was implemented to support development goals and connect neighborhoods. He used the word “catalyst” when discussing the streetcar’s relationship to development objectives. This informant pointed to Portland as having been a model for what was sought in Seattle.

The transit planner informant characterized the streetcar as both an economic development asset and a transit investment. He noted that the streetcar serves a “last mile” role in the transit system, and that it serves as a circulator that provides additional capacity for trips within the city.

Assessment of Development Goals

The informants regarded the SLU streetcar as having been successful, particularly with respect to achieving its development goals. Multiple informants conceded that the SLU area was growing prior to streetcar implementation, and thus it is hard to attribute development activity directly to the streetcar’s presence. Nevertheless, they viewed it as having been a contributor. One informant noted the interest and excitement about development in SLU that the streetcar helped to generate.

The transit planning informant observed that the SLU area had previously been underdeveloped with some employment in the area where the streetcar line now begins (Westlake Hub) and the area where it ends (near the Fred Hutchinson Cancer Research Center) but little in between. The informant pointed to major redevelopment activity now occurring in that intermediate area. This arrangement mimics that of Portland’s first NS Line, in which the streetcar line terminals serve a large university campus at one end, a health complex on the other end, and an underdeveloped but emerging middle section. He also noted that this redevelopment activity is also expected to have a positive effect on streetcar ridership at the adjacent stops, which presently have low ridership.

The two private land development informants pointed to a large number of major international development firms being active in the SLU area now, whereas their firm was "really the only active developer" in SLU in earlier years. They pointed to the area's strong real estate market, the presence of new retail and restaurant development in the area, and an overall increase in activity. They also pointed to the relocation of Amazon to the SLU area, and to the close link between the streetcar and the development of its facilities. The economic development specialist concurred with the view that the SLU Line had supported business and commercial activity in SLU.

The land use planner expressed a more cautious assessment. He noted that it was hard to give a good assessment of the streetcar's development role because SLU had been rapidly changing anyway. He thought the streetcar had likely helped to boost land values along its spine, and that it provided good public relations. He thought it had been most successful in generating interest and excitement about development in SLU. He noted that because it was a high-profile investment, it received a great deal of of media attention that tended to focus on its attractiveness, its ease of use, and the support it received from large employers. Likewise, this informant noted that it drew some criticism from sectors of the community as well. He reported that some critics thought that public monies would be better spent on bus service and road improvements. Other critics were concerned that the investment disproportionately benefitted one major developer and might have been implemented at his behest.

Assessment of Streetcar's Transportation Performance

While the informants tended to have similar views of the streetcar's role with respect to development in SLU, there was some disagreement about its transportation performance. In fact, one informant was quite negative about it. Others were more cautious. Informant comments focused on the short SLU alignment, the lack of integration with the larger transit system, and future streetcar development that might make it part of a more effective streetcar network.

The land use planning informant was the most pessimistic about the streetcar's performance as transportation. He characterized the transportation aspect as the least successful part of the streetcar. He stated that it was likely "not a good transit performer," despite its higher than expected ridership. He noted that he personally would never use the streetcar due to its slow speed and the lack of investment in signal timing or other strategies that might allow it to run at higher speed. He pointed to it being more like a shuttle and commercial connector. He said that it did not serve a very large area due to its short alignment. Finally, he noted what he perceived as the lack of integration between the streetcar and the rest of the transportation network. He thought the SLU line had been driven by local perspectives and issues as opposed to city or regional ones. Nevertheless, he sees future lines such as First Hill as providing an opportunity to transform the investment into more of a transit one that serves more residential areas.

The other informants focused many of their comments on the First Hill Line and other potential streetcar extensions that they believe will increase the streetcar's utility as a transit investment. The land developer informants noted that the ultimate objective is a network of streetcars in Seattle. They noted that SLU is one of three pieces in what is envisioned as a connected system. The second piece is the First Hill Line, which will run through a business center, and the final piece is the center city connector that would connect the other two pieces. Mayor Murray wants to operate that connector in its own right-of-way along First Avenue. The economic development informant and transit planning informant made similar statements.

The authors also asked the informants about the rider market for the SLU Line. The transit planning informant observed that he did not consider tourists to be an important rider market to the same degree in Seattle as they are on many other streetcar systems. He agreed that there is an increase in ridership during summer that may include more tourists and visitors, but he also noted the small number of tourist-oriented destinations along the SLU alignment. He said that the Natural History Museum and the lakefront park are two visitor destinations, but that much of the alignment is underdeveloped or in the early stages of redevelopment. He thought that workers are the primary users of the line, due to the presence of Amazon and other major employers. The economic development specialist informant concurred with this view.

The informants thought that the new First Hill Line is likely to have more visitor riders due to its location. The economic development specialist noted that he expects a 50:50 mix of visitors and tourists on that line due to his observations of the customer profile at the nearby Pike Place Market. Both the land developer informants and the transit planning informant agree that because of the uses along this line, there are likely to be many more visitor riders than use the SLU Line.

As a piece of transportation infrastructure, the SLU Line is managed and operated by a public transportation entity. While the City of Seattle planned, designed, and managed the construction of the streetcar line, King County Metro's rail division, which also operates light rail service, operates and maintains the SLU Line. King County Metro also operates bus service. The possibility of service coordination thus exists, although the transit planning consultant reported that there is no service coordination between the streetcar and other modes due to the inconsistent headways. This same informant was also not aware of any major service changes to bus routes due to streetcar implementation, save for the shifting of a bus route onto the same street as the streetcar when it was expanded from a one-way street to a two-way street. The lack of coordination with respect to scheduling or planning definitely suggests that the SLU Line is not viewed primarily as a piece of the local transit system, which makes Seattle different from Portland, its inspiration for building the line.

Public Attitudes

The informants noted that public attitudes toward the streetcar depend on where the individual resides or works in relation to the SLU streetcar. They noted that those who are close in proximity to SLU tend to view the streetcar as a positive asset, while residents from elsewhere in the larger Seattle region often question whether the streetcar was the best public investment. Most of the informants shared these views.

The transit planning informant characterized the public within the city of Seattle as tending to support transit, while suburbanites tend to be less supportive of transit. He pointed to a recent local vote to provide financial support for transit that had strong support in the city but failed on a county basis in King County, of which Seattle is a part. He said that within the city there is a belief that transit is critical to the economy. He observed that many people in the city use transit or other non-single-occupant automobile modes, including 50 percent of travelers to downtown Seattle.

The private land developer informants emphasized strong local support as well. They noted that non-motorized mode advocates within the city, such as the Cascade Bicycle Club, support the streetcar because of the ability to carry bicycles on the vehicles. They observed that local retailers within the SLU neighborhood support the streetcar and use it in their marketing. They like the "permanence" of a line that is not going away. They also noted that firms such as Amazon that have moved into the SLU neighborhood have become very supportive. Amazon purchased a streetcar to improve the line's service frequency, and it is one of a number of employers who pay to provide additional peak period service.

The land use planning informant emphasized that when speaking of public attitudes, there are two different "publics." He noted that the local people living and working in SLU tend to be very positive toward the streetcar. They think it is a good asset for the community. The informant noted that these individuals were quite positive from the beginning, and they have become even more supportive now. However, he also noted that among the larger population, there is a sense that the streetcar represents a large financial giveaway to major developers and is not an effective transportation tool. The informant noted a sense among many of these individuals that the SLU area was destined to thrive even without the streetcar.

The land use planning informant noted that policymakers' views tend to be similarly mixed. He characterized a sense of happiness that the streetcar has achieved its development purpose. At the same time, there are questions about whether investing in the streetcar was the best way to address the city's larger transportation needs. He noted that some policymakers wonder whether a bus rapid transit or light rail investment might have been a better use of money, and whether such investments might have allowed the city to create a better transit system.

Private Sector Role

More so than in any of the other cities, although Portland might be a close second, private sector actors have played a major role in the origins, development, and ongoing operation of the streetcar in Seattle. Our informants noted the involvement of landowners in providing momentum early on that culminated in the SLU Line. They pointed to the roles of major firms such as Vulcan Properties and Amazon in providing public and financial support. They also spoke to the role of biotech firms, the hospitals, and other major institutional actors as supporters of the streetcar.

Vulcan, the firm founded by former Microsoft executive Paul Allen, has been a particularly important participant in the discussions around the streetcar in Seattle. The land developer informants spoke at great length about Vulcan's role. They noted that Vulcan tended to work with many other groups on streetcar issues, such as the Cascade Neighborhood Council, which consists of resident-based groups in the area. The Council and Vulcan are members of an organization called South Lake Union Friends and Neighborhoods (SLUFAN), composed of residents, business people, and developers that the city engages to raise the visibility of different issues in the larger community.

The land developer informants recalled that in the early stages of the effort to promote streetcar development, Vulcan and other major firms, such as Vance Corporation (a real estate and property management firm), provided leadership for the Build the Streetcar Committee. At this time, one of the informants was engaged in outreach to the business community to provide information for a proposed local improvement district that would help finance the streetcar. This informant characterized their efforts as “like a political campaign,” as they included a website, brochures, and personal contact with key individuals and organizations in the community. This individual noted that site visits to Portland and Vancouver to view streetcar and light rail in those cities ultimately led to the selection of modern streetcar technology in Seattle as the preferred technology and helped to consolidate political support for the streetcar among city council members. The informant noted the belief that the streetcar would be a permanent investment, as opposed to a bus, and seemed to best fit the SLU area.

The two land developer informants characterized Vulcan as being interested in the streetcar because of a “diversity of possible benefits” that might flow from development in the area to the wider city. They recalled that former Mayor Nickels had identified the SLU area as a major bio-tech life sciences center, although it was then largely zoned industrial and had many vacant warehouses, parking lots, and small businesses. The transit service in SLU was not good, and they recalled that the streetcar was selected to be a key rail spine for an area that was “in need of an urban transformation.” The selected alignment connected the Fred Hutchison Cancer Research Center at one terminus and the Westlake Center, with its connections to LRT and rubber-tire transit, at the other end.

Development possibilities were certainly a key driving factor in the involvement of private sector actors such as Vulcan. The land developer informants emphasized the significant development effects, which had been anticipated in SLU because of Portland’s experience with a streetcar. They recalled that the city had commissioned an appraiser to study the value of new development along the Portland streetcar line with an eye toward estimating development outcomes as well as potential land development tax revenue for a Seattle streetcar line. The informants recalled that the study estimated $155 million in new tax revenue for the city, with 75 percent of that figure consisting of recurring income that could be used to help finance the investment. They felt the study was important in building local support for the streetcar.

The other informants also pointed to the important roles played by Vulcan and other private actors. The transit planner informant agreed that there had been strong private sector involvement in the push to build the streetcar, including from Vulcan Properties, Amazon, and the Fred Hutchinson Cancer Research Institute for the SLU Line and from Seattle University and Swedish Medical Center for the First Hill Line. This informant observed that major property owning firms had representatives who co-chaired the Build the Streetcar

Coalition, which helped to build support among other business and property owners in the area. This same informant noted that some private entities continue to be engaged in the streetcar, including financially. Amazon provided funding to add another streetcar vehicle and provide additional service. Institutional actors like the Medical School and biotech firms have also provided funding for additional service. The informant pointed to a history of major employer support for transit and other transportation demand management strategies in Seattle.

The economic development specialist informant also pointed to the financial partnerships with Amazon and other key firms to fund streetcar service. This individual also mentioned conversations with the Museum of History and Industry (MOHAI) for some type of financial contribution to the streetcar. This contribution might fund some legacy vehicles and establish an express service targeting visitors who are seeking to reach key tourist destinations. This informant noted that some modifications of stops will be required if this idea moves forward, as the boarding level for legacy vehicles is higher than the level for modern streetcar vehicles.

The land developer informants conceded that the involvement of high-visibility private actors, such as Paul Allen's Vulcan firm, had drawn some criticism. They noted that Mr. Allen's status as a local billionaire had fed some criticism that the streetcar was "just a toy for Vulcan." However, these informants insisted that site visits to Portland to see what had happened there represented a real turning point in debates about the streetcar, including among local council members. They noted that the attendees had seen firsthand the investment that had occurred along the Portland line and had recognized that the streetcar could be of great benefit in Seattle as well.

Finance

The informants pointed to the importance of stable funding in enabling what they largely perceived as a successful streetcar project. The transit planner informant noted that the capital funding for the SLU line came 50 percent from a local improvement district funded by assessments on property located within three blocks of the line, 25 percent from federal grants, and 25 percent from local and city funds. This informant emphasized the key early role of the Build the Streetcar Coalition in building consensus among the affected property owners in favor of the assessment. He recalled that they voted (with votes weighted by assessed value) 98 percent in favor of creating the local improvement district. The assessment district contributed $26 million from the estimated $67 million assessed value increment attributed to the streetcar. The informant believes increases in property values are now much higher. The same informant said operations were initially funded by redistributing bus service hours to the streetcar, obtaining a financial commitment from the city, and receiving support from major entities such as Amazon for increases in vehicles and service hours.

The informants as a whole characterized the streetcar's funding arrangements as stable, which they contrasted with bus service for King County Metro. The transit planning informant noted that King County Metro's current budget difficulties might necessitate bus service cuts of up to 30 percent. The relative certainty and permanence of streetcar service stood out a great deal when contrasted with the extreme uncertainty of the bus service situation.

Transportation and Land Development Policy

Two informants spoke of supportive public policies in transportation and land development that assist the streetcar. Transportation policies include reduced parking requirements for developers, employee transit use programs with major employers, and streetscape investments to make more transit-friendly, walkable streets. The informants also noted land regulation changes to encourage more dense development in the streetcar corridor. The land use planning informant noted that the zoning changes represent a doubling of potential development capacity in the SLU area. The same informant noted that while the city has invested in streetscape and other public infrastructure investments in the area, they do not provide direct financial incentives to encourage development there. This informant's sense was that such incentives were not necessary.

Streetcar Challenges

The key informant interviews identified several challenges that these individuals believe face the streetcar in Seattle. One of these was earlier identified as the transportation part of the streetcar system. One informant cited the lack of integration of the streetcar into the larger transportation network, as well as the lack of public investment in traffic management and signal technology that would allow the streetcar to operate at higher speeds.

Another informant pointed to the lack of coordination between land use planning and transportation planning, particularly at the metropolitan level, in Seattle. This informant believed that the lack of regional coordination made developing an effective regional transit system much more difficult. He particularly criticized the frustrations he had experienced in trying to get regional transit agencies to really see transportation and land use planning integration as being important. This individual suggested that other communities considering streetcar investments should think more carefully about these regional coordination issues prior to streetcar implementation. However, the same informant characterized local transportation and land use policy coordination within the City of Seattle as quite good.

Lessons for Other Communities

In addition to the need for more attention to regional-level land use and transportation planning coordination noted above, the informants identified several key takeaways from the Seattle experience that they deemed relevant to other communities. The first of these was the importance of early outreach to all stakeholders to build public support. The informants noted the role played by outreach in leading to very high approval rate for the local improvement district to help fund the streetcar.

The second takeaway is to think about the long-term implications of early decisions about factors such as alignment location. The informants observed that having tracks adjacent to the curb poses challenges to bicyclists. Concerns about this issue in Seattle mean that the First Hill Line will have tracks in the middle of roadway instead.

The third takeaway cited by the informants was the important role that motivated advocates played. The informants emphasized that the work toward the SLU was very difficult and required hard work from people who were absolutely dedicated to seeing it through to completion, including a large number of important private sector actors. Two informants noted the role of the Seattle Urban League's James Kelley as a streetcar supporter who was able to communicate effectively to communities of color about the potential jobs benefits from streetcar investment.

Finally, as perhaps the most important takeaway, the informants emphasized the importance of understanding the local context for streetcar development. They noted that a boilerplate does not exist for creating a streetcar line that will work everywhere. The alignment, neighborhood, and stakeholders all are important to shaping the approach that a particular city should take.

CONCLUSION

Among the five streetcar cities, Seattle ranks third in ridership, third in cost effectiveness, and second in service productivity. It is also the shortest of the five streetcar lines. Among the cases, Seattle's experience is most similar to that of Portland, which served as a principal inspiration for Seattle's streetcar investment decision. As was true of Portland, primary drivers of streetcar investment were redevelopment efforts in a targeted transitioning area near the downtown that was seen as underdeveloped. As was also true of Portland, the local private sector, represented by property owners, major employers, and key advocacy groups, played a major role in pushing for the streetcar's implementation. These actors viewed the streetcar in Seattle as a potential development catalyst, which is how they tended to evaluate the experience they had observed in Portland. By and large, they seem to feel that it has achieved its development objectives. Whether or not the development in South Lake Union would have occurred without the streetcar being built is a point on which there is some disagreement, although most observers tend to agree that the area had tremendous development potential waiting to be tapped.

From a transit perspective, the SLU streetcar appears to be viewed as an adequate performer by most observers, despite its shortcomings with respect to speed, length, and integration or coordination with other local transit services. It is notable that ridership and productivity measures for the streetcar are either improving or stable at a time when the bus system is declining on these measures. The presence of major employers who are actively engaged in promoting the streetcar, including some with a financial stake, undoubtedly contributes to the ridership it does attract.

APPENDIX E: PROFILE OF TECO LINE STREETCAR IN TAMPA, FLORIDA

The fifth and final case-study city is Tampa, Florida. The streetcar line in Tampa is more than a decade old at the time of this study. Tampa's streetcar line primarily caters to a visitor riding market. The streetcar vehicles are vintage trolleys (Figure 147) that operate on an alignment that connects the Channelside District and other areas located to the south and east of downtown Tampa to Ybor City, a historic neighborhood that attracts a number of visitors. Average daily ridership is relatively low on this system compared with the others studied. Local informants attribute the low ridership to a combination of the economic downturn in 2008, the service's schedule, and its alignment, which will be discussed later.

Figure 147. A Vintage Trolley Operating in Tampa's Ybor City Neighborhood[446]

BASIC CHARACTERISTICS OF STREETCAR SERVICE

The streetcar line in Tampa, Florida is called the TECO (Tampa Electric Company) Line. The 2.7-mile [4.35 kilometer] line cost $32 million to build, and it opened in 2002. The line is served by three vehicles, which operate on an exclusive right-of-way to provide service to 11 stops (Figure 148 and Table 66). Three local entities are involved in the ownership, management, and operation of the TECO Line. Hillsborough Area Regional Transit (HART) owns the streetcars, and the streetcar division of its operations department operates the streetcars; the City of Tampa owns the streetcar rails and right of way; and Tampa Historic Streetcar, Inc. (THS) is the governing board with responsibility for major policy decisions. HART also operates local bus service in the community (Figure 149).

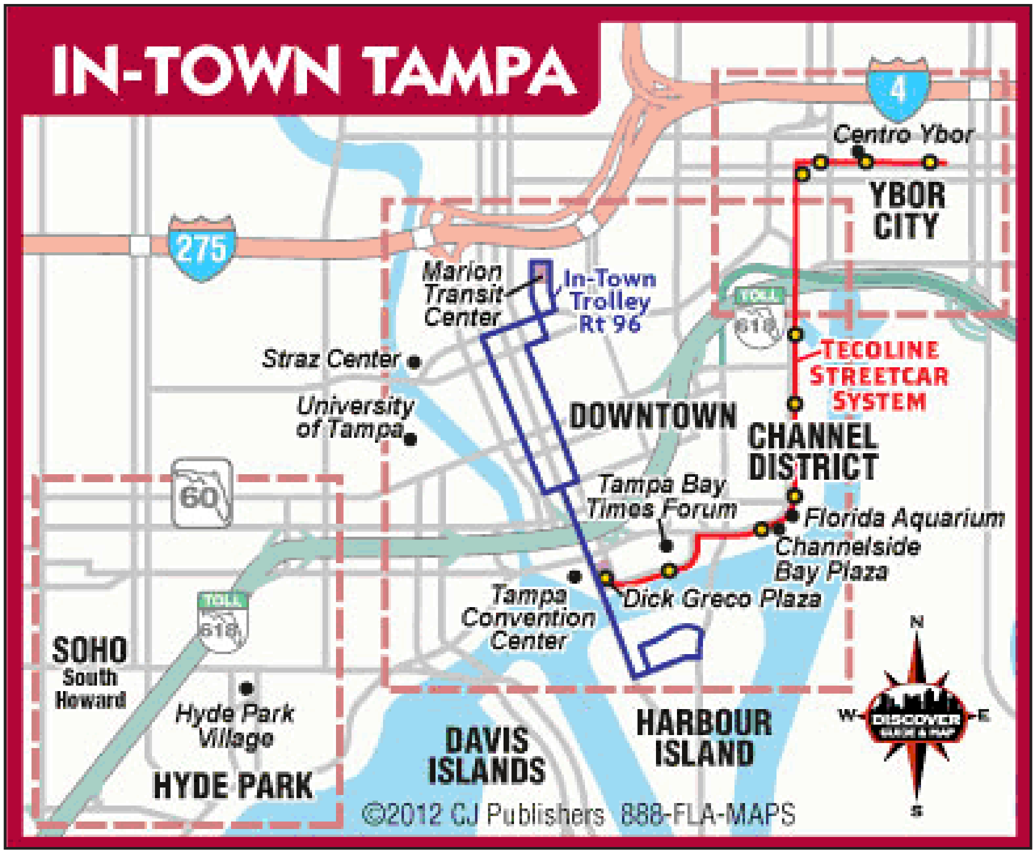

Figure 148. Map of Streetcar Line in Tampa, Florida[447]

Table 66. Physical Characteristics of the Streetcar System in Tampa[448]

Characteristic		**Value**
Year Open		2002
Capital Cost (unadjusted dollars)		$32,000,000
Number of Lines		1
Number of Vehicles		3*
Number of Stations		11
Length		2.7 miles (4.35 km)
Alignment Type	Exclusive	2.7 miles
	Mixed Traffic	0

*Note: The maximum number of vehicles operated in service is three, while they have a total inventory of ten historic streetcars (email communication from Steve Feigenbaum on February 5, 2014).

The local bus routes form a relatively sparse network of largely north-south and east-west routes. The network is denser in downtown Tampa and the nearby Ybor City area, within which the streetcar line operates. Figure 150 indicates that several bus routes serve the areas surrounding the streetcar stops, which suggests that transfers between the two modes are at least spatially feasible. However, the streetcar line's operating schedule constrains the ability of bus transit users to use the streetcar service for trips taken at certain times of the day, as noted below, which reduces the utility of cross-mode transfers.

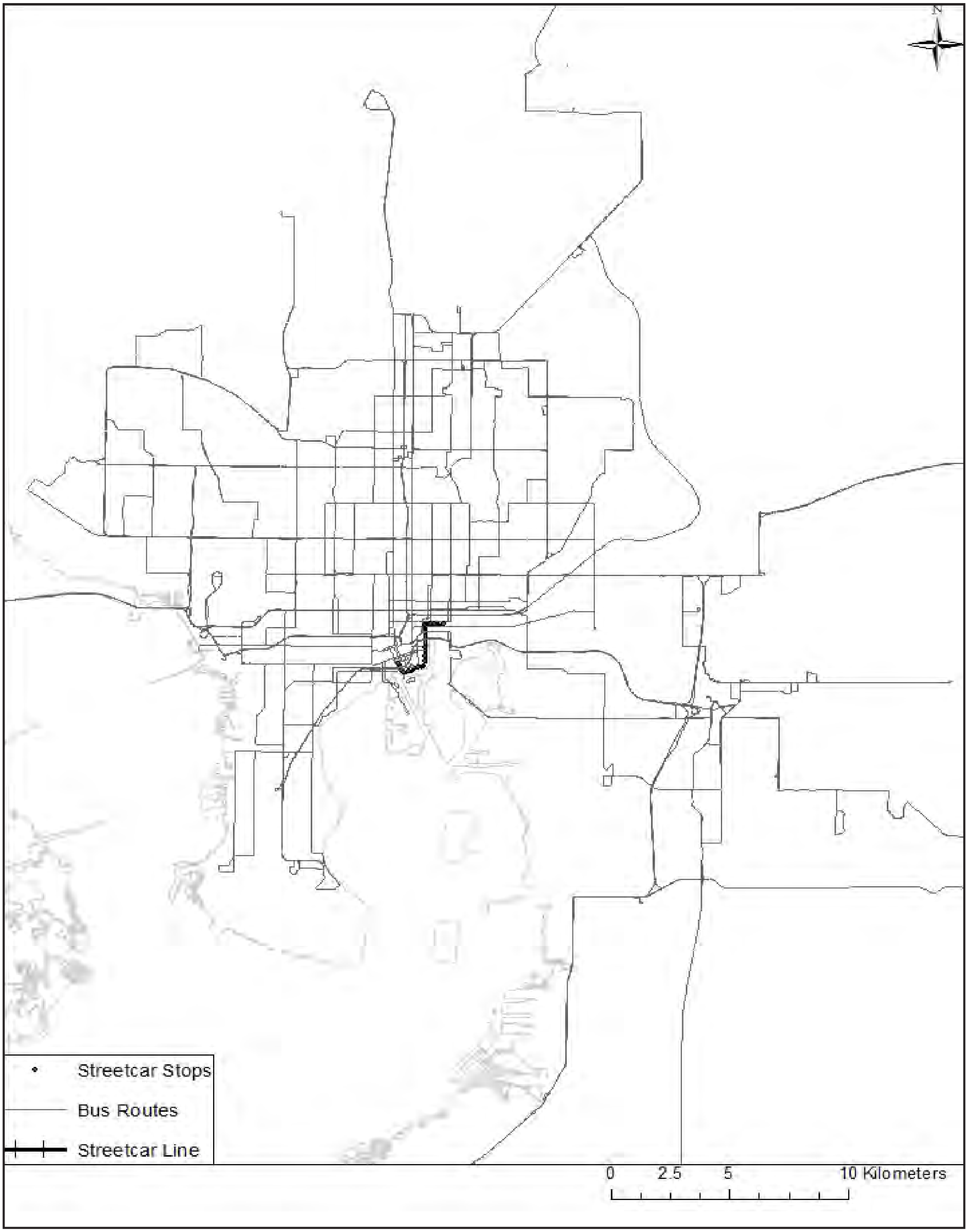

Figure 149. Map of Transit System in Tampa (2012)[449]

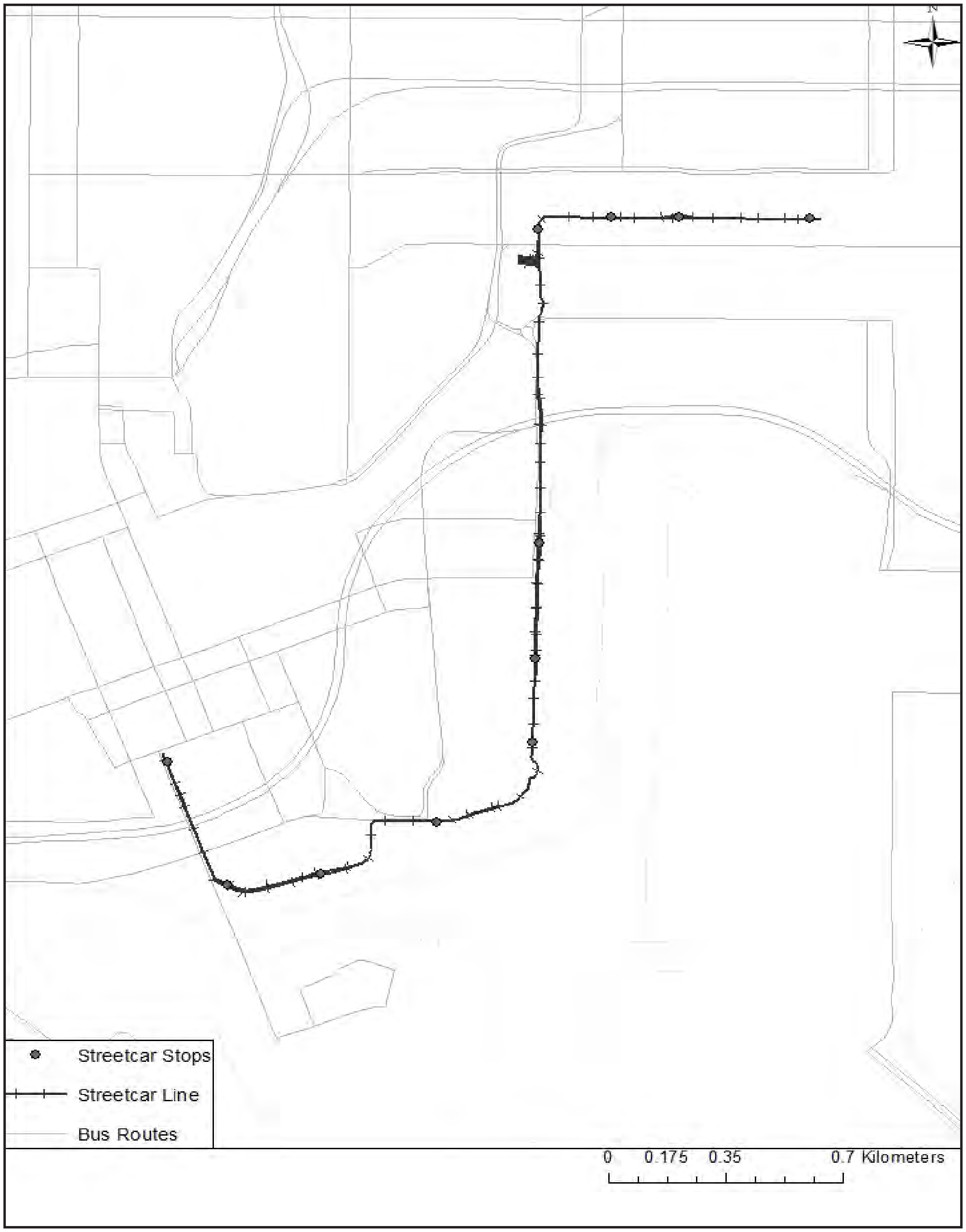

Figure 150. Map of Streetcar and Bus System in Core of Tampa (2012)[450]

The TECO Line begins operations at noon from Sunday through Thursday and at 11 a.m. on Fridays and Saturdays. The line does not operate during morning commute hours, which thus reduces its utility for certain kinds of trips. Service frequencies are consistent throughout the day, with 20-minute weekday service and 30-minute weekend service (Table 67). The service schedule and frequencies reflect the TECO Line's primary orientation toward the visitor travel market. The base fare is relatively high at $2.50 per ride, although discounted passes are available (Table 68). Transfers are free between the streetcar and local buses, although no data are available on the actual amount of transfer activity.

Table 67. Service Characteristics of the Streetcar System in Tampa[451]

Characteristic	Value
Headways	
Weekday Peak	20 min
Weekday Off-Peak	20 min
Weekend Average	30 min
Hours of Service	
Monday-Thursday	10 hr
Friday	15 hr
Saturday	15 hr
Sunday	8 hr

Table 68. Fare and Transfer Policy for Transit Services in Tampa[452]

Characteristic	Type	Cost ($)
Fare Type	Base Fare	$2.50
	*Reduced Fare	$1.25
Pass Type	Day Pass	$5.00
	*Reduced Day Pass	$2.50
	3-Day Pass	$11.00
	20-Ride Fare Card	$25.00
	Annual Pass	$200.00
	**Family All Day Ticket	$12.50
Transfer Fee	Bus/Streetcar	--

Notes:

* Seniors 65 years and older and people with disabilities receive fares at a reduced price.

** Valid on Streetcar only for 2 adults and 3 children or 1 adult and 4 children and available only at Streetcar Ticket Vending Machines.

The TECO Line connects downtown Tampa/Channelside area with Ybor City and other nearby tourist attractions and parking facilities. John Smatlak observes that "the line serves the so-called 'visitors crescent' that encompasses the Convention Center, Ice Palace, Garrison Seaport, Florida Aquarium, and the historic Ybor City district. According to the Tampa Downtown Partnership, more than $800 million in new, privately funded construction projects are recently completed, under construction, or have been approved within two blocks of the streetcar line since its inception. Many of these projects feature the streetcar system in their marketing and advertising."[453] The tourism/visitor orientation is apparent in the service characteristics discussed earlier, and it can also be seen in the data on the types of trips the streetcar serves. For example, the bottom panel of Table 69 indicates that more than 90 percent of streetcar trips are taken for social or recreational purposes. Very limited survey data is available on streetcar users, as they are not a primary focus of HART's data gathering operations.

Table 69. Customer Profile, HART, Tampa[454]

		HART System (%)	Streetcar (%)
Gender	Male	46.7	56.7
	Female	53.3	43.3
	Total	**100.0**	**100.0**
Race	White	28.7	not available
	Black	48.5	not available
	Hispanic	17.6	not available
	Asian	1.7	not available
	Other	3.5	not available
	Total	**100.0**	
Age	18 or under	1.9	0.4
	18 - 24	24.1	11.8
	25 - 34	21.5	29.5
	35 - 44	18.3	25.8
	45 - 54	20.7	16.4
	55 - 64	10.3	12.3
	over 65	2.4	3.5
	Missing	0.8	0.3
	Total	**100.0**	**100.0**
Employment Status	Full Time	42.0	not available
	Part Time	19.0	not available
	Not Employed	32.0	not available
	Retired	7.0	not available
	Total	**100.0**	
Income	Under $5,000	29.7	not available
	$5,000 to $9,999	14.9	not available
	$10,000 to $19,999	20.8	not available
	$20,000 to $29,999	15.4	not available
	$30,000 to $39,999	9.7	not available
	$40,000 to $49,999	3.9	not available
	$50,000 or more	5.6	not available
	Total	**100.0**	
Access Mode	Walked	85.0	not available
	Bicycled	4.0	not available
	Drove	0.5	not available
	Was Dropped Off	3.4	not available
	Rode with Someone	0.4	not available
	Other	6.7	not available
	Total	**100.0**	

		HART System (%)	Streetcar (%)
Trip Purpose	Work	27.9	4.3
	School/College	9.5	-
	Social	5.4	37.7
	Medical	5.4	-
	Home	36.3	-
	Recreation	0.7	54.7
	Shopping	6.7	-
	Other	8.1	3.3
	Total	**100.0**	**100.0**

Note: Categories reported as defined in source documents.

SOCIOECONOMIC CONTEXT FOR STREETCAR SERVICE

At the time of the 2010 Census, the city of Tampa, Florida had a population of just under 336,000 people. The total population for the Tampa-St. Petersburg metropolitan area was just under 2.8 million.[455] Streetcar service is confined to Tampa's downtown/Channelside area, which is on the eastern side of Tampa Bay, and to the commercial/recreational center of Ybor City, northeast of downtown Tampa. The city's median household income was just over $43,000 per year, while about 21 percent of the population lived below the poverty line. The city population was more than 26 percent black and about 63 percent white at the time of the 2010 Census. The Hispanic population counted for about 23 percent of the city's total population.

Transportation analysts typically use population as an indicator of trip production potential, and thus a clearer understanding of the spatial distribution of population within a community is an important part of any analysis of travel-related phenomena. Figures 151 and 152 display city-scale population and population density for Tampa, both by census block group, at the time of the 2010 Census. The first exhibit suggests that larger population zones tend to be located toward the edges of the city of Tampa, while the second exhibit emphasizes that the higher-density zones tend to be in the core areas of the city. Most of the city's block groups have low-to-moderate total populations and low-to-moderate population densities, which is perhaps not surprising given that most of Tampa's population growth has come in recent decades and thus has been shaped by the automobile.

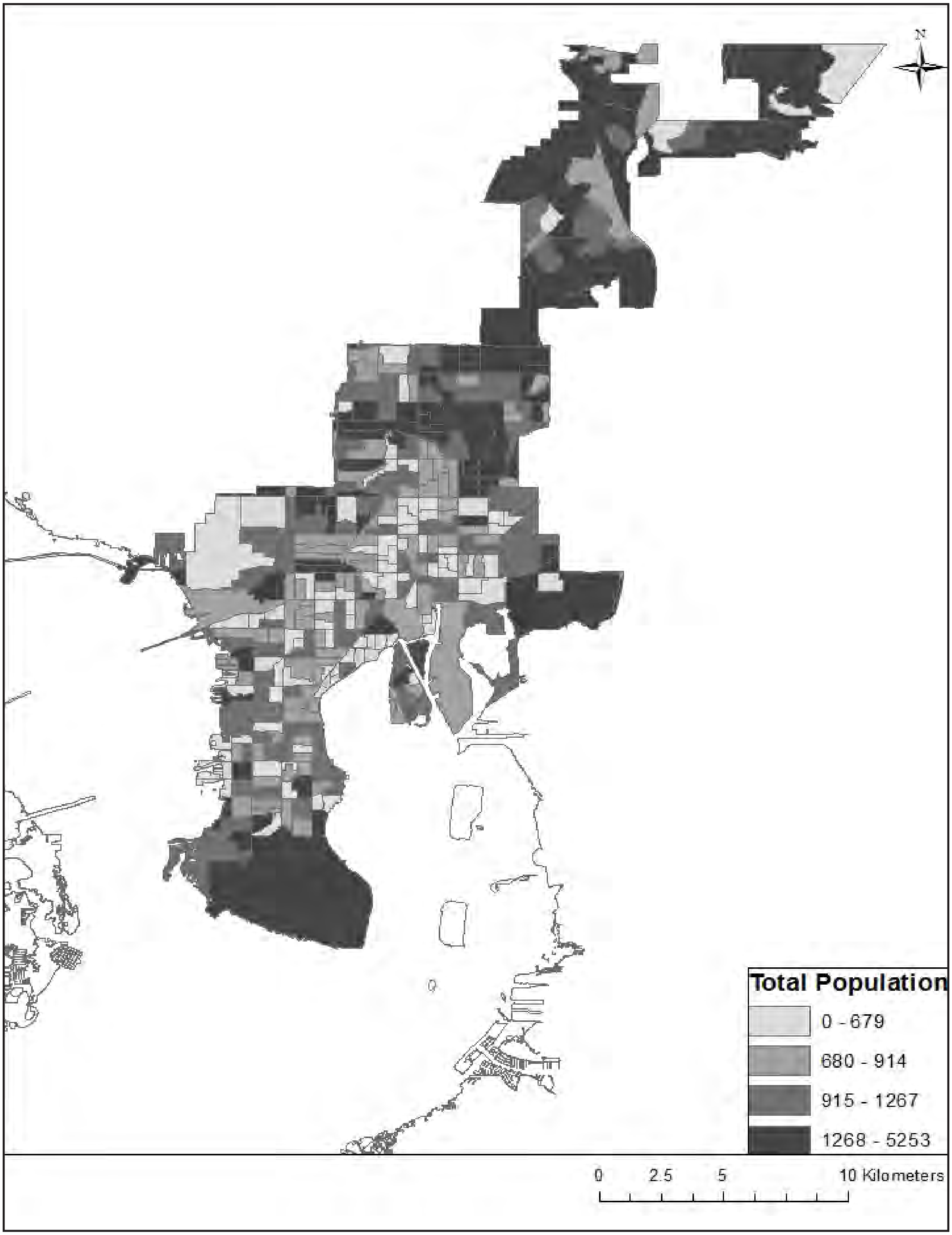

Figure 151. Population by Block Group in Tampa (2010)[456]

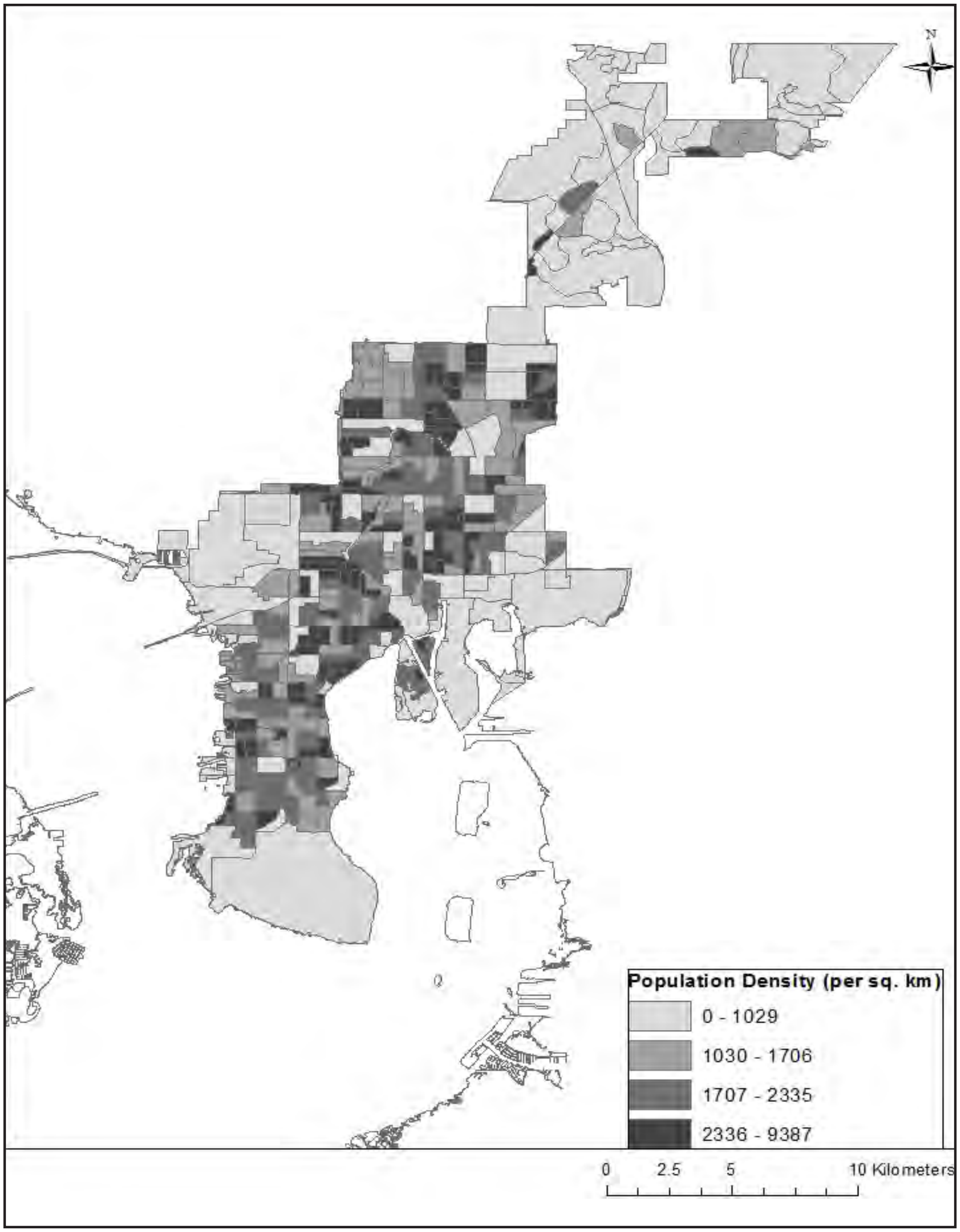

Figure 152. Population Density by Block Group in Tampa (2010)[457]

Figures 153 and 154 depict population and population density at a larger map scale for the areas in the Tampa core area immediately surrounding the streetcar line. The first of these maps indicates that the area has population in the low to moderate range except for a high population block group at the northern end of the line in Ybor City. The population density map depicts a very different pattern, highlighting the importance of accounting for block group size in the analysis. Here, the higher population density block groups are those along the western side of the streetcar line. Ybor City emerges as an area of lower population densities, as do the block groups at the southern end of the line. All these population density levels are relatively modest for core urban areas.

Employment represents potential trip attractors, and thus understanding its spatial distribution is also important. Figures 155 and 156 depict employment and employment density, respectively, for the city of Tampa. The first of these maps suggests a spatially dispersed employment pattern with many outer and edge location block groups appearing as major employment centers. The second of these maps indicates that some of this pattern is at least partially an artifact of differences in the physical sizes of the block groups. In this second map, many areas within the core of the city emerge as areas with relatively high employment densities. However, most of Tampa's block groups fall within the low to moderate employment density categories. Even its highest employment density category is relatively modest for a core urban area. Within the immediate vicinity of the streetcar, employment counts are higher in the block groups at the north end of the corridor and lower toward the middle and southern ends of the line. However, employment densities are highest in the block groups at the center of the streetcar alignment (Figures 157 and 158). Taking population and employment together, the streetcar appears to serve areas that, by Tampa standards, are of moderate to high densities, although not the highest density locations in the city.

Figure 153. Population by Block Group in Core of Tampa (2010)[458]

Figure 154. Population Density by Block Group in Core of Tampa (2010)[459]

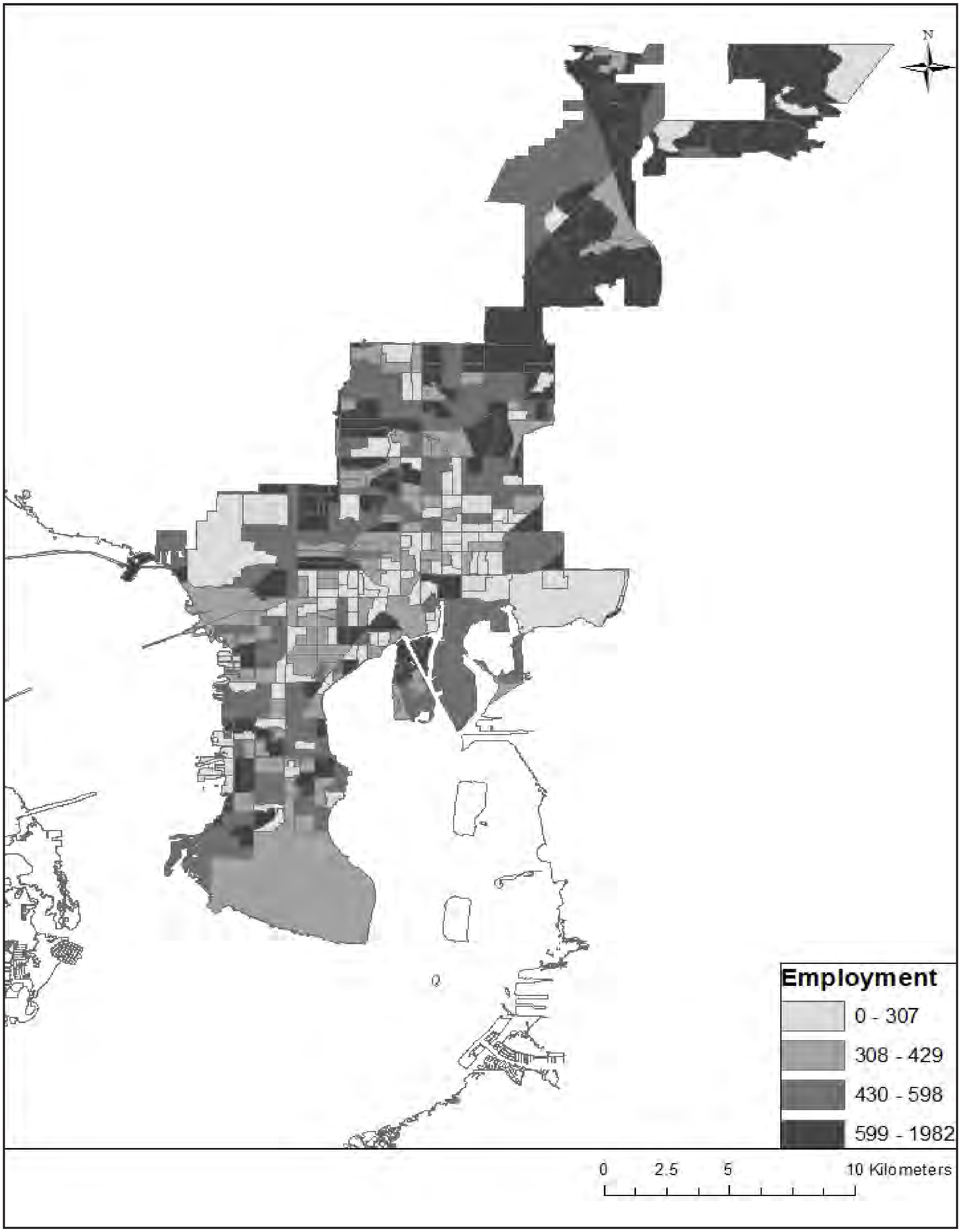

Figure 155. Employment by Block Group in Tampa (2010)[460]

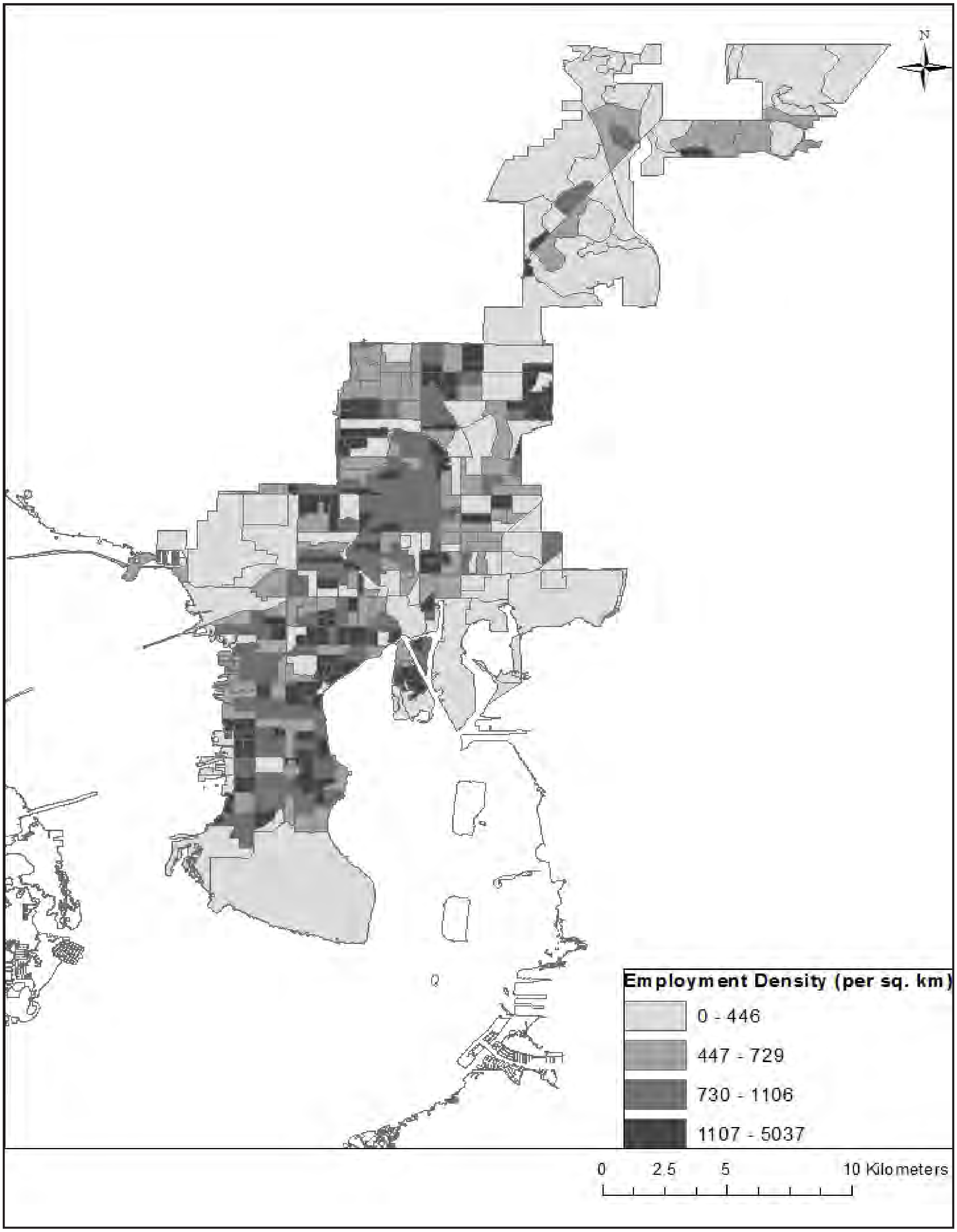

Figure 156. Employment Density by Block Group in Tampa (2010)[461]

Figure 157. Employment by Block Group in Core of Tampa (2010)[462]

Figure 158. Employment Density by Block Group in Core of Tampa (2010)[463]

Downtown Tampa and Ybor City are characterized by a traditional orthogonal street pattern (Figure 159). However, the average block size in Ybor City is 2.82 acres [1.14 hectares], noticeably lower than the average of 4.10 acres [1.66 hectares] in the downtown Tampa/ Channelside area. Streets in downtown Tampa are also wider, have more lanes, and carry more traffic than those in Ybor City. These differences would seem to render Ybor a more amenable place for pedestrians. Regardless of these differences, the cumulative density of population plus employment in both Ybor City and Downtown Tampa is equal to or less than 7.11 people + jobs per acre [2.88 per hectare]. As in the other cases examined for this study, this land-use characteristic is below the threshold recommended for cost-effective light-rail systems.[464]

Tampa's population is predominantly white, but the city also has large black and Hispanic populations. The spatial distribution of the black population is shown in Figures 160 and 161. The first figure depicts larger black population shares in Tampa's eastside block groups and in the areas due north of the downtown core. The second figure indicates that within the areas immediately surrounding the streetcar line, the black population shares tend to be in the low to moderate ranges, with the exception of higher black population shares in the block groups just west of the line's northern terminus in Ybor City. Generally speaking, black population shares tend to be higher in the core areas of Tampa.

The spatial distribution of Tampa's white population is shown in Figures 162 and 163. The white population tends to cluster in larger numbers in the block groups on the western side of the city and in the northern areas. Within the immediate vicinity of the streetcar line, white population shares are fairly high. The Hispanic population is depicted in Figures 164 and 165. Like the black population, the Hispanic population is represented in larger numbers in the core areas of Tampa. However, it is much more concentrated in Tampa's western areas. Within the downtown core areas, Hispanic population shares are typically in the low to moderate range, although the block groups just east of the streetcar line have higher Hispanic population shares. Tampa also has a small but growing Asian population. This population tends to locate in larger numbers in block groups along the water and at the different ends of the city, and it is represented in smaller numbers in the core inner block groups (Figures 166 and 167). The block groups at the center of the streetcar alignment tend to have moderate numbers of Asian residents, although the community is still quite small compared with the other groups.

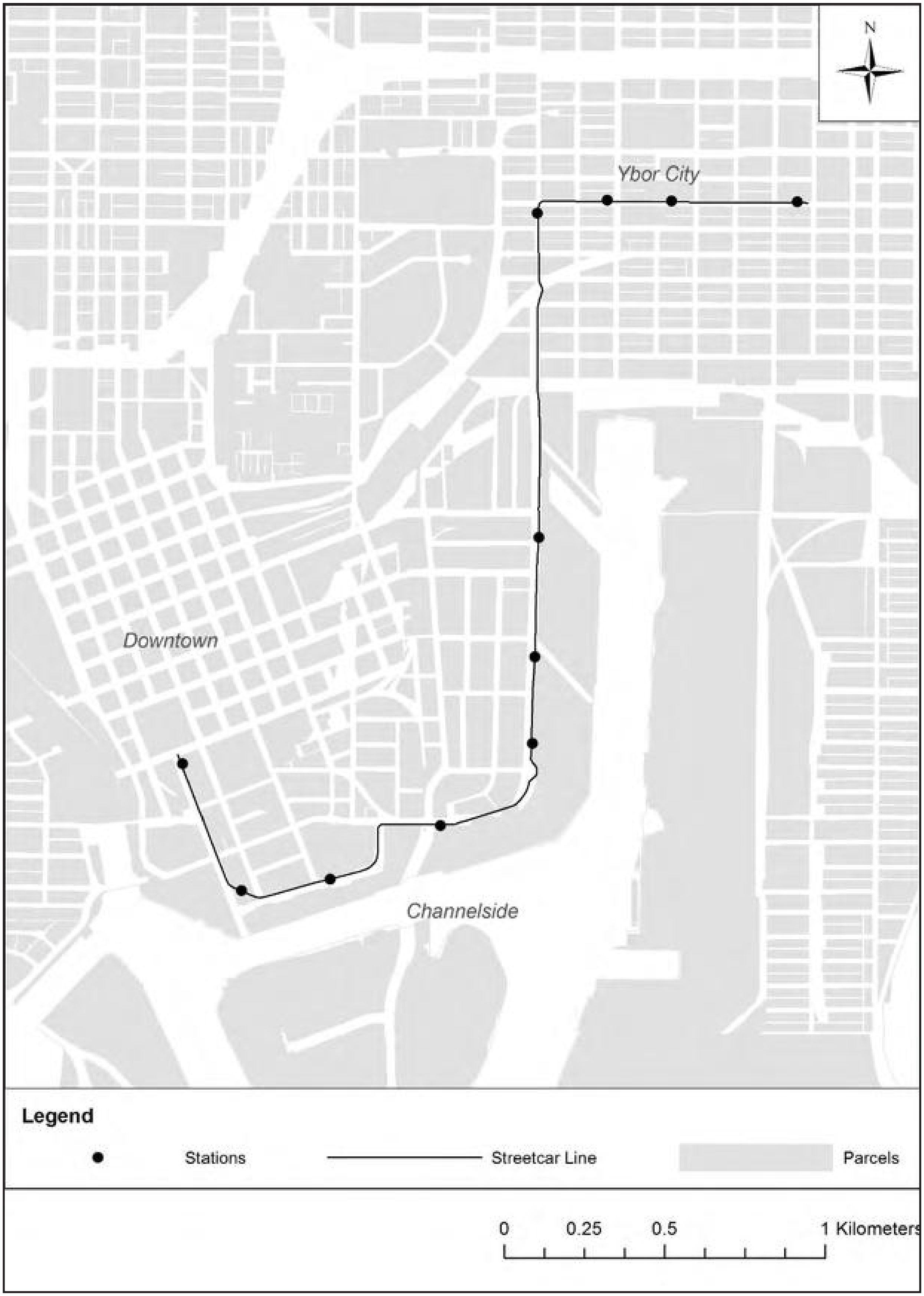

Figure 159. Urban Morphology-Parcel Map for Tampa (2012)[465]

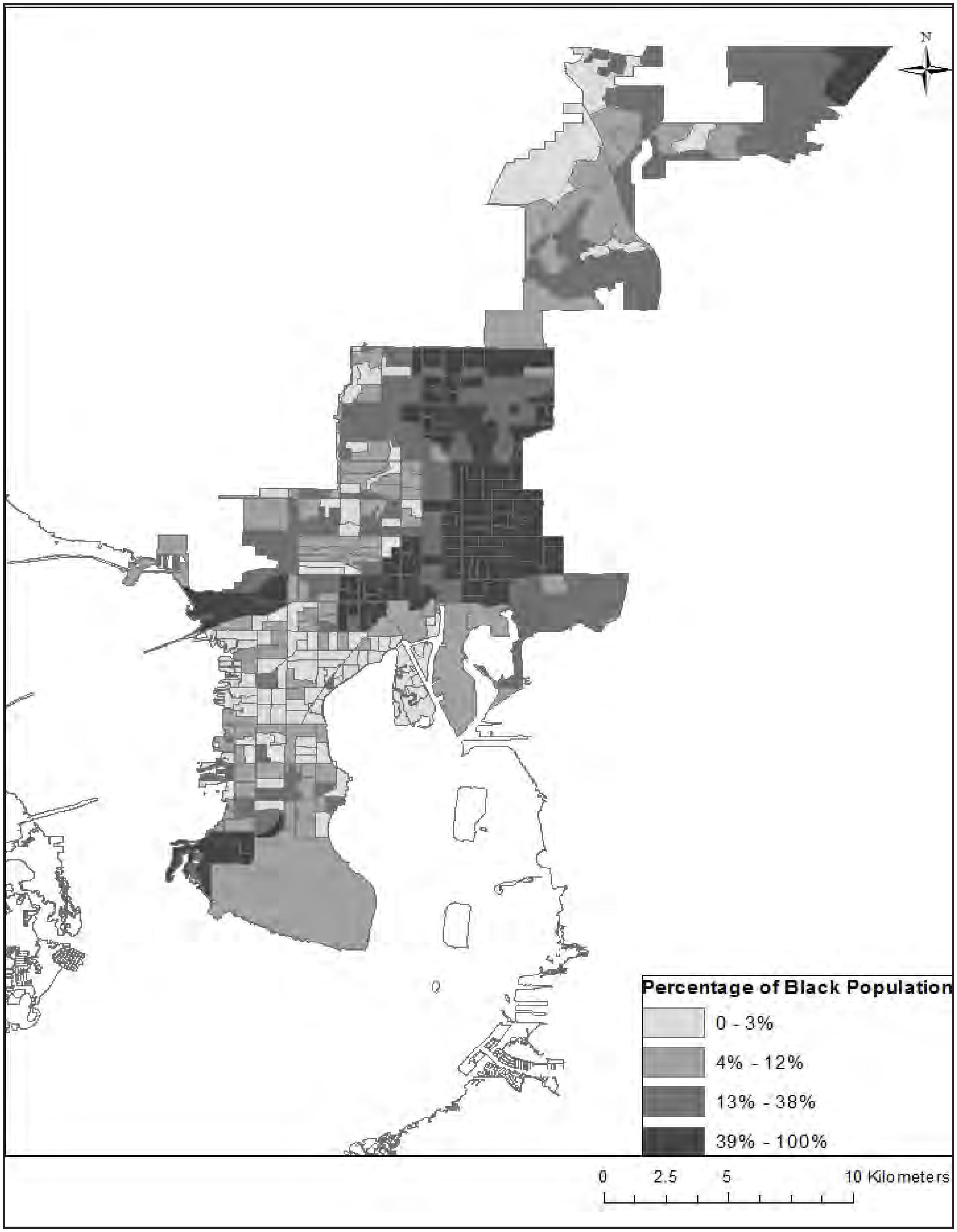

Figure 160. Black Population by Block Group in Tampa (2010)[466]

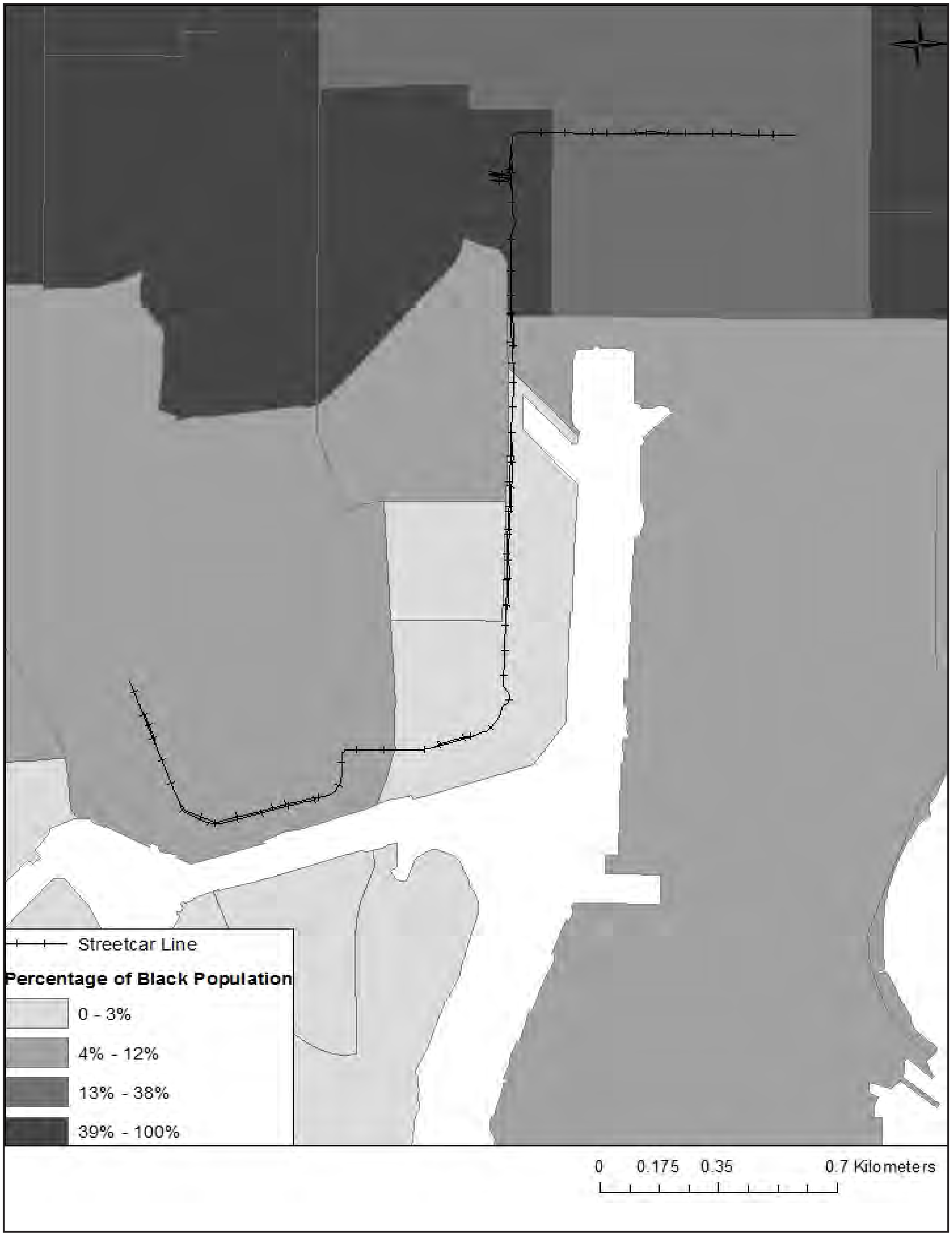

Figure 161. Black Population by Block Group in Core of Tampa (2010)[467]

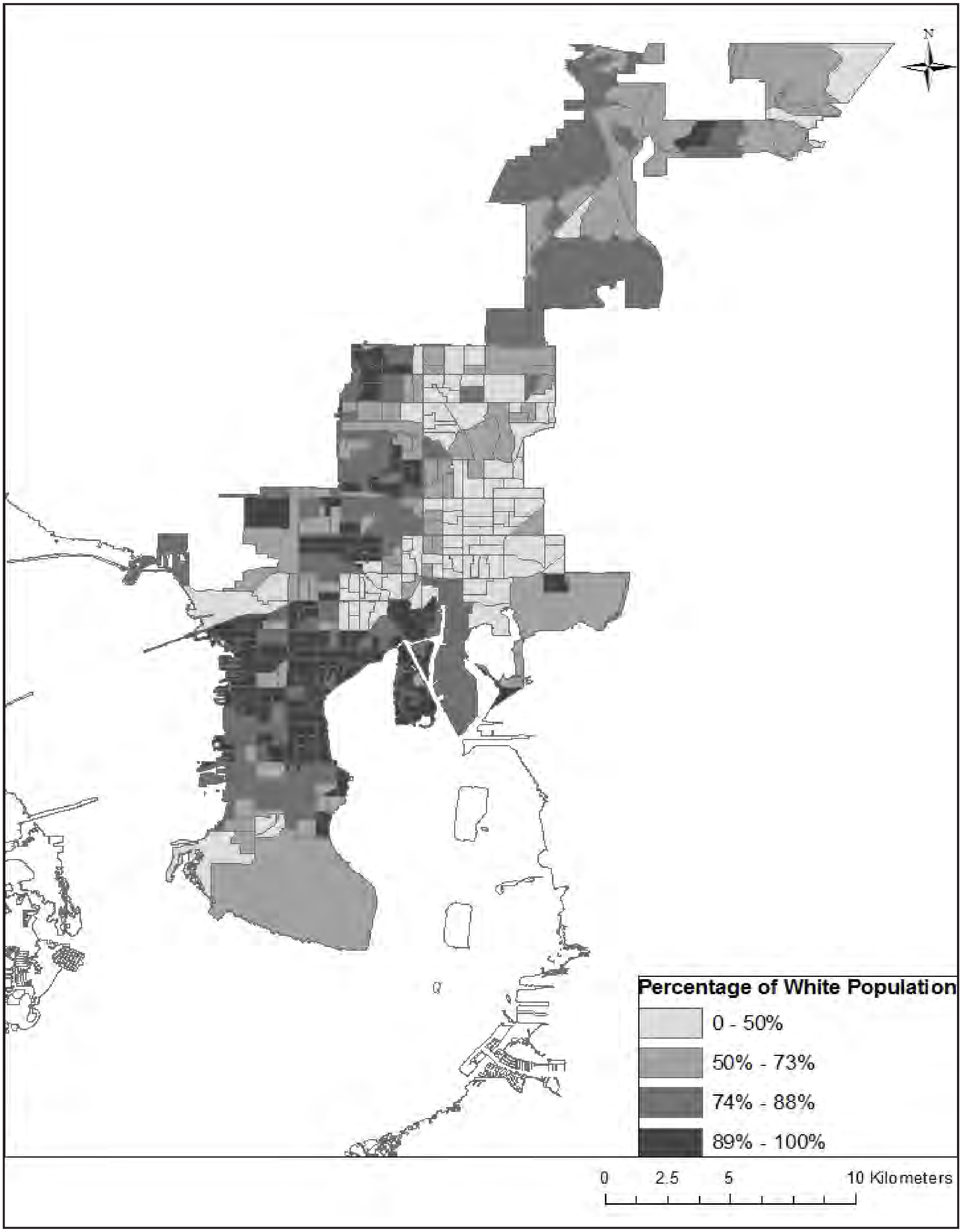

Figure 162. White Population by Block Group in Tampa (2010)[468]

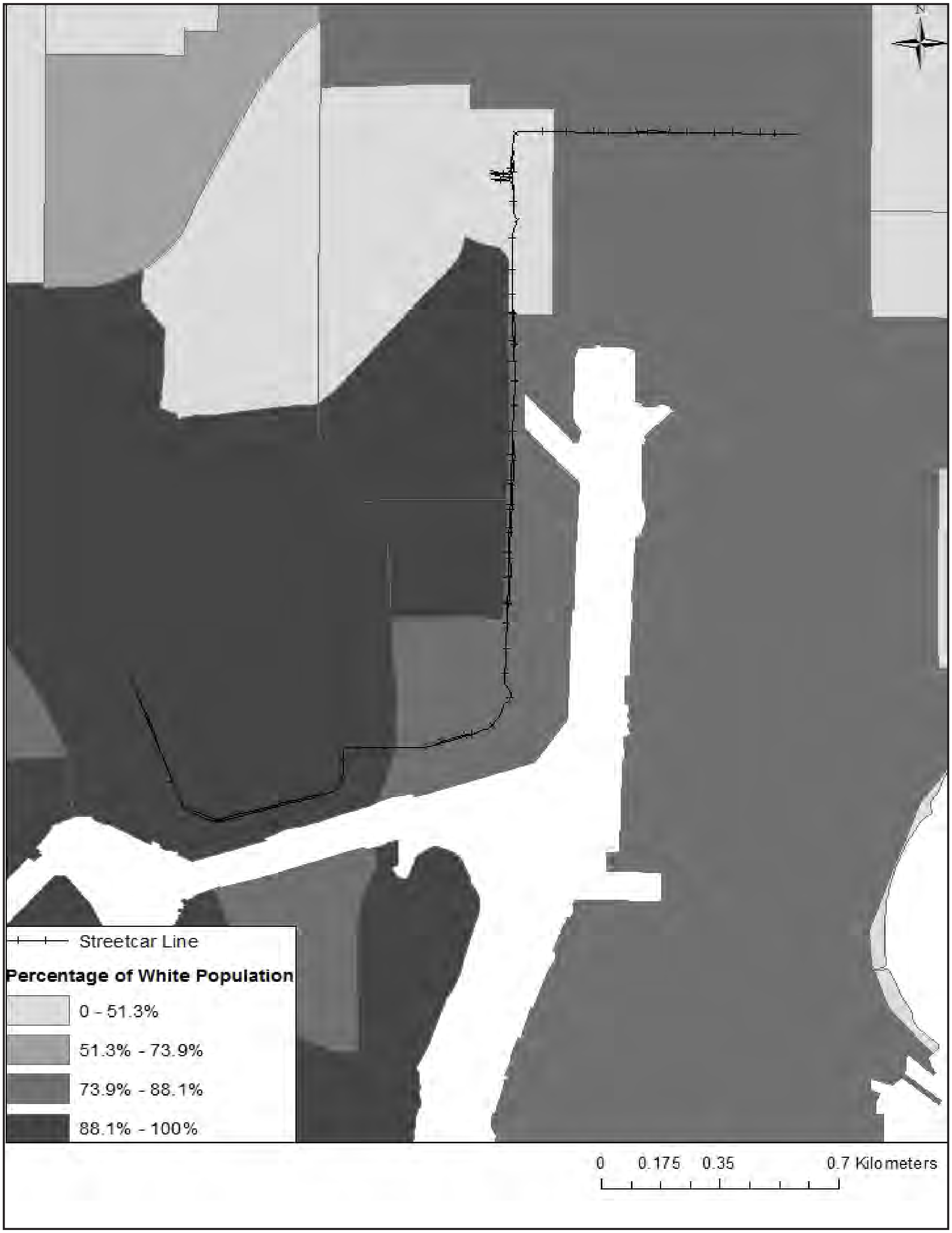

Figure 163. White Population by Block Group in Core of Tampa (2010)[469]

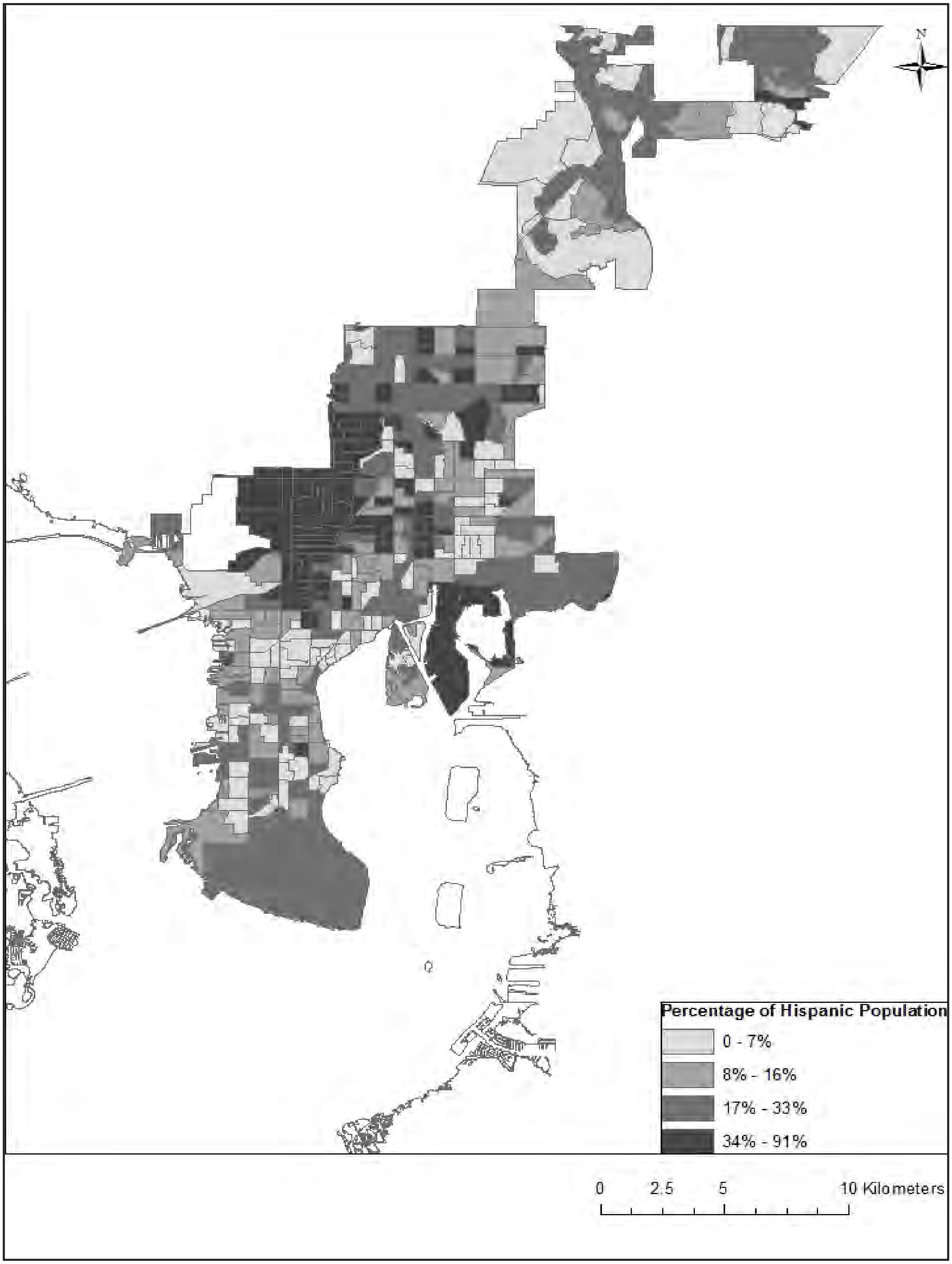

Figure 164. Hispanic Population by Block Group in Tampa (2010)[470]

Figure 165. Hispanic Population by Block Group in Core of Tampa (2010)[471]

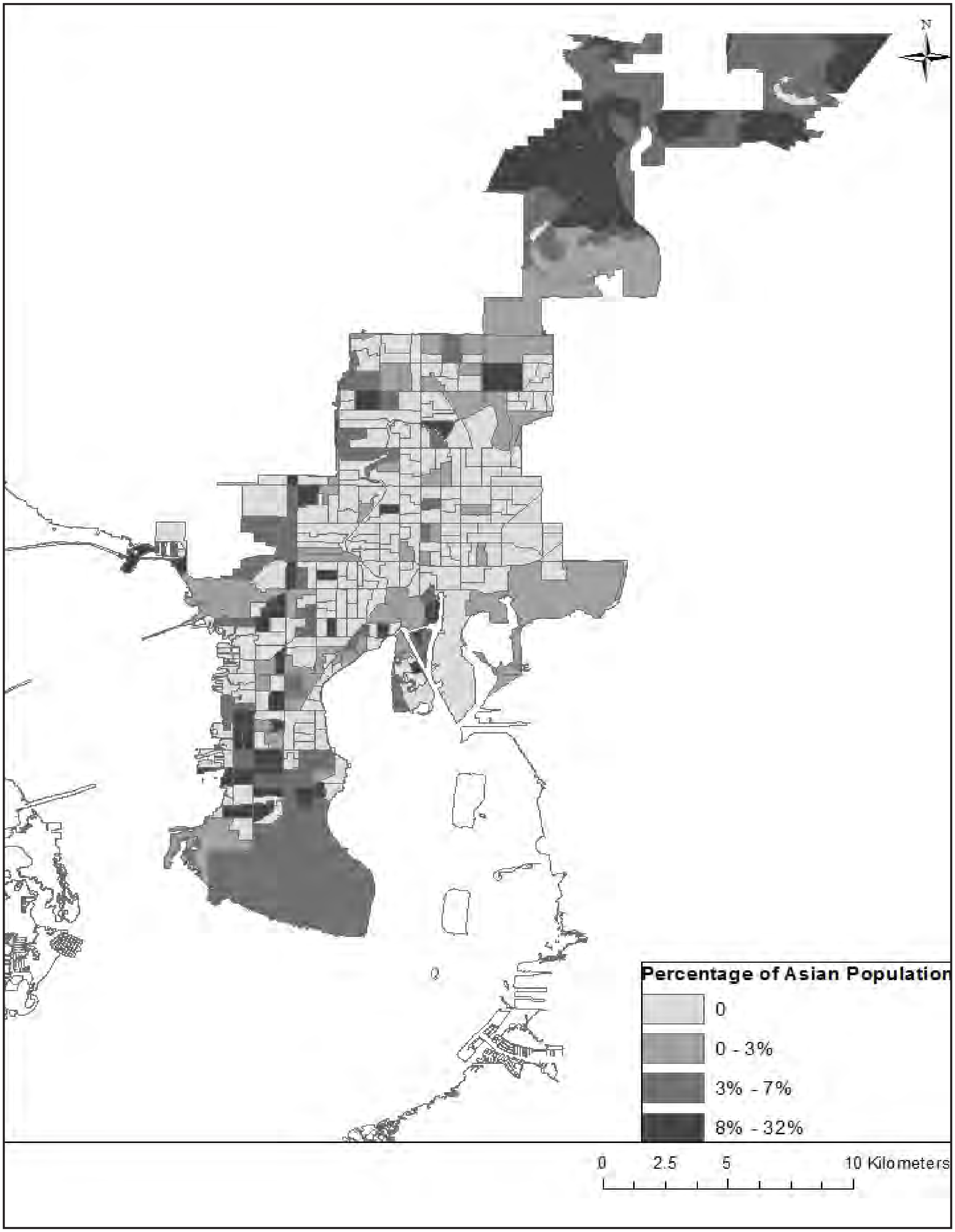

Figure 166. Asian Population by Block Group in Tampa (2010)[472]

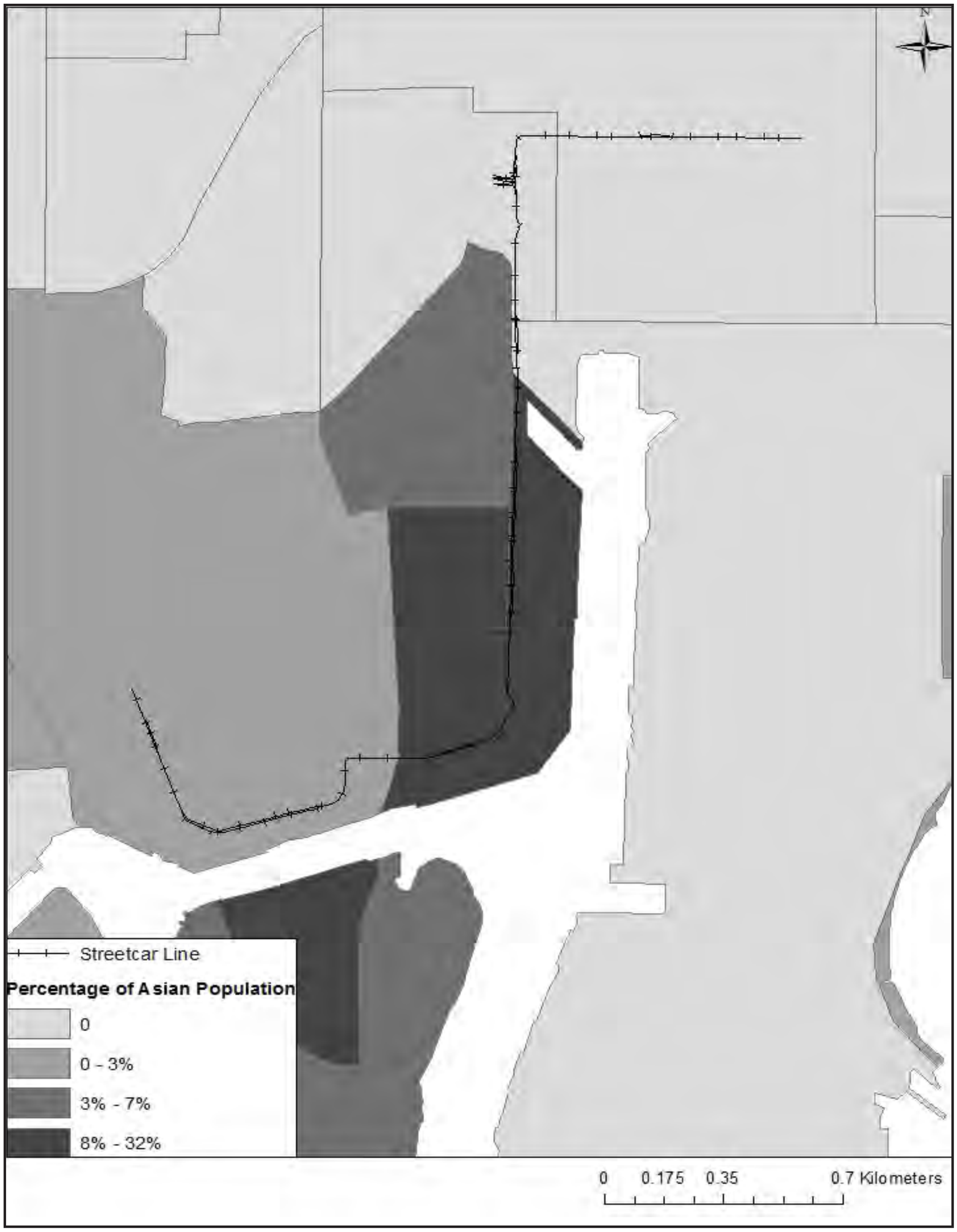

Figure 167. Asian Population by Block Group in Core of Tampa (2010)[473]

Median household income and vehicle access are two variables strongly correlated with transit use, with lower-income households and those households with lower levels of vehicle access tending to use transit much more often than other households. Figures 168 and 169 depict the spatial pattern of median household income by block group. The income maps are strikingly similar to those for the white and Asian populations just discussed, with household incomes tending to be higher in the outer areas than in the immediate core of the city. Block groups in the approximate center of the city tend to have lower income levels. However, several block groups with relatively high incomes are in the center of the streetcar alignment.

It is not surprising that there is some consistency between the spatial patterns of household incomes and vehicle access (Figures 170 and 171). Vehicle access is depicted as the average number of vehicles per housing unit. Vehicle access is highest in the outer areas and lower in the core areas in Tampa. Within the area served by the streetcar line, vehicle access tends to be relatively low in most block groups. Related to vehicle access is the transit commute mode share, which tends to be higher in areas with low levels of vehicle access, although the mode shares themselves are relatively modest—which is perhaps not surprising given Tampa's predominantly auto-oriented development patterns (Figures 172 and 173). Residents in inner city block groups are much more likely to use transit for work trips than are those living in other areas. The block groups surrounding the streetcar line tend to have very low transit commute shares, with the exceptions of the block groups in Ybor City at the north end of the line.

Taken as a whole, the area around the streetcar line possesses some of the socioeconomic attributes associated with higher transit use, but it is far from the most optimal location in Tampa, purely from a socioeconomic perspective, for generating large numbers of regular transit users. This all points to the streetcar's primary role as part of the city's tourism and visitor strategy as opposed to a service focused on attracting traditional transit riders.

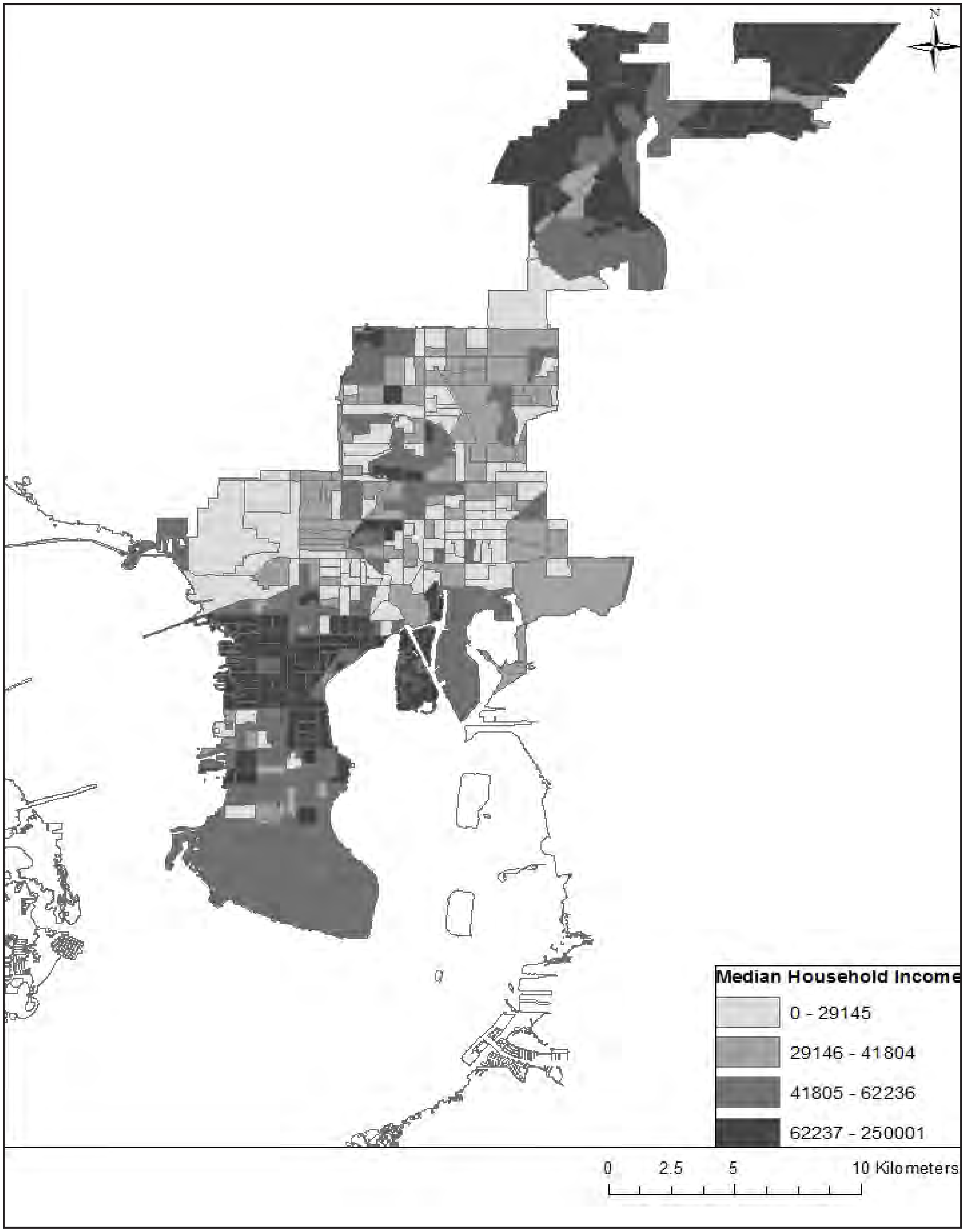

Figure 168. Median Household Income by Block Group in Tampa (2010)[474]

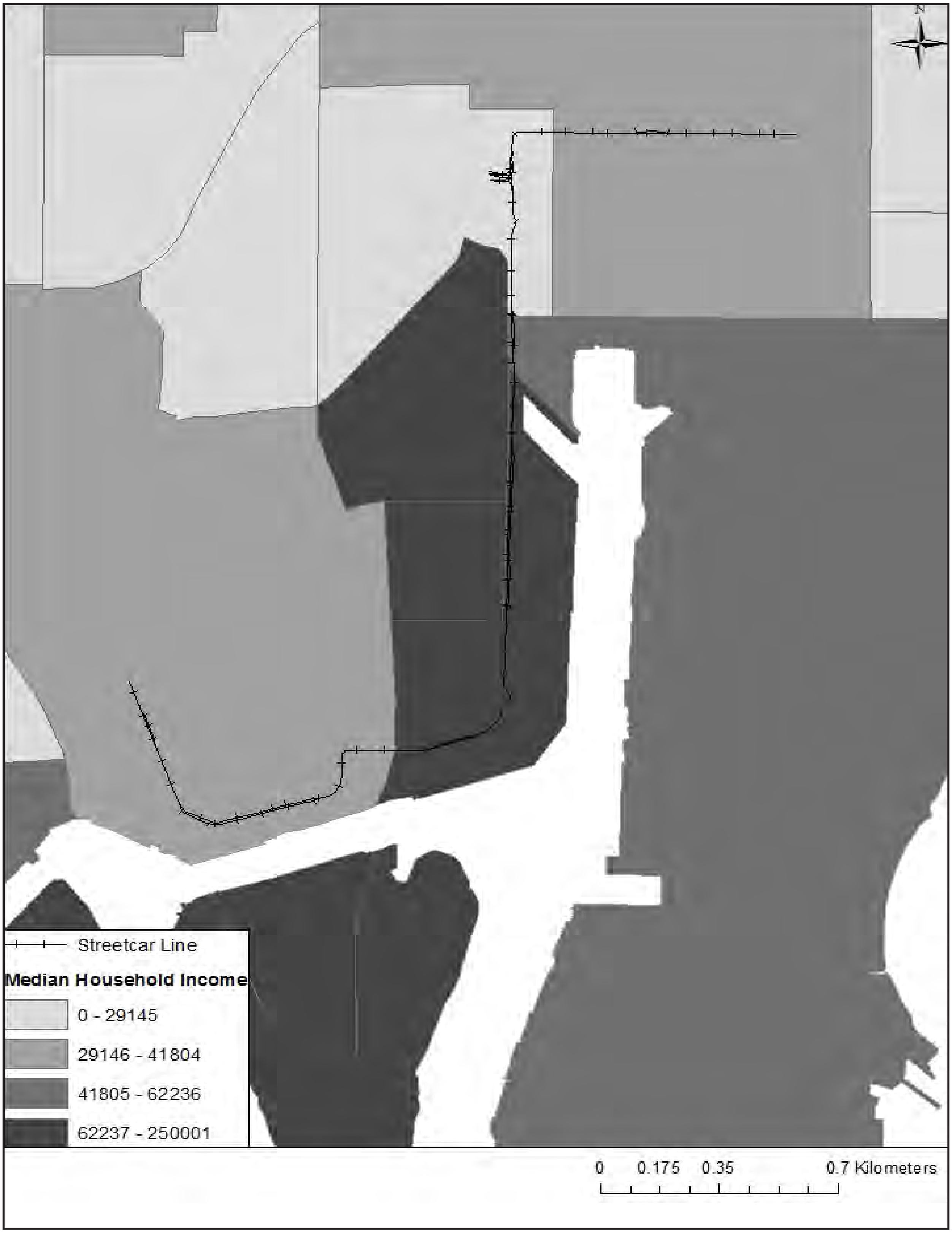

Figure 169. Median Household Income by Block Group in Core of Tampa (2010)[475]

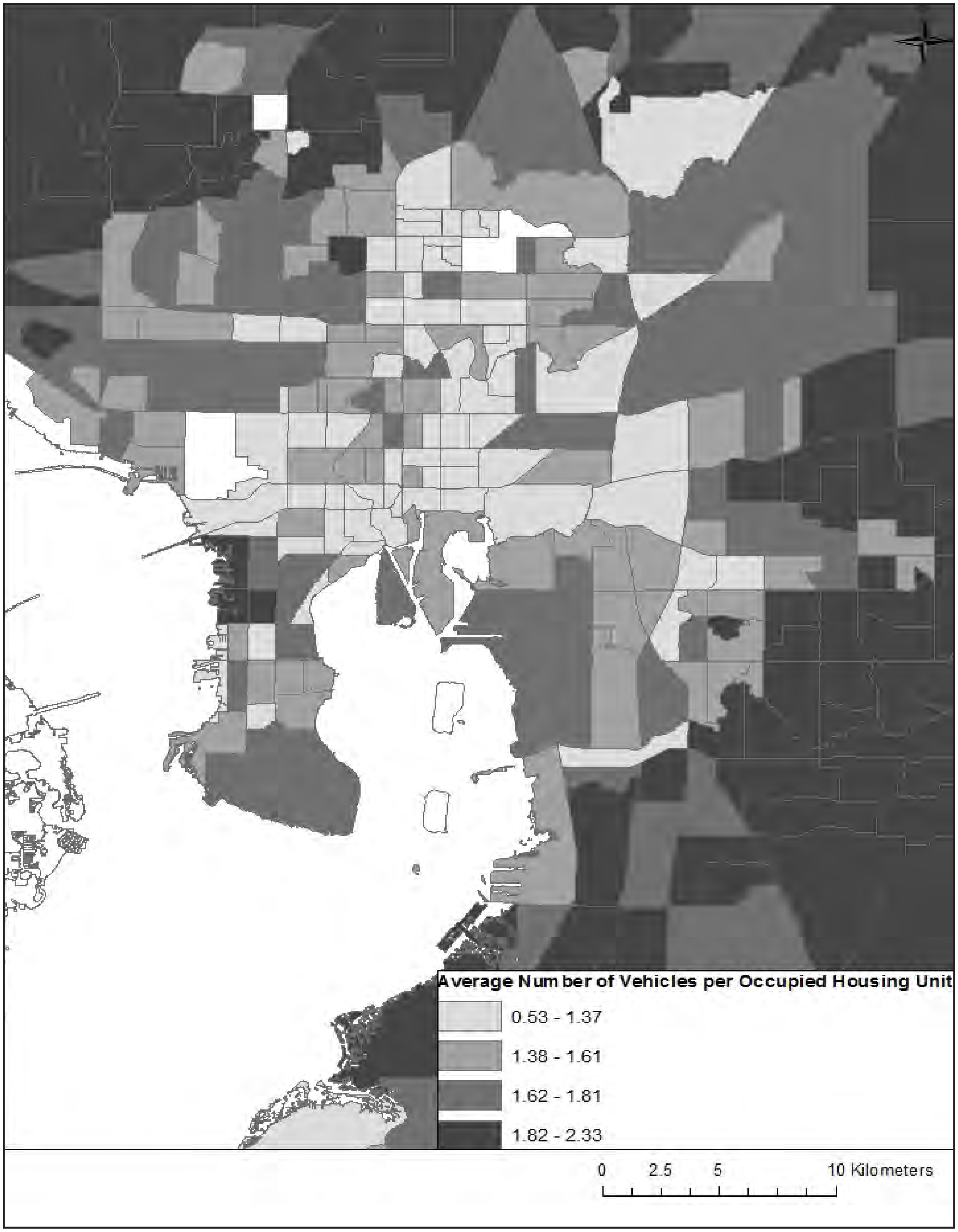

Figure 170. Vehicles per Housing Unit by Block Group in Tampa (2010)[476]

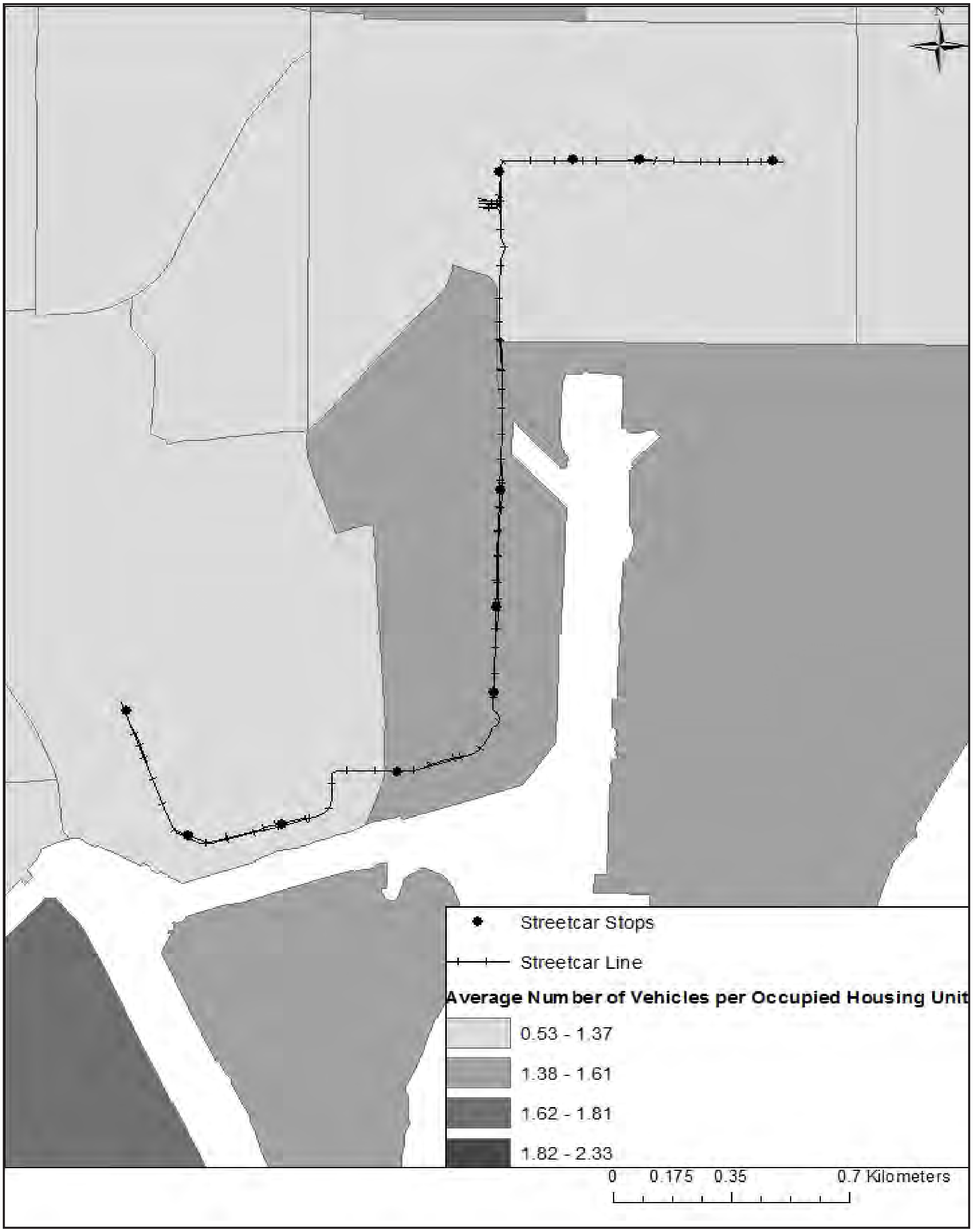

Figure 171. Vehicles per Housing Unit by Block Group in Core of Tampa (2010)[477]

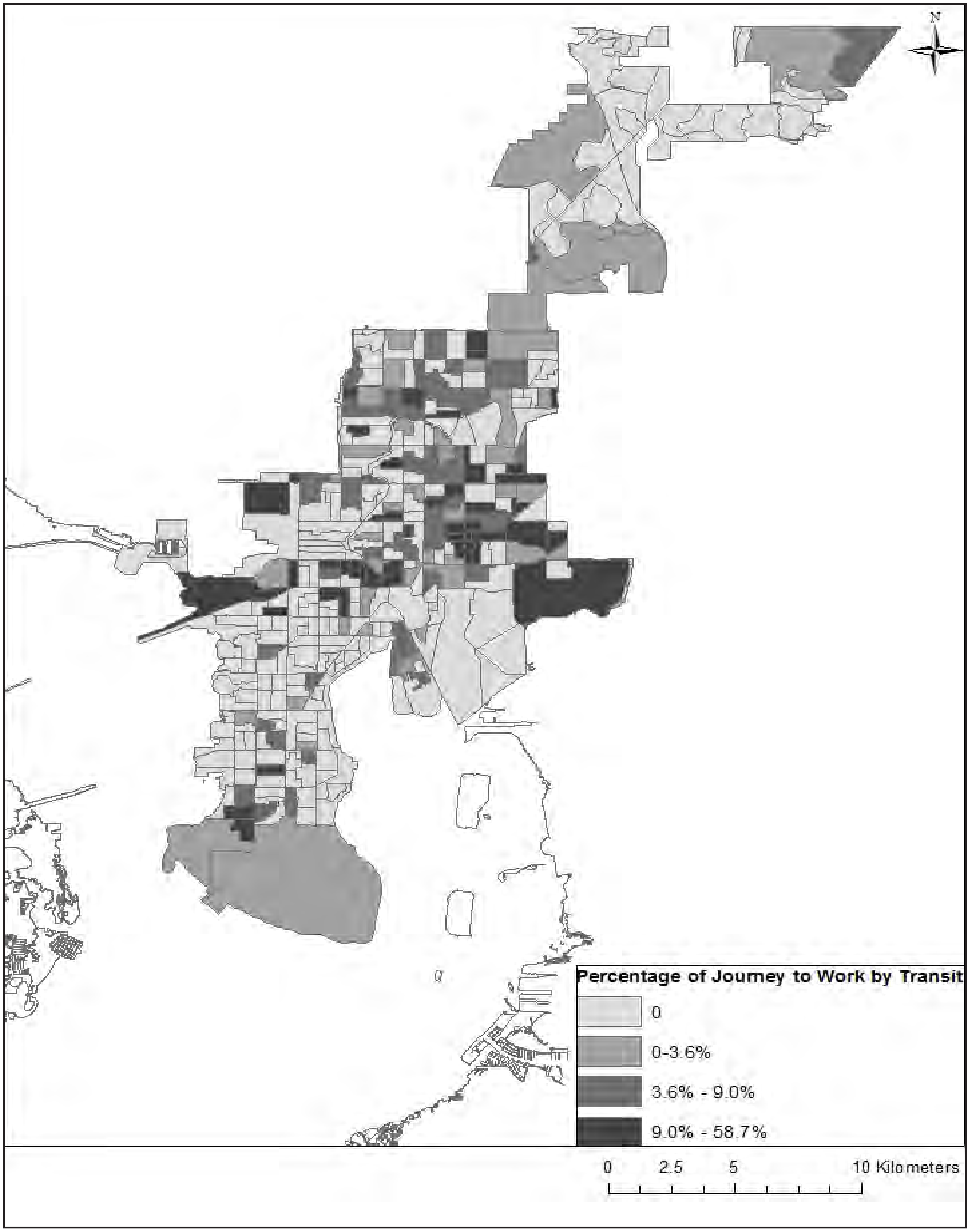

Figure 172. Transit Commute Share by Block Group in Tampa (2010)[478]

Figure 173. Transit Commute Share by Bock Group in Core of Tampa (2010)[479]

LAND USE AND DEVELOPMENT CONTEXT FOR STREETCAR SERVICE

The TECO Line streetcar is located in a core area of central Tampa that is primarily commercial, although it is not heavily built up. Figure 174 depicts land uses for parcels in the area surrounding the streetcar line. The picture portrayed here is of an area with moderate densities and significant room for potential concentrated redevelopment. Also shown on the map are special activity centers, including convention centers, hotels, museums, libraries, and other destinations that cater to visitors. At the northeast end of the alignment, the Ybor City district itself is a major visitor destination. Many of these special activity destinations are very close to the line's various stops.

Figure 175 adds streetcar ridership, by stop, to the image to clearly highlight the very important role played by these visitor-oriented destinations for the streetcar line's ridership. Indeed, the high-ridership stops tend to have special activity centers close by. Also clear from the map is the very low ridership at most of Tampa's streetcar stops. Tampa's streetcar has the second-lowest ridership among the cases considered in this report. Only Little Rock has lower ridership levels.

Figure 176 reports the land uses in finer detail, noting in particular the concentration of commercial activity and locations of major educational centers. Three important observations can be made from this figure. First, educational centers such as schools, universities, and college campuses are not well served by the streetcar in Tampa, although educational centers play important roles in streetcar patronage in other cases in this study. Second, downtown Tampa, which represents one of the two dominant commercial clusters, is not served directly by the streetcar. Finally, most of the land adjacent to the streetcar alignment in the Channelside District, to the North of Ybor City, and in some areas in downtown Tampa is under the purview of public, quasi-public, and/or institutional agents. This suggests an important potential role for the public sector to implement land-use, transportation, and development policies focused on creating conducive environments for streetcar patronage. The authors turn to a more detailed discussion of ridership and performance later in the profile.

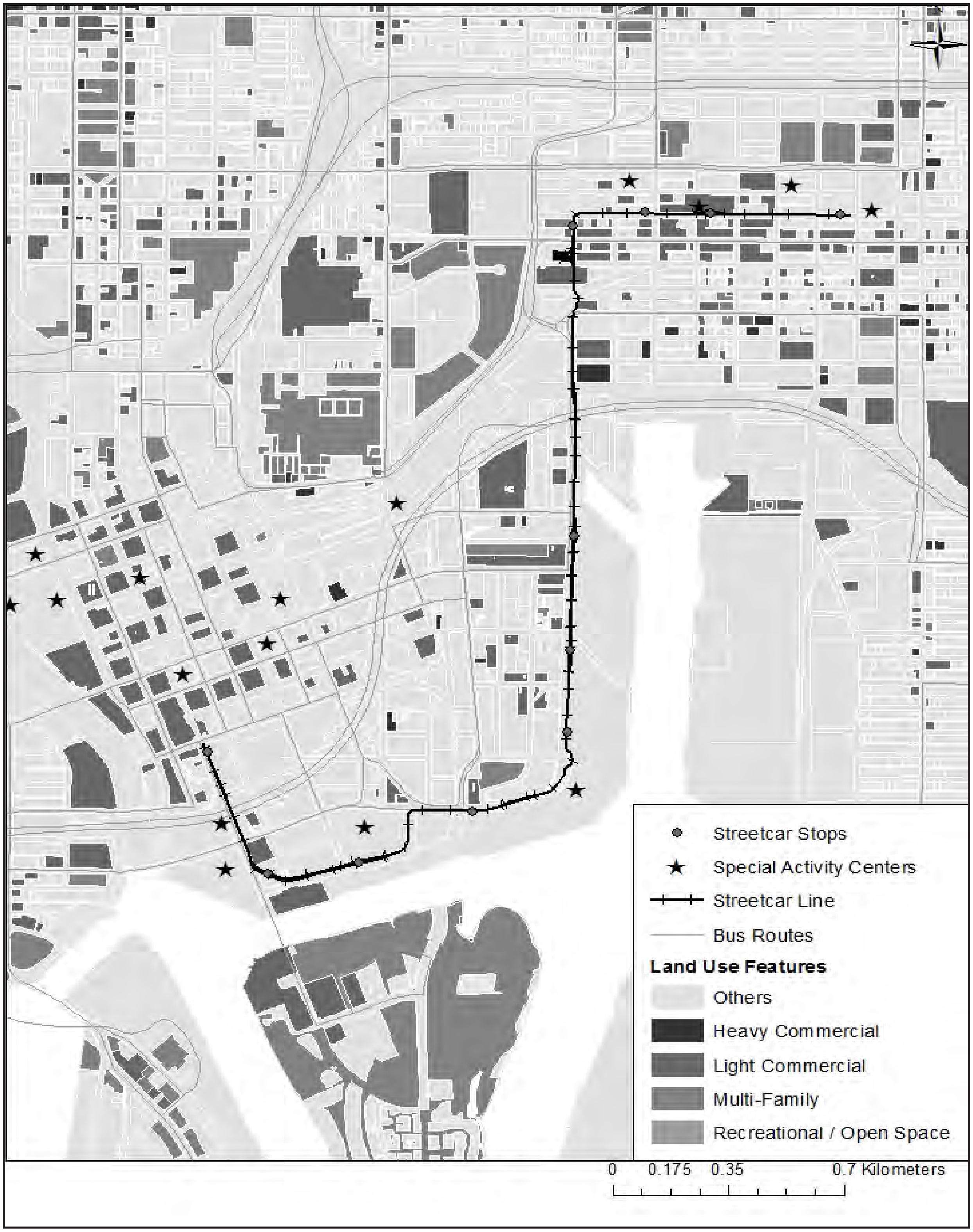

Figure 174. Land Uses and Special Activity Centers Around Streetcar Stops in Tampa (2012)[480]

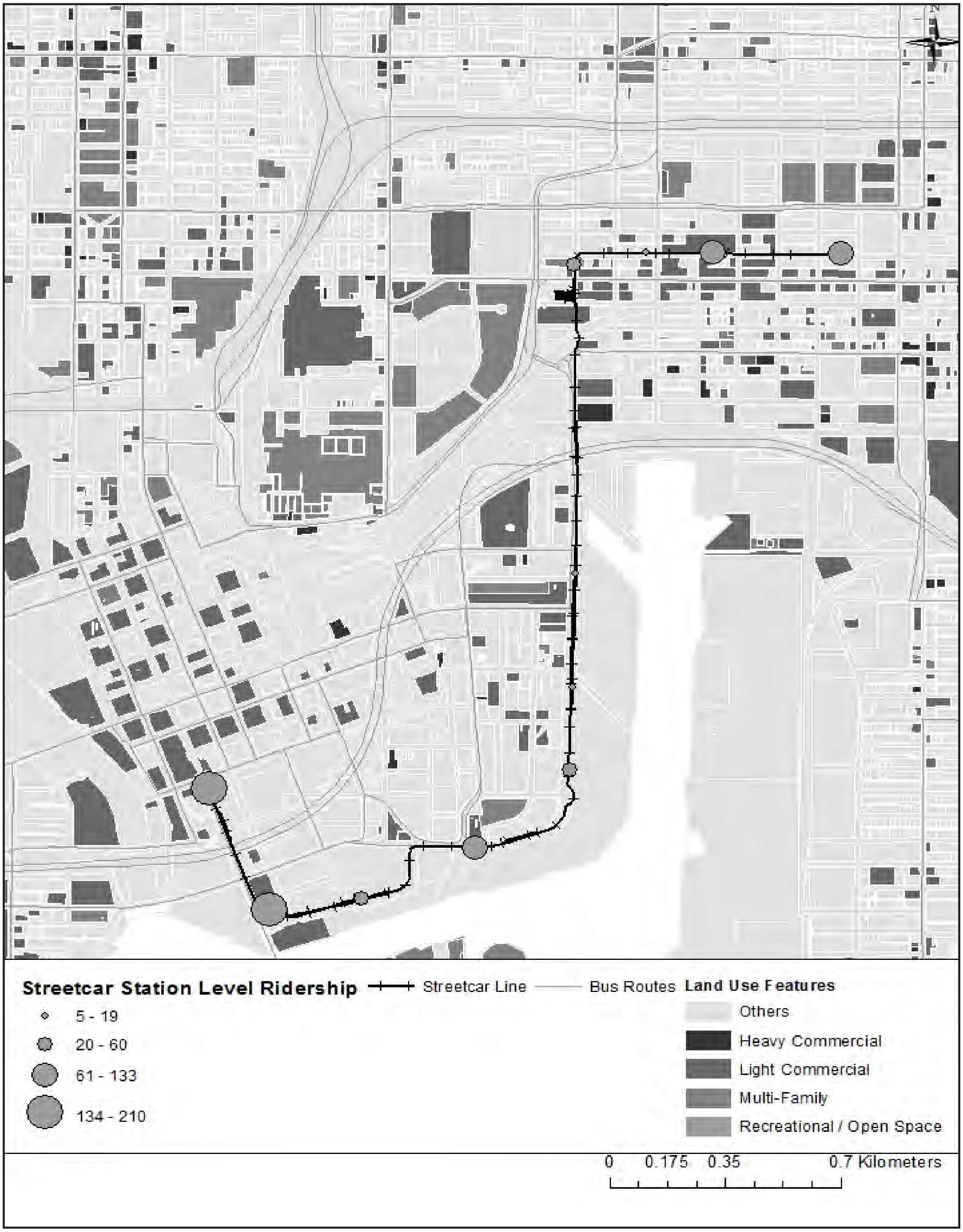

Figure 175. Land Uses, Special Activity Centers, and Streetcar Ridership in Tampa (2012)[481]

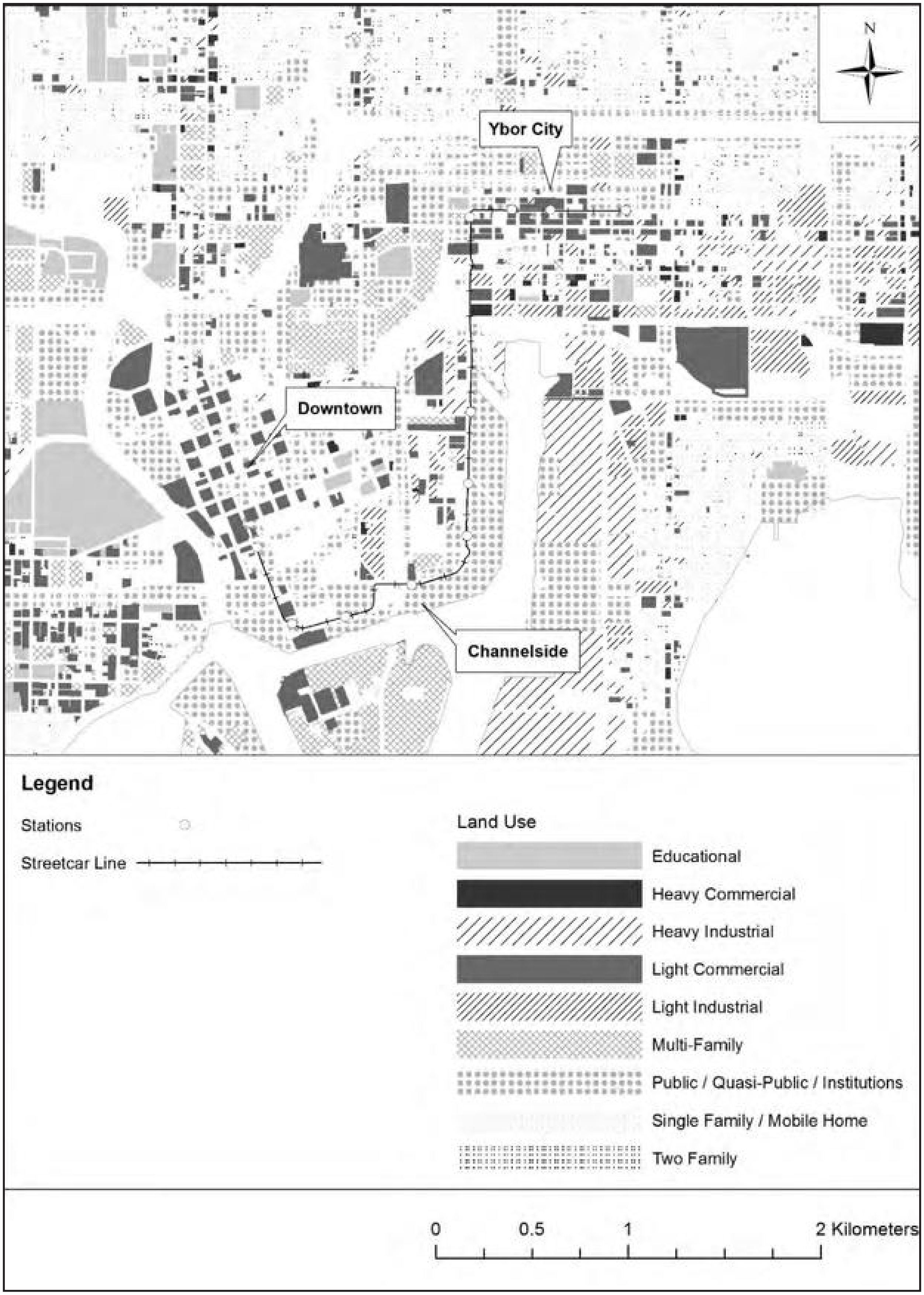

Figure 176. Detail of Land Uses in Core of Tampa (2012)[482]

HISTORICAL BACKGROUND ON STREETCAR DEVELOPMENT

The first Tampa streetcar system was a wood-fueled, multiple-car system operated by the Tampa Street Railway Company (TSRC) that began service in 1885 and ran from downtown Tampa to Ybor City. Less than a decade later, with the invention of the overhead electricity-powered streetcar system, TSRC merged with a private electric company to form the Tampa Street Railway and Power Company (TSRPC). Soon other companies entered the streetcar business. Just two years after the TSRPC merger in 1892, the Consumers Electric Light and Street Railway Company (CELSRC) surpassed TSRPC as the leading streetcar company and bought them to form the Tampa Electric Company (TECO) in 1899.[483] The proliferation of streetcar lines during these years led to significant urban growth outside Tampa's downtown core.

Throughout the early 20th century, Tampa's streetcar system boomed. At its high point, the system consisted of over 53 miles [85.30 kilometers] of track, 11 routes, and 22 hours per day/7 days per week service.[484] The system operated approximately 190 streetcars that ran over a combined 9,000 miles [14,484 kilometers] per day, one of which was the 420, the longest Birney streetcar ever built at 45.8 feet [13.96 meters]).[485] High ridership levels continued through World War II. At the end of the war, the streetcar system of Tampa, like those in other cities, began to feel pressure from other increasingly popular transportation modes (especially private automobiles), and streetcar ridership began to fall. TECO began to lose significant amounts of money as riders abandoned the streetcar. Citizens who had increasingly taken to the automobile soon began complaining that streetcars caused too much congestion on local streets, which led to local efforts to remove streetcars from local streets.[486] The Tampa streetcar soon retired, halting service in August 1946.

Several decades later in October 1995, the Tampa streetcar re-emerged from its long hibernation at a town meeting held by the Hillsborough Area Regional Transit Authority (HART). The purpose of this meeting was to propose plans for a new streetcar system that would run from downtown Tampa to Ybor City as part of a newly approved, large-scale commuter rail system.[487] The proposal was presented by a task force that was headed by Tampa and Ybor City Street Railway Society president Mike English. This group would later become the non-profit organization Tampa Historic Streetcar (THS), responsible for managing the streetcar system.[488] English believed the streetcar would be popular among residents on event/game days at the local arena and also with tourists, as the streetcars were "romantic, and fun, and efficient."[489] The belief that the streetcar would help revitalize downtown Tampa and draw tourism to Ybor City led to strong backing by the leadership of HART, Tampa's major transit agency, and Tampa Mayor Dick Greco. The initial plan was for an overhead power line system of eight replica streetcars that would cost around $18 million, with responsibility for finance split into thirds among the city, the private sector, and funds from federal grant programs.[490]

Over the next several months, various streetcar plans were placed at the top of the transportation agenda for the city and HART, with significant attention focused on questions of finance. In March 1996, HART revealed that it was possible to procure $19 million of capital funding from the federal, state, and city governments, but officials were still unsure of sources to pay for the estimated $1 million per year streetcar operating costs.

Specialized tax districts, corporate sponsorship, donations, and property tax increases were some of the ideas presented to fill this void. Regarding system design, planners had proposed a 2.27-mile [3.65 kilometer] line that used 11 stops and featured eight streetcars that could seat approximately 40 people each.[491]

A financial breakthrough occurred in June when Tampa's metropolitan planning organization (MPO) transferred $14.9 million of funds for some of its own transportation projects, such as the People Carrier, to be an available source of funding for HART's proposed streetcar project. In addition to these newly available funds, the Federal Transit Administration agreed to provide a $1.4 million grant for streetcar construction, and the City of Tampa made a promise to contribute $5 million.[492]

While there was support among these organizations for the streetcar plan, there were also many critics of the streetcar plans. Some critics focused on the need to fund ongoing operations costs, while others were upset that money was not being funneled to the struggling bus service that had been running a deficit for many years.[493] The tension between funding for streetcar versus bus would resurface over the years in Tampa, and it has also been seen in other cities.

Despite these criticisms, Tampa officials and HART staff pushed on. They met with Memphis officials, whose city possessed its own streetcar service, for guidance on the project and its preliminary design in March 1998. By this time, the city had finally drafted a plan to pay for beginning construction and for covering the streetcar operating costs. For initial construction, the city decided to issue a $20 million bond, and for the operating costs, the city proposed a plan of three parts: rider fees and in-car advertising ($300,000 per year), increased property taxes for those owning property near the line ($250,000 per year), and the sale of naming rights for the system ($1 million), streetcars ($250,000 each), and stops ($75,000-$125,000 each).[494] Officials insisted that all the funds generated from these activities would be placed in an endowment that should earn enough interest to cover forecast operating costs.

With the final vote of the City Council only months away, several new controversies arose.[495] The first was over rising construction costs. The estimate for the streetcar capital cost rose to at least $23 million, causing several council members to reconsider their support of the project. Secondly, Mayor Greco disclosed that the city's portion of the funding, now $5-8 million, was to come from gasoline tax funds, which did not sit well with many council members who thought the money should be used to fund other transportation projects. Additional areas of concern included the lack of air conditioning on streetcars, which would be a potential problem in the city's warm summers, and their slow speeds, which meant that the trip from the Convention Center origin to the Ybor City end would take about 45 minutes (Danielson 1998). Eventually, HART secured $15 million from state and federal grants for construction, $800,000 from company advertising, and another $1 million from Tampa Electric Co. (TECO) for the system naming rights, which helped to reduce some of the financial conflicts. The streetcar system was now, and still is, called the TECO Line Streetcar System or simply TECO Line.

After Florida Department of Transportation (FDOT) promised to dedicate $5 million of its own funds, and an $8 million appropriation from the MPO was obtained, the Tampa City Council became more confident in the parties' abilities to raise the necessary funding for construction and operations. On June 4, 1998, they agreed to move on with the streetcar project and use the $5 million in gas tax money.[496] The project now seemed to have more than enough available money to cover the estimated capital/operating costs and to continue.

Although excitement over the streetcar was high, other similar local projects had a different type of buzz surrounding them.[497] In January, Tampa's low-fare trolley bus that ran from downtown to Ybor City, much like the new streetcar was to do, was planned for closing. The original idea was to have all-day bus service, but this was soon turned into a route that ran only during the typical lunchtime. It was thought that workers and residents downtown would use the streetcar-inspired bus instead of their automobiles to go for lunch and run errands. This idea never caught on with Tampa citizens, and ridership was low. This fact seemed to portend poor ridership for the streetcar, as well.

Around the same time, Tampa's Harbour Island People Mover, which ran from downtown to Harbour Island south of Ybor City, shut down after 13 years of operation due to lack of ridership and an inability to generate revenues that could cover operating costs. The elevated tram experienced many operating difficulties, which meant that it was quite expensive to operate. Further, its main service area, the shops and restaurants on Harbour Island, almost completely shut down, which suppressed ridership demand. The system was such a failure that the owner "agreed to pay the city $5 million to get out from under the financial drain of operating the tram."[498] One-fifth of the money was used to demolish the track, and the rest went to HART to help pay for expanded trolley services and the ongoing streetcar venture.

These local failures did not deter some people from being optimistic about the streetcar. City Councilman Rudy Fernandez expressed the exceptional view of the TECO Line when he said, "It's a different animal entirely. We're talking about building a streetcar that people will ride just for the fun of it. Unfortunately, we can't say that about a green bus."[499]

By the turn of the millennium, development of the streetcar system, which was planned to open December 1999, was behind schedule because of the large amount of construction activity in downtown Tampa and the other hurdles commonly found in projects of this magnitude. This was not an issue for Gomaco Trolley Company, though, which had started work on the eight replica Birney streetcars priced at $595,000 apiece.[500] It also did not stop the hype building around the streetcar and its perceived ability to generate downtown economic stimulation. By the time the TECO Line route was finalized, the city's transportation department had been flooded with communications from business people inquiring about the completion date and details of the streetcar operation.[501] Other streetcar supporters believed the streetcar would give Tampa a better identity and make it a more unique destination.[502] The first streetcar arrived from Gomaco in March 2000, notwithstanding planners again pushing the TECO Line opening date back to sometime in 2001. At year's end, HART completed a bid agreement with Herzog Contracting Corp. of $15.5 million for streetcar line construction.[503]

The year 2001 did not start off well for HART and the TECO Line. A dispute over a land purchase between HART and several land owners was taken to court, and it was eventually ruled that HART was to pay $9.5 million for land it appraised at $5.5 million.[504] This cost increase, which was covered by a clean air grant from Tampa's MPO[2], the addition of a 12th stop, and the inclusion of air-conditioning in the streetcars boosted TECO Line's price tag to just over $31 million.[505] As a result, the city changed its early predictions of the necessary yearly ridership necessary to maintain operating costs from around $260,000 up to $500,000.[506] The city's funding responsibility also increased to approximately $10 million, almost double its original estimate.

Nevertheless, in late March 2001, construction on the TECO Line began with completion set for February 2002. Shortly after construction began, the city and HART, yet again, hit a financial speed bump. The streetcar line design included a track crossing over a CSX Corp. railroad track, which required an operating agreement between the two entities. The City of Tampa offered to pay for the new crossing gate that included the new streetcar rail, and "CSX agreed to design the interlocking tracks for the crossing," However, CSX also required crossing insurance of $500 million, or around $1 million a year in premiums. The city argued that the amount was unfair and that they didn't have the money for this expenditure, but CSX stood behind its requirement saying, "It's industry standard."[507]

Just four months after construction began, the *St. Petersburg Times* reported a total predicted end cost of up to $53.5 million, $12.7 million of which would be from the city. Among these costs were a $13.5 million convention center and Marriott Hotel streetcar terminal, a $7.3 million streetcar maintenance facility at Ybor Station, and nearly $750,000 of track improvements. When asked about the large cost increase (197 percent), City Council Chairman Charlie Miranda said, "I would have looked at it with a different opinion. But I can't go back."[508] Miranda had voted yes on the streetcar project in the original proposal vote.

As the deadline for completion approached and construction continued, the city and its local businesses hung on to their optimism about what the streetcar would bring to the community. Although many businesses in Ybor City were losing money from the disruptions caused by streetcar construction, shop owners believed the streetcar was just the thing to help revitalize the area once it was complete.[509] Disregarding the variability of projected ridership levels and the possibility of not generating enough rider revenue, one of Mayor Greco's consultants reaffirmed the businesspeople's assumption that the streetcar's purpose was to bring economic stimulus to the area when he said, "I'm looking at the economic impact and not what the initial ridership is. It's not a transportation project; it's an economic development component of downtown."[510]

Several months behind schedule, in August 2002, the first streetcar was tested on the TECO Line.[511] Two months later, the businesspeople's and the city's long wait finally came to an end. Saturday, October 19, 2002 TECO Line began service (RPR 2000-2012). The final costs for the project ($36.4 million) were nearly $13 million over the original projected budget.[512] This overspending led to an investigation by the Florida Department of Law

2 The Environmental Protection Commission (EPC) did not approve of this. They wanted time to research whether the streetcar actually impacted air quality and historically discouraged the use of clean air funds for streetcar projects. The EPC requested the MPO delay use of these funds but was ignored; the MPO approved the grants.

Enforcement (FDLE) and several audits. This also led to HART Executive Director Sharon Dent, who was being held responsible for the funds mismanagement, stepping down from her position when her contract was up for renewal in late 2004.[513]

Along with the original TECO Line route, HART and the City had planned to eventually extend the streetcar lines throughout Tampa as a part of a large-scale rail system project. It was expected that by 2010 an extension of the streetcar line would run from the Tampa Convention Center to the downtown area just north of where many residents worked. Other plans included connecting the University of South Florida to downtown via commuter rail and building another rail line in West Tampa that would eventually connect to the Tampa International Airport.[514] In September 2004 the Tampa City Council attempted to secure federal funds for the proposed 0.38-mile [0.61 kilometer] streetcar extension that would cost over $7 million.[515] However, the Hillsborough Metropolitan Planning Organization (MPO) voted against the Council's proposal saying the streetcar extension was not "a top priority" and that other areas and projects were more deserving of the limited available funding.[516]

The MPO did give streetcar supporters a second chance, however, when in January 2005, it allowed supporters to pitch alternative ideas and convincing arguments that the extension project was worthy of receiving a grant for funding.[517] Nevertheless, the proposal of extending the TECO Line was defeated, with Hillsborough County Commissioner Rhonda Storms taking a strong and aggressive stance against the streetcar. She even went so far as to threaten to block HART's funding for the upcoming year because of its insistence on developing the extension. She said, "You're taking a chance on a streetcar system that goes from no place to nowhere."[518] Ironically, after several weeks of heated debate among factions who either supported or opposed the streetcar extension, the program that would be the source of funds for the project was eliminated.[519] Still, supporters of streetcar expansion remained confident that the funding could still be gathered from other sources.

In the meantime, the original TECO Line was having its own problems. First, locals' perception of the streetcar and its performance was becoming more negative. Many observers, including Commissioner Storms, believed the route did not access enough key locations and did not attract enough riders. They believed the streetcar would generate more ridership if it had initially been planned to go directly through the downtown area, as opposed to the areas near the downtown where it operated. A *Tampa Tribune* article written in 2006 listed some of the other problems that were holding the TECO Line back from being as successful as other streetcar systems such as Portland's, which began service just a year before Tampa's.[520] These problems included a lack of an aggressive political movement to expand the streetcar, the City and County being "reluctant to invest local tax dollars," "difficulty in attracting federal grants," and failure to meet projections and meet past promises. Also, operating costs were seen as too high, partially due to having to pay CSX $400,000 a year in insurance premiums.[521]

Besides becoming increasingly unpopular among residents who saw the streetcar as primarily a tourist attraction with no significant ridership, available operating funds began to dwindle.[522] As a result, in June 2005 officials of THS, who were still the business managers of the streetcar, voted to raise the fares by up to 33 percent, possibly making it the most expensive streetcar ride in the country.[523] Conditions continued to worsen in early 2006 when HART warned THS and the City that it may not be able to operate the line any longer, and the agency encouraged THS to send out bid requests for the job.[524] The agency claimed that operating the streetcar was reducing funds that were supposed to help improve bus services. Tensions began to rise between HART and THS.

By early 2008, Tampa's streetcar was widely perceived to be doing poorly. The endowment that was supposed to pay for operating costs with the interest it accrued was being used up rapidly. The City was looking at having to become responsible for the costs, but as reported by Tampa Mayor Iorio, it would not be able to do so. If the streetcar failed to run due to insufficient funding, the City would also have to return upwards of $20 million in grant funding. Also, property values along the streetcar were declining, which was reducing the tax money that was supposed to be going toward funding the streetcar. To turn things around, streetcar officials laid out a plan to raise money by selling more ads and naming rights, to reduce service by reducing the number of cars operating on weekdays, and to change the property tax structure along the route. Still, supporters were trying to push for the downtown streetcar extension, claiming that it would attract more local riders and significantly increase revenues.[525]

Just a few months later, in March 2008, the streetcar situation began to look better. It was then that the group of officials, who oversaw the TECO Line and its development, finally agreed on a plan to extend the streetcar to Tampa's downtown area. This plan was focused on increasing ridership by attracting local residents to use the streetcar for their daily commutes and not to relegate the line only for tourists and conventioneers. This was made possible by cost-cutting efforts, a special tax agreement, the transfer of a grant for a streetcar museum, and the acquisition of other federal grants from the Surface Transportation Program. The project was expected to cost up to $4.4 million and would possibly start running by mid-2010.[526]

On October 9, 2009, ground broke for the TECO line extension, and it opened for service "under budget and ahead of schedule" on December 19, 2010.[527] Many observers believed the extension finally completed the streetcar line by creating access to downtown. The TECO Line was now connected to "a larger number of hotels, restaurants, residents, retail, office and government buildings."[528] Many also thought the extension would bring on more development, just as they believed that the first phase did. Around early 2012, this belief seemed confirmed when the University of South Florida opened its Center for Advanced Learning and Stimulation adjacenet to one of the extension's new stops, Whiting Station. In the wake of this development, the extension project was awarded the Tampa Downtown Partnership's Urban Excellence Award for encouraging "a more vibrant and connected environment between the cultural, residential and business destinations in Downtown Tampa and Ybor City."[529]

However, a major looming issue for the Tampa streetcar system was still not completely resolved, namely the high operating costs and lack of funding to cover them. By mid-2013, the endowment used to help pay for operating costs was drawn down. This caused THS to scramble for funds by asking the Hillsborough County Tourist Development Council to help pay for the streetcar system's operation. Other options included further cutback in service, but officials were afraid they would lose the majority of local ridership. Streetcar ridership declined by more than seven percent from the previous year, adding to the line's ongoing woes."[530]

STREETCAR RIDERSHIP AND SERVICE PERFORMANCE

The streetcar in Tampa is one of the weaker performers, from a purely ridership perspective, among the modern streetcar projects. Its ridership has fallen precipitously in recent years, even as local bus ridership has increased (Table 70). At one time, the streetcar accounted for five percent of HART boardings and about two percent of passenger miles, but it now accounts for about half of these numbers as of 2012. Average trip lengths on the streetcar have remained fairly constant at about 1.7 miles [2.74 kilometers] which is about one-third the length of the average bus trip. Streetcar ridership is highest in January and March, but it is otherwise relatively constant throughout the year (Table 71). There is no obvious seasonal pattern to bus ridership.

Table 70. Annual Ridership by Mode in Tampa (2003-2012)[531]

	Unlinked Passenger Trips			Unlinked Passenger Miles		
Year	Streetcar	Bus	Total	Streetcar	Bus	Total
2003	458,900	9,185,410	9,644,310	842,994	43,832,969	44,675,963
2004	423,156	9,818,574	10,241,730	922,043	49,068,968	49,991,011
2005	422,536	11,041,918	11,464,454	919,513	53,429,245	54,348,758
2006	406,393	11,914,287	12,320,680	838,421	60,035,670	60,874,091
2007	431,701	12,208,985	12,640,686	862,224	61,790,158	62,652,382
2008	439,555	13,054,151	13,493,706	728,890	67,522,796	68,254,686
2009	446,743	13,125,468	13,572,211	776,734	63,651,970	64,428,704
2010	399,637	12,665,359	13,064,996	789,244	60,062,433	60,851,677
2011	358,737	14,562,656	14,921,393	685,934	73,794,563	74,480,497
2012	301,516	14,314,610	14,616,126	523,031	73,017,436	73,540,467

Table 71. Monthly Unlinked Passenger Trips by Mode in Tampa (2012)[532]

	Unlinked Passenger Trips		
Month	Streetcar	Bus	Total
January	33,378	1,212,765	1,246,143
February	26,895	1,211,235	1,238,130
March	39,205	1,279,460	1,318,665
April	25,213	1,190,398	1,215,611
May	22,071	1,221,771	1,243,842
June	22,546	1,110,067	1,132,613
July	23,583	1,121,796	1,145,379
August	17,328	1,230,802	1,248,130
September	18,238	1,188,896	1,207,134
October	28,220	1,344,896	1,373,116
November	19,373	1,199,902	1,219,275
December	25,466	1,133,630	1,159,096

Streetcar service levels have declined over time, but not as precipitously as ridership has declined (Table 72). Service levels increased after opening and peaked in 2006 and 2007 but have since fallen. Bus service levels increased until around 2010 and have since fallen. Over the same period, average streetcar speeds (vehicle revenue miles divided by vehicle revenue hours) increased from about 4.6 miles [7.40 kilometers] per hour to 5.4 miles [8.69 kilometers] per hour. Average bus speeds have fluctuated near an average of 12.7 miles [20.44 kilometers] per hour over this same period. Operating expenses have followed the same general trend as service levels (Table 73).

Table 72. Annual Service Characteristics by Mode in Tampa (2003-2012)[533]

	Vehicle Revenue Miles			Vehicle Revenue Hours		
Year	Streetcar	Bus	Total	Streetcar	Bus	Total
2003	80,220	6,219,959	6,300,179	17,329	510,698	528,027
2004	82,931	6,396,699	6,479,630	17,481	514,872	532,353
2005	83,709	6,716,394	6,800,103	17,580	542,002	559,582
2006	86,809	6,875,484	6,962,293	18,016	556,007	574,023
2007	87,147	7,393,632	7,480,779	17,985	588,622	606,607
2008	81,856	7,108,885	7,190,741	16,090	568,232	584,322
2009	74,603	7,421,599	7,496,202	14,564	581,600	596,164
2010	71,395	7,702,879	7,774,274	13,845	604,499	618,344
2011	76,806	7,660,741	7,737,547	14,423	600,914	615,337
2012	67,599	7,477,638	7,545,237	12,561	586,224	598,785

Combining the ridership, service, and operating expense data just presented, the authors constructed performance measures for cost effectiveness and service productivity (Table 74). The table indicates that the streetcar has experienced deteriorating performance in both measures, even as the bus service has become more cost effective and more productive, particularly in recent years.

Table 73. Annual Operating Expense by Mode in Tampa (2003-2012)[534]

	Streetcar		Bus		Total	
Year	Unadjusted $	2012 $	Unadjusted $	2012 $	Unadjusted $	2012 $
2003	$1,844,780	$2,301,965	$30,445,904	$37,991,193	$32,290,684	$40,293,158
2004	$1,626,233	$1,976,618	$38,412,495	$46,668,771	$40,038,728	$48,665,389
2005	$1,773,858	$2,085,396	$42,349,724	$49,787,489	$44,123,582	$51,872,885
2006	$1,716,591	$1,955,006	$46,574,144	$53,042,775	$48,290,735	$54,997,782
2007	$2,402,357	$2,660,787	$49,947,440	$55,320,464	$52,349,797	$57,981,251
2008	$2,078,695	$2,216,729	$50,686,745	$54,052,552	$52,765,440	$56,269,281
2009	$2,383,666	$2,551,027	$58,879,358	$63,013,376	$61,263,024	$65,564,403
2010	$2,542,168	$2,676,752	$58,650,778	$61,755,781	$61,192,946	$64,432,533
2011	$2,209,652	$2,255,439	$57,552,928	$58,745,492	$59,762,580	$61,000,931
2012	$1,775,507	$1,775,507	$54,927,727	$54,927,727	$56,703,234	$56,703,234

Table 74. Service Performance by Mode in Tampa (2003-2012)

	Cost Effectiveness (Operating Expense per Passenger Trip, 2012$)		Service Productivity (Passenger Miles per Vehicle Mile)	
Year	Streetcar	Bus	Streetcar	Bus
2003	$5.02	$4.14	10.51	7.05
2004	$4.67	$4.76	11.12	7.67
2005	$4.94	$4.51	10.98	7.96
2006	$4.81	$4.45	9.66	8.73
2007	$6.16	$4.53	9.89	8.36
2008	$5.04	$4.14	8.90	9.50
2009	$5.71	$4.80	10.41	8.58
2010	$6.70	$4.88	11.05	7.80
2011	$6.29	$4.03	8.93	9.63
2012	$5.89	$3.84	7.74	9.76

Note: Values calculated from Tables E-5, E-7, and E-8.

Summarizing the modal statistics on the performance of Tampa's streetcars, the streetcar has experienced declining ridership and service in recent years, with the decline in ridership outpacing the drop in service. The result is deteriorating performance in terms of cost effectiveness and service productivity (Table 75). Average speeds have increased over time, while average trip lengths are relatively stable. There is not a strong seasonal pattern to ridership or service, although ridership peaks in January and March (Table 76).

Table 77 reports average weekday boarding counts for each of the 11 streetcar stops in the Tampa system. There is significant variability, ranging from a low count of nine boardings at York Street to a high of 450 boardings at Tampa Bay Federal Credit Union (Centro Ybor). The land-use characteristics surrounding each of these stops help explain in part their contrasting ridership levels. Tampa Bay Federal Credit Union is the gateway to the commercial/entertainment district of Ybor City, where a number of restaurants, retail, and entertainment venues are located and help to make this area one of the main destinations for tourists and visitors in Tampa. York Street Station, on the other hand, sits between a cruise terminal and the Ports Authority parking garage. This less developed location sees activity primarily when passengers are boarding or alighting cruise ships.

Four other streetcar stops report relatively high (for Tampa) average weekday boarding counts ranging from 326 to 392. In order of magnitude, these are Centennial Park Station, Dick Greco Plaza, Whiting Station, and The Tampa Tribune Station. These are typically close to Special Activity Centers and/or the availability of nearby parking facilities and hotels (Figure 177). The remaining five stops report average weekday boarding counts in the 100s and below.

Table 75. Summary of Streetcar Ridership, Service, and Performance by Year in Tampa (2003-2012)[535]

Year	Unlinked Passenger Trips	Passenger Miles	Vehicle Revenue Miles	Vehicle Revenue Hours
2003	458,900	842,994	80,220	17,329
2004	423,156	992,043	82,931	17,481
2005	422,536	919,513	83,709	17,580
2006	406,393	838,421	86,809	18,016
2007	431,701	862,224	87,147	17,985
2008	439,555	728,890	81,856	16,090
2009	446,743	776,734	74,603	14,564
2010	399,637	789,244	71,395	13,845
2011	358,737	685,934	76,806	14,423
2012	301,516	523,031	67,599	12,561
Year	**Productivity (PM/VM)**	**Cost Effectiveness (2012$)**	**Speed (VRM/VRH)**	**Average Trip Length (PM/UPT)**
2003	10.51	$5.02	4.63	1.84
2004	11.12	$4.67	4.74	2.18
2005	10.98	$4.94	4.76	2.18
2006	9.66	$4.81	4.82	2.06
2007	9.89	$6.16	4.85	2.00
2008	8.90	$5.04	5.09	1.66
2009	10.41	$5.71	5.12	1.74
2010	11.05	$6.70	5.16	1.97
2011	8.93	$6.29	5.33	1.91
2012	7.74	$5.89	5.38	1.73

Table 76. Summary of Streetcar Ridership and Service by Month in Tampa (2012)[536]

Month	Unlinked Passenger Trips	Vehicle Revenue Miles	Vehicle Revenue Hours
January	33,378	5,805	1,078
February	26,895	5,305	986
March	39,205	5,757	1,070
April	25,213	5,425	1,008
May	22,071	5,616	1,043
June	22,546	5,590	1,039
July	23,583	5,650	1,049
August	17,328	6,245	1,160
September	18,238	5,494	1,021
October	28,220	5,675	1,054
November	19,373	5,349	994
December	25,466	5,596	1,040

Table 77. Summary of Streetcar Stop-Level Average Weekday Ridership in Tampa (2012)[537]

Station	Line	Boardings	Alightings
Cadrecha Plaza	TECO	35	81
Centennial Avenue	TECO	111	164
Cumberland Avenue	TECO	60	34
Dick Grecho/Transportation Center	TECO	210	113
HSBC Station	TECO	24	15
Port Authority Station	TECO	10	5
Tampa Bay Federal Credit Union	TECO	133	184
Streetcar Society Station	TECO	19	30
Tampe Tribune Station	TECO	111	117
Whiting	TECO	162	128
York Street	TECO	5	4
Total		**880**	**875**

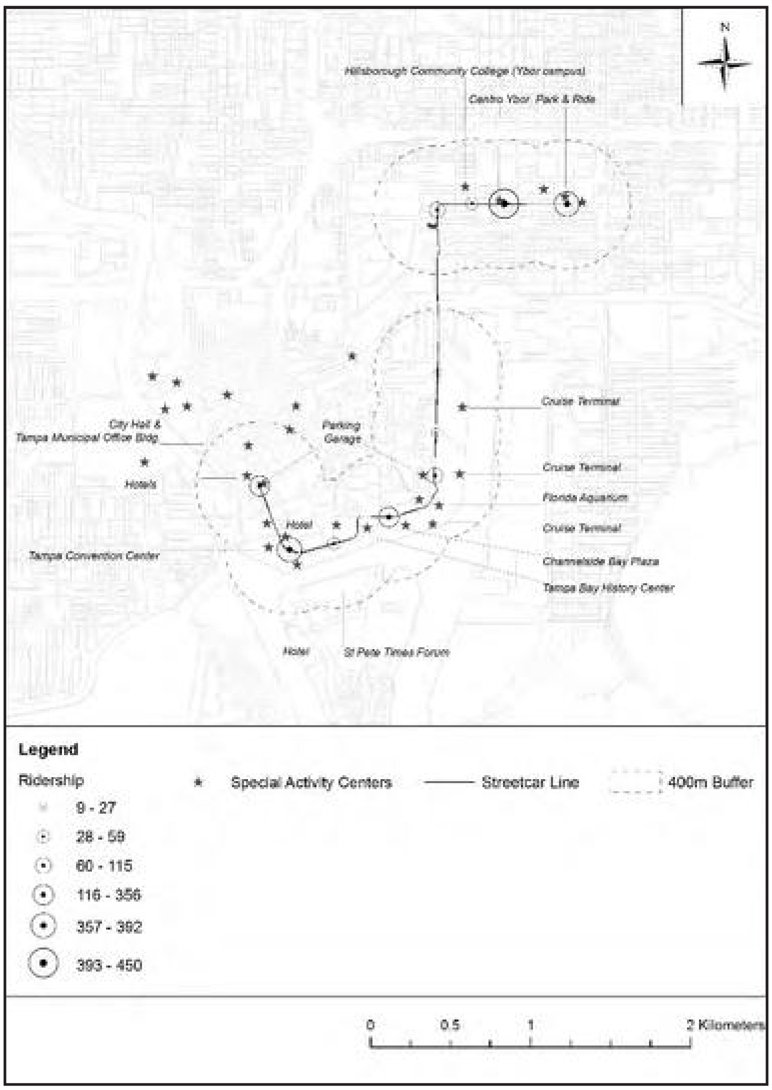

Figure 177. Special Activity Centers and Streetcar Ridership in Tampa (2012)[538]

A visual assessment of Figure E-31 reveals a close relationship between most streetcar stops and Special Activity Centers (SAC), whether in the Ybor District or along the Channelside waterfront adjacent to downtown Tampa. The majority of these SACs are tourism related or visitor-serving facilities such as the Tampa Convention Center and the hotels adjacent to Dick Greco Plaza, the Florida Aquarium adjacent to Cumberland Avenue Station, Channelside Bay Plaza adjacent to The Tampa Tribune Station, and the St. Pete Times Forum adjacent to HSBC Station, among several others. Equally noticeable is the relationship between the presence of nearby parking facilities and higher ridership counts at the terminal stations of Centennial Park Station in Ybor City and Whiting Station in downtown Tampa.

The geographical deployment of Tampa's streetcar line and its close spatial association with tourism/visitor oriented SACs suggest a strong vocation for serving visitors more than local utilitarian transit riders. The intention to serve and perhaps catalyze activity along the Channelside waterfront is also apparent in its layout as well as in its operating hours. It is also worth noting the cluster of governmental, educational, and cultural activity centers on the northern end of the streetcar line near the Whiting Station, which suggests the potential for future service expansion along the pedestrian mall on Franklin Street.

Figure 178 further reinforces the notion that the streetcar does not serve primarily local transit riders, as the figure does not reveal a clear pattern between the number of bus route connections at or close to streetcar stops and the number of boardings. Some stops that report no bus connectivity report high ridership levels (Tampa Bay Federal Credit Union Station and Centennial Park Station), while on the other hand some stops that report high connectivity (e.g., Whiting Station) do not have proportionally higher ridership levels. Some research on factors associated with light rail and other rail transit station-level boardings indicates a positive relationship between the level of bus connectivity and station-level ridership[539] because these systems serve large numbers of regular transit users who value such connections. However, the lack of such a relationship suggests that in Tampa's streetcar system, commuters and other regular transit users do not constitute a large share of the ridership. This hypothesis is borne out by the available data and from insights gleaned during the key informant interviews, which is discussed in the next section.

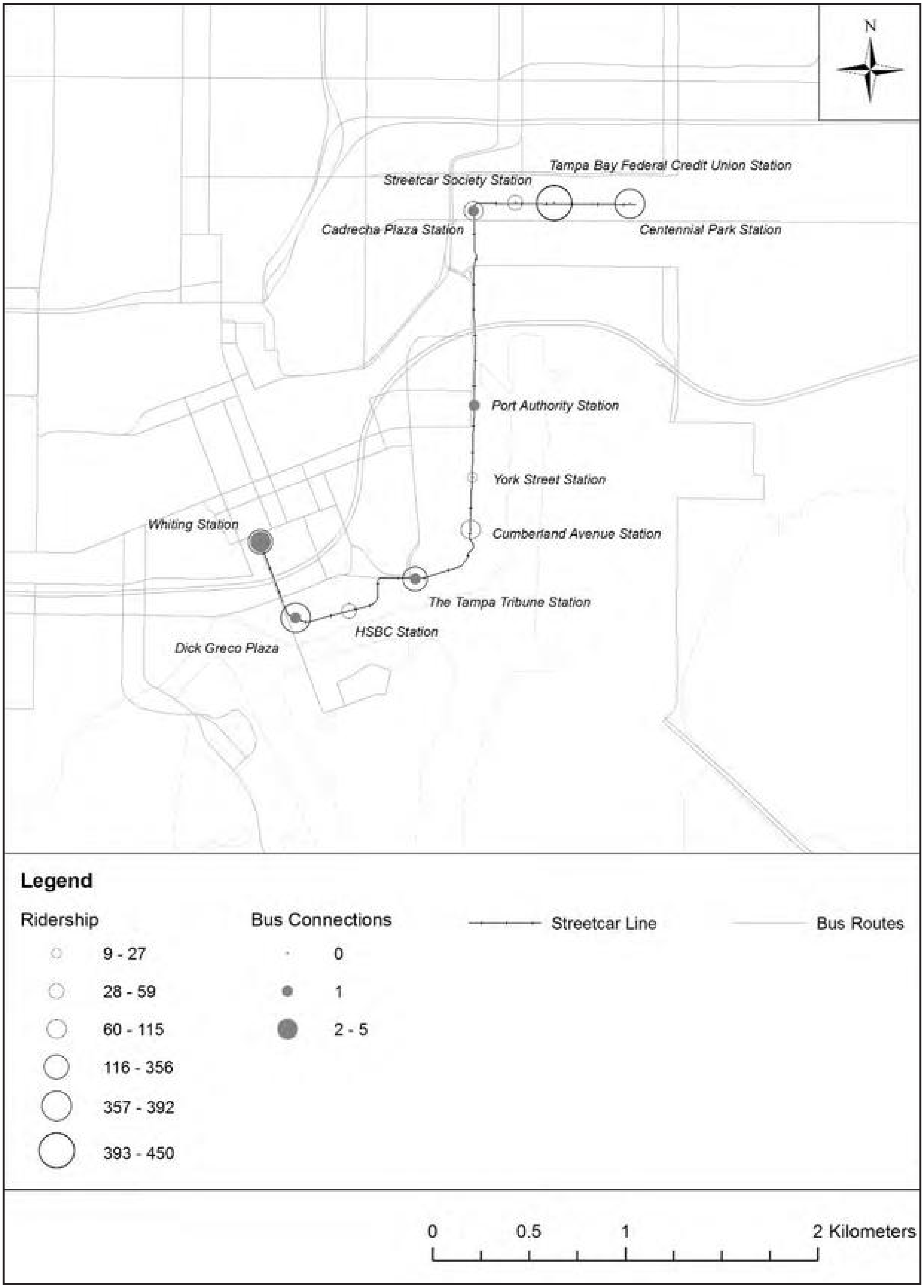

Figure 178. Bus Connectivity and Streetcar Ridership in Tampa (2012)[540]

INSIGHTS FROM KEY INFORMANT INTERVIEWS

In addition to collecting and analyzing quantitative data and documentary evidence, the authors conducted one-hour semi-structured telephone interviews with several key informants in the Tampa region who were able to provide their perspective on streetcar goals, performance, and future prospects in the region. Informants representing a diverse set of perspectives, including the local business community, local and regional transit and planning organizations, and economic development organizations, participated in the interviews. These informants were identified through documents or were suggested by other interviewees as pertinent informants given the nature of the questions the authors hoped to address.

The authors sought to use the interviews to complement the insights developed from the quantitative assessment discussed earlier, and to identify hard-to-quantify phenomena that might impact people's perceptions of the streetcar and its performance. Each informant was provided a set of 12-24 questions in advance of the interviews, including a set of questions asked of all informants and specific questions asked of that individual, given the role he or she plays in the community. A set of typical interview questions can be found in Appendix F.

For Tampa, the authors conducted six semi-structured interviews with seven key informants. They interviewed two representatives of a downtown business organization during the same interview. Several key themes emerged from the interviews, including the importance of funding stability for ongoing streetcar operations, the conflict between the streetcar's role as a traditional transit service versus a tourist amenity, the Tampa streetcar's institutional/organizational complexity, the importance of institutional and political leadership and vision-setting, the long-term consequences of early planning decisions about alignments and vehicles, and the streetcar's role as an icon of the city. The seven key informants included multiple individuals whose involvement with streetcar-related issues predates implementation of the TECO Line service (Table 78). These individuals included a senior-level local/regional planner, a senior-level transit planner, a streetcar marketing specialist, an economic development specialist who also serves with Tampa Historic Streetcar, Inc., two downtown business community representatives, and a chamber of commerce representative who is also affiliated with Tampa Historic Streetcar, Inc. Each individual is identified by his or her role in the community within the narrative that follows.

Table 78. Roster of Key Informants Interviewed for Tampa Study

Informant	Role
1	Local/Regional Planner
2	Transit Planner
3	Marketing Specialist
4	Economic Development Specialist
5	Business Community 1
6	Busincess Community 2
7	Chamber of Commerce

Streetcar Goals

A number of our informants emphasized that the TECO Line streetcar originated as the proposed “first leg” of a larger light-rail transit (LRT) system, which thus implied a strong traditional transit role for the service, but that it soon evolved into a redevelopment and tourism-focused service of much shorter length. The streetcar’s current alignment reflects this change in the service’s purpose, as it now serves a largely underdeveloped waterfront district (Channelside) located between the entertainment/tourist-oriented Ybor City and Tampa’s Convention Center. In between these major destinations are several activity centers oriented toward tourism and visitors, including hotels, cruise terminals, an aquarium, waterfront shopping mall, and a sports arena.

According to one business community informant, however, the shift in purpose from transit to tourism/development is not yet completely settled, as “…groups (in charge of streetcar planning/operations/finance) are still trying to identify and concur on the main goals for the streetcar; they are not clear and the groups don’t understand each other on that aspect; …even some people are still debating if the streetcar should be transit or a cultural piece or both.” This conflict has important consequences for decisions about streetcar planning and operations, given the very different needs of visitors and traditional transit riders.

Despite some uncertainty about the streetcar’s primary purpose, the interviews indicate that urban redevelopment and tourism have historically driven most of the decisions made around the streetcar. The economic development informant observed that the notion that “urban redevelopment follows transit investment” has been one of the guiding principles of streetcar implementation in Tampa. This idea was based on his understanding of Portland’s experience with streetcar implementation and the adjacent development activity that some observers have attributed to the streetcar lines in that city. This informant believes the Portland experience is replicable in other cities, including Tampa, although he conceded the lack of significant development results to date in Tampa’s Channelside District. He and several other informants attribute the lack of significant development activity to the 2008 recession and its aftermath.

A number of informants emphasized the streetcar’s role in serving tourists and in providing an identity for Tampa. Many informants noted that the streetcar has now become a visible image, or icon, of the city. One informant spoke happily about the streetcar being featured during national television coverage of major events such as the Super Bowl, while another informant spoke about how local residents have embraced the streetcar as a city icon. Whether or not the idea of creating an icon was in the minds of early streetcar promoters, its role as one today is widely perceived among the informants. This makes the Tampa experience similar to that of other cities where the role of streetcar as icon was also mentioned in interviews for other communities.

Public Attitudes Toward the Streetcar

According to the informants, the local community largely sees the streetcar as a tourist amenity and not as a utilitarian transportation service. They might view it as an icon of the city, but not one that they are likely to use to meet their transportation needs. Among the observations gained from the informants:

"It is what it is…a fixed guide way system (not flexible) ... a fantasy."
– Transit Planner

"It is not a transit vehicle; it is more of an amenity." – Marketing Specialist

"(The streetcar) is a challenge to use for transportation…even some locals use it for leisure." – Economic Development Specialist

"It is pretty (or "cute"), but they (local residents) don't ride it…"
– Marketing Specialist

"(The streetcar goes) … from nowhere to nowhere."
– Economic Development Specialist

The informants also spoke of the attitudes of local elected officials and key policymakers toward the streetcar, and of differences in these attitudes:

"(S)ome like it, others do not…they see it as an expensive foster-child."
– Marketing Specialist

Some informants used the word "stepchild" to refer to the streetcar, which seemed to reflect the perception that many policymakers see the streetcar as a secondary (at best) piece of transportation infrastructure that receives less attention and care than other, more critical transportation services. The economic development specialist attributed this attitude to HART's leadership over the years, while others used similar language when referring to local elected officials, such as members of the City Council and previous mayors. The informants noted that the attitude of the Tampa mayor is particularly important among elected officials, given the city's strong mayor institutional structure. One informant emphasized a record of no streetcar support by prior mayors, after its early championing by former Mayor Greco. However, the same informant noted that the current mayor seems to have taken a real interest in the streetcar. This informant seems more optimistic about the system's future, as local policymakers are discussing increased service hours and decreased headways.

In general, there seems to be a sense among the key informants that the current political landscape is slightly more supportive of the streetcar now than it had been in the past. Still, one business community informant noted that some council members remain quite concerned about the financial costs of the streetcar, with particular concern over the ability to support its annual operating expenses. This informant noted that "… the city wants to keep it (streetcar) going and viable, free or low cost ride.” But this is difficult to achieve because fares do not cover operating costs (the fare box recovery ratio reported for 2012 was 32 percent), there are large ongoing annual insurance premium expenses required for the streetcar to cross the CSX railroad tracks, and the trust fund used to help finance operational expenses is running out of funds. Thus, some uncertainty still exists in terms of institutional support, particularly among council members and to some degree within HART’s leadership. However, the informants suggest that there may be a positive shift in mayoral support, which some informants believe should increase the likelihood of the streetcar continuing to receive financial support from the city.

Streetcar Finances

As noted earlier, finances are a major issue affecting the streetcar in Tampa. While federal and city funds were used to construct the system, and regional planning and transit agencies were somewhat supportive early on in its development, the stability of the system’s operating funding is in question. Operational funding depends substantially on a $6 million endowment fund whose interest payments were originally deemed able to support annual streetcar operations. However, the unexpected recurring annual cost of approximately $500,000 for insurance premiums required by the CSX freight company (the streetcar line crosses a freight track) has led to the early depletion of the endowment fund and sent local policymakers scrambling to find new ways to close the funding gap. One way they have done so is to reduce the amount of streetcar service.

A number of informants pointed to the important role played by the service’s uncertain operating funds in leading to decisions about hours of service and headways, which one informant reported had each been reduced in recent years. The transit planner informant lamented the effects of these service reductions in increasing the service’s reliance on tourists and visitors and decreasing its usefulness for serving more utilitarian trips, both of which he believes have resulted in reduced ridership.

Local decision-making has also undercut the financial sustainability of operating funding sources for the streetcar. The local/regional planning informant recalled that originally streetcar promoters had intended for the residential and commercial developments along the streetcar line to contribute financially toward streetcar operations through a benefits assessment taxing district. During a council hearing about the proposal, a local resident complained about the proposal to tax residents, so an amendment was quickly made that exempted residential developments from the district. The informant believes that this has been a serious problem, especially given the significant residential development in the area.

Owners of large public lands have also not been reliable funding partners. The marketing specialist informant noted that the Port Authority is the largest landowner in the Channelside District and is exempted from the property assessment. Originally, the Port Authority made payments to help support streetcar operations in lieu of the property tax assessments, but the informant noted that they have reduced their annual contribution significantly in recent years and now seem very resistant to providing any future financial support.

All of the aforementioned financial issues have created a situation of uncertainty in streetcar operations, and they have led to budget-saving and ridership-reducing service cuts, which most informants view as seriously detrimental to most long-term streetcar goals. Nevertheless, some informants seemed optimistic that solutions to these issues could be found and that the City of Tampa might assume a more central role in financing the streetcar. These informants noted the impracticality of ceasing to operate the service (due to the requirement for the City to repay federal capital grant funds), the more positive attitude of the current mayor toward the service, and the presence of inter-governmental agreements that place greater financial responsibility on the City in times of financial distress.

Institutional Complexity and Perceived Leadership Vacuum

Three organizations are involved in streetcar planning, marketing, operations, and financing in Tampa: Tampa Historic Streetcar, Inc. (THS), Hillsborough Area Regional Transit (HART), and the City of Tampa. The three organizations have an inter-governmental agreement to plan and operate the streetcar through which THS is the governing body responsible for planning and marketing decisions, HART is sub-contracted by THS to operate the service, and the City owns the tracks and power infrastructure for the streetcar. The agreement requires HART to contribute to operating expenses and the City to contribute to capital expenses. THS is the governing body and consists of a board with seven members and four alternates. The City of Tampa appoints four members and one alternate, and HART appoints three members and three alternates.

According to the informants, the present relationship among the three institutions and their representatives is good, but the level of political engagement and financial support for the streetcar has varied across administrations at the city level and from one director to another at HART. One of the informants characterized the streetcar as being treated like a step-child by HART, whose leadership has focused more time and attention on its bus services. Other informants pointed to the general lack of attention or support from local elected officials for many years. Some informants pointed to a lack of real leadership, or even stewardship, of the streetcar. The business community informants shared this view and expressed a frustration that their business organization is “…the only cheerleader” defending the “albatross” (streetcar).

On the other hand, a Chamber of Commerce informant commented on the openness of HART representatives as well as City Council members to listen to suggestions on streetcar issues from the community on matters related to planning, pricing, scheduling, and the like. He also noted that THS, HART, and his local business organization are “trying to engage and cooperate more…(and) open to suggestions to boost ridership and exposure (marketing) to the local and larger City community.” Yet the same informant, who also participates in the streetcar’s governing body, notices no clear visioning and no clear leadership on the streetcar: “…all groups want (the streetcar) to succeed, but how much investment each group gives and how much time they dedicate to the streetcar is not clear.”

This perception of no leadership in Tampa is somewhat echoed in a comment made by the transit planner informant that HART has not supported the streetcar as it did before and that the streetcar would benefit from "… a more powerful entity than THS to be able to oversee and intercede with others on behalf of the streetcar." Related to THS's performance as the streetcar's governing body, the business community informants noted a high turn-over rate of members on the THS board, suggesting that valuable institutional knowledge is difficult to maintain and update under such circumstances and that sub-optimal management of the streetcar in Tampa might have been a result.

The key themes that emerge regarding streetcar organizational arrangements and relationships point to a gap in leadership and visioning to the detriment of streetcar performance. If there is no clear purpose, or goals, and no single entity ultimately responsible for streetcar affairs, it is difficult to make decisions and strategic maneuvers focused on optimizing the limited financial resources available for planning, operating, and marketing Tampa's streetcar. Further, it's even more difficult to improve its performance as a tourism amenity, development tool, and/or transit service. It is also more difficult to hold anyone accountable when goals are not achieved.

Other Transit Issues

More than one informant, and in particular the marketing specialist informant and the transit planning informant, expressed concerns about the performance of the legacy vehicles currently operated on Tampa's streetcar line. These vehicles were selected in Tampa, as in many cities, to evoke a sense of nostalgia, but this has come at a serious unexpected cost. Maintenance and replacement of antique parts are difficult and expensive to obtain, which adds to the service's financial difficulties. The breakdown of legacy vehicles has also decreased the service reliability and it has negatively affected its ridership and performance. Hence, it was not surprising to hear from several informants that serious consideration is being given now to acquiring modern vehicles to replace the legacy vehicles if the resources can be found to do so.

Non-Transit Issues

One recurring theme among multiple informant interviews is the emergence of the streetcar as an icon of the City of Tampa and particularly for the Ybor City area. The informants noted that the streetcar is featured frequently in news reports and marketing material prepared for a diversity of purposes. Some informants perceive this as a positive consequence that contributes to the city image, and that has a beneficial effect on Tampa's culture. Another informant noted that such publicity is "free marketing" that should help and encourage streetcar use.

Many informants believe that streetcar implementation in Tampa played a role in encouraging residential and commercial development in the Channelside District and has benefited businesses in Ybor City. Yet they also recognize that its influence is partial and complementary to other development factors such as a developer's overall economic assessment, building regulations, and local zoning. Special subsides or incentives for promoting development were not used in Tampa, although one of the informants noted that at least one hotel in the area served by the streetcar did indeed expect the streetcar to be present as a condition for development. Other informants also pointed to their perceptions that the streetcar had been a positive amenity in attracting hotel, restaurant, residential, and other developments to the area.

Streetcar Challenges and Possible Solutions

Several recurring themes emerge from the interviews as related to challenges for Tampa's streetcar functioning whether as a development tool, a tourist attraction, and/or as a transit service. The need for stable operational funding sources is the most important concern for all informants, while some informants also place a priority on receiving additional capital funds for network extensions and other physical improvements required to make the service more relevant to utilitarian transit riders. The funding issues directly impact other challenges noted by all informants. They related the service's limited hours and late morning starts, its long headways, and its relatively high fare, as diminishing operating funds have led to service cuts and fare increases that then reduce ridership. The ongoing decline in ridership noted by all informants and confirmed in the quantitative trends and tables that form part of this study is likely associated in significant part to these issues. Other transportation challenges for the streetcar cited by the informants include the presence of inexpensive, plentiful parking near the streetcar, the alignment's lack of connection to major downtown activity centers, and the combined high fare and long travel times that make taxi services competitive for groups of travelers serving the Convention Center to Ybor City travel market that the streetcar's alignment directly serves.

The informants also emphasized the role of the economic recession, which had a significant negative impact on Tampa's tourism affecting the cruise industry, the number of conventions in Tampa, and commercial activity along the Channelside District. Given Tampa's tourist-oriented service characteristics (i.e., alignment, operating hours, and headways), it is also expected that ridership would decline together with diminished tourism activities. This pattern suggests a greater vulnerability for tourism-oriented streetcar systems to larger scale economic conditions as compared with streetcar systems that cater to a more diversified ridership market.

Lastly, but not the least of challenges facing the streetcar, is the obstacle to residential/commercial real-estate development represented by the last economic recession, whose effects are still being felt in Tampa. The streetcar alignment was devised to help implement a land-use vision that has yet to be fulfilled in the Channelside District. Some informants noted that employment and residential densities are still relatively low compared with other streetcar cities, and commercial spaces are characterized as mostly vacant.

All informants recognize these challenges to the success of Tampa's streetcar as a tourism amenity, development tool, and/or transit service. It appears that most informants share a common diagnostic despite the variety of perspectives, experiences, and expertise they represent. This suggests the possibility that an ongoing conversation around the streetcar has been occurring in the community, and that the tri-partite institutional arrangement creates the space for identifying and sharing the challenges as well as potential solutions, which are discussed below.

The key informants for this case study largely agree on the key challenges facing Tampa's streetcar, and interestingly, there is also widely shared agreement on the solutions to these problems. Of course, agreeing on solutions does not necessarily imply agreement on the form these solutions might take or their likelihood of implementation.

The most important solution to Tampa's challenges is to identify a stable long-term source for operating funds. This would facilitate improvements in service hours and headways that would make the service more attractive to potential riders, and it might also allow fares to be reduced. While there is widespread agreement on the need to increase the quality of service, there is some disagreement on the need to reduce fares. While most informants perceive that the current fare is too high and may deter potential riders, the transit informants point to the importance of the service's relatively high (32 percent) fare box recovery ratio as an indicator of the efficiency of its operation. The desire to lower a fare that is considered too high and the assertion that a high fare box recovery is a good thing are obviously contradictory positions, as lowering the fare will inevitably lower the ratio. Some conflict is inevitable among different sets of actors with their very different perspectives on what the most important attributes of the service should be. In the short to medium term, a shift from legacy to modern streetcar vehicles should improve the streetcar's performance and reliability. This recommendation, made by the transit planner informant, was also echoed by most other informants.

The informants also pointed to longer-term capital improvements that would increase the utility of the streetcar for a wider array of trips. The transit planner informant suggested a double-track along the current alignment as a means of more fully utilizing the current vehicle fleet and reducing headways. On a much more ambitious scale, several informants pointed to the idea of extending the streetcar line due north into Tampa's downtown. The extension would bring more employment and other destinations within the area served by the streetcar, and it would also allow the streetcar to link to a transit center where transfers could be made between the streetcar and the extensive local bus system. Such an extension would increase the streetcar's utility as a transit investment, as opposed to a predominantly tourism one. But such an extension would require significant additional capital investments.

Though ample and cheap automobile parking was mentioned as a challenge for streetcar ridership, only a few informants had considered implementing "progressive" parking policies such reducing parking requirements, increasing parking fees downtown, and/or implementing parking meters prior to implementing streetcar service improvements. This cautious positioning regarding parking policy may reflect the predominant role of private automobile transportation in the Tampa community and perhaps a significant cultural obstacle in creating an ideal landscape for the streetcar's resurgence. But in the more successful streetcar cities, most notably Portland, parking policy decisions are used to encourage more use of streetcar and other transit modes, and they appear to be having the intended positive effect on transit use. Whether such a strategy is feasible in Tampa is open to debate, but as long as the automobile remains a more convenient alternative to the streetcar or other transit modes, the ridership on the streetcar and other transit services will remain quite low.

One of the most transformative proposals to improve Tampa's streetcar performance came from the local/regional planner informant who suggested: 1) re-branding and re-purposing the streetcar as part of a longer, region-serving light-rail transit service (the tracks already conform to light-rail technology); and 2) redefining the streetcar institutional arrangements so that a single and more powerful entity than THS takes leadership, visioning responsibilities, and planning roles. The informant believed that both kinds of shifts would be necessary for the streetcar to succeed as a transit service.

Over the longer term, the business community representatives emphasized the need to encourage new development along the line and repurpose large land holdings of the Port Authority that are currently used as parking lots in the Channelside District. The Port Authority is one of the largest landlords in the streetcar's service area, and its parcels are currently underdeveloped. There is potential for higher intensity transit-oriented development that could benefit synergistically with the existing streetcar system. Various informants, including the economic development specialist informant and local/regional planner informant, attest to an incipient resurgence of interest by developers in the Channelside area. If the regional economy continues to recuperate, the transformation of this area might become a reality that was envisioned in the planning efforts of the existing streetcar. But this is clearly a longer-term proposition, which may or may not materialize.

The variety and number of recommendations identified from the informants' interviews reflect the complex situation that Tampa's streetcar is currently experiencing and the need to approach it within a multidisciplinary and multi-objective policy framework. While the informants disagree on the details, all agree on the necessity that something big must happen in Tampa to make the streetcar more viable. As one of the business community informants noted, the streetcar must "go big, or go home," a statement that underscores the perception that major changes are needed now.

Advice to Other Cities

What advice would our Tampa informants give to other communities considering the implementation of a streetcar?

The business community informants emphasized the need for clarity of purpose early in the planning process. The community must decide whether it is a tourism amenity, a transit service, a development tool, or a combination of these. The community must have a clear vision and goals with respect to this purpose, as this is key to making effective decisions about planning, operations, and other aspects of streetcar service.

The transit planner informant and the business community informants emphasized the need to study and understand demand before embarking on these costly transportation investments. This observation is also linked to alignment selection, as these informants observed that the "…route should serve where demand is… building it (the streetcar) doesn't create ridership." This statement stood in stark contrast with the view of the economic development specialist that "urban redevelopment (and hence potential ridership) follows transit investment." These two distinct perspectives by two distinct sets of stakeholders reflect diverse visions for the system as a development tool or as a transit service. This is a salient theme in Tampa's case, and it may be intimately related to its particular evolution.

The business community informants also advise viewing any streetcar as a transportation investment and making decisions to encourage its use as transportation. For example, they suggest that a city should make a streetcar alignment long enough to reach the origins and destinations necessary for a stable ridership level. As of now, one of these informants thinks the alignment in Tampa is much too short to be functional, as it doesn't reach key attractors beyond the tourism destinations.

Certainly the fact that the streetcar's planning, alignment, and operations focus primarily on tourists and visitors makes it more vulnerable to economic shifts (i.e., recession). Purposing a streetcar investment solely as a tourism amenity could be a higher-risk public investment when compared with designing it to serve a more diverse market of potential riders. Of course, designing it to be useful to more riders would necessitate a lengthier system that would undoubtedly have higher capital and operating costs than a shorter, tourist-focused system.

The transit planner informant stresses the importance of "front-end planning" and the need to be realistic in representing the possible consequences of streetcar development. This informant noted the inclination to "satisfy the Feds," suggesting that local actors often tailor their proposals, and the resulting cost and rider forecasts, to meet their perception of what the federal grant officials are looking for in the proposal as opposed to being realistic given local realities. This observation echoes recent critical literature on transportation infrastructure investments and mega-projects that point to recurrent underperformance in terms of forecast ridership and significant cost overruns compared with the final planning projections. This literature points to intentional data manipulation and distortion of rationality and technical reports in the procurement process for governmental funds that present biased or distorted data to secure competitive funds for otherwise non-qualifying projects.[541]

This informant also noted the need for communities to better manage parking in areas served by the streetcar. It is necessary to devise and implement parking policies focused on creating incentives for using the streetcar and other transit modes instead of relying on the automobile.

Finally, the interviewees emphasized the importance of fixing financial responsibilities early in the planning process, "…who is going to pay for it long-term," and the need for the local community to have a "connection" to the streetcar.

CONCLUSIONS

This investigation points to a streetcar system in Tampa that exhibits declining performance and multiple ongoing challenges. Both endogenous and exogenous factors seem to have played a role in the TECO line's evolution and performance, to date, and significant consensus exists among a diverse set of stakeholders on what caused its present challenges. These actors have identified a number of possible strategies to address these challenges, some of which seem more feasible in the near term than do others.

But the fundamental question of purpose remains. Is the streetcar in Tampa primarily a transportation investment, a tourism service, a development tool, or something else?

To date, it has functioned primarily as a tourism service and secondarily a development tool, but many of the informants believe that the streetcar must serve as a transportation investment in the years ahead. This requires a significant change in the physical and operational characteristics of the service, and it will necessitate significant additional financial investments. It will also require a great deal of advocacy and of leadership in a community where the informants would suggest that this has been in relatively limited supply. Nevertheless, many informants remain hopeful for the streetcar's future.

APPENDIX F: INTERVIEW MATERIALS

The authors conducted a total of 21 interviews with 23 informants. The interviewees included individuals representing a diverse set of perspectives on streetcar implementation and operation in each city. Each interview took place by telephone. The research team provided the interviewees a consent form and set of questions prior to the interview. The basic interview questions asked of most respondents are included below. In some instances, additional case-specific questions were asked of informants occupying particular roles in the community being studied. The interview consent form follows the question list.

Background Questions (asked of all informants)

1. What is your professional background and current position?

2. To what extent does your position require you to be engaged in decisions affecting planning, operation, marketing of the streetcar in your community?

3. What activities have you participated in that relate to planning, operation, marketing of the streetcar in your community?

Goals and Objectives (asked of all informants)

1. From your perspective, what is/was the primary goal(s) of streetcar implementation in your community? Is the streetcar primarily a transit investment, an urban development tool, or something else?

2. How would you assess the streetcar's performance in attaining its goals? Why?

3. What do you regard as the most successful aspects of streetcar implementation? The least successful? Why?

4. If you identified a weakness of the streetcar, can anything be done to address this deficiency? Is this feasible?

5. If you identified a strength of the streetcar, has this strength been leveraged to encourage more streetcar use, urban redevelopment activity, etc? How so? To what end?

Stakeholders and the Public (asked of all informants)

1. How closely did you interact with key stakeholders in the planning and decision-making process that led to implementation of the streetcar?

2. Who were these stakeholders? From your perspective, what were their objectives related to streetcar implementation?

3. Were there any conflicts about goals and/or objectives among the key participants? If so, how were they resolved?

4. Were there any concerns raised about streetcar implementation by you or other participants prior to implementation? What were they? Why? Have they proven to be valid? Invalid?

5. How would you characterize the public's attitude toward the streetcar prior to implementation? To the streetcar today? If the attitude has changed, how and why do you suspect it has changed?

Funding, Planning, Operations (asked of transit planning informants)

1. To what extent are you involved in planning decisions about transit service in your community? What kinds of decisions?

2. Are you aware of any changes made to transit service due to the streetcar? What kinds? Why?

3. How would you assess the results of these changes, if any?

4. How was the streetcar system capital investment funded?

5. How are streetcar operations funded?

6. Are there any plans for service expansion for the streetcar? What kinds? When? How funded?

7. Which entity actually: makes planning decisions about the streetcar? Makes operating decisions about the streetcar? Operates the streetcar service?

8. How closely integrated are streetcar and bus services in the community? What kinds of strategies are in place to integrate the modes? How effective are these strategies?

Transit Performance (asked of transit planning informants and other close observers)

1. How closely have you monitored the streetcar's performance since implementation?

2. How would you assess its performance as a transit service? Explain.

3. Would you characterize the streetcar as a stronger or weaker performer than local bus service in the same travel corridors? Why?

4. If a strong performer, what is it about the streetcar that leads to strong performance?

5. If a weak performer, why? Is this remediable?

6. Who rides the streetcar in your community (rider market)? What kinds of trips?

What kinds of destinations?

7. Do streetcar riders use other transit services as well?

Non-Transit Dimensions (asked of all informants)

1. Are you aware of any land-use (zoning) changes considered/coordinated during the planning and design phases of the streetcar system? What kinds? Results?

2. Are you aware of any development incentives made to encourage development around streetcar stops or near the line? What kinds? Results?

3. Were streetscapes or urban improvement projects planned and executed in unison with the streetcar system? Why? Results?

Other contacts (asked of all informants)

1. Are there other individuals in your community you work closely with on streetcar issues? Who? In what ways?

2. Do you recommend that we try to speak with any of these individuals?

Final Takeaway (asked of all informants)

1. If someone from a community considering building a streetcar were to approach you for your overall assessment of the pros and cons of streetcar implementation based on your city's experience, what would you tell them?

THE FLORIDA STATE UNIVERSITY
COLLEGE OF SOCIAL SCIENCES & PUBLIC POLICY
Department of Urban and Regional Planning

Agreement to Participate in Research

Responsible Investigator(s): Jeffrey Brown, Luis Enrique Ramos

Title: Streetcars in the Modern US City: An Examination of Its Purpose, Planning, Function, and Results

1. You have been asked to participate in a research study examining the goals and objectives, planning process, operational, functional, ridership, urban development, and other results of streetcar planning and implementation in the United States. The research will begin and conclude during the 2014 calendar year.

2. You will be asked to answer questions about your role (if any) in streetcar planning and/or implementation, your understanding of the purposes of streetcar development, and your observations of the results of the implementation with respect to ridership and/or urban development. We will ask the questions during a one-hour, one-time interview. With your permission, we will record the interview for note-taking purposes.

3. No foreseeable risks are expected to arise from your participation in the study.

4. We will provide you with a copy of the final research report. The research will provide insights for regional transit agencies, city authorities, and state and federal transportation departments, which are interested in developing streetcars as a transportation and/or urban development tool. The information will be presented in the form of a report and academic articles.

5. Although the results of this study may be published, no direct quotations will be included without your express, written permission. Your name will not appear in any published material without your express, written permission. You will instead be identified in terms of your general role in streetcar planning and development (e.g. planner, developer, elected official, etc). We will maintain your confidentiality to the extent allowed by law.

6. There is no compensation for participation in the study.

7. Questions about this research may be addressed to ***Jeffrey Brown, (850) 644-8519.*** Complaints about the research may be presented to ***Timothy Chapin, Department Chair, Department of Urban and Regional Planning, (850) 644-8515.*** If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact the FSU IRB at 2010 Levy Street, Research Building B, Suite 276, Tallahassee, FL 32306-2742, or 850-644-8633, or by email at humansubjects@magnet.fsu.edu.

8. No service of any kind, to which you are otherwise entitled, will be lost or jeopardized if you choose to "not participate" in the study.

9. Your consent is being given voluntarily. You may refuse to participate in the entire study or in any part of the study. During the interviews, you have the right to not answer questions you do not wish to answer. If you decide to participate in the study, you are free to withdraw at any time without any negative effect on your relations with the Florida State University or with any other participating institutions or agencies.

10. At the time that you sign this consent form, you will receive a copy of it for your records, signed and dated by the investigator. The signature of a subject on this document indicates agreement to participate in the study.
The signature of a researcher on this document indicates agreement to include the above named subject in the research and attestation that the subject has been fully informed of his or her rights.

________________________ ____________
Signature Date

________________________ ____________
Investigator's Signature Date

FSU Human Subjects Committee approved on 11/6/2013. Void after 11/5/2014.
HSC # 2013.11488

ABBREVIATIONS AND ACRONYMS

ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
CATA	Central Arkansas Transit Authority (Little Rock)
CBD	Central Business District
CCDC	Center City Development Corporation (Memphis)
CELSRC	Consumers Electric Light and Street Railway Company (Tampa)
CL	Central Loop Streetcar Line (Portland)
CSRC	Citizens' Street Railway Company (Memphis)
FDOT	Florida Department of Transportation
FTA	Federal Transit Administration
FTIS	Florida Transit Information System
GIS	Geographic Information System
HART	Hillsborough Area Regional Transit (Tampa)
LID	Local Improvement District
LRT	Light Rail Transit
MATA	Memphis Area Transit Authority (Memphis)
MAX	Metropolitan Area Express (Portland)
MPO	Metropolitan Planning Organization
MSRC	Memphis Street Railway Company (Memphis)
NS	North-South Streetcar Line (Portland)
NTD	National Transit Database
OHSU	Oregon Health Sciences University (Portland)
PM	Passenger Miles
PSI	Portland Streetcar, Inc. (Portland)
PSU	Portland State University (Portland)
RH	Revenue Hours
RKM	Revenue Kilometers
RM	Revenue Miles
SAC	Special Activity Center
SLU	South Lake Union (Seattle)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century
TECO	Tampa Electric Company (Tampa)
THS	Tampa Historic Streetcar, Inc. (Tampa)
TRB	Transportation Research Board
Tri-Met	Tri-County Metropolitan Transportation District of Oregon (Portland)
TSRC	Tampa Street Railway Company (Tampa)

TSRPC	Tampa Street Railway and Power Company (Tampa)
UMTA	Urban Mass Transportation Administration
USDOT	U.S. Department of Transportation

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