PROVIDENCE METROPOLITAN TRANSIT ENHANCEMENT STUDY

APPENDIX F: PROVIDENCE STREETCAR ECONOMIC DEVELOPMENT IMPACT ANALYSIS

PREPARED BY HDR ENGINEERING, INC.

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This is one of a set of technical appendices prepared as part of the Metro Transit Study, and is available on www.transit2020.com

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Economic Development Impact Analysis

December 16, 2009

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1. INTRODUCTION

HDR was tasked with providing a preliminary assessment of the economic development potential related to the proposed streetcar project in Providence, Rhode Island. Economic development impacts are estimated in terms of:

- Near-term capital investments and construction activity to implement the streetcar;
- On-going annual operating and maintenance expenditures, and jobs related to streetcar operations; and
- Economic development and re-development potential near the streetcar measured by square feet of development by land use, residential population, and jobs.

The analysis of economic development impacts was based on Providence-specific data collection, interviews with local and regional development experts, and benchmarking comparisons to other cities that have implemented streetcars.

1.1 Organization of This Report

This report is comprised of six sections as detailed below.

Section 2 of the report provides information related to the data collection efforts. Existing studies were reviewed and data related to land use and real estate were compiled. In addition, interviews were conducted with development experts in Providence including local private developers, regional developers with properties in Providence, the City of Providence Planning Department, the Providence Foundation, and local universities (Brown University, Johnson and Wales). The interviews were conducted to ascertain a variety of informed perspectives on the proposed streetcar project and its likely effects on development near the preliminary alignment. On-site observation and assessment of properties along the conceptual alignment was also conducted. Current uses were observed and opportunities for development were considered.

Information related to six streetcar systems in the United States is provided in Section 3. These comparator streetcar systems were researched for the purpose of developing performance and economic development comparisons.

Section 4 of the report provides information related to the effect that streetcar development has on property values. Specifically, it summarizes the property value increases in other streetcar systems in the United States and relates that to likely effects in Providence.

Direct, indirect, and induced economic impacts related to streetcar construction and operations expenditures were estimated using IMPLAN, an input-output based economic impact modeling system. This analysis is described in Section 5 of the report.

The final section of the streetcar economic analysis involved the estimation of development impacts in terms of square feet of development by land use, as well as population and employment. These results are presented in Section 6 of this report.

2. DATA COLLECTION

This section of the report provides a description of the data utilized for the economic development analyses conducted for the proposed Providence Streetcar. In addition, it includes findings from interviews of local and regional development experts.

2.1 LAND USE AND REAL ESTATE DATA

Several Providence related studies and data sources were reviewed in order to determine the most likely development impacts in the immediate area surrounding the proposed Providence Streetcar.

A primary data source utilized in the analysis was the Providence Tax Assessor's Database. This data base provides a parcel-by-parcel analysis of the land in the City of Providence, including land use type, size of parcel, address and other information. This information served as the primary source for the determination of land use in each of the study areas.

The studies below also contributed to the analysis:

- *Rhode Island Interstate 195 Relocation Surplus Land: Redevelopment and Marketing Analysis*, (CKS/Jones Lang Lasalle/RIEDC/Fuss & O'Neill, September 2009) – Analyzes potential uses for the parcels that are currently occupied by I-195. Identifies the parcels and their sizes as well as provides potential zoning and usage;
- *Jewelry District/Old Harbor Planning Framework Study*, (Cecil Group, September 2008) – Study of future potential for the Jewelry District/Old Harbor area. Used primarily for land use and vacancy rate assumptions in this area; and
- *MarketView Providence*, (CB Richard Ellis, Year End 2008) – Provides an overview of market conditions in Providence. Information is used to contribute to vacancy rates in the Capital Center, Downcity and Jewelry District areas.

Data from the assessor database and the I-195 study were used to determine all of the parcels within a three-block radius of the proposed streetcar alignment. Two different categories of development were considered – development of currently existing but underutilized structures, and currently vacant land. The parcels with existing buildings were broken down by current use, and the currently vacant parcels were divided by the percentage of development by type that would likely occur in the future, based on the current mix in each area as well as information in the reference reports. Types of development considered include residential, retail, office, industrial, and institutional. A complete description of the analysis is provided in Section 5.

2.2 COMPARATOR STREETCAR SYSTEMS

Demographic, operation, ridership, and cost data were compiled for six cities in the United States. This information was compared to similar data collected for the proposed Providence Streetcar system. Transit-oriented development (TOD) statistics were collected, as was information related to destinations of interest in the comparator cities. Section 3 presents the data that were collected for each of the streetcar systems.

2.3 ECONOMIC DEVELOPMENT INTERVIEWS

As input to the economic development analysis, HDR conducted interviews with private developers, economic development and planning officials, and local universities. A summary of the comments made by respondents is summarized below.

Interviews were conducted with development experts in Providence including local private developers, regional developers with properties in Providence, the City of Providence Planning department, the Providence Foundation, and local universities (Brown University, Johnson and Wales). The interviews were conducted to ascertain a variety of informed perspectives on the proposed streetcar project and its likely effects on development near the preliminary alignment. On-site observation and assessment of properties along the conceptual alignment was also conducted.

Summary of Interviews

Based on interviews conducted during this work, Rhode Island has done little to grow its economy in recent years. The overall tone to the interviews was that the community needs to make Providence a good place for business. Respondents indicated that there has been too much reliance on education and medical services. One challenge and sometimes controversial issue for the City of Providence is the large amount of land (estimated at 51 percent) that does not result in property taxes.

According to the interviews, some big companies have left Providence and it has been difficult to re-fill that space. Downtown Providence is somewhat overbuilt in office space and faces competition for office tenants from more suburban locations. Absorption has averaged about 100,000 square feet per year, and it may take a few years to fill the existing vacant space. Office tenants often move around the city, rather than attracting new businesses, and especially during the current economic downturn, there is little to no demand for general office uses.

There are also challenges to development and growth in Providence. For example, the city has relatively high taxes and the permitting process is perceived as difficult and challenging (both a state and city issue). In addition, parking is a challenge as it is necessary for new building development (exacerbated by the high auto share for commuters), but adds to developer costs. The current office vacancy rate is about 15 percent and this is likely to rise as Blue Cross Blue

Shield of Rhode Island shifts to its new building. This will add more vacant office space to the market, which will likely take awhile to absorb.

Respondents highlighted several strengths for development and growth in Providence. First, there is a high quality of life with good access to the ocean, and cultural/arts activities. Second, urban living is affordable and there is good proximity to Boston and New York. Providence is perceived by some to be the most desirable and dynamic of the mid-size New England cities, and there is a demand for urban living at mid-price levels. Third, the city hosts world-class universities and hospitals which attract a large volume of high-quality students and professionals.

Providence boasts a lot of surface parking in Downcity and the Jewelry District (JD), and there are opportunities to add parking garages to consolidate parking and develop surface parking lots. This would enable surface parking to be converted to office, arts, university, retail, and residential uses. There is also an opportunity for the streetcar to reduce the overall needs for parking and to help it concentrate in fewer locations.

Respondents indicate that the opportunity in Downcity may be greater for filling existing buildings with higher vacancy, though there is still significant opportunity to develop vacant and under-utilized parcels.

There is broad agreement to pursue mixed use development in the Jewelry District, and recognition that not all streets need commercial development. A focus on a few key streets for 1st floor retail and commercial uses may be preferable. The proposed streetcar "couplet" in the JD is appealing to developers to broaden the development influence but maintain the intimate feel given the dense urban grid. It was suggested that it is important for properties to be open at the street-level rather than closed off. There is some concern that if too much R&D is located in JD, then the area might become too "sterile." In addition, it is important to get 1st floor retail uses "right" and more retail and grocery services (amenities) are needed.

When asked whether development near Brown University is possible, respondents indicated that there is probably less new development potential, as the area is pretty filled in already. That said, Brown is a draw based on a range of activities and the streetcar can facilitate access. According to Brown, there is still about 1 million square feet of development potential on College Hill. There is also the possibility for a longer-term transit center/TOD near Thayer Street.

Regarding development opportunities near the Amtrak station and Capital Center, respondents indicated that there are four to five vacant parcels nearby, which could be spurred by the streetcar. Most likely this would be residential development, possibly with some office and retail space.

Institutions, such as Brown, Rhode Island School of Design (RISD), Johnson & Wales, and hospitals, can be considered the "anchors" of development in Providence. They maintain

stability and activity in the downtown. Respondents questioned, "If not for their development, who would develop in the city?"

It was suggested that there are plenty of development opportunities for the private sector, even if some of the I-195 parcels are used by Brown and J&W. A common perspective is for an institutional-based development strategy complemented by an organic, entrepreneurial strategy (start-ups, RISD/Brown spin-offs, retail and residential led on private side). Given the current economic downturn, that might also be a more practical approach as private sector real estate gradually recovers.

According to the respondents, new office users tend to be smaller than traditional finance, insurance and other large users, with most representing less than 20,000 square feet. Many are as small as 3,000 square feet. Users tend to be in design, high-tech, arts, R&D, and bio-tech.

Developer Perspectives

According to respondents, it is very difficult for developers to build new buildings in Providence. Market rents do not support the cost of development/construction. Rents would need to be in the $30/square foot range but are currently in the low $20s. Most commuters and visitors to downtown Providence drive, and the parking requirements of new development are costly.

Based on experiences in other parts of the city, it will likely take years to fully develop the JD, given its relative size in vacant/underutilized properties. Respondents indicated that tax abatements or incentives are needed as gap financing for developers. The G-Tech building happened only because it was a tax driven deal with the state, and G-Tech is the only new major user. One idea offered was tax stabilization so that property taxes do not rise after development (thus penalizing developer), or a new market tax credit.

Developers indicated that there is a need for more city amenities to help attract the boomers/empty-nesters, as well as Generation X who show an interest in living in Providence. In the absence of a streetcar, Providence may be fortunate if they can keep existing levels of activity and not decline. In other words, developers indicate that "no growth" is a possibility. If the city does commit to a streetcar, it will be an indicator of the city's investment to promote development and this would increase the ability for the city to compete in the Boston-DC northeast corridor. Respondents indicate that a streetcar could result in up to a 25 percent increase in density/use in 5 years. They key is the development of a coordinated streetcar and parking strategy, which should endeavor to: a) remove or reduce parking requirements for developers; and b) provide parking options near the streetcar line to promote parking once and then use of the streetcar for mobility in the downtown area. One developer explicitly said that they like the idea of a streetcar, if the city commits to parking facilities along the route. To one developer, a streetcar will not be a driver for economic development but rather an amenity to help attract a range of uses.

Respondents indicated that it will be important to get big companies on-board in support of ridership, sponsoring stations, etc. The streetcar is unlikely to lead to large new buildings but rather help support a more livable city. There is a unified sentiment that beyond institutional development opportunities, private sector growth will probably start more with residential development and helping to provide the amenities to attract more population to the city. The city cannot count on large office developments. In-fill development of any magnitude could take a minimum of five years based on current economic conditions, available space, and historic absorption trends. That said, a streetcar could help accelerate the development path, especially for the JD. Again, however, development will probably be first concentrated on residential uses. Developers do continue to think first about the institutions and then about potential life sciences – ingredients are there (with universities, space, etc.) but capital is needed. A streetcar could help attract researchers, which is critical to the life science industry.

Brown University Perspective

Brown has a favorable perspective on the streetcar; they have an expensive shuttle system and have users on College Hill, at the hospitals and in between (e.g., the new Medical School in the JD). The University has a portfolio of properties in the JD and is committed to mixed use; they want to integrate with neighborhoods and not be closed off.

The Medical School is to open in fall of 2011, with more than 100,000 square feet of building area and 300-350 people between faculty, students, and staff. Brown is also seeking about four acres of parcels from the I-195 conversion at a "fair market value." Brown does not currently have specific development plans in the JD beyond the Med School, but they do think that a streetcar could help accelerate projects and their development plans. It is estimated that there are 20 acres of surface parking in Downcity, despite the tight development pattern and grid system, which provides opportunities for in-fill development.

Johnson & Wales (J&W) Perspective

J&W is not looking for growth in the "heart" of the JD but is focused on the I-195 parcels. They are not expanding their Providence student population. Current efforts are to provide more/better housing options for the existing student base. Their development plans, which bridge between Downcity and the JD are unlikely to be influenced by a streetcar, although their students and faculty/staff would likely benefit from it.

3. COMPARATOR SYSTEM ANALYSIS

To best learn from and build on the experience of other streetcar systems across the country, HDR collected demographic, operational, ridership, cost, and other data for six streetcar systems and their cities. The comparator systems evaluated were: Tucson, Arizona; Portland, Oregon; Seattle and Tacoma, Washington; Tampa, Florida; and Little Rock, Arkansas. In particular, these comparisons are used to develop a range of likely development effects based on the actual experiences of cities that have implemented streetcars.

While the cities differ from Providence in some ways, they are similar in others. For example, the City of Tampa has a population twice the size of the population of Providence, but its system length and the number of stations on the system is analogous to what is proposed in Providence. As a result, it was included in the assessment of comparable streetcar systems. Other cities have similar population levels, but differ in terms of their streetcar systems. The following sections provide the data collected on the various systems.

3.1 POPULATION OF COMPARATOR SYSTEMS

United States Census Bureau data for 2008 were collected for the each city and metropolitan area. According to this data, Tacoma and Little Rock are most similar to Providence in terms of city population. Tucson, Portland, and Seattle are four times the size of Providence, and Tampa is twice the size of Providence. Metropolitan area population statistics position Providence in the middle of the comparator cities.

Because it is assumed that many of the streetcar users will be commuters, data were collected based on zip codes for business district employment. Table 1 presents the population and employment data for each of the six comparator streetcar systems.

Table 1: Comparator City Demographic Data

Demographic Data	Providence (Proposed)	Tucson (Proposed)	Portland	Seattle	Tacoma	Tampa	Little Rock
2008 Population	171,557	541,811	557,706	598,541	197,181	340,882	189,515
2008 Metropolitan Area Population	1,596,611	1,012,018	2,207,462	3,344,813	785,639	2,733,761	675,069
2007 Downtown Employment	43,470	30,899	57,518	151,772	32,865	22,211	29,302

3.2 COMPARATOR SYSTEM DETAILS

All of the systems included in the comparator analysis have been completed within the past seven years, with the exception of Tucson. Tucson's proposed system is anticipated to be on line in 2011. Tampa is the oldest system, having been completed in 2002.

The systems utilize different vehicles, ranging from modern vehicles to heritage replicas. The Cities of Portland, Seattle, and Tacoma all utilize modern, European streetcars. Tampa and Little Rock use replica systems built within the last decade.[1]

The number of streetcars on the systems also varies from three in Seattle to 10 in Portland. No system is longer than four miles. While Providence is proposing nine stations, the City of Portland has 46 stations on its route. The fewest stations are on the Tacoma system, which has six stations. Table 2 presents the system details for each of the streetcar systems.

Table 2 Streetcar System Details

System Details	Providence (Proposed)	Tucson (Proposed)	Portland	Seattle	Tacoma	Tampa	Little Rock
Year Completed	TBD	2011 (est)	2007	2007	2003	2002	2004
Vehicle Type	TBD	modern	modern	Modern	modern	heritage replica	heritage replica
System Length (route miles)	2.3	3.9	4.0	1.3	2.6	2.4	3.5
Stations	9	19	46	11	6	10	14
Streetcars	5	7	10	3	3	9	5
ROW	mixed flow	mixed flow	mixed flow	mixed flow	dedicated ROW	mixed flow	mixed flow
Routes	2	1	1	1	1	1	2

3.3 OPERATION DATA FOR COMPARATOR SYSTEMS

According to data collected for each of the six comparator systems, fares range from free to $2. Fares are $1 for the proposed Tucson system and Little Rock. Seattle and Tampa charge $2 and Tacoma is free. Portland's fares range from free to $2. Total weekly service hours range from a

[1] Albuquerque Streetcar Evaluation Summary Report, Prepared by Leland Consulting Group and Fehr & Peers, August 2008.

high of 125 for the proposed Tucson system to a low of 78 in Little Rock. Operational details are provided in the table below.

Table 3 Operational Data

Operation Details	Providence (Proposed)	Tucson (Proposed)	Portland	Seattle	Tacoma	Tampa	Little Rock
Fares	TBD	$1.00	FREE to $2.00	$2.00	FREE	$2.00	$1.00
Total Weekly Service Hours	103	125	123	103	107	85	78
Peak Headway (minutes)	8	10	13	15	10	15	20

3.4 RIDERSHIP AND RIDERSHIP GENERATORS

Annual ridership on the comparator streetcar systems varies greatly from 3.6 million in Portland to 200,000 in Little Rock. Daily ridership is a low of 685 passengers in Little Rock and a high of more than 12,000 in Portland. Table 4 provides ridership data.

Table 4 Ridership

Ridership Details	Providence	Tucson (Proposed)	Portland	Seattle	Tacoma	Tampa	Little Rock
Initial Ridership	TBD		4,300 wkdy	970 wkdy	2400 wkdy	500,000 yr.	140,000 yr.
Annual Ridership	TBD	1,000,000	3,550,316	450,000	920,000	940,000	200,020
Daily Ridership	TBD	3,600	12,328	1,230	2,925	1,082	685

In addition to collecting data related to ridership, HDR also obtained information related to ridership generators. Stadiums and convention centers can be a draw for out-of-town visitors, and universities and medical centers can feed rail systems with their employees, students and patients.

The table below shows the ridership generators associated with each of the comparator cities, as well as data for each generator. Please note that data are provided only if the destination is within ¼ of a mile of a streetcar stop. While Providence boasts one of New England's largest airports, for example, it is not located within ¼ of a mile of a proposed station stop and is consequently not included in the data presented below.

Table 5 Ridership Generators

Ridership Generators***	Providence (Proposed)	Tucson (Proposed)	Portland	Seattle	Tacoma	Tampa	Little Rock
Stadium (seats)	12,500	60,000	0	0	23,000	20,500	18,000
Int'l Airport (million annual pass.)	0		0	0	0	0	2
University (enrollment)	44,000	36,000	24,000	0	2,292	0	0
Convention center (sq. ft.)	137,000	210,000	0	0	120,000	600,000	33,000
Medical Center/Hospital (employees)	10500*	2,000	4,500	2,800	0	0	0
Other destinations	Amtrak/PPAC	Westside	Theater District	Seattle Center	State Museum	Cruise Port	Clinton Library

Source: City of Albuquerque Modern Streetcar Rail Investment Cost-Benefit Study 1/16/2008

3.5 CAPITAL AND OPERATION COST

The capital costs associated with the Providence streetcar project are estimated to be $76 million. This is less than the proposed Tucson's costs of $150 million, as well as Portland's investment of $103 million. The City of Tacoma's investment of $81 million is most similar to that proposed for Providence.

Annual operating costs for the Providence system are anticipated to range between $1.8 and $3.5 million. Other systems operate at a cost of $4.8 million (Portland) and $775,000 (Little Rock). Per rider, Portland's system operates at $29. The most costly system among those considered by HDR is Seattle's at $158 per rider annually. Capital and operating cost data for each of the six systems are provided in the following table.

Table 6 Capital and Operating Costs

Capital Cost Details	Providence (Proposed)	Tucson (Proposed)	Portland	Seattle	Tacoma	Tampa	Little Rock
Capital Cost (millions)	$76	$150	$103	$52	$81	$53	$27
Capital Cost per Mile (millions)	$35	$24.6	$26	$40	$31	$22	$8
Capital Cost per Annual Rider	TBD	$150	$29	$158	$109	$122	$135
Operation Cost Details	**Providence (Proposed)**	**Tucson (Proposed)**	**Portland**	**Seattle**	**Tacoma**	**Tampa**	**Little Rock**
Annual Operating Cost	$1.8M - $3.5 M	$2,600,000	$4,800,000	$2,000,000	$3,940,000	$2,400,000	$775,000
Cost per Passenger	TBD	$3	$2	$6	$5	$6	$4
Cost per Passenger per Mile	TBD	$1	$0	$2	$2	$2	$1

Please note that the capital cost per mile for the Tucson Streetcar System is construction only. If vehicles and the Maintenance Facility are included, the capital cost per mile is $38 million.

3.6 ECONOMIC DEVELOPMENT

Using the data for the comparator systems, HDR estimated development potential associated with the streetcar for the City of Providence. While the data are somewhat limited, and only six systems were included in the analysis, the estimates should provide some sense of what development potential may be possible for Providence with the construction and operation of the proposed streetcar system.

Dollars of development, number of residential units, and total square footage of commercial real estate associated with each of the six systems are provided in Table 7. This information was not available for all systems, but the data obtained does provide a framework from which to consider development opportunities for the proposed system.

Development data are limited for streetcar projects, but the Portland system experienced $3.5 billion in development attributable to its streetcar. The cities of Tampa and Little Rock reported development of $1 billion and $400 million, respectively.

Table 7 Real Estate Development

TOD Statistics**	Portland	Seattle	Tacoma	Tampa	Little Rock
Analysis area (since system approved)	w/in 3 blocks	w/in 4 blocks	w/in 3 blocks	w/in 3 blocks	w/in 2 blocks
Total $ of development	$3.5 billion			$1 billion	$400 million
Total # of residential units	10,212	6,100	2,000+	2,740	600
Total SF of Commercial Real Estate	5.5 million	3.3 million			

While some attributes of the systems are similar to the proposed Providence system, there are differences. For example, Little Rock's system is 1.2 miles (66 percent) longer and utilizes five (64 percent) more streetcars than the proposed Providence system. Little Rock's city population is also higher, approximately 190,000 people as compared to Providence's population of 171,000. Its downtown employment, however, is half the size of Providence and its city population is only about 10,000 people larger.

Tampa's population is twice as large as Providence, but its downtown employment is half of Providence. Tampa's system is roughly the same length as Providence and it has only one more station than Providence, but it runs nearly twice as many streetcars.

All of these differences make metropolitan Providence relatively unique, but it is possible to estimate ranges of real estate development that may be achievable. Based on the data for the comparator systems, it is anticipated that Providence could achieve at least $300 million in new development, and a more likely estimate would be between $400 million to $1.2 billion in investment for new and re-development in Providence attributable to the streetcar.

4. STREETCAR PROPERTY VALUES

Academic evidence demonstrates that residential, commercial and business real estate served by high-quality public transportation can command higher rents and sustain higher value than similar properties not as well served by transit. This frequently studied hypothesis has been extended by inference to the modern streetcar movement, but few actual studies of the impact of streetcars on property price appreciation have been completed to date.

4.1 IMPACTS OF A STREETCAR

The evidence on streetcars that does exist indicates that the key factors that have a role in the amount of value that is conferred by streetcar includes employment density, residential factors such as population density, and the extent of and linkage to the rest of the transit system. This report provides a summary of the property value increases in the different streetcar systems.

An overview of studies indicates that, as with the development of Portland, Tampa and Seattle streetcars, it is not uncommon to find a 400 percent increase in the value of property along the adjacent areas of these three cities' streetcars. Raw land without development increased in value over 100 percent near the three streetcar lines during a 5-6 year time period in each of the cities researched. In all case studies, underutilized property became attractive to developers. Properties that were vacant before the construction of the reviewed streetcar systems typically experienced the greatest level of appreciation.[2]

4.2 NEW ECONOMIC DEVELOPMENT: COMMERCIAL

The Portland Streetcar opened with the goal of connecting two major redevelopment areas: 70 acres of abandoned rail yards and a contaminated brown field site just north of downtown (the River District) and another 128 acres of largely underused or vacant industrial land requiring environmental remediation at the opposite end of downtown (the South Waterfront). Since the streetcar project was started, $3.5 billion has been invested within two blocks of the streetcar alignment.

The streetcar investment has become the centerpiece of a significant shift in the density and location of new development within Portland's Central Business District. In a 2005 study, E.D. Hovee & Company found that the properties located closest to the streetcar line have experienced the largest share of development. The area around the alignment have achieved Floor Area Ratios (FARs) that more closely approach the properties' zoned density potential than properties situated further from the streetcar alignment. Within two blocks of the alignment, 5.4 million square feet of office, institutional, retail and hotel construction have been developed.

[2] "Value Capture and Tax Increment Financing Options for Streetcar Construction," The Brookings Institution, HDR, Re-Connecting America, and RCLCO (May 2009).

Table 8 below shows the Portland streetcar property increases to date due to the streetcar construction; Table 9 presents the total projected economic development through 2011 also generated by the Portland streetcar.[3]

Table 8 Portland Streetcar: Projected Residential/Commercial/Business Development Impact

Line	Low Estimate *	High Estimate
Blue	$211 million	$238 million
Blue + Green East	$394 million	$448 million
Blue + Green West	$308 million	$346 million
Blue + Green	$491 million	$556 million
Blue + Red	$259 million	$297 million
Blue + Green + Red	$540 million	$616 million

*Adjusted to 2008 dollars (4.0% annual increase) – Source: CDDC, 2006

Table 9 Total Economic Development to 2011

Line	Low Estimate	High Estimate
Blue	$216 million	$248 million
Blue + Green East	$410 million	$464 million
Blue + Green West	$319 million	$356 million
Blue + Green	$508 million	$578 million
Blue + Red	$270 million	$208 million
Blue + Green + Red	$562 million	$637 million

*All totals adjusted to 2008 dollars (4.0% annual increase)

Source: CDDC, 2006

Includes market value of development of condominiums, rental units, commercial/businesses and hotels; cumulative property tax (not considering abatements); cumulative net gain from city income tax (over 800 new employees); cumulative increase in convention/tourism expenditures.

In Corpus Christi, a smaller system has resulted in similar impacts. The Regional Transportation Authority's Six Points Station investment of $1.3 million has revitalized occupancy in empty store fronts and development of new high-quality retail and business services in the neighborhood. Commercial property valuations have risen from $5 million to $8 million.[4]

[3] The Portland Streetcar Development Oriented Transit Report, April 2008 and "Value Capture and Tax-increment Financing Options for Streetcar Construction", a joint report developed by The Brookings Institution, HDR, Reconnecting America and RCLCO, May 2009.

[4] "Building Investment Value in Our Economy and Marketplace," American Public Transportation Association, http://www.publictransportation.org/reports/asp/building_investment_value.asp, accessed September 17, 2009.

Tampa has also seen over $75 million of economic development from the development of its new University Area Transit Center. A community center was developed in a chronically depressed neighborhood nearby and renovation of a major mall.

In Eden Prairie, Minnesota, on 22 acres surrounding its Southwest Station, SouthWest Metro Transit has guided mixed-use development that returns over $400,000 in residential property taxes and nearly $300,000 in retail property taxes annually.

4.3 New Economic Development: Residential

Residential neighborhoods appear not to be subject to the big changes experienced in industrial and commercial areas and are therefore less likely to increase in value quickly. This has been the case in Portland where there was rapid industrial appreciation. Between 1997 and 2003, the value of industrial properties increased between 44 and 112 percent. Raw land increased the most while single family housing was the most stable. A likely explanation for this observation, specifically in Portland, is that the value of the streetcar to residents is not realized until service has been established. While values were increasing in the Pearl District due to planning and development of the streetcar, residential values in the neighborhoods around the planned streetcar to the northeast were growing slower. Even still, within two blocks of the Portland Streetcar alignment, 10,212 new housing units have been constructed and substantial residential appreciation eventually did occur.

The vacant and multifamily properties along the Tampa TECO Streetcar saw the greatest increases at 166 percent and 117 percent respectively since its opening in 2002. Industrial properties along the Tampa TECO streetcar route were typically converted into non-industrial uses. This resulted in the median assessed value in the area around the alignment rising 608 percent between 2002 and 2008 for the 24 industrial properties developed into non-industrial uses. Also to be noted is that certain property types increased in value more than others, possibly due to speculation, increased value from proximity to surrounding changing properties, or future potential for change. For example, industrial, vacant, and multi-family properties appreciated significantly more than single family, commercial, and office use properties.

In one study[5] done for Seattle, however, it was found that the value differences for apartments, condos, hotel and retail properties between the “before the streetcar” and “after the streetcar” project values, as a percentage of the total value, were less than those found in prior studies. This study showed that about zero to five percent of total improvement value had increased compared to the value before the streetcar project.

Employment Factors

The studies reviewed indicate that an important factor for the success of a streetcar project is existing or potential employment density along the streetcar alignment. In Portland, large lot

[5] City of Seattle, Special Study for the South Lake Union Streetcar Project Local Improvement District (LID) No. 6750, Seattle, Washington, March 2006.

single family, commercial and industrial properties all experienced much higher appreciation than multifamily and small lot single family properties, indicating that higher density redevelopment was seen as a real opportunity by the development community once the streetcar became a reality. By 2008, there were no longer any large single family lots as all had been redeveloped into condos or subdivided.

Also in Portland, 55 percent of all CBD development since 1997 occurred within 1-block of the streetcar and properties located closest to the streetcar line more closely approach the zoned density potential than properties situated farther away. Developers are building new residential buildings with significantly lower parking ratios than anywhere else in the region, suggesting the residents demand a neighborhood dense with conveniences including transit nearby.

Another major driver in the Seattle Streetcar property value increase is the planned relocation of Amazon.com's headquarters. This relocation is estimated to add 11 new buildings on six blocks of land in the South Lake Union District. Evidence is beginning to mount that this district is likely to show greater growth than Portland's Pearl District and Tampa's Channelside, two similar areas in terms of pre-existing old industrial and underutilized property. Vacant properties in South Lake Union developed into offices have increased in value by more than 166 percent. Seattle fits into a similar model of redevelopment as Portland and Tampa in that most of South Lake Union consisted of older industrial type properties that were ready for change. The district was far enough away from downtown that people did not previously see it as a viable alternative but with the streetcar and a concerted development effort, it has now become a major employment center for the region.

Residential Factors

A city's existing trend of living downtown in dense neighborhoods for convenience or dispersal out of the downtown area is another factor that impacts whether and how a streetcar creates economic development benefits. For example, the introduction of Tampa's TECO streetcar in October 2002 from Ybor City to the city's downtown and the Channel District did not necessarily create high property values.

In Hillsborough County, which contains the city of Tampa, property value increases along the streetcar line were 14 percent to 36 percent lower than the rest of the county. A possible explanation is atmosphere of Ybor City could make living in the district less desirable than in other neighborhoods closer to downtown. Furthermore, while the Channelside District has a higher rate of appreciation, properties along the streetcar line in Ybor City north of the freeway increased by a less significant level, about 71 percent.

Since December 2007, when the Seattle streetcar started operating, the value appreciation for all properties along the alignment ranged between 50 percent and 85 percent. Like Tampa, Seattle's development occurred mostly where re-developable properties, such as industrial and multi-family uses, could be converted to office space.

4.4 AREA TRANSIT RIDERSHIP

Current transit networks and their linkage to the streetcar project can also impact how successful a streetcar project is at creating economic development benefits. RIPTA operates a transit system around Rhode Island that serviced over 25 million riders in 2008. Ninety-five percent of these riders are from fixed route service. The Providence LINK Trolley service services three percent of total RIPTA riders, the next highest percentage of fixed route riders, with over a half a million riders annually[6]. Amtrak also services downtown Providence, handling over 600,000 riders in 2008[7].

Although many reports discuss the economic development benefits of a streetcar project, none of these specifically isolate the benefits derived from the streetcar alone. A city's policies on zoning, taxing, the communities' perception of the streetcar, the population of residents and employee patterns of dispersal or concentration in the downtown area all contribute. Additionally, the network links of a transit system and the existing transit assets as well as the state of the overall economy can have impacts on whether or not a streetcar project can become a means of economic development. It has been observed anecdotally in other cities around the country that with these pieces in place, a streetcar can engender economic development along its alignment.

4.5 FINDINGS AND LIKELY PROPERTY VALUE IMPACTS IN PROVIDENCE

While there are numerous studies that consider the impact of transportation improvements on property values, there are limited studies of the impact of streetcars on property values. It is possible, however, to extrapolate from the analyses that are available and combine those findings with Providence-specific land use, economic and transit factors to draw some preliminary conclusions about potential property value increases due to the construction of a streetcar system.

Based on the assessment of property value adjustments due to streetcar service in other cities, property values for retail space near the Providence Streetcar system are likely to increase more significantly than office, despite that retail development may be relatively modest as compared to other uses as it tends to occupy street-level space (see Section 5 for the complete development analysis). Of the streetcar systems considered, residential property values did increase in and around the streetcar alignment. In some cases, a low magnitude of residential appreciation was observed. It may be the case that residential property appreciation is delayed until after the introduction of service, while commercial properties are often observed to appreciate in anticipation of service. The timing and magnitude of both effects varies from one system to the next.

[6] Rhode Island Public Transit Authority, http://www.ripta.com/about/index.php?section=0 accessed September 17, 2009.
[7] Amtrak, News & Media, *State Fact Sheets*, available at http://www.amtrak.com/servlet/ContentServer?pagename=Amtrak/PressRoom as of Jan. 14, 2009.

Studies of the Portland Streetcar indicate that more than half of the central business district development occurred within 1-block of the streetcar. While Portland and Providence differ in some ways, the cities are similar in others. Both are older, established and densely populated. Portland's experience with its streetcar may be instructive to Providence as it considers moving forward with a streetcar system.

Independent of all other activities in and around a proposed streetcar system, fixed guideway transit does appear to incrementally increase property values. For Providence, this suggests that construction and operation of the proposed streetcar system is likely to increase property values located along the alignment.

5. ECONOMIC IMPACT ANALYSIS OF CONSTRUCTION AND O&M EXPENDITURES

Investment in a streetcar system in downtown Providence is expected to produce:

- Near-term economic and employment benefits in Providence County, Rhode Island, and the nation as a whole. The construction of the streetcar line will create a variety of domestic construction, manufacturing, and supporting industry jobs opportunities.
- On-going annual operating and maintenance expenditures, jobs, and economic impacts related to providing the streetcar service, and maintaining the equipment and infrastructure.

5.1 DIRECT, INDIRECT AND INDUCED ECONOMIC IMPACTS

Three distinct impacts were measured in the economic impact analysis conducted for RIPTA. They are: direct, indirect and induced:

- Direct Impact: Represents the initial construction expenditures that are received by businesses located in the study area;

- Indirect Impact: Indicates the impact of the additional business spending generated as these businesses sell more output and purchase additional inputs from their suppliers; and

- Induced Impact: Represents the increase in economic activity, over and above the direct and indirect effects, that is associated with increased labor income received by workers and spent on household goods and services purchased from businesses within the study area that otherwise would not have happened.

The total economic impact is determined by summing the direct, indirect, and induced effects.

The construction economic impact analysis was conducted based on the major construction labor and materials expenditures in the capital cost budget and using the nationally recognized IMPLAN economic impact modeling system. Costs have been estimated for track elements, stations and support facilities, sitework and special conditions, systems, right of way (ROW), vehicles and professional services related to the design of the project. The estimated total construction cost of the streetcar project used in this analysis is $75.7 million. 2010 dollars are utilized.

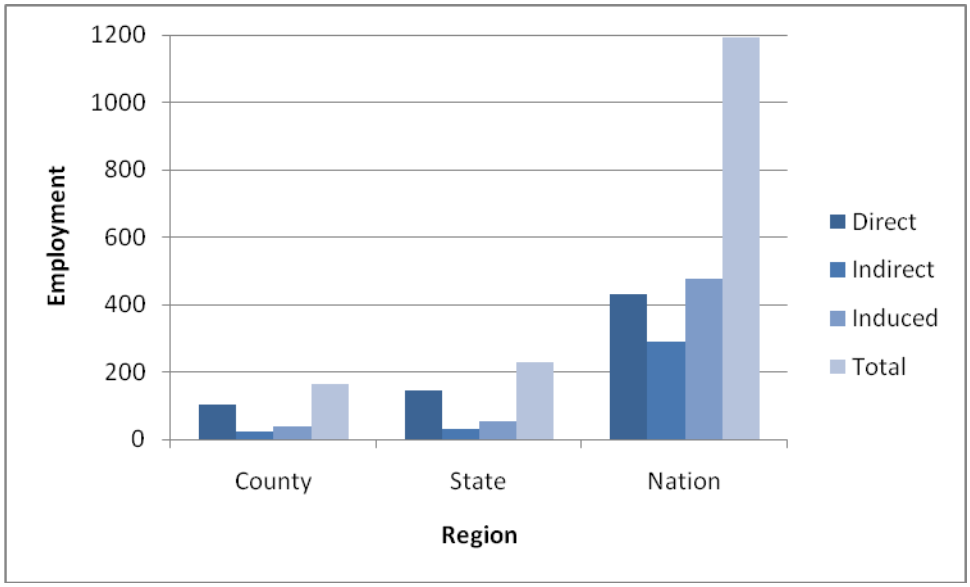
Impacts were estimated for Providence County, Rhode Island, and the United States. It is assumed that the majority of the materials, including the streetcar vehicles, will be purchased from suppliers and manufacturers outside of Rhode Island. For example, it is likely that the modern streetcars at a cost of over $20 million will be manufactured at a specialized operation

in Oregon. It is further assumed that nearly all of the on-site labor will be from within the state, and a large portion from within Providence County. While much of the impact will be to construction industries, architecture, engineering and related services will also benefit from the project.

5.2 INCREASED EMPLOYMENT

As a result of the economic output impacts, streetcar construction will also result in direct, indirect, and induced employment in all three regions. Total employment impacts are 164 jobs for Providence County, 229 jobs for Rhode Island, and 1,194 jobs in the United States. Of these, 105, 146, and 429, respectively, are directly related to the construction of the streetcar. These results are presented in the figure below.

Figure 1: Providence Streetcar Employment

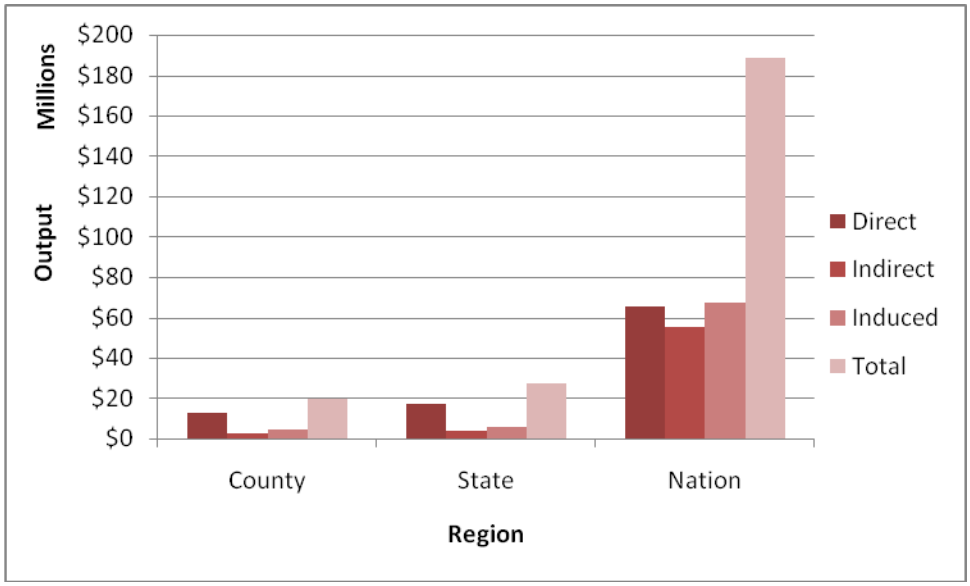


5.3 INCREASED ECONOMIC OUTPUT

Direct impacts of the streetcar construction on total sales (output) in Providence County are calculated to be $12.5 million. The direct sales are $17.1 million and $65.4 million for Rhode Island (inclusive of Providence County) and the United States (inclusive of Rhode Island), respectively.

Total output impacts, including direct, indirect, and induced effects, of streetcar construction are $19.7 million for Providence County, $27.0 million for Rhode Island, and $188.4 million for the United States. These results are presented in Figure 2.

Figure 2: Economic Output Impacts of Providence Streetcar



5.4 Additional Economic and Fiscal Impacts

The economic impacts of the proposed streetcar system extend beyond total sales and job creation. Direct impacts of job creation in the county and state study areas are primarily in construction-related jobs, as nearly all of the manufacturing is expected to take place outside of the state, while the labor to physically build the project will come from Providence County and Rhode Island.

Indirect and induced impacts are more widespread across varying industries. The number of employees and the additional wages accrued to these workers are another impact of the project. Additionally, there is expected to be an increase in output, tax revenue and gross regional product (value added) for each of the study areas due to streetcar construction activities. The total short term impacts in these five categories are indicated in Table 10 below.

Table 10: Economic Impacts of Providence Streetcar Construction

	Employment	Wages	Value Added	Output	Tax
Providence County	164	$8.0	$9.8	$19.7	$2.3
Rhode Island	229	$10.7	$13.3	$27.0	$3.1
United States	1,194	$62.7	$95.2	$188.4	$22.1

6. STREETCAR DEVELOPMENT POTENTIAL

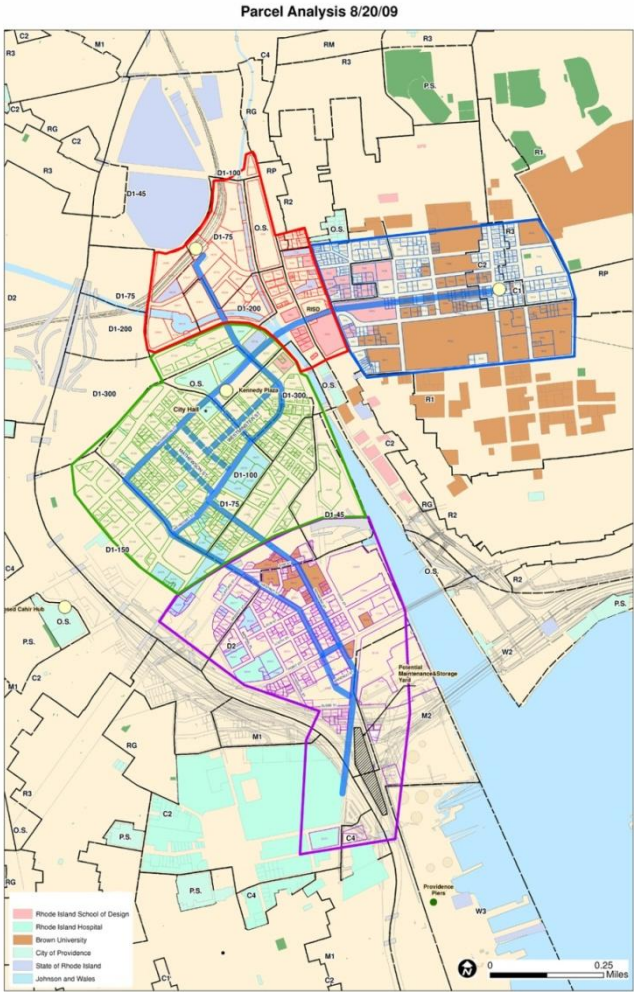
Streetcars have the potential to shape and guide redevelopment in urban areas. Streetcar systems can promote residential, commercial, and institutional development, providing mobility and economic benefits to the community.

The proposed Providence Streetcar project is a 2.1 mile circulator that would connect the various activity centers within downtown Providence, allowing for improved mobility. While the alignment has not yet been finalized, the service is expected to connect from the Rhode Island Hospital to College Hill and a proposed Thayer Street transit hub while traveling through or near the Jewelry District, Downcity and Capital Center areas. This section of the economic development analysis thus focuses on estimates of development potential measured by square feet of development by land use and the likely associated jobs and residential population. It is based on a compilation of the material presented in the earlier sections, particularly the development interviews and comparisons to other established streetcar systems.

The purpose of the economic development analysis is to assess the potential impacts of RIPTA's proposed streetcar service in the downtown Providence area. The economic development analysis covers an approximately three block radius around the proposed streetcar alignment. The area is divided into four sections – College Hill, Capital Center, Downcity, and the Jewelry District.

Figure 3 shows the study areas. The analysis was conducted in terms of square footage of potential development attributable to the streetcar service. It accounts only for the incremental development potential due to the proposed streetcar service. It does not include the share of development that would have occurred even without the streetcar system. Given that development typically takes time to be fully realized, the results are presented for a forecast year of 2025, approximately 10 to 12 years after proposed streetcar implementation.

Figure 3 Development Analysis Areas



The economic development estimates are presented in terms of:

1) **Geography –** Estimates of economic development gains are presented for each of the four areas within the 3 block radius of the alignment – College Hill, Capital City, Downcity and Jewelry District.
2) **Square Footage –** The amount of vacant and underutilized space that is available is estimated, and the square footage that is available, developable, and attributable to the streetcar is calculated for 2025.
3) **Jobs and Population –** The analysis captures residential, commercial, and institutional development potential and converts these estimates into likely job and population increases.

6.1 METHODOLOGY

The methodology to estimate induced economic development due to the implementation of a streetcar circulator in downtown Providence involved a risk analysis framework, a set of key

development assumptions and data, and residential, commercial and office growth assumptions. The following methodology was applied to estimate the economic development potential in Downtown Providence:

1) **Data collection and review of other studies** – In order to frame the assumptions in the analysis, several recently completed relevant reports were consulted for information such as land use, vacancy rates, and proposed future developments.
2) **Model development** – Based on the data collected and information found in other studies, the modeling methodology was developed. The model is a risk-based analysis, which explicitly accounts for uncertainty in a number of key variables and produces a range of estimates.
3) **Results and risk analysis** – A set of economic growth assumptions and risk factors were generated for the analysis. These were presented to the City of Providence for review, leading to a refined set of results. A complete description of the risk analysis process is provided in Appendix B of this report.

6.2 MODEL DEVELOPMENT

Several steps were taken to ensure that the most reliable estimates of potential economic development related to the streetcar service were generated. Providence related studies were reviewed and data was collected to determine the most likely development impacts in the immediate area surrounding the proposed Providence Streetcar. Section 2 provides information related to the resources utilized in the model development.

As mentioned in Section 2.1, the Providence Tax Assessor's Database was a primary data source for the analysis. This database provides a parcel-by-parcel analysis of the land in the City of Providence, including land use type, size of parcel, address and other information. Data from the assessor database was combined with the I-195 study to determine all of the parcels within a three-block radius of the proposed streetcar alignment. In addition, the City of Providence Department of Planning and Development provided a parcel-level map of existing vacant and developable parcels within the Downcity and Jewelry District areas and reviewed all data and key assumptions in the analysis.

Two different categories of development were considered in the analysis – development of currently existing but underutilized structures, and currently vacant land. The parcels with existing buildings were broken down by current use, and the currently vacant parcels were divided by the percentage of development by type that would likely occur in the future. This determination was made by considering the current mix in each area as well as information in the reference reports and findings from the development interviews. Types of development considered were: residential, retail, office, industrial, and institutional.

A critical step in the process of determining the development impacts attributable to the streetcar was calculating the amount of square footage to be developed by land use type. The existing conditions parcel data was available for the study area and existing vacant land was

divided into residential, commercial/industrial and other vacant in the assessor database; however, these land use types were aggregated to all vacant, and an assumption was applied to the vacant land to divide it among potential uses. This method was employed because the current tax assessor category is not necessarily representative of the future use of vacant land. This is also useful, as the parcels in the I-195 area do not currently have a land use type. The shares of development attributable to each use were calculated from this data.

Underutilized Land

For existing buildings, both a vacancy rate and a square footage Floor Area Ratio (FAR) were considered when determining the total amount of space available for future development. The FAR is used to estimate the square footage of buildings compared to the size of the parcel, taking into account that most buildings have more than one story. The assessor data contains only the size of the parcel footprint; to account for height and any possible green space around the building, the estimated FAR was applied to the size of the footprint to determine the average space in a building. Risk ranges were utilized for both of these factors, varying by area within the city and based on information from the reference reports, other data and estimates.

For example, the median vacancy rate for office space in the Capital Center area is 20 percent and the estimated FAR is 8.0, multiplied by the 80 percent of commercial parcels that are office. This suggests approximately 326 thousand square feet of vacant office space in existing buildings in the Capital Center area. The median ("most likely") values for vacancy rates and FARs are shown in Table 11 and Table 12 below. Full tables, including the low and high values, can be found in Appendix A of this report. Appendix B provides a complete description of the risk analysis process.

Table 11 Median Vacancy Rates of Existing Buildings by Area and Use Type

	College Hill	Capital Center	Downcity	Jewelry District
Residential	5.0%	10.0%	25.0%	30.0%
Retail	8.5%	15.0%	15.0%	15.0%
Office	8.0%	20.0%	14.0%	16.0%
Industrial	N/A	N/A	N/A	10.0%
Institutional	0.5%	0.5%	0.5%	10.0%

Table 12 Median Square Footage Multipliers for Existing Buildings

	College Hill	Capital Center	Downcity	Jewelry District
Residential	2.0	8.0	5.0	2.3
Retail	1.0	1.0	1.0	1.0
Office	2.0	8.0	5.0	2.3
Industrial	N/A	N/A	N/A	1.0
Institutional	1.5	3.0	3.0	2.3

Vacant Land

The approach to estimate currently vacant land is similar to that of existing underutilized land, except that vacancy rates are not relevant (since there are no buildings on the parcel). The assessor database, I-195 study, and City of Providence vacant land map were used to determine the parcels that would be within the study area. The land was then broken down into usage category. Because the land is currently vacant, assumptions were made about the most likely type of future development as a percentage of total land – residential, office, retail, or institutional – for each of the four study sections. These assumptions are shown in Table 13 below.

For example, it was assumed that 60 percent of development in Downcity would be residential, 20 percent retail and 25 percent office. Different rates were used for the parcels that will become available once the relocation of I-195 is complete. These are divided between Downcity and the Jewelry District, as the Interstate currently divides the two sections of the City. As Brown and Johnson & Wales both have plans for some of the parcels in the area, potential uses were divided among residential, retail, office and institutional. Based on development interviews, the development of parcels for institutional use is likely to be relatively independent of the presence of the streetcar (though there is some indication that it could help accelerate projects).

Table 13 Vacant Land Use Assumptions

	College Hill	Capital Center	Downcity	Jewelry District	I-195 Downcity	I-195 Jewelry District
Residential	5%	40%	60%	55%	5%	5%
Retail	40%	20%	20%	15%	20%	15%
Office	35%	40%	25%	15%	35%	30%
Industrial	0%	0%	0%	0%	0%	0%
Institutional	20%	0%	0%	15%	40%	40%

Once these shares were calculated for each of the four regions, the estimated FAR was then applied to determine the likely total square footage of space available on these vacant parcels. For instance, the median office FAR for Downcity was 5.0, meaning that the square footage of building space available would be 5.0 times the size of the parcel area. The median FARs used in the analysis can be seen in the table below, and the complete range of low and high values based on risk can be found in the Appendix A of this report.

Table 14 Currently Vacant Land Median Floor Area Ratios (FARs)

	College Hill	Capital Center	Downcity	Jewelry District
Residential	2.0	8.0	5.0	3.5
Retail	1.0	1.0	1.0	1.0
Office	3.0	8.0	5.0	5.0
Industrial	0.0	0.0	0.0	0.0
Institutional	2.0	3.0	3.0	5.0

Future Development Attributable to the Streetcar

A share of the future development that could be attributed to the streetcar was considered, once the amount of space available for future development in existing buildings was calculated for each category in each area for both existing and vacant structures. Risk factors were also applied to this variable. The median values are shown below and the full detail of the development potential related to the streetcar can be found in the Appendix A of this report.

For the Capital Center area, the estimated median share of office development in existing buildings attributable to the streetcar is 15 percent. This translates into approximately 49 thousand square feet of development that could be directly related to the presence of the streetcar. Similar calculations were done for each category of land use and vacancy status within the four sections of the study area.

Table 15 Most Likely Share of Development Attributable to Streetcar, Existing and Vacant

	Existing				Vacant					
	College Hill	Capital Center	Downcity	Jewelry District	College Hill	Capital Center	Downcity	Jewelry District	I-195 Downcity	I-195 Jewelry District
Residential	0%	15%	20%	30%	0%	10%	20%	25%	20%	25%
Retail	8%	15%	20%	30%	10%	10%	20%	25%	20%	25%
Office	5%	15%	20%	30%	5%	10%	20%	25%	20%	25%
Industrial	5%	15%	20%	30%	5%	10%	20%	25%	0%	0%
Institutional	5%	15%	20%	30%	5%	10%	20%	25%	4%	5%

Economic Development Potential

Property development leads to employment and population increases. The estimates of the development potential attributable to the streetcar were translated into employment and population estimates. Using a multiplier of jobs per 1,000 square feet, each use was converted into an estimate of employment. To estimate population based on residential development, a multiplier of 1.50 per 1,000 square feet was applied to the development estimates. In general,

industry standards were used to calculate these values, with the exception of office space. A slightly lower and more conservative office space multiplier of 2.8 was used as the typical industries targeted for development in Providence are life sciences and research. These industries often require more space per individual employee. The table below presents the multipliers for most likely jobs and population.

Table 16 Most Likely Population and Jobs per 1,000 Sq. Ft. of Development

Usage Type	Multiplier
Residential (population)	1.50
Retail	1.70
Office	2.40
Industrial	0.80
Institutional	2.00

6.3 RESULTS

This section presents the results of the economic development estimates attributable to the streetcar. Each set of results includes the "most likely" predicted result (50 percent) as well as 10 percent (Low) and 90 percent (High), which are the upper and lower ends of the confidence interval. For the purposes of interpretation, the 10 percent or Low result means that there is a 10 percent chance that the growth in population or employment will be less than the reported value (i.e., 90 percent chance that it will be at least that large). The 90 percent or High value means that there is a 90 percent chance that the population or employment growth will not exceed that value. Appendix B of this report details the risk analysis.

Square Footage of Development by Land Use

The total square feet of development shown in Table 17 indicates the most likely level of development for existing underutilized buildings and vacant land. According to the analysis, nearly 3 million square feet of development is estimated in the most likely development scenario. Of this, 1.5 million is to residential and 1.2 million to office development. The total development estimated in the analysis is in line with comparable existing streetcar services in the United States.

Table 17 Most Likely Total Square Footage of Development Attributable to Streetcar

	Residential	Retail	Office	Industrial	Institutional	TOTAL
College Hill	0[8]	3,729	3,974	0	1,493	**9,195**
Capital Center	239,802	23,561	279,079	0	1,631	**544,074**
Downcity	613,271	90,700	533,965	0	9,296	**1,247,231**
Jewelry District	641,660	69,242	360,653	2,358	97,709	**1,171,622**
TOTAL	**1,494,733**	**187,232**	**1,177,671**	**2,358**	**110,128**	**2,972,122**

Downcity has the highest development potential related to the streetcar, accounting for more than 1.2 million square feet, or nearly 42 percent of potential development. This is rather unsurprising given that the majority of the proposed streetcar track is in the Downcity area. In addition, it has the largest amount of vacant space, in terms of availability in existing buildings and vacant land available for development, inclusive of some of the I-195 parcels.

The second largest amount of development is in the Jewelry District, accounting for slightly less than 1.2 million square feet, or 39 percent of development. The majority of the development comes from currently vacant land. The removal of I-195 and the creation of a streetcar will serve to better connect the Jewelry District and Rhode Island Hospital to the rest of the city.

Capital Center has a relatively high vacancy rate in existing buildings, accounting for the second largest amount of available square footage, as well as a large amount of vacant and developable space in a couple of vacant parcels to the east of the Amtrak station. Despite this, the streetcar is expected to have a relatively modest impact on development. This is due to the fact that much of the development in this area will not likely be related to the streetcar's ability to circulate through Providence, but more in terms of access to the Amtrak Station and quick service to Boston.[9]

The College Hill section has both a limited amount of vacant land and a low vacancy rate of existing buildings, due to the presence of the universities. In addition to these low rates, the streetcar service is least likely to have an impact on development in this area, as Brown and the Rhode Island School of Design are likely to move forward with their development initiatives somewhat independently of the presence of the service. This is why there is a low level of streetcar related development shown in Table 17 for the College Hill area.

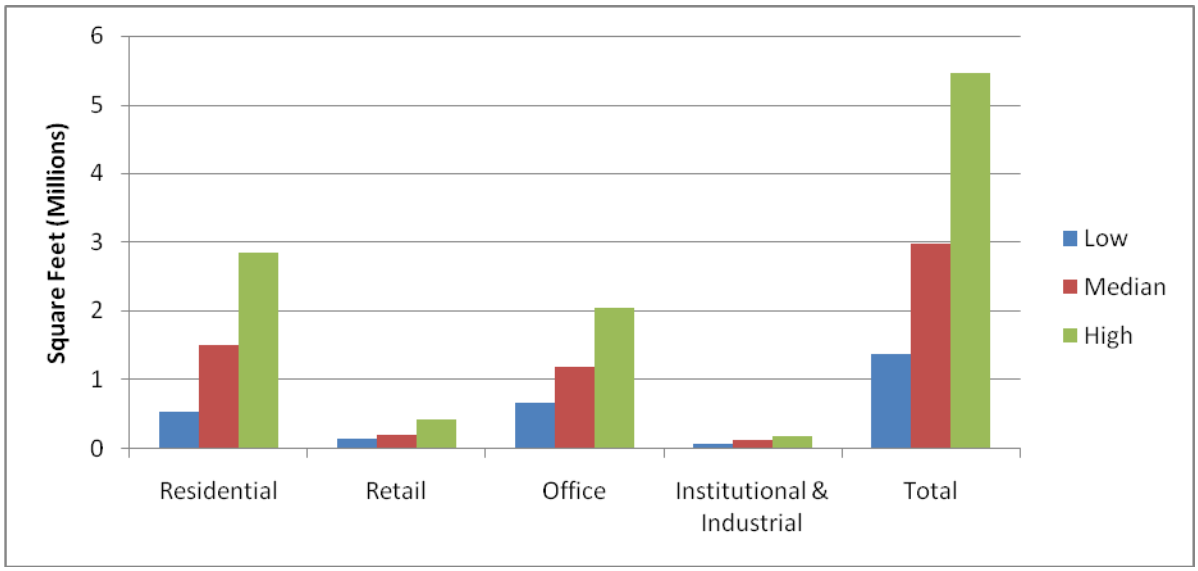
Because there is some uncertainty related to likely development, however, a risk analysis was included in the development estimation. This analysis yielded low, median, and high levels of development, as shown in Figure 4 below. Based on these results, there is a 90 percent chance

[8] New residential development in the College Hill area is zero (0) due to the universities not building any new residences, but rather incorporating existing residential structures into their plans.

[9] Much of the recent development in this area has been in terms of commuter oriented residential development, and office space that allows for quick access to the intercity rail line.

that approximately 1.4 million square feet will be developed. Although the most likely development level is estimated to approach 3 million square feet, there is a 10 percent chance that development could exceed 5.5 million square feet. In summary, this analysis has estimated an 80% confidence interval of development due to the streetcar of between 1.4 million to 5.5 million square feet.

Figure 4 Range of Square Feet of Development Due to Streetcar



Population and Employment

The square feet of development estimates translate into population and jobs by using the population and jobs per 1,000 square feet factors presented above. This step generates most likely estimates for population and employment levels, as well as low and high ranges. The differences in land availability across the city result in a mix of employment creation and job usage in the varying segments of the streetcar alignment. Table 18 below shows the most likely estimates of jobs and population increases due to the streetcar related development.

Table 18 Most Likely Jobs and Population Due to Streetcar Related Development

	Residential	Retail	Office	Industrial	Institutional	Population	Jobs
College Hill	0	6	10	0	3	**0**	**19**
Capital Center	360	40	670	0	3	**360**	**713**
Downcity	920	154	1,282	0	19	**920**	**1,454**
Jewelry District	962	118	866	2	195	**962**	**1,181**
TOTAL	**2,242**	**318**	**2,826**	**2**	**220**	**2,242**	**3,367**

Assuming the most likely level of development, the streetcar is expected to contribute 3,367 new jobs and 2,242 new residents within the study area. Most of the residents are anticipated to locate Downcity and in the Jewelry District, with more than 1,800 new residents distributed

between the two areas. The largest share of employment is expected to be in office jobs located in Downcity, followed by a mix of retail, office, institutional and R&D jobs in the Jewelry District.

As discussed previously, a risk analysis was conducted to generate a range of estimates of development potential in order to account for uncertainty. The risk analysis results in a low range development of 1,922 jobs and 755 new residents, as shown in Table 19. The high range of development results in 5.5 million square feet, consistent with 6,584 jobs and 4,335 residents in Providence.

Table 19 Range of Jobs and Population Due to Streetcar Related Development

	Population	Employment
Low	755	1,922
Median	2,242	3,367
High	4,335	6,584

7. SUMMARY OF FINDINGS

Based on the results of the qualitative and quantitative assessments conducted in this report, the following conclusions can be drawn.

- According to interviews:
    - A streetcar could lead to a 25 percent increase in land use density in 5 years.
    - To ensure success, there should be a coordinated streetcar and parking strategy, endeavoring to:
        - Remove or reduce parking requirements for developers; and
        - Provide parking options near the streetcar line to promote parking once and then use of the streetcar for mobility in the downtown area.
- Between $400 million and $1.2 billion in real estate development is likely attributable to the streetcar based on comparator streetcar systems in the United States and a preliminary assessment of Providence.
- Based on an overview of streetcar property value studies:
    - A 400 percent increase in the value of property along the adjacent areas of city streetcars is not uncommon.
    - Raw land without development increased in value over 100 percent on three streetcar lines during a 5-6 year time period.
    - Underutilized property becomes attractive to developers when streetcar service is initiated. Properties that were vacant before the construction of the reviewed streetcar systems typically experienced the greatest level of appreciation.
- The economic impact analysis of the streetcar construction expenditures indicates that:
    - 164 jobs in Providence County, 229 jobs in Rhode Island, and 1,194 jobs in the nation will be generated as a result of streetcar construction.
    - National output will reach $188 million. Providence County output is estimated to be $20 million and Rhode Island output is expected to be $27 million as a result of the streetcar construction.
- Between 1.4 and 5.5 million square feet of development attributable to the streetcar was estimated in the economic development analysis. Nearly 3 million square feet of development is anticipated in the most likely development scenario, with 1.5 million devoted to residential and 1.2 million to office development.
- Most of the development is expected to be in the Downcity and Jewelry District. The most likely level of development is estimated to result in 3,367 jobs and 2,242 residents.

APPENDIX A – DETAILED ASSUMPTIONS FOR DEVELOPMENT POTENTIAL ANALYSIS

Table A1: Vacancy Rates of Existing Buildings

	Most Likely	Low	High
College Hill			
Residential	5.0%	4.8%	8.0%
Retail	8.5%	8.2%	12.0%
Office	8.0%	7.8%	20.0%
Industrial	0.0%	0.0%	0.0%
Institutional	0.5%	0.0%	1.0%
Capital Center			
Residential	10.0%	9.0%	35.0%
Retail	15.0%	13.0%	21.0%
Office	20.0%	18.0%	25.0%
Industrial	0.0%	0.0%	0.0%
Institutional	0.5%	0.0%	1.0%
Downcity			
Residential	25.0%	15.0%	35.0%
Retail	15.0%	5.0%	22.0%
Office	14.0%	10.0%	20.0%
Industrial	0.0%	0.0%	0.0%
Institutional	0.5%	0.0%	1.0%
Jewelry District			
Residential	30.0%	15.0%	45.0%
Retail	15.0%	8.0%	20.0%
Office	16.0%	10.0%	31.5%
Industrial	10.0%	5.0%	20.0%
Institutional	10.0%	5.0%	15.0%

Table A2: Square Footage Multipliers for Existing Buildings

	Most Likely	Low	High
College Hill			
Residential	2.0	1.0	3.5
Retail	1.0	0.9	1.5
Office	2.0	1.0	3.5
Industrial	1.0	0.9	1.5
Institutional	1.5	1.0	4.0
Capital Center			
Residential	8.0	3.0	8.5
Retail	1.0	0.9	1.5
Office	8.0	3.5	9.0
Industrial	1.0	0.9	1.5
Institutional	3.0	1.0	5.0
Downcity			
Residential	5.0	1.5	7.0
Retail	1.0	0.9	1.5
Office	5.0	3.0	8.0
Industrial	1.0	0.9	1.5
Institutional	3.0	1.0	5.0
Jewelry District			
Residential	2.3	1.0	3.5
Retail	1.0	0.9	1.5
Office	2.3	1.0	4.5
Industrial	1.0	0.9	1.5
Institutional	2.3	1.0	3.0

Table A3: Vacant Land Square Footage Multipliers

	Mean	Low	High
College Hill			
Residential	2.0	1.0	3.5
Retail	1.0	0.9	1.5
Office	3.0	1.0	4.0
Institutional	2.0	1.0	4.0
Capital Center			
Residential	8.0	1.0	8.5
Retail	1.0	0.9	1.5
Office	8.0	3.5	9.0
Institutional	3.0	1.0	5.0
Downcity			
Residential	5.0	1.5	8.0
Retail	1.0	0.9	1.5
Office	5.0	3.0	9.0
Institutional	3.0	1.0	5.0
Jewelry District			
Residential	3.5	1.6	8.0
Retail	1.0	0.9	3.0
Office	5.0	2.5	9.0
Institutional	5.0	2.0	8.0

Table A4: Development of Existing Land Attributable to Streetcar

	Mean	Low	High
College Hill			
Residential	0%	0%	0%
Retail	8%	1%	12%
Office	5%	1%	12%
Industrial	5%	1%	12%
Institutional	5%	1%	12%
Capital Center			
Residential	15%	8%	30%
Retail	15%	8%	30%
Office	15%	8%	30%
Industrial	15%	8%	30%
Institutional	15%	8%	30%
Downcity			
Residential	20%	12%	35%
Retail	20%	12%	35%
Office	20%	12%	35%
Industrial	20%	12%	35%
Institutional	20%	12%	35%
Jewelry District			
Residential	30%	16%	40%
Retail	30%	16%	40%
Office	30%	16%	40%
Industrial	30%	16%	40%
Institutional	30%	16%	40%

Table A5: Development of Vacant Land Attributable to Streetcar

	Mean	Low	High
College Hill			
Residential	0%	0%	0%
Retail	10%	1%	12%
Office	5%	1%	12%
Industrial	5%	1%	12%
Institutional	5%	1%	12%
Capital Center			
Residential	10%	8%	30%
Retail	10%	8%	30%
Office	10%	8%	30%
Industrial	10%	8%	30%
Institutional	10%	8%	30%
Downcity			
Residential	20%	12%	35%
Retail	20%	12%	35%
Office	20%	12%	35%
Industrial	20%	12%	35%
Institutional	20%	12%	35%
Jewelry District			
Residential	25%	16%	40%
Retail	25%	16%	40%
Office	25%	16%	40%
Industrial	25%	16%	40%
Institutional	25%	16%	40%
I-195 Downcity Parcels			
Residential	20%	12%	30%
Retail	20%	12%	30%
Office	20%	12%	30%
Industrial	0%	0%	0%
Institutional	4%	2%	6%
I-195 Jewelry District Parcels			
Residential	25%	12%	30%
Retail	25%	12%	30%
Office	25%	12%	30%
Industrial	0%	0%	0%
Institutional	5%	2%	6%

APPENDIX B -- RISK ANALYSIS FRAMEWORK

Forecasts traditionally take the form of a single "expected outcome" supplemented with alternative scenarios. The limitation of a forecast with a single expected outcome is clear -- while it may provide the single best statistical estimate, it offers no information about the range of other possible outcomes and their associated probabilities. The problem becomes acute when uncertainty surrounding the forecast's underlying assumptions is material.

A common approach to bracket the central estimate is to create a "high case" and "low case" scenario. This scenario approach can exacerbate the problem of dealing with risk because it gives no indication of likelihood associated with the alternative outcomes. The commonly reported "high case" may assume that most underlying assumptions deviate in the same direction from their expected value, and likewise for the "low case." In reality, the likelihood that all underlying factors shift in the same direction simultaneously is just as remote as everything turning out as expected.

Another common approach to providing added perspective on reality is "sensitivity analysis." Key forecast assumptions are varied one at a time in order to assess their relative impact on the expected outcome. The problem here is that the assumptions are often varied by arbitrary amounts. A more serious concern with this approach is that, in the real world, assumptions do not veer from actual outcomes one at a time. It is the impact of simultaneous differences between assumptions and actual outcomes that is needed to provide a realistic perspective on the riskiness of a forecast.

Risk Analysis avoids the problems outlined above. Application of a risk analysis process (RAP) helps avoid the lack of perspective in "high" and "low" cases by measuring the probability or "odds" that an outcome will actually materialize. This is accomplished by attaching ranges (probability distributions) to the forecasts of each input variable. The approach allows all inputs to be varied simultaneously within their distributions, thus avoiding the problems inherent in conventional sensitivity analysis. The approach also recognizes interrelationships between variables and their associated probability distributions.

Assign Central Estimates and Conduct Probability Analysis

When conducting a risk analysis, each key factor or variable is assigned a central estimate and a range (a probability distribution) to represent the degree of uncertainty. In the following table, an example table is provided. The first column gives an initial median (most likely) estimate for retail jobs per square feet of space. The second and third columns define an uncertainty range representing a 90 percent confidence interval. This is the range within which there exists a 90 percent probability of finding the actual outcome. The greater the uncertainty associated with a forecast variable, the wider the range.

Example Data Sheet for Retail Jobs per Square Feet of Space

	Most Likely	Low Estimate	High Estimate
Jobs/Square Foot	1.7	1.2	2.5

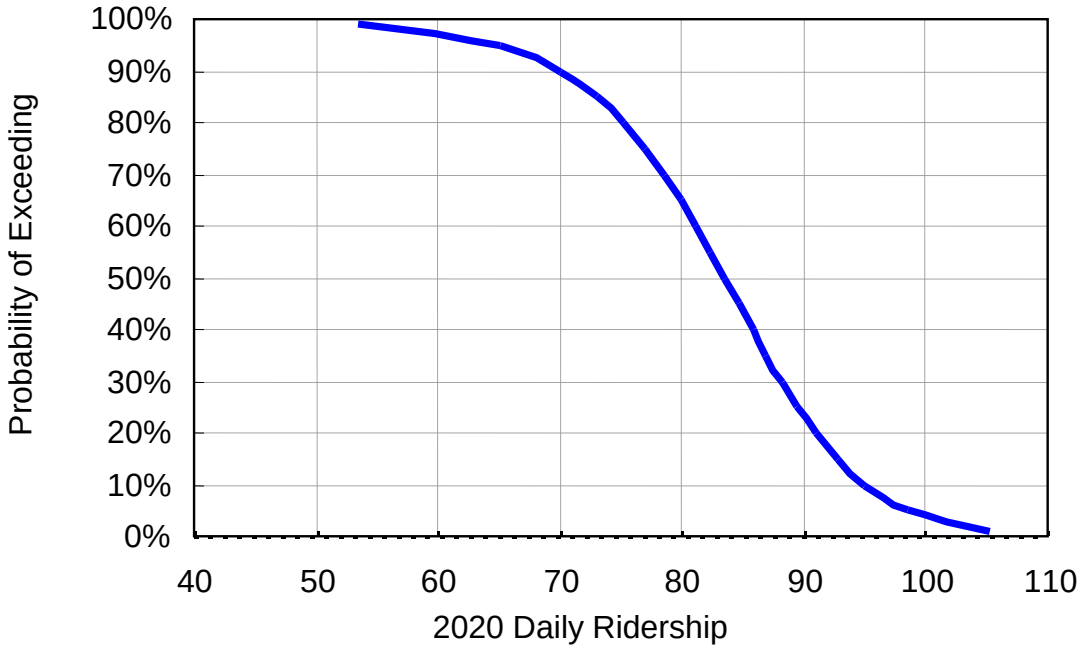
Probability ranges are established on the basis of both statistical analysis and subjective probability. Probability ranges need not be normal or symmetrical; that is, there is no need to assume the bell shaped normal probability curve. The bell curve assumes an equal likelihood of being too low and being too high in forecasting a particular value. For example, it may be the case that if a projected growth rate deviates from expectations, circumstances are such that it is more likely to be higher than the median expected outcome.

The RAP model transforms the ranges as depicted above into formal probability distributions (or "probability density functions"). This liberates the non-statistician from the need to appreciate the abstract statistical depiction of probability and thus enables stakeholders to understand the process whether or not they possess statistical training.

Issue Risk Analysis

The final probability distributions are formulated by the risk analyst with input and review by stakeholders. These are combined using a statistical simulation technique, commonly known as Monte Carlo analysis, which allows each variable and forecasting coefficient to vary simultaneously according to its associated probability distribution. The end result is a central forecast, together with estimates of the probability of achieving alternative outcomes given uncertainties in underlying variables and coefficients. Although the figures below are not based on RIPTA data, they do illustrate the risk analysis utilized in this economic development estimation.

Risk Analysis of Annual Average Daily Boardings, *an Illustration*



Risk Analysis of Annual Average Daily Boardings, *an Illustration*

Projected Traffic	Probability of Exceeding Value Shown at Left
105.3	0.01
98.4	0.05
94.9	**0.10**
91.0	0.20
88.2	0.30
85.8	0.40
83.5	**0.50**
81.2	0.60
78.5	0.70
75.2	0.80
71.3	**0.90**
65.0	0.95
53.5	0.99
82.9	**Mean Expected Outcome**