PAWTUCKET/CENTRAL FALLS
Commuter Rail Facility
Feasibility Study & Site Analysis

Submitted to

City of Pawtucket

Department of Planning and Redevelopment

Submitted by

VHB *Vanasse Hangen Brustlin, Inc.*

Supported by

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Washington, DC 20590

June 2007

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Vanasse Hangen Brustlin, Inc.

In association with

URS Corporation

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June 2007

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Introduction

The cities of Pawtucket and Central Falls are examining the feasibility of restoring Boston and Providence commuter rail service to the communities as a way of increasing mobility for travelers, addressing travel demand, providing access to economic opportunity, improving the environment and quality of life, and enhancing economic growth. The current study was initiated with funding from the Federal Transit Administration (FTA), the Federal Highway Administration (FHWA), the Rhode Island Department of Transportation (RIDOT), and Transit-Oriented Development (TOD) Grant funds. The focus of the study was to determine the operational feasibility of restoring commuter rail service to Pawtucket/Central Falls; evaluate alternative sites for a commuter rail stop and the impact of those sites on surrounding neighborhoods; and develop a conceptual design for the preferred alternative.

History

Pawtucket and Central Falls are two former mill towns, with a long history of railroad usage. By the late 1800s, rail service to the two cities had been established on the Boston & Providence Railroad line between Providence and Boston. In the early 1900s, the New York, New Haven, & Hartford Railroad realigned the tracks to their present right-of-way through the area and constructed a station straddling both the tracks and the city line between Pawtucket and Central Falls. This station opened in 1916 and continued in service until 1959, when the station building was closed.

Commuter rail service to Pawtucket and Central Falls continued until 1987, when it was terminated because the MBTA decided to end service on the Providence line between South Attleboro and Providence stations. Since that time, the station has fallen into disuse and disrepair. There is no transit service between Pawtucket/Central Falls and Boston, while buses serve riders between the cities and Providence. Despite the fact that 30 MBTA trains pass through Pawtucket and Central Falls every day on the Northeast Corridor to Providence, the cities have no direct rail service.

Project Background

The cities of Pawtucket and Central Falls obtained grant funding from the FTA, FHWA, and RIDOT to determine the possibility of restoring commuter rail service to these communities. In order to address the first step of the FTA process, the cities undertook this study to identify and screen alternative locations for a commuter rail stop. Two sites were identified as possible locations for a commuter rail facility in Pawtucket/Central Falls, referred to as the former station site and the rail yard site.

Former Station Site

The former station site (Figure 1-1) consists of the site of the former commuter rail stop, where service was provided until 1987. The site is a bounded by Broad Street to the west, Barton Street to the south, Montgomery Street to the east, and Clay Street to the north. It is almost evenly divided between the cities of Pawtucket and Central Falls. The railroad right-of-way bisects the site, running from the southwest corner to the northeast corner. Including the right-of-way, the area is about 3.52 acres. The parcel is currently in private ownership.

There are three tracks running through the right-of-way in the vicinity of the former station site. The tracks are depressed with respect to the site, passing underneath Barton Street and Clay Street. The FRIP track is used by freight trains. The other two tracks are passenger rail tracks, used by Amtrak and the MBTA, and are referred to as the mainline tracks. The FRIP track occupies the west side of the right-of-way. The southbound mainline track runs in the middle, and the northbound mainline track runs on the east side of the right-of-way.

Historically, the area beneath the station was a four-track right-of-way. The two mainline tracks were in the center of the right-of-way. Along the east side of the right-of-way was the inbound station track, and along the west side of the right-of-way was the outbound station track. As part of Amtrak's Northeast Corridor Electrification Project, the northbound mainline track was moved to the east side of the right-of-way, to the location of the former inbound station track.

The existing station building straddles the right-of-way, resting on a concrete slab supported by retaining walls on either side of the right-of-way and two rows of steel columns between the tracks. One row of columns is between the FRIP and southbound mainline tracks; the other is between the two

mainline tracks. The building was not in use at the time of this writing. In the northwest corner of the site is an abandoned gas station. The remainder of the site is paved.

The area surrounding the site is mainly residential, consisting mostly of single and multi-family detached houses, with some apartment buildings, including one high rise development. Interstate 95 (I-95) is located about ¾ of a mile east of the site.

■

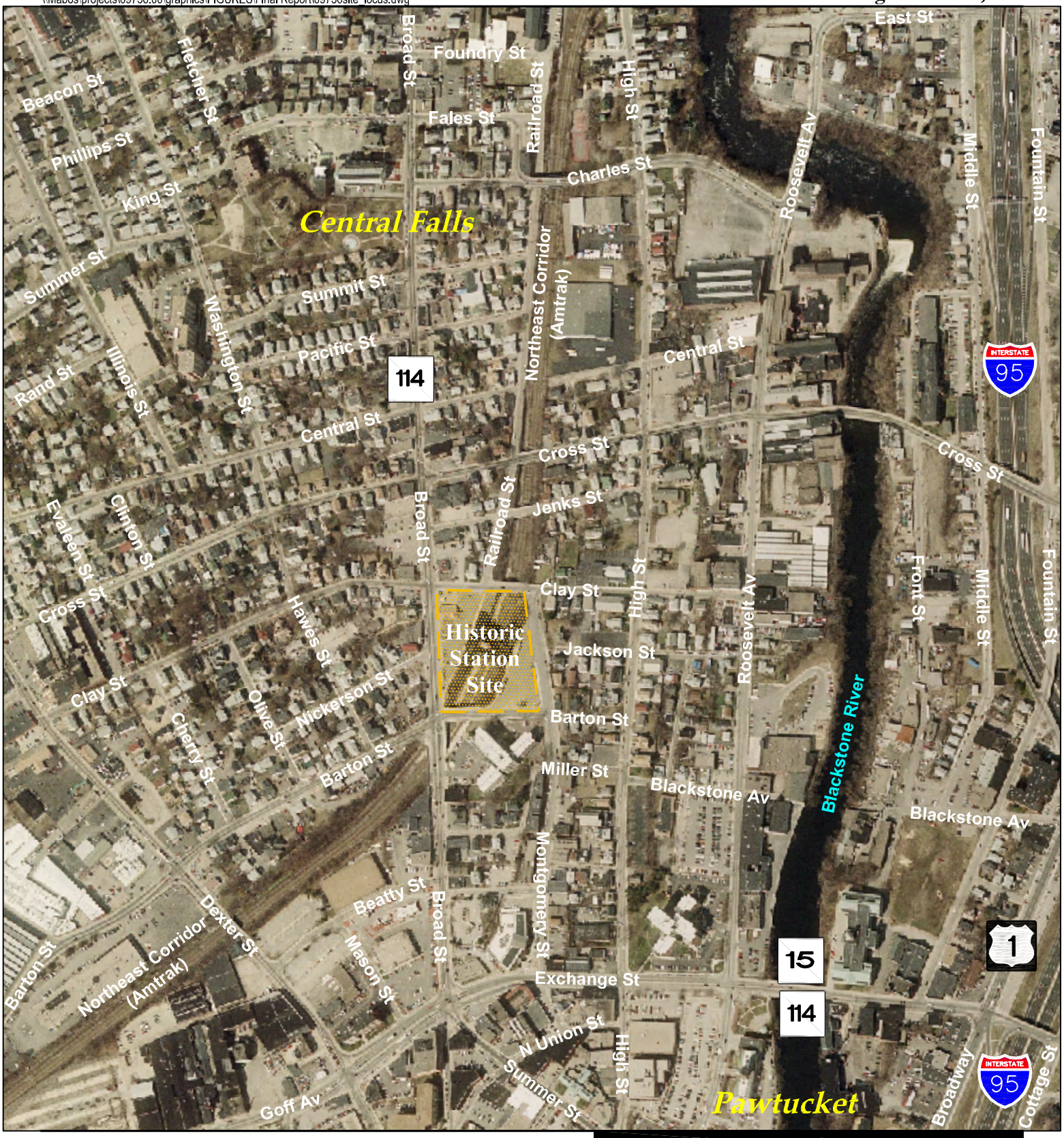
Rail Yard Site

The second alternative consists of an active rail yard owned by the Providence & Worcester Railroad (Figure 1-2). The site is a triangle bounded by the right-of-way to the northwest, the Mineral Spring Cemetery to the south, Pine Street to the east, and commercial/industrial developments to the south and east. It is located entirely within the City of Pawtucket, about one-half mile southwest of the former station site. The parcel, excluding the abutting right-of-way, is about 7.52 acres.

The track configuration at the rail yard site is the same as at the former station site, with the exception that the tracks are approximately at grade with the rail yard. The FRIP track is on the west side of the right-of-way, further from the site than the mainline tracks on the eastern side. The rail yard site is at a signal block boundary on the mainline tracks.

The majority of the site is occupied by railroad tracks. A small remnant of the former freight house building that has been partially demolished, a smaller, abandoned structure, and several loading docks in various states of disrepair are also on the site.

The surrounding area is mainly commercial and industrial, including several warehouse buildings. The nearest residential areas are to the southwest on the opposite side of the Mineral Springs Cemetery, and to the west a few blocks on the other side of the right-of-way. The rail yard site is also accessible from I-95 located, about 1 mile east.



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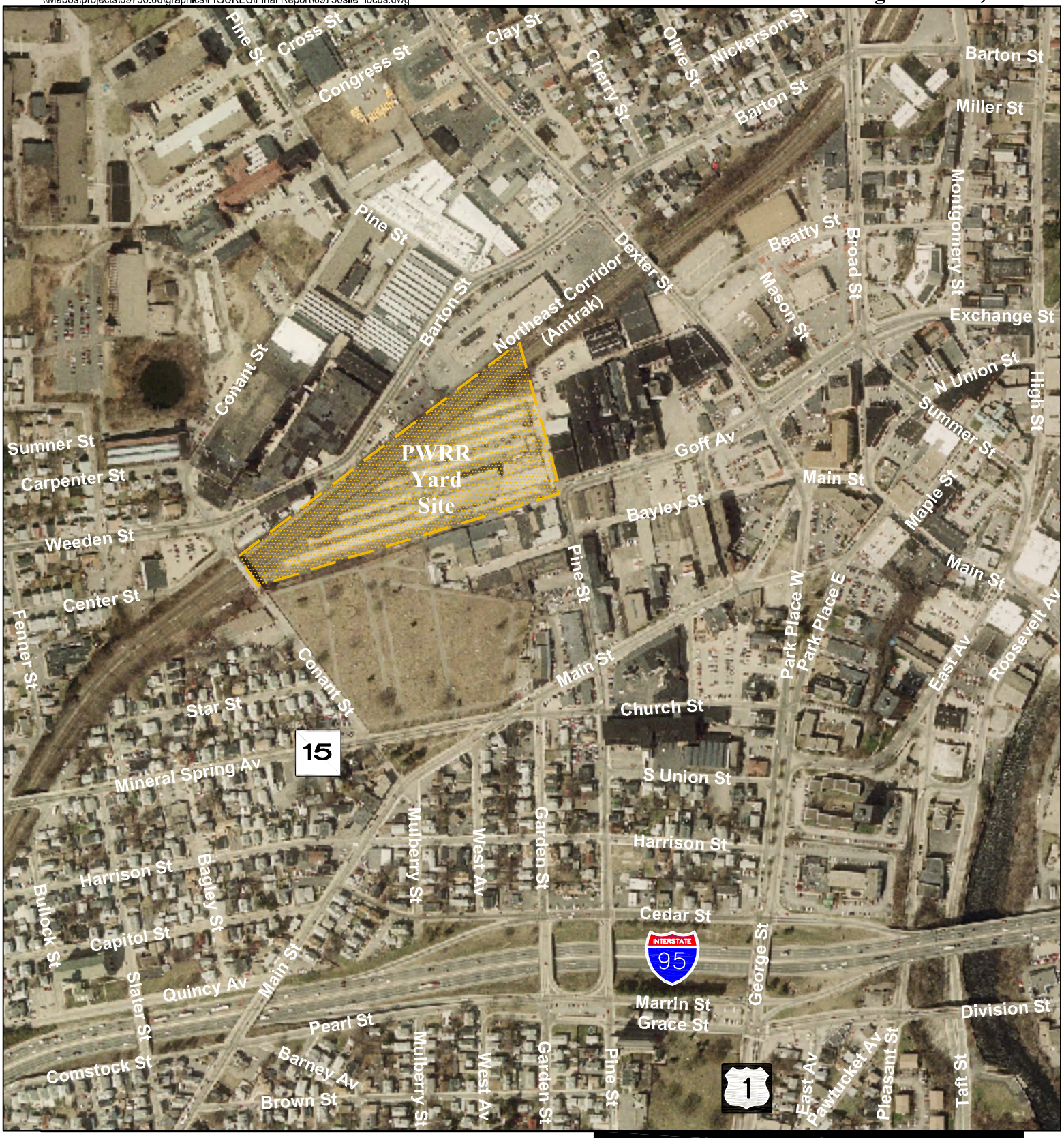
Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 1-1

Former Station Site
Locus Map



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Pawtucket/Central Falls Commuter Rail Facility
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Figure 1-2

Rail Yard Site
Locus Map

Study Goals and Objectives

The study was comprised of three major phases, each corresponding to one major question to be answered in the study:

- Phase I: Is it operationally feasible to restore commuter rail service to Pawtucket/Central Falls?
- Phase II: Which of the two alternative sites for a commuter rail stop provides the best opportunities for rail service and community development?
- Phase III: What would the design of a commuter rail facility at the preferred site look like, and how would it impact the community?

Phase I, the service feasibility analysis, included several tasks. First, it attempted to determine whether it is operationally practicable to stop commuter trains at a station in Pawtucket/Central Falls without adverse impacts to existing rail operations. It also evaluated whether a station would attract sufficient ridership to justify a station stop. Phase I also included a structural assessment of the existing substructure at the former station site and environmental assessments of both site alternatives. The results from these tasks will determine the viability of commuter rail service to Pawtucket/Central Falls.

Phase II, the evaluation of the two alternative sites, identified the preferred site for a commuter rail stop in Pawtucket/Central Falls. Phase II tasks included establishing design criteria and generating schematic designs for both sites. Evaluation criteria were established to be used to compare the two site alternatives. The comparison resulted in the identification of a preferred alternative.

Phase III, the evaluation of the preferred alternative, included the design of a concept plan for the preferred alternative. Based on the concept plan and information on the surrounding communities, environmental impacts were identified, transit-oriented development (TOD) opportunities were assessed, and a financial analysis was performed to analyze funding strategies. Finally, a development and implementation plan was established.

Report Organization

This report is organized into fourteen chapters and a set of appendices.

Chapter 1 presents an overview of the study, a history of rail service to Pawtucket/Central Falls, the goals and objectives of the study, and a description of the alternative sites.

Chapter 2 summarizes the public outreach process that was undertaken as part of the study.

Phase I Tasks

Chapter 3 presents the conclusions of the operations analysis, including a description of existing services, identification of potential issues, and a draft operating plan.

Chapter 4 presents the results of the ridership analysis, including prior studies and the analysis methodology.

Chapter 5 discusses the design criteria that were developed for a commuter rail facility in Pawtucket/Central Falls, including railroad infrastructure elements, architectural elements, and site design elements.

Chapter 6 summarizes the structural evaluation of the existing concrete slab spanning the tracks at the former station site, as well as the substructure supporting the slab.

Phase II Tasks

Chapter 7 presents a conceptual assessment of the former station site alternative, including a schematic layout, operational impacts, traffic impacts, environmental impacts, and costs.

Chapter 8 presents a conceptual assessment of the rail yard site alternative, including a schematic layout, operational impacts, traffic impacts, environmental impacts, and costs.

Chapter 9 explains the screening process, introduces the screening criteria, and presents the results of the screening, identifying the preferred alternative.

Phase III Tasks

Chapter 10 presents a conceptual site design of the preferred alternative, including operational impacts, traffic impacts, environmental impacts, and financial analysis.

Chapter 11 discusses transit-oriented development opportunities at the preferred site alternative.

Chapter 12 lays out a development and implementation plan for the next steps of the project.

2

Public Outreach

As part of the study, the team undertook a program of public outreach to provide information to and get input from the various affected parties, including abutting landowners, neighborhoods around the sites, and existing service providers on the Northeast Corridor (NEC).

Overview

Pawtucket and Central Falls are densely developed urban environments, and the NEC is one of the busiest rail corridors in the nation. The restoration of commuter rail service to Pawtucket/Central Falls, the location of the commuter rail facility, and the design of that site will likely have impacts on residents and businesses in the communities and on existing rail services on the NEC. The impacted parties can be broadly divided into two categories: stakeholders, who have a vested interest in the project, and the general public, which includes anyone who has a general interest in the project.

Stakeholders include existing service providers, such as the Massachusetts Bay Transportation Authority (MBTA), Amtrak, and the Providence & Worcester Railroad (PWRR). Other stakeholders include public agencies involved in the project, such as the Rhode Island Department of Transportation (RIDOT) and the municipal governments themselves. Community groups and owners of the alternative sites have a stake in the project, because the station might affect their community or private development activities.

The general public includes any interested party not directly affected by the project. The general public includes both neighborhood residents and community businesses.

Outreach Program

The outreach program consisted of five main elements:

- Formation of and meetings with a Stakeholder Committee
- Meetings with railroads operating on the NEC in the project vicinity
- Public meetings at key stages of the study process
- Transit-oriented development workshops in abutting neighborhood
- Availability of information through the City of Pawtucket website

The Stakeholder Committee was composed of members representing an array of community groups, government entities, railroads, and other privately held interests. Over the course of the study, the committee met four times. The following is a list of the meeting dates and the purpose of each meeting:

- Stakeholder Committee Meeting #1: April 11, 2006: To introduce the project, explain the three phases of the study, and initiate the Stakeholder Committee and explain its role in and contribution to the process.
- Stakeholder Committee Meeting #2: October 3, 2006: To present the results of Phase I activities, explain in detail Phase II tasks, and solicit input and questions concerning Phase I results and Phase II tasks.
- Stakeholder Committee Meeting #3: December 4, 2006: To present the results of Phase II activities, and introduce and discuss the concept plan for the preferred alternative.
- Stakeholder Committee Meeting #4: May 29, 2007: To present the results of Phase III activities, including 10% concept design and costs, and discuss next steps.

Minutes from the Stakeholder Committee meetings are included in Appendix A of this report.

Separate from the meetings held with the stakeholder committee, other meetings were held with railroad companies to discuss operational concerns and technical issues regarding the establishment of a commuter rail station in Pawtucket/Central Falls. The following is a list of the meeting dates and the purpose of each meeting:

- Railroad Stakeholder Meeting #1: February 23, 2006: With RIDOT, to discuss coordination of service to Pawtucket/Central Falls with RIDOT plans for service to Warwick, Wickford Junction, and South County.

- Railroad Stakeholder Meeting #2: March 13, 2006: With MBTA, to discuss MBTA concerns regarding commuter rail service to Pawtucket/Central Falls.

- Railroad Stakeholder Meeting #3: March 16, 2006: With Amtrak, to discuss Amtrak concerns about commuter rail service to Pawtucket/Central Falls and any impact on Amtrak intercity service.

- Railroad Stakeholder Meeting #4: April 25, 2006: With P&W, to discuss PWRR concerns regarding the impact of a commuter rail station in Pawtucket/Central Falls on freight service on the NEC.

- Railroad Stakeholder Meeting #5: June 5, 2006: With MBTA, Amtrak, and PWRR, to discuss conflicting and parallel concerns of the three operators of existing NEC service regarding the establishment of a commuter rail station in Pawtucket/Central Falls.

- Railroad Stakeholder Meeting #6: September 21, 2006: With MBTA, Amtrak, and PWRR, to discuss conflicting and parallel concerns of the three operators of existing NEC service regarding the establishment of a commuter rail station in Pawtucket/Central Falls.

Minutes from the railroad stakeholder meetings are included in Appendix A of this report.

The team also held four public meetings to involve the broader community at critical stages of the study process. The meetings were advertised through outlets such as local newspapers, flyers posted at public buildings and transit facilities, and the City of Pawtucket website. The following is a list of the meeting dates and the purpose of each meeting:

- Public Meeting #1: May 18, 2006: To introduce the project, explain the three phases of the study, and initiate public involvement in the process.

- Public Meeting #2: October 24, 2006: To present the results of Phase 1 activities, explain in detail Phase II tasks, and solicit input and questions concerning Phase I results and Phase II tasks.

- Public Meeting #3: February 13, 2007: To present the results of Phase II activities, and introduce and discuss the concept plan for the preferred alternative.

- Public Meeting #4: June 7, 2007: To present the results of Phase III activities, including 10% concept design and costs, and discuss project next steps.

Minutes from the public meetings are included in Appendix A of this report.

In addition, two community workshop-style meetings were held to discuss neighborhood concerns and transit-oriented development opportunities at and around the preferred station site. These workshops were advertised through local newspapers, flyers, the City of Pawtucket website, and direct contact with community organizations. The following is a list of the meeting dates and the purpose of each meeting:

- Community TOD Workshop #1: May 10, 2007: To provide the community an opportunity to learn about and comment on the proposed station and its effect on the neighborhood. To encourage community participation, child care, translation services, and refreshments were provided.

- Community TOD Workshop #2: May 24, 2007: To address the comments and concerns provided by the community at the first workshop, and to provide examples of successful transit-oriented development at other locations. Child care, translation services, and refreshments were provided.

Information about the project was also made available on the City of Pawtucket website. This information included meeting notices, presentations, and minutes; project information such as maps; and contact information for the public to provide questions or comments.

3

Operations

The first issue that must be addressed as part of Phase I of this feasibility study is whether commuter trains can once again service a Pawtucket/Central Falls commuter rail facility. If it is not operationally feasible to stop trains, there is no reason to estimate ridership or evaluate alternative sites. As previously discussed in Chapter 1, it has been over 25 years since commuter rail trains last stopped in Pawtucket/Central Falls. Over that period of time, a number of changes have taken place on the rail lines that pass through the two alternative station locations. The two biggest changes were the program to electrify the mainline tracks, allowing high-speed intercity passenger rail service to be initiated in 2000, and the relocation of the eastbound mainline track from the center of the right-of-way to the east side of the right-of-way in the area of the former Pawtucket/Central Falls station building.

This chapter documents the preliminary operational analysis that was conducted to examine the operational feasibility of commuter rail service at either of the two alternative station sites.

Existing Conditions

The two alternative station sites are located within one mile of each other on Amtrak's high-speed Northeast Corridor (NEC). This corridor is one of the most heavily used mixed traffic (intercity, commuter, and freight rail) corridors in the entire nation. The NEC extends from Washington, DC to Boston, MA, a distance of approximately 460 miles. Amtrak owns, maintains, and operates much of the corridor, including the area within Pawtucket and Central Falls. Amtrak acquired ownership of major segments of the NEC in 1976, during the creation of Conrail, as part of the restructuring of the northeast freight rail system following the financial collapse of Penn Central Railroad and six other northeast and midwest rail corporations.

The former Pawtucket/Central Falls Railroad Station is located at milepost 189.9 along the NEC. The tracks are located in a cut section with the station

building spanning the right-of-way. Formerly, there were four tracks through the station area – two main line tracks located in the center of the right-of-way, between the steel columns supporting the station, and two outside tracks, one on each side. Two island platforms separated the tracks – one platform was located between the eastbound (northbound) main line track and the easterly station track and the second platform was located between the westbound (southbound) main line track and the westerly most station track. The track arrangement was modified as part of the Northeast Corridor Improvement Program (NECIP). The eastbound main line has been relocated to the east side of the right-of-way. The westbound main line is centered within the area between the two station platforms. The third track, located along the west side of the right-of-way, is the Freight Rail Improvement Project (FRIP) track, also known as Track 7. Figure 3-1 illustrates the existing track layout at the former station site. At the time this picture was taken in 2005, the FRIP track, at the left side of the right-of-way, was still under construction.

Figure 3-1: Existing Track Layout – Former Station Site

The PWRR Pawtucket Yard site is located at MP 188.5. There are three corridor tracks in this area: two mainline tracks and the FRIP track (Track 7). The two mainline tracks and the FRIP track are slightly lower than the yard

tracks. Figure 3-2 illustrates the existing track layout at the PWRR Pawtucket Yard.

To help relieve congestion on the NEC in Rhode Island, RIDOT worked closely with Amtrak and PWRR to install an additional 22 miles of track and signals between Quonset Point in North Kingstown and the Boston Switch in Central Falls. The completed FRIP provides a third track, allowing for bi-directional operations of freight traffic from Quonset to Worcester. This has improved the reliability as well as the capacity on the line and allow the freight companies to better promote the services they can provide to local businesses. The FRIP is a significant component of the State of Rhode Island's plans to extend commuter rail service south of Providence to the soon to be developed Warwick Intermodal Station and Wickford Junction Station.

Figure 3-2: Existing Track Layout – PWRR Yard Location

Rail traffic through the two station sites is comprised of Amtrak intercity, MBTA commuter rail, and PWRR freight trains. The following sections provide a summary of the three existing services.

■

Amtrak

Amtrak operates both high speed and regional intercity passenger rail service along the NEC through Pawtucket/Central Falls. Amtrak's operation is focused on providing intercity service between Boston, New York City, and Washington DC. On a typical weekday, Amtrak operates 17 trains in each direction (34 total trains). Of the 34 weekday daily trains, 16 are high speed and 18 are regional service trains. During a typical weekday morning, the predominant flow of Amtrak trains through Pawtucket/Central Falls is from Boston towards New York. There is only one northbound Amtrak train scheduled through the area between 5:00 and 9:00 AM and a total of only four trains before 12 noon. In the late afternoon, the service is more balanced with seven trains (four southbound and three northbound) between 3:30 and 6:00 PM.

■

MBTA

The MBTA operates commuter rail service along the NEC through Pawtucket/Central Falls. The MBTA operation is focused on providing local service between Providence and Boston. On a typical weekday, the MBTA operates 15 trains in each direction (30 total trains). During the weekday morning commute period, the MBTA operates seven trains from Providence to Boston (5:00 – 9:00 AM departure times). In the evening, six trains operate from Boston to Providence (3:30 – 7:00 PM departure times). The MBTA has recently expanded weekend service to Providence, consisting of nine trains in each direction on Saturday and seven in each direction on Sunday.

■

PWRR

The PWRR operates both through and local freight service along the NEC through the two alternative sites. As of June 2006, the PWRR operated two weekday trips in each direction. PWRR operations are primarily along Track 7 or on their own tracks. Access to the NEC is determined by Amtrak. PWRR expects train traffic to increase significantly when Track 7 (FRIP track) is connected at Davisville.

Operational Considerations

The four stakeholders with direct and indirect control of the rail line and services were consulted to help identify the primary operational considerations. Through a series of five meetings, representatives of RIDOT, Amtrak, the MBTA, and the PWRR discussed their concerns and issues. Each one of these stakeholders has differing needs and goals, all of which must be carefully considered so as not to significantly impact each other. As described in the previous section, the multiplicity of users, frequency of service, variation in train speeds, track and station limitations, and peak hour congestion points combine to make the NEC an extremely complex and fragile operation.

The operational considerations identified include:

- Service at Pawtucket/Central Falls would have to be designed such that it does not adversely impact existing passenger and freight rail service.
- Amtrak does not want commuter rail trains stopping on the mainline tracks because of the potential for cascading delays to high speed and regional intercity service.
- Both the MBTA and PWRR expressed concerns about capacity on the FRIP track (Track 7). Both feel that commuter trains should not operate on Track 7 the entire way from Providence to Pawtucket/Central Falls and that Track 7 should not be used to operate commuter rail service.
- PWRR raised the issue of platform clearances if commuter trains stop on the FRIP track. Platform clearance refers to the distance between the edge of the train and the edge of the platform.
- The MBTA schedule should not be negatively impacted. The existing schedule between Boston South Station and South Attleboro should not be changed, and the schedule must allow sufficient time for trains to turn for the return trip from Providence to Boston.

A Pawtucket/Central Falls stop would add approximately 3 to 4 minutes to the MBTA Providence schedule, causing minimal changes to the commuter rail service. Those same 3 to 4 minutes, however, could result in significant impacts to Amtrak service. The signaling system on the NEC is built to operate high-speed trains. To safely operate at high speeds, approximately 15,000 feet (about 3 miles) must be cleared ahead of the high-speed train. This means that a high-speed train (Acela Express) cannot follow a train any closer than this distance while maintaining the Maximum Authorized Speed (MAS). When trains travel at 150 MPH, which occurs in Massachusetts between East Junction (MP 194.5) and Sharon Heights (MP 210.5), they travel

a distance of approximately 7 ½ miles in three minutes. Previous studies concluded that following movements (high-speed train to slower commuter rail trains and visa versa) require a minimum 15-minute window between trains. Currently, Amtrak and the MBTA are able to manage the windows well, but it is a delicate task. The addition of three minutes to a Providence commuter rail train will need to be carefully orchestrated and may ultimately require slight changes in operating times for each of the services.

Draft Operating Plan

The operational considerations summarized in the previous section were used to help develop the initial operating concept for a Pawtucket/Central Falls stop. The concept developed, which includes track changes in addition to the draft schedule, is valid for both station location alternatives.

Based on an initial review of the operational considerations and the Amtrak (Spring 2006) and MBTA (June 2006) timetables, the following general conclusions were developed:

- The issue of stopping commuter trains on the main line appears to be less of a concern during the morning peak period than during the evening peak period. In the morning, the only northbound Amtrak train is No. 66, the overnight train from Washington. Otherwise, there does not appear to be any potential conflict between inbound commuter and Amtrak trains during this period.

- There would be more potential for conflicts during the evening peak period. The Amtrak schedule has two southbound Acela Express trains (2171, 3:15 PM departure from Boston and 2175, 5:20 PM) and two outbound regional trains (175, 4:20 PM and 177, 5:35 PM).

The draft schedule and associated string line diagrams were developed with the following assumptions and guidelines:

- To account for a stop in Pawtucket/Central Falls, three minutes were added to the Providence end of the trip (inbound trains were adjusted to leave Providence three minutes earlier; outbound trains were adjusted to arrive in Providence three minutes later).

- The draft operating plan was based on Amtrak's Spring 2006 schedule and the MBTA's June 2006 draft schedule. It is important to note that this latest MBTA schedule extends all service to Providence station.

- The MBTA's standard turn time is 20 minutes; the minimum acceptable turn time is 10 minutes. Turn time is the time required for a train crew to end an outbound run, switch out, and start an inbound run.

- The maximum authorized speed (MAS) on the two mainline tracks is generally 70 MPH through the two station sites.

- Three types of potential conflicts were identified:

  - Any scheduled departure of an MBTA train from Providence that was 10 minutes or less in front of an Amtrak train

  - Any scheduled arrival of an MBTA train in Providence that was 10 minutes or less in front of an Amtrak train.

  - Turn times of less than 10 minutes

- When potential conflicts or schedule issues arose, it was decided that the commuter train in question would not stop at Pawtucket/Central Falls.

The draft schedule and string diagrams representing operations are presented in Figures 3-3 and 3-4. The proposed schedule has the following features:

- Of the seven trains departing Providence during the morning peak (5:00 – 9:00 AM), all but one (No. 810) would stop at Pawtucket/Central Falls.

- Of the six trains departing Boston during the afternoon peak (3:30 – 7:00 PM), all but one (No. 819) would stop at Pawtucket/Central Falls.

- Two outbound morning trips (Nos. 801 and 803) would provide service from Pawtucket/Central Falls to Providence.

- Two inbound afternoon trips (Nos. 822 and 824) would provide service from Providence to Pawtucket/Central Falls.

- A total of four inbound trips and three outbound trips, out of fifteen in each direction, would not stop at Pawtucket/Central Falls. Only one of these trips, No. 819, cannot stop due to a potential Amtrak conflict; all other trips would not be able to stop because of the need for adequate turn time.

- Inbound trains that would not stop include two morning trains (Nos. 810 and 814, departing Providence at 7:40 and 9:43), one early afternoon train (No. 820, departing Providence at 3:17), and one evening train (No. 826, departing Providence at 8:10).

- Outbound trains that would not stop include one late morning train (No. 805, departing Boston at 10:20), one early afternoon train (No. 809, departing Boston at 2:00), and one afternoon peak train (No. 819, departing Boston at 6:10).

This operating plan was developed to show that service to Pawtucket/Central Falls could be provided within the flexibility of the existing MBTA and Amtrak schedule. The operating plan does not preclude the future extension of MBTA service to TF Green Airport and South County (Warwick and Wickford Junction). This service would require extensive modificiations to the MTBA schedule, which would be coordinated with service to Pawtucket/Central Falls if implemented.

BOSTON - SOUTH STATION TO PROVIDENCE COMMUTER RAIL
DRAFT SCHEDULE WITH PROPOSED PAWTUCKET/CENTRAL FALLS STATION

INBOUND

Turn In Minutes							12		10			11			14			10		18			12				10			17		
Turn From	Yard1	Yard2	Yard3	Yard4		Yard5	801	Yard6	803			805			807			809		811			813				821			823		
Train Number	800	802	804	806	66	808	810	812	814	190	2150	816	170	2154	818	172	2158	820	174	822	86	2164	824	2166	176	2168	826	2170	94	828	2172	178
Stations																																
Providence	5.04	5.22	6.04	6.30	7.04	7.09	7.40	8.07	9.43	10.23	10.55	11.39	11.49	12.54	1.27	2.27	2.54	3.17	4.18	5.07	5.25	5.52	5.57	6.54	7.17	7.57	8.10	8.54	9.14	9.39	9.54	11.03
ORMS					7.05					10.24	10.56		11.50	12.55		2.29	2.55		4.19		5.26	5.53		6.55	7.18	7.58		8.55	9.15		9.55	11.04
LAWN					7.08					10.32	11.06		12.00	1.05		2.42	3.05		4.29		5.34	6.03		7.05	7.32	8.08		9.05	9.25		10.05	11.17
Paw/Central	5.10	5.28	6.09	6.35		7.15		8.13				11.45			1.33					5.14			6.03							9.45		
So. Attle	5.17	5.35	6.16	6.42		7.22	7.50	8.20	9.52			11.52			1.42			3.30		5.23			6.10				8.21			9.52		
HEBRONVILLE					7.13					10.36	11.09		12.05	1.08		2.47	3.08		4.34		5.38	6.06		7.08	7.36	8.14		9.11	9.30		10.08	11.21
Attleboro	5.27	5.45	6.28	6.52		7.32	7.58	8.30	10.02			12.02			1.51			3.41		5.33			6.18				8.29			10.08		
Back Bay	6.15	6.35	7.14	7.40	7.47	8.11	8.44	9.18	10.50	11.00	11.31	12.50	12.28	1.30	2.33	3.10	3.30	4.18	4.58	6.18	6.15	6.28	6.58	7.30	8.00	8.33	9.08	9.30	9.54	10.50	10.30	11.45
So. Station	6.20	6.40	7.19	7.45	7.52	8.16	8.49	9.23	10.55	11.05	11.36	12.55	12.33	1.35	2.38	3.15	3.35	4.23	5.03	6.23	6.20	6.33	7.03	7.35	8.05	8.38	9.13	9.35	9.59	10.55	10.35	11.50

OUTBOUND

Train Number	2151	95	2153	801	2155	171	803	2159	93	805	2163	173	807	2167	137	809	2171	811	175	813	815	2175	177	817	819	179	821	823	825	67	827	829
Stations																																
So. Station	5.15	6.05	6.15	6.25	7.15	8.20	8.30	9.15	9.35	10.25	11.15	11.40	12.05	1.15	1.40	2.00	3.15	3.45	4.20	4.35	5.00	5.20	5.35	5.40	6.10	6.40	6.50	8.15	9.05	9.45	10.25	11.59
Back Bay	5.20	6.10	6.20	6.30	7.20	8.25	8.35	9.20	9.40	10.30	11.20	11.45	12.10	1.20	1.45	2.05	3.20	3.50	4.25	4.40	5.05	5.25	5.40	5.45	6.15	6.45	6.55	8.20	9.10	9.50	10.30	12.04
Attleboro				7.10			9.15			11.12			12.54			2.48		4.31		5.24	5.49			6.26	6.55		7.41	9.03	9.53		11.13	12.47
HEBRONVILLE	5.41	6.35	6.41		7.41	8.51		9.41	10.05		11.41	12.10		1.41	2.10		3.41		4.49			5.46	6.05			7.09				10.14		
So. Attle				7.16			9.21			11.19			1.01			2.58		4.37		5.33	5.57			6.33	7.02		7.48	9.10	10.00		11.20	12.55
Paw/Central				7.22			9.27						1.07							5.39	6.03			6.39			7.54	9.16	10.06		11.26	1.01
LAWN	5.44	6.38	6.44		7.44	8.54		9.44	10.09		11.44	12.14		1.44	2.14		3.44		4.50			5.49	6.09			7.13				10.18		
ORMS	5.46	6.41	6.46		7.46	8.56		9.46	10.11		11.46	12.16		1.46	2.16		3.46		4.55			5.51	6.11			7.15				10.20		
Providence	5.50	6.55	6.50	7.28	7.50	9.01	9.33	9.50	10.16	11.28	11.50	12.21	1.13	1.50	2.21	3.07	3.50	4.46	5.00	5.45	6.09	5.55	6.16	6.45	7.11	7.20	8.00	9.22	10.12	10.25	11.33	1.08
Turn To				810			814			816			818			820		822		824	Yard1			Yard2	Yard3		826	828	Yard4		Yard5	Yard6

All Trains Terminating at Providence 3 Minutes Added
All Trains Originating at Providence 3 Minutes Subtracted

	To Boston	To Prov.
AM Peak	4	1
AM Shoulder	2	0
PM Peak	2	4
PM Shoulder	0	2
Total Trips	15	15

All Amtrak Trains	
All MBTA Trains	
Tight Headway	
No Stop at Paw/Cent	

Based Upon Amtrak NEC Timetable No. 1 Effective April 24, 2006
Based Upon MBTA Commuter Rail Schedule draft of June 2006

Figure 3-3
Draft Operating Plan

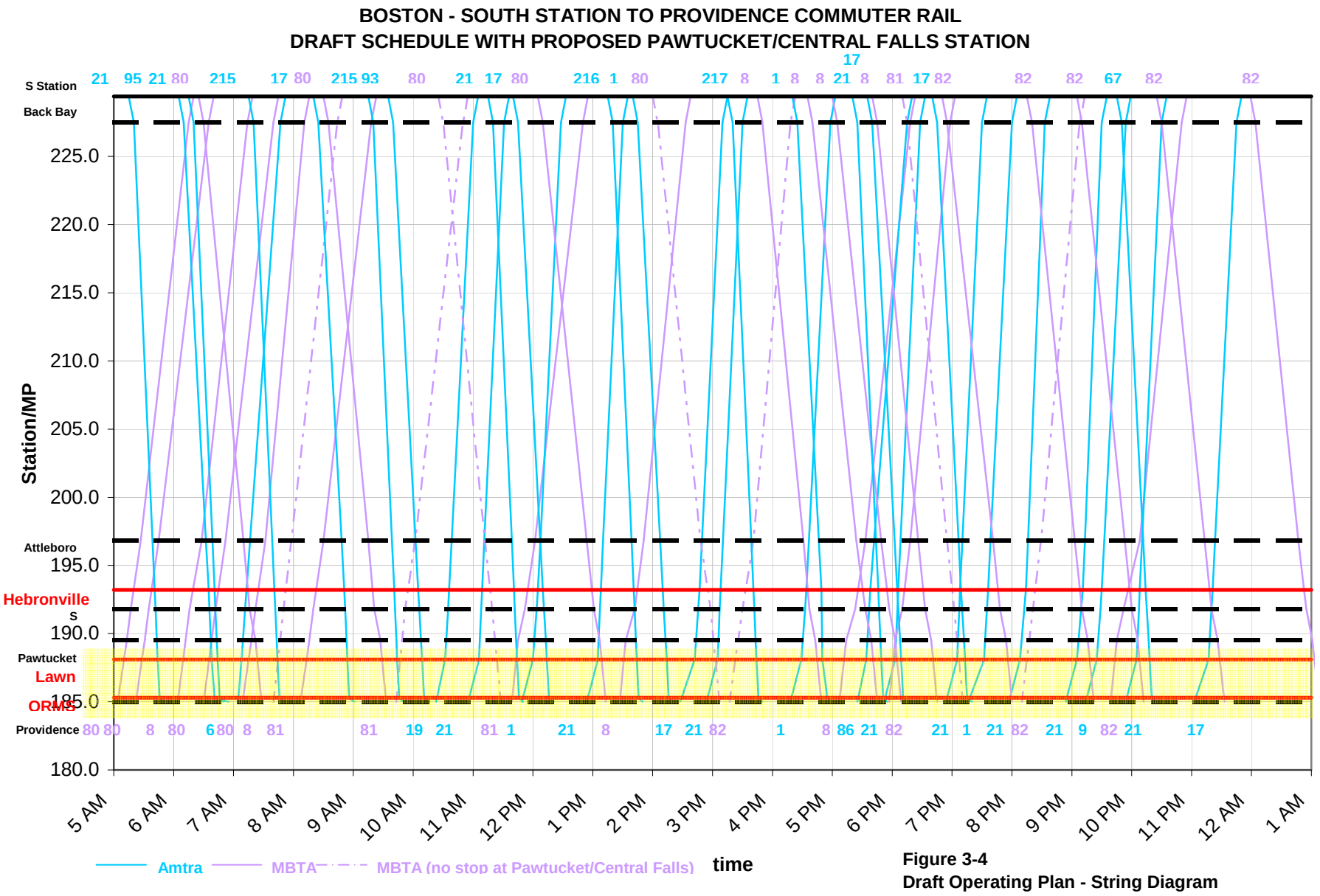


Figure 3-4
Draft Operating Plan - String Diagram

4

Ridership

A ridership analysis was performed as part of the Phase I analysis to demonstrate that a commuter rail stop in Pawtucket/Central Falls would attract sufficient ridership to justify providing a significant level of service.

In 2003, an initial assessment of the ridership potential for a Pawtucket/Central Falls commuter rail facility was completed[1]. This initial assessment, developed for the Pawtucket Foundation, identified a range of 789 to 919 weekday daily boardings for the 2000 base year. The forecasts were for a Pawtucket/Central Falls to Boston market. The initial assessment did not consider the Pawtucket/Central Falls to Providence or South County markets.

This chapter describes the methodology used to develop a revised preliminary ridership forecast for the proposed project. The revised methodology considers the Providence and T.F. Green markets as well as the Boston market. It presents a summary of the methodology, a comparison of the Boston market ridership between the initial assessment and the current forecasting effort, and finally the revised forecasts produced for the current study effort.

Methodology

The Quick-Response method described in the National Cooperative Highway Research Program (NCHRP) Report 187, Quick-Response Urban Travel Estimation Techniques and Transferable Parameters and NCHRP 365, Travel Estimation Techniques for Urban Planning was used as the basis for preparing the revised preliminary ridership forecasts. This method compares utilities (times and costs) of competing modes to determine a modal split. The Quick-Response or similar methods have been used for developing passenger forecasts for transit projects by public agencies nationwide.

▼

[1] *Proposal for a Central Falls/Pawtucket Multi-Modal Transportation Center*, Prepared by the Pawtucket Foundation, February 2003

Ridership was projected to 2030 to be consistent with Federal Transit Authority (FTA) planning policy. The forecasting process employed to develop projected 2030 ridership for the study included the identification of work trips between origins and destinations, capture areas, impedances, and travel times. The major sources of data used in the analysis include:

- 2000 Census
- 2000 Journey to Work data
- Rhode Island Statewide Model
- Central Transportation Planning Staffs Regional Model
- Rhode Island Public Transit Authority Schedules
- Massachusetts Bay Transportation Authority Fare Structure and Schedules

The origin and destination capture areas were defined and then examined to determine the potential number of daily work trips and total trips that could be generated. Capture areas are the geographic regions surrounding a station where potential transit users either live or work. Impedances are variables that affect the cost and/or convenience of travel by any given mode, and thus influence the likelihood that people will use that mode. For the current ridership projections, impedances such as travel time, wait time, and parking cost were defined. Travel times were estimated and used in conjunction with the impedance data and capture area trip making characteristics to project transit ridership.

■

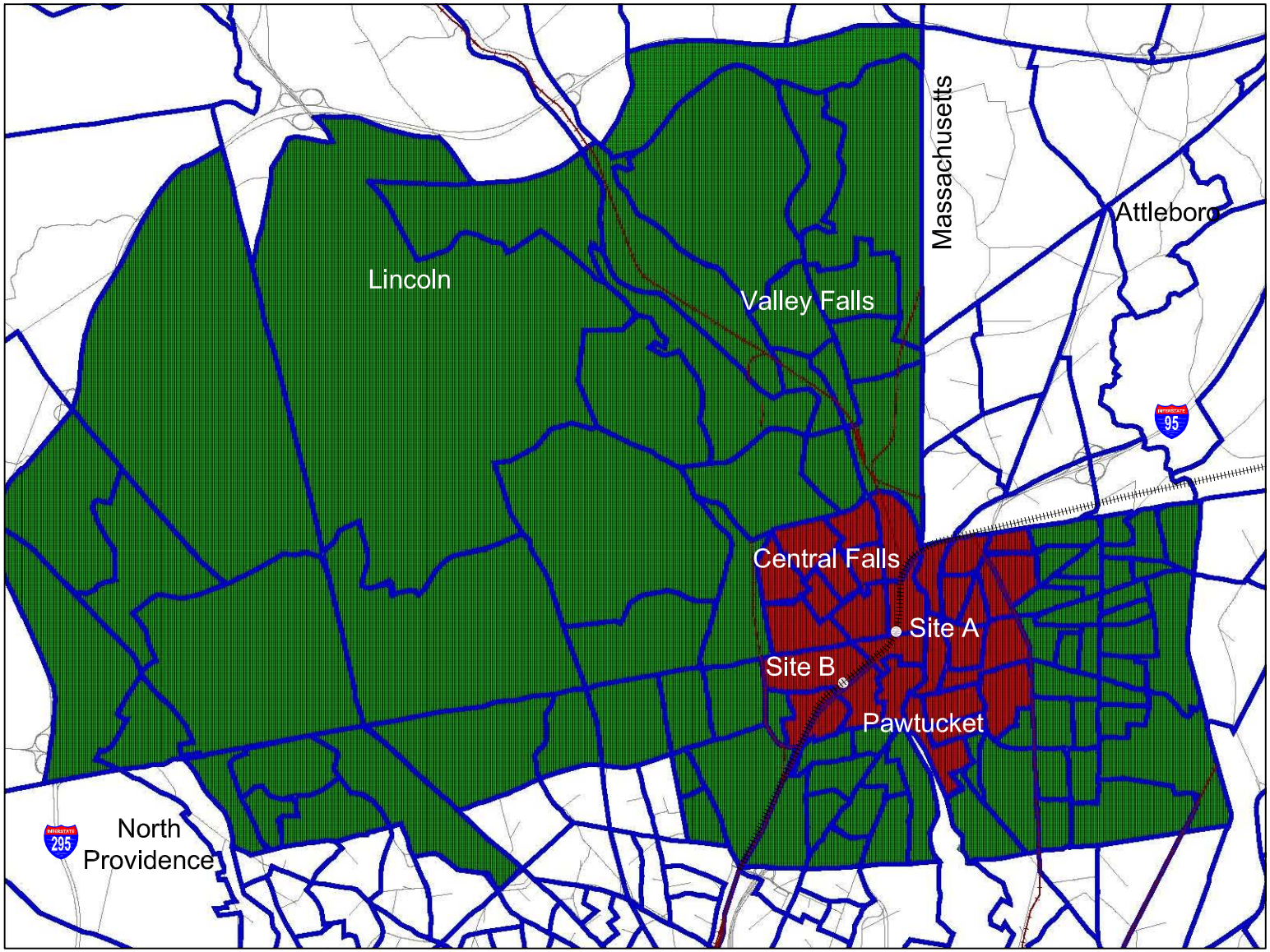
Identification of Capture Areas

The following steps were employed to define the capture areas and establish the associated trip making characteristics:

- Two capture areas around the new station were defined as shown in Figure 4-1. The smaller area identifies a market that is about one mile radius surrounding each site. This area is referred to as the immediate service area[2]. Residents of this zone are more likely to walk to the new station. The larger area, referred to as the extended service area[3], defines the zone whose residents might access the new station, by means other than walking, to travel to Providence, T.F. Green Airport, or Boston.

▼

[2] *Proposal for a Central Falls/Pawtucket Multi-Modal Transportation Center*, Prepared by the Pawtucket Foundation, February 2003, page 13.
[3] *Proposal for a Central Falls/Pawtucket Multi-Modal Transportation Center*, Prepared by the Pawtucket Foundation, February 2003, page 15.



Legend

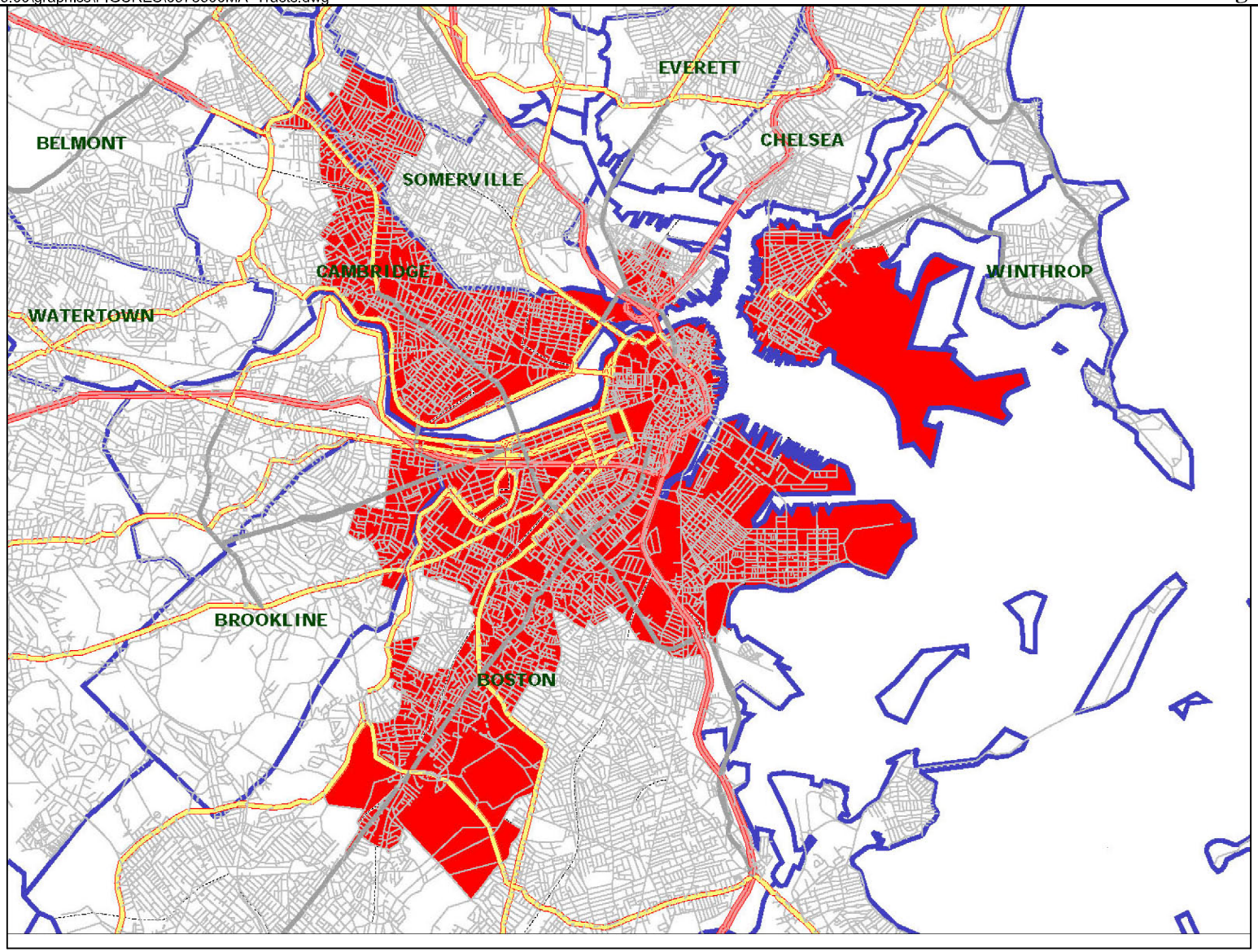
- *Walk/Drive Access*
- *Drive Access*
- *Traffic Analysis Zones*
- Site A — *Former Station Site*
- Site B — *Rail Yard Site*

Pawtucket/Central Falls Commuter Rail Facility

Feasibility Study and Site Analysis

Figure 4-1

Station Capture Areas



Legend

Employment Capture Area - Boston

Pawtucket/Central Falls Commuter Rail Facility

Feasibility Study and Site Analysis

Figure 4-2

Boston Employment Capture Area

- Four destination capture areas were also defined (for the morning peak period). These include:
  - Downtown Providence, which was defined as I-195 to the south, I-95 to the west, Main Street to the east, and Orms Street to the north.
  - East Side of Providence, which was defined as the area between South Main Street and the Seekonk River.
  - T.F. Green Airport in Warwick, which was defined as the actual Airport and the area surrounding the Warwick Intermodal Station Development Area.
  - Boston, which was defined as areas in Boston, Cambridge, Somerville and Brookline that have access to rapid transit. The Boston capture area is shown in Figure 4-2.
- The 2000 Journey to Work Data between the origin census tracts and the destination census tracts was used to understand commuting trip characteristics. The number of trips was increased to 2030 based on the projected growth assumed in the Rhode Island Statewide Model. The annual growth for trips heading to Boston was assumed to be 0.85 percent. This percentage was based on the I-95 trip growth assumptions in the Central Transportation Planning Staff's regional model.
- In order to account for work trip patterns that do not exist currently, the household characteristics of the origin TAZs were analyzed. For example, the one-mile radius area around the former station includes a significant portion of people without vehicles who cannot presently travel outside of the immediate area for employment. For the most part, the employment market for those that do not own vehicles is limited to the immediate vicinity of their household and the area served by existing bus transit. The ridership was adjusted to account for these people, who might now be able to find work in other areas without owning a car.

■

Identification of Impedances and Travel Times

To determine how much of the potential rail and bus population to Providence and the East Side in Providence would potentially take commuter rail, the impedance for auto, walk access rail, drive access rail and walk access bus for each origin/destination pair were compared. To determine how much of the potential traveling population to Boston and T.F. Green Airport would take commuter rail, the impedance for auto, walk access rail, and drive access rail were compared. Bus impedance was not included because it was not considered to be a viable alternative for these markets.

Transit and automobile travel impedance was measured in minutes and included total travel time associated with each trip, as well as out-of-pocket costs (converted to time in minutes) based on the average hourly wage rate for the potential train and bus population. The higher the total impedance for a certain mode compared to the other available modes, the less likely an individual is to use that mode. For example, if the total impedance for transit is less the total impedance for auto, the population being considered is more likely to take transit. If the impedances are equal for an origin/destination pair, then it is assumed that approximately 50 percent of the people making this trip will likely use transit and 50 percent will likely drive. The following describes the times and costs that were included in the impedance calculations for both auto and transit.

1. The auto impedance includes:

- Travel time and distance from origin to destination were extracted from the 2030 Rhode Island Statewide Model. Since the model coverage area ends at I-495 in Massachusetts, the travel time and distances from I-495 to Boston were added to the values from the Statewide Model. The travel time and distance were determined based on local knowledge, and information from SmartRoutes and Mapquest. They were assumed to be 55 minutes during rush hour and 32 miles.

- Incremental cost of driving was assumed to be 44.5 cents per mile according to the General Services Administration. The 44.5 cents per mile was used to convert the total trip distance to the incremental cost of driving.

- Out of vehicle travel time represents the time it takes to reach the final destination after leaving the roadway network (time to find parking and time to walk to final destination). It was assumed that this is five minutes.

- Average cost per day for parking in Downtown Providence, Downtown Boston, East Side of Providence, or T.F. Green Airport. The average cost per day for parking in Downtown Providence was assumed to be $2.50. The parking cost in the East Side of Providence and T.F. Green Airport was assumed to be free. The cost of parking in Downtown Boston was assumed to be $10.00. While a one-time parking fee in Boston is significantly larger, the $10.00 represents an average parking cost that takes into account one-time user fees, discounted rates including monthly passes, and free parking that some people receive with their employment.

2. The transit impedance includes:

- Drive or walk time to station represents the time it takes to reach the station from the riders' origin. Drive time was defined by the Statewide

Table 4-6: Inbound Boardings to Boston and Outbound Boardings to Providence and TF Green Increased to Account for Non-Peak Travel

	To Boston		To Providence		To TF Green	
	Low	High	Low	High	Low	High
2000 Ridership	802	860	128	289	15	26
2030 Ridership	1,080	1,161	269	562	27	45

Based on 2000 and 2001 license plate surveys conducted at Providence, Attleboro and South Attleboro stations, there are Boston-bound riders from towns in the Pawtucket/Central Falls Station origin capture area who currently use these stations. Table 4-7 shows how the ridership is split between new rail riders and rail riders who might shift from existing stations. Origin town information from the license plate surveys and 2000 journey to work data was used to determine the magnitude of shifting ridership. It was assumed that riders going to Pawtucket/Central Falls from Cumberland, Lincoln and Smithfield would be new riders. However, rail riders from the towns of Central Falls, North Providence and Pawtucket would likely shift to the Pawtucket/Central Falls stop if it existed. It was assumed that rail riders traveling between Pawtucket/Central Falls and Providence or T.F. Green would be new rail riders since there is no current rail service to these areas.

Table 4-7: Inbound Boardings to Boston and Outbound Boardings to Providence and TF Green New Rail Ridership Versus Shifted Rail Ridership

	To Boston		To Providence		To TF Green	
	Low	High	Low	High	Low	High
New 2000 Ridership	620	679	128	289	15	26
Shifted 2000 Ridership	181	181	0	0	0	0
Total 2000 Ridership	802	860	128	289	15	26
New 2030 Ridership	846	928	269	562	27	45
Shifted 2030 Ridership	234	234	0	0	0	0
Total 2030 Ridership	1,080	1,161	269	562	27	45

An additional adjustment to the ridership between Pawtucket/Central Falls and T.F. Green Airport was made to account for the fact that a new commuter rail stop would expand employment opportunities. The initial forecasts are based on factored up journey to work trip patterns. Providing a transit service between Pawtucket/Central Falls and T.F. Green Airport opens up new employment opportunities for residents without vehicles. Based on the 2000 Census, the percent unemployment and zero car households for the towns of Pawtucket and Central Falls (the towns with walk access to the station) are above the statewide averages. The

  - For people destined to T.F. Green Airport, it was assumed that they would take a shuttle or walk to their work destinations. An egress time of 15 minutes was assumed.

- Incremental cost was defined as the cost per mile of driving to the station. As with the auto impedance, 44.5 cents per mile was assumed.

- Average rail fare to destination accounts for the commuter rail fare. The fare to Boston was assumed to be the then-current MBTA Zone 8 monthly fare of $198, which, when divided by the assumed 40 trips per month, results in a daily fare of $4.95. The rail fare to Providence and East Providence was assumed to be the then-current MBTA Interzone Pass (# of zones = 1) monthly fare of $71, which results in a daily fare of $1.78. The rail fare to T.F Green Airport was also assumed to be the then current MBTA Interzone Pass (# of zones =1) with a monthly fare of $71 and a daily fare of $1.78.

- Parking fee of $2 per day was assumed at the proposed station. This is equal to the parking fees at the Attleboro and South Attleboro stations.

- Reverse commute impedance was added for trips traveling from Pawtucket to Providence or T.F. Green. Based on the proposed schedule, there will only be one or two trains traveling in the non-peak direction, compared to four or five trains in the peak direction. This constrains riders' schedules and increases transit impedance in the non-peak direction.

The auto costs and transit costs were converted to time based on average income by origin town. These average annual wage rates are defined based on data on population, per capita income, and employed population from the 2000 US Census. The annual wage rates were converted to wage per minute based on a 2,000 hour work year. Table 4-1 shows the average hourly rage assumptions.

Table 4-1: Hourly Wage Assumptions

	Per Capita Income	Population	Employed Population	Average Employee Wage	Hourly Wage Rate
Central Falls	$10,825	18,928	7,169	$28,581	$14.29
Cumberland	$25,592	31,840	16,551	$49,233	$24.62
Lincoln	$26,779	20,898	10,874	$51,465	$25.73
North Providence	$46,299	32,411	16,513	$46,299	$23.15
Pawtucket	$17,008	72,958	33,192	$37,385	$18.69
Smithfield	$23,224	30,613	11,059	$43,287	$21.62

Results

Based on the methodology described in the preceding section, forecasts of potential ridership for a Pawtucket/Central Falls commuter rail facility were developed. The initial set of forecasts compare the Boston market results from the current study with the 2003 study. The comparison is provided for informational purposes and to identify areas where the two sets of forecasts for the Boston market vary. The final ridership forecasts present the combined results of the four markets – Boston, Providence, the East Side in Providence, and T.F. Green Airport in Warwick.

Initial Set of Ridership Forecasts

Table 4-2 compares the current study's rail mode share for trips destined to Massachusetts from a Pawtucket/Central Falls commuter rail facility to the mode shares documented in the 2003 Study. There are differences in individual rail mode shares for each town; however, the overall shares are not significantly different.

Table 4-2: Percentage of Travelers Taking Commuter Rail to Boston, Boarding at Pawtucket/Central Falls

	2000 Base Year (Current Study)		2000 Base Year (2003 Study)	
	Percent Rail		Percent Rail	
	Low	High	Low	High
Central Falls	78%	84%	73%	84%
Cumberland	60%	63%	NA	NA
Lincoln	63%	67%	61%	72%
North Providence	68%	73%	64%	76%
Pawtucket	70%	75%	69%	81%
Smithfield	59%	62%	59%	71%
Total	**68%**	**73%**	**67%**	**78%**

Table 4-3 compares the forecast number of rail trips and total journey to work trips (JTW) between the two forecasts. The 2003 Study estimated a range of 789 – 919 inbound boardings for the base year 2000 ridership to the Boston Area. In the current study, the 2000 forecast range is from 569 to 610 inbound boardings. As shown in the final line of the table, the total journey to work market is different between the two studies. The 2003 Study assumed that the potential market is 1,174 home to work trips while the current study estimates this number to be 835. The difference in the potential market size is accounted for by the differences in the defined capture areas around the Pawtucket/Central Falls commuter rail facility (the extended service area) and the Boston Area. The current study is based on the Rhode Island Traffic Analysis Zones and did not always include an entire town. The earlier study based the analysis at the town level and included the entire town when calculating the total journey to work market. In addition, the current study assumed a smaller market in the Boston area including only portions of Boston, Somerville, Cambridge and Brookline. The 2003 Study assumed the Boston market included all of Boston, Cambridge, Somerville and Brookline.

Table 4-3: 2000 Boston Inbound Boardings for Pawtucket Station

	2000 Base Year (Current Study)		2000 Base Year (2003 Study)	
	Inbound Boardings		Inbound Boardings	
	Low	High	Low	High
Central Falls	32	34	137	158
Cumberland	28	29	NA	NA
Lincoln	76	81	136	160
North Providence	99	107	62	74
Pawtucket	331	356	430	498
Smithfield	3	3	24	29
Total	**569**	**610**	**789**	**919**
Total JTW to Boston	**835**	**835**	**1,174**	**1,174**

Notes: 1,174 calculated based on Table 2 and Table 3 of KKO's October 9, 2003 memorandum.

Table 4-4 shows the differences in potential markets by town. The difference in the number of potential trips from Pawtucket (139) makes up 41 percent of the entire difference of potential riders. Since the entire towns of Pawtucket and Central Falls are included in the origin capture areas (as they were in the 2003 study), the entire difference in potential market is at the Boston end. The differences for the other towns are a result of not including the entire town as an origin and the smaller capture area at the destination (Boston market).

Table 4-4: 2000 Journey to Work Assumptions to Boston Area

	Current Study	2003 Study	Difference
Central Falls	41	88	-47
Cumberland	46	NA	+46
Lincoln	121	219	-98
North Providence	145	211	-66
Pawtucket	476	615	-139
Smithfield	5	41	-36
Total	835	1,174	-339

Notes: The JTW data for the 2003 study is based on Table 2 and 3 of KKO's October 9, 2003 memorandum. It should be noted that the information in Table 3 for Central Falls, Lincoln and North Providence was shifted between the towns based on an error found in Table 1 of the report.

■

Final Ridership Forecasts

A set of final ridership forecasts was prepared based on the methodology and the initial forecasts previously described. This final set of forecasts includes the newly developed ridership for the Boston market as well as the ridership for the Providence (including the East Side in Providence) and T.F. Green markets. Table 4-5 shows the projected rail ridership forecasts and the mode shares for 2000 and 2030 for Boston-bound trips, Providence-bound trips, and T.F. Green-bound trips.

Table 4-5: Inbound Boardings to Boston and Outbound Boardings to Providence and TF Green

	To Boston		To Providence		To TF Green	
	Low	High	Low	High	Low	High
2000 Rail Forecast	569	610	91	205	11	19
2000 JTW	835	835	6,058	6,058	171	171
% Rail Mode Share	68.2%	73.1%	1.5%	3.4%	6.3%	10.9%
2030 Rail Forecast	767	825	191	399	19	32
2030 JTW	1,076	1,076	9,833	9,833	251	251
% Rail Mode Share	71.2%	76.6%	1.9%	4.1%	7.8%	12.7%

The forecasts shown in Table 4-5 were adjusted to account for non-peak travel (trips traveling outside the perk period). This adjustment, a factor of 1.4085, is based on documented travel patterns in Providence. Existing commuter rail ridership data for boardings at Providence indicate that 71 percent of the Boston-bound commuter rail riders travel during the morning two-hour peak period. A similar percentage of Providence bound travelers travel during the evening two-hour peak period. It is assumed that a majority of the trips traveling during these two time periods are work trips and that the majority of the trips that occur outside of the peak periods on the commuter rail are non-work trips. The resulting factor for non-work trips is 1.4085 (1/0.71). Table 4-6 shows the adjusted forecast numbers.

Table 4-6: Inbound Boardings to Boston and Outbound Boardings to Providence and TF Green Increased to Account for Non-Peak Travel

	To Boston		To Providence		To TF Green	
	Low	High	Low	High	Low	High
2000 Ridership	802	860	128	289	15	26
2030 Ridership	1,080	1,161	269	562	27	45

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Total 2030 Ridership	1,080	1,161	269	562	27	45

An additional adjustment to the ridership between Pawtucket/Central Falls and T.F. Green Airport was made to account for the fact that a new commuter rail stop would expand employment opportunities. The initial forecasts are based on factored up journey to work trip patterns. Providing a transit service between Pawtucket/Central Falls and T.F. Green Airport opens up new employment opportunities for residents without vehicles. Based on the 2000 Census, the percent unemployment and zero car households for the towns of Pawtucket and Central Falls (the towns with walk access to the station) are above the statewide averages. The

unemployment rate for the state was approximately 5.6 percent. The unemployment rate for Pawtucket was 7.1 percent and 8.2 percent for Central Falls. The percent zero vehicle households is 10.9 percent for the state, 16.1 percent for Pawtucket and 25.1 percent for Central Falls.

The employment in the T.F. Green Airport vicinity is expected to increase substantially in the future. The number of enplaned and deplaned passengers at the airport is expected to nearly double by the year 2025.[4] In addition to the airport growth, there is a substantial amount of potential growth as part of the Warwick Station Redevelopment District. The Rhode Island Statewide Model assumes approximately 2,100 employees in the airport TAZ for the year 2000 and 400 employees for the Warwick Station Redevelopment District. Employment could potentially double by the year 2030 adding about 2,500 jobs. If just 5 percent of these jobs are filled by Pawtucket and Central Falls residents who are transit dependent, the ridership between Pawtucket/Central Falls and T.F. Green could be increased by as much as 125 riders. This increases the 2030 forecasts of 27 and 45 shown in Table 4-7 to 152 and 170 riders. The final 2030 forecasts are shown in Table 4-8.

Table 4-8: Final 2030 Inbound Boardings to Boston and Outbound Boardings to Providence and TF Green

	To Boston		To Providence		To TF Green	
	Low	High	Low	High	Low	High
New 2030 Ridership	846	928	269	562	152	170
Shifted 2030 Ridership	234	234	0	0	0	0
Total 2030 Ridership	1,080	1,161	269	562	152	170

Conclusions

As reported in Table 4-8, in 2030, forecast total daily boardings at a Pawtucket/Central Falls commuter rail facility are projected to range between 1,501 and 1,893 passengers. Of these boardings, approximately three-quarters (1,080 to 1,161) are oriented to the Boston market. The modeled 2000 Base Year Boston-bound boardings of 569 to 610 passengers, which are the basis for the 2030 forecasts (as previously discussed in the Initial Forecasts section), compare favorably to the current daily boardings experienced at some of the MBTA's moderately-sized stations (Norwood

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[4] T.F. Green Airport Improvement Program, Environmental Impact Statement, Technical Memorandum #2, Air Passenger and Operations Forecast, prepared for the Federal Aviation Administration and Rhode Island Airport Corporation by Vanasse Hangen Brustlin, Inc. in association with InterVISTA Consulting, Inc. Table 3-1 page 3-1, October 7, 2005.

Depot, Wellesley Hills, Hersey, Holbrook/Randolph). The Base Year numbers are slightly less than originally reported in the 2003 Study, but they are more closely aligned with the definitions of the immediate and extended services as defined for the facility. This closer correlation should allow for an easier transition from the current planning forecasting process to the travel demand model forecasting process.

As this project advances in the development process, several factors that affect transit capture rates should be considered:

- Land use and intensity of development: The ability of a transit system to attract riders from other modes of transportation is strongly related to the land use and intensity of development around transit stations and stops. Areas with more intense development are more likely to generate transit trips than areas with lower intensity land uses.

- Special trip generators: The presence of special trip generators such as veteran's hospitals, colleges, universities, and tourist attractions near a transit stop can enhance ridership at that station. Often the people using these types of facilities are more transit dependent because of income, age, disabilities or other factors.

- Income of travelers: Income level is a determining factor in transit usage. Persons with lower incomes are less likely to own an automobile or have multiple automobiles available and are therefore more likely to use transit than travelers with higher incomes.

These three factors are likely to have an impact on ridership at a Pawtucket/Central Falls commuter rail facility. The income factor has already been recognized in the sketch planning process. The other two factors are more easily captured when the travel demand model forecasting process is employed. Certain manual adjustments can be identified and employed, however, as part of the current planning process when the Site Analysis effort is undertaken.

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5

Design Criteria

An important element of any project is to establish the overall design criteria early in the project development process. As part of Phase I, design criteria were established, in order to allow development of realistic designs and effective alternatives analysis in subsequent phases. This chapter summarizes the general site program and standards that will govern the design.

General Site Program

The conceptual design effort focuses on the development of initial designs for a commuter railroad station along the Northeast Corridor in Pawtucket or Central Falls. The proposed railroad station would require, but would not be limited to, the following features:

- New or revised site access
- Commuter parking and drop-off areas
- A fully accessible station facility that complies with the Americans with Disabilities Act (ADA) guidelines

The facility would include:

- Two 800-foot long platforms
- Canopies to cover a portion of the platforms
- Platform amenities such as guardrails, benches, litter cans, signage, lighting, tactile warning strips, public address systems, public and Amtrak phones, and Train Approach Message System (TAMS). Platforms would be handicap accessible.
- Commuter drop-off/pick-up area would be provided on at least one side of the tracks. This drop-off/pick-up area would include handicap accessible parking, curb ramp, and handicap van parking.
- Parking spaces, with at-grade or structured parking alternatives to be explored.

- Grade-separated pedestrian crossing would be provided between the two platforms. The access would be fully ADA compliant and meet code for egress.

In addition, the conceptual design effort will consider traffic improvements related to site access. These improvements may include but are not limited to new or revised signalized intersections and other improvements necessary to support vehicular and pedestrian traffic.

To assist in developing the schematic designs, three key elements of the design were identified – Railroad Infrastructure, Architectural, and Site. Appropriate design criteria were reviewed and summarized for each of the key design elements. The criteria were compiled from existing design standards available from Amtrak, the MBTA, RIDOT, the municipalities, and industry resources. These criteria, which serve as guidelines in the development of the schematic designs for each site, are summarized in the following sections.

Railroad Infrastructure Elements

The railroad elements of the schematic design process include three specific areas of interest – the track and roadway structure, the signal and communications system, and the power system. Design in each of these areas shall conform to the requirements of the following standards, codes, and guidelines as applicable:

- American Railway Engineering and Maintenance-of-Way Association (AREMA), 2006 Manual for Railway Engineering Volumes 1 to 4 and Portfolio of Trackwork Plans.
- Amtrak AMT 63 – Track Design Specification (standards for high-speed rail corridors).

The following general design assumptions will be used as the basis for design of the railroad related improvements:

- Additions and modifications to the existing railroad infrastructure will have similar designs and material specifications as the existing systems (to the extent possible) so as to ensure ease of maintenance and inventory control.
- The existing track, electrification, signal system, and communications system will be left undisturbed to the maximum extent possible so as minimize the disruptions to train service during construction. Particular attention will be given to the catenary poles and the location of new facilities within the railroad right-of-way.

In addition to these general references and assumptions, each discipline considered specific applicable guidelines and standards which are summarized in the following sections.

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Track and Roadway Structure

Design of the track and roadway structure shall be in accordance with the following documents:

- Amtrak Standard Track Plan for Minimum Roadway Clearances (AM 70050 – G).
- Amtrak M&W 1.
- United States Department of Transportation (USDOT), Track Safety Standards, Federal Railroad Administration (FRA) Office of Safety, November 1, 1992.

■

Signal and Communications Systems

All design work and related material in the area of the signal and communications system shall conform to or extend the requirements of the following standards, codes, and guidelines:

- Communications and Signals Manual, Volumes 1 to 5, 2006 edition, AREMA.
- Code of Federal Regulations 49 Part 236 Rules, Standards and Instructions Governing the Installation, Inspection, Maintenance and Repair of Signal Train Control Devices and Appliances issued by the USDOT, FRA.
- Amtrak AMT- 23 – Special Instructions Governing Construction and Maintenance of Signals and Interlockings.
- Amtrak AMT- 27 – Instructions For Testing Signal Apparatus and Signal Systems.
- NORAC Operating Rules – Eighth Edition January 1, 2003.

The following general design assumptions will be used as the basis for design of the signal related improvements:

- Amtrak's NEC Nine Aspect Signal System will be used as the basis for all Signal and Communications design. This will include portions of the FRIP track if not currently in place.

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Power System

All design work and related material in the area of the power system shall conform to or extend the requirements of the following standards, codes, and guidelines:

- Amtrak Specification AED-1, "Procedures and Design Criteria to be Employed by Electrification Consultants Engaged in the Design of Electrification Facilities on the National Railroad Passenger Corporation", Revised 3/2004.
- National Electrical Safety Code, 2002 edition, The Institution of Electrical and Electronics Engineers, Inc. (IEEE).
- Railway Electrification Guidelines, Canadian Electrical Code Part III.
- Inductive coordination of electric supply and railroad communication/signal systems – principles and practices, A report of the Joint Committee of the Association of American Railroads (AAR) and Edison Electric Institute (EEI) on Inductive Coordination.
- The National Electrical Code, 2002 edition, National Fire Protection Association.

Architectural Elements

The architectural elements of the schematic design process include four specific areas of interest – the overall station program, parking garage, platforms and cross-track pedestrian access structures. Design in each of these areas shall conform to the requirements of the following standards, codes, and guidelines as applicable:

- American Association of State Highway and Transportation Officials (AASHTO), "Standard Specifications for Highway Bridges", Seventeenth Edition, 2002.
- AASHTO LRFD Bridge Design Specifications, 3rd Edition, 2004.
- American Concrete Institute (ACI), "Building Code Requirements for Reinforced Concrete" (ACI 318-95).
- ACI, "Building Code Requirements for Structural Concrete" (ACI 318-02).
- ACI, "Building Code Requirements for Masonry Structures" (ACI 530-02).

- American Institute Of Steel Construction (AISC), "Specification for the Structural Steel Buildings – Allowable Stress Design and Plastic Design, including Supplement No. 1, 2001.
- AISC, "Manual of Steel Construction, LRFD" 3rd Edition, 2001.
- AREMA Manual for Railway Engineering, American Railway Engineering and Maintenance-of-Way Association, 2006.
- Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) updated 2004.
- American Society of Civil Engineers (ASCE), "Minimum Design Loads for Buildings and Other Structures" (ASCE 7-02).
- Amtrak Standard Track Plan for Minimum Roadway Clearances (AM 70050 – G).
- FRA Regulations.
- International Code Council, "International Building Code", 2003 Edition.
- International Code Council, "International Existing Building Code", 2003 Edition.
- National Fire Protection Association (NFPA) 130 – Standard for Fixed Guideway Transit and Passenger Rail Systems.
- Occupational Safety and Health Administration (OSHA) Regulations.
- Rhode Island State Building Code, Regulation SBC-1-2004, July 1, 2004, with amendments Effective January 1, 2006: incorporates the International Building Code, 2003 Edition, by reference.
- Rhode Island State Plumbing Code, Regulation SBC-3: Incorporates the International Plumbing Code, 2003 Edition, by reference.
- Rhode Island State Mechanical Code, Regulation SBC-4: Incorporates the International Mechanical Code, 2003 Edition, by reference.
- Rhode Island State Electrical Code, Regulation SBC-5: Incorporates the National Electrical Code, 2002 Edition, by reference.
- Rhode Island State Energy Conservation Code, Regulation SBC-8: Incorporates the International Energy Conservation Code, 2003 Edition, by reference.
- Rhode Island Accessibility Code, Regulation SBC-14: Incorporated into SBC-1-2004 Chapter 11.

- Rhode Island Accessibility for Individuals with Disabilities in State and Local Government Facilities Code, Regulation SBC-15: Incorporated into SBC-1-2004 Chapter 11.
- Rhode Island State Rehabilitation Building and Fire Code for Existing Buildings and Structures, Regulation SRC-1.
- US Department of Transportation ADA Regulations

Should the former station be listed in the Federal Registry of Historic Places, protected status for the original structure will result in an additional set of design criteria being applied to the building. Special criteria that are applicable to existing/historic structures may result in adjustments to the code criteria should portions of the original station be incorporated into the proposed Commuter Rail Facility.

In addition to these general references and assumptions, each discipline considered specific applicable guidelines and standards which are summarized in the following sections.

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Design Loads

Structures shall be designed for dead loads, live loads, snow loads, wind loads and seismic loads as specified in the building codes listed above. Structures and portions of structures shall be designed for the most critical combination of these loads as specified by the appropriate code.

Dead Loads shall consist of the estimated weight of the entire structure which shall include, but not be limited to, walls, floors, roofs, ceilings, partitions, pipes, utilities, stairways, and other similar architectural or structural items.

Live Loads are those loads produced by the use and occupancy of the structure. They do not include environmental loads such as wind, snow, or seismic loads. Table 5-1 summarizes design loads and critical loading factors. Mechanical rooms or other local conditions may require more stringent loads.

Table 5-1: Design Loads/Factors

Load / Factor	Value
Ground Snow load (P_g)	30 psf
Minimum Flat Roof Snow Load (P_f)	30 psf
Basic Wind Speed	100 mph
Frost Depth	4'-0"
Minimum Uniform Distributed Live Load: Lobby Platform	 100 psf 125 psf
Building Classification Category	III
Seismic Coefficients: (Ss) (S_1)	 0.270 0.081
Seismic Use Group	II
Snow Factor (I_s)	1.1
Wind Factor (I_w)	1.15
Seismic Factor (I_E)	1.25

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Overall Station Program

The station building element of the schematic design process includes two specific areas of interest – the building program and layout, and the station signage. In addition to the requirements of the applicable standards, codes, and guidelines described under Architectural Elements above, the following general design assumptions shall be considered for the station building element:

- Minimum lateral clearance from centerline of track to face of a building is 16'-0".
- Materials used must be durable, low maintenance, and vandal resistant. Designs must incorporate ease and safety of maintenance.
- Designers must incorporate life cycle costing analyses into the design process to ensure the most cost effective design over the useful life of the project, including ongoing maintenance costs.
- The stations, high level platforms, pedestrian crossing, platform canopies, elevators and stairways shall conform to the State Building Code, including the Elevator Code.

- All station elements shall conform to the MBTA's Station Design Guidelines and Standards for new stations and high level platforms.
- In addition to these general references and assumptions, each discipline considered specific applicable guidelines and standards which are summarized in the following sections.

Access and Egress Requirements

Certain sections of the Rhode Island State Building Code must be used to establish Access and Egress requirements for the platform, station and garage structures. In particular, Chapters 10: Means of Egress and 11: Accessibility will be used to determine specific provisions for Paths of Egress, Platform Occupancy, Stairway Width, Access Routes Continuous to a Public Way for Outdoor Areas, and Areas of Refuge or Exterior Areas for Assisted Rescue and to determine their applicability to each site.

Accessibility

Persons with disabilities must have full access to all shelters and platforms as specified by the Americans with Disabilities Act Access Guidelines and the MBTA Guide to Access. These guidelines for making the new transportation facility accessible will be applied to the design of the commuter rail stop and to the renovation and rehabilitation of the former station building, if applicable. Clearances around platform obstructions and spacing between platform and train as well as platform height relative to car entry heights will be designed to meet all ADAAG criteria. Access to elevators which connect the station level and platform will be provided at primary entry/exit points making access equal for all passengers. Elevators shall connect station levels, platforms, primary building entries, and parking lots or garage levels. ADA accessibility requirements to be incorporated into the design include the following:

- Station buildings must have accessible entrance(s), restrooms and ticket window.
- Accessible public pay telephones equipped with volume controls.
- Installation of at least one text telephone (TTY) in station buildings where public pay telephones exist.
- An accessible route to all public areas, including train platforms via elevators and/or ramps.

- Signage meeting ADA requirements, including tactile signage with Braille type.
- An accessible route to parking areas and provision of accessible parking.
- Tactile warning strips along platform edges.
- Cane protection, where required.
- Installation of audio-visual information systems or equivalent.

Signage

Signage shall be provided throughout the station to facilitate the use of the facility for commuters. Signs may include welcome signs at entrances to parking and station areas, directional signs to elevators and platforms (with track number signs), and station identification signs on the platforms. Signs are also provided for the safety and protection of customers. Signs for disembarking customers include those pointing to exits and taxi and bus areas. OSHA signage regulations shall be referenced for safety and fire items. All parking signage shall conform to RIDOT requirements.

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Parking Garage

In addition to the requirements of the applicable standards, codes, and guidelines described under "Architectural Elements" above, the following general design assumptions shall be considered for the parking garage element:

- Minimum vertical clearance in parking garage on standard levels is 7′-2″.
- Minimum vertical clearance in parking garage on van accessible levels is 8′-2″.
- Minimum clear span is 60′-0″.

■

Platform

Platforms should have adequate space for passengers gathering and waiting to board the trains during peak times. They should be well lighted, drained, and should have a slip-resistant surface. Barriers, railings, or fencing shall be provided along the back face of the platform.

Two elevated, high-level pre-cast concrete platforms shall provide access to the existing tracks. One platform shall provide access to outbound trains on Track 1. The other platform shall provide access to inbound trains on Track 2. Both platforms shall have minimum 800 feet usable length and have a 24″ tactile yellow warning strip running the length of the track side edge of the platform meeting ADA access guidelines. Both stairways and elevators shall provide access to the platforms.

A canopy shall provide overhead and wind protection along portions of both platforms. Table 5-2 summarizes dimensional and clearance criteria for the platforms and canopy.

Table 5-2: Platform Dimensional Requirements

Description	Criteria
Platform Length	800’
Height above rail to top of platform	4’-0”
Platform Width:	
Preferred	12’-0”
Absolute Minimum	8’-0”
Horizontal Clearance (Centerline track to edge of platform):	
FRIP (P & W RR)	7’-0”
AMTRAK (NEC)	5’-7” + 1.5”/° of curvature
Maximum Cross Slope	1/8” per 1’-0”
Horizontal Clearance – Vertical Canopy Support to Edge of Platform:	
Preferred Minimum:	10’-0”
Absolute Minimum:	8’-0”
Vertical Clearance – Top of Rail to Bottom Face of Canopy	12’-1”
Minimum Horizontal Clearance – Centerline Track to Canopy roof Overhang:	
Track 7 (FRIP)	8’-11”
Tracks 1 and 2 (NEC)	8’-6"
Minimum Clearance – Track Centerline to Face of Canopy Columns:	
Track 7 (FRIP)	16’-6”
Tracks 1 and 2 (NEC)	15’-1”

■

Cross-Track Pedestrian Access

Cross track pedestrian access is an important safety element of station design. It will be provided by a pedestrian bridge over the railroad tracks. In addition to the requirements of the applicable standards, codes, and guidelines described under “Architectural Elements” above, the following general design assumptions shall be considered for the pedestrian bridge element:

- Minimum width of pedestrian bridge is 10’-0”.
- Minimum ceiling height for pedestrian bridge is 8’-0”.

- Minimum vertical clearance to bottom of bridge in electrified territory is 24'-3" (Amtrak standard).

■

Historic Building Design Requirements

Using the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings, work on the old railway station will use these guidelines making adjustments to the former station in order to allow for reuse which meets current code requirements to the maximum extent possible without damaging its historical qualities. Where elements of the original design are damaged but can be restored, the guidelines will permit "work-arounds" which will allow for reuse and handicapped accessibility. Design decisions will be made within the context of the historic building on an item-by-item basis. The Guideline for evaluating proposed modifications made to achieve accessibility will be an assessment determining "potential negative impact on the building's historic character". The goal under the Secretary's Standards is to see that "particular care is taken not to obscure, radically change, damage, or destroy character-defining features in the process of rehabilitation . . . to meet accessibility requirements."

Site Elements

The site design element of the schematic design process includes four specific areas of interest – access, parking, pedestrian circulation, and drainage. Design in each of these areas will conform to the following general references:

- A Policy on the Geometric Design of Highways and Streets, published by AASHTO.
- RIDOT Design Manual.
- National Pollution Discharge Elimination System Permit Program.

In addition, the following general design criteria will be used as the basis for design of the proposed new station site:

- Construction, maintenance, police, and emergency vehicle access shall be considered.
- A clear, consistent pavement marking scheme shall be developed for roadway areas to enhance safety and prevent conflicts between modes.

- Existing topography shall be respected both to minimize site grading and to preserve areas of natural vegetation. Where grading is required to improve drainage and for other design requirements, grading shall conform to applicable standards and regulations.
- Access roadways shall be designed according to AASHTO and RIDOT guidelines, which cover areas including, but not limited to, the number of lanes, roadway widths, and minimum vehicle turning radii for expected traffic volumes and vehicle mix.
- The vehicle mix will typically include passenger cars (design vehicle P), single-unit transit buses (design vehicle BUS), and single-unit trucks and service vehicles (design vehicle SU).

In addition to these general references and assumptions, each discipline considered specific applicable guidelines and standards which are summarized in the following sections.

■

Access

The following general design criteria will be used as the basis for design of the access roadways within the proposed station site and for any improvements to adjacent public streets:

- Existing road networks, traffic patterns, and traffic signals shall be evaluated, and all proposed road improvements by others should be identified at the outset of design.
- Roadways in public rights-of-way that are to be improved or reconfigured shall be designed to current standards set forth by RIDOT and as required by local codes.
- At intersections, good sight lines, unrestricted by grade change, blind curves, or vegetation, and adequate queuing distance for vehicles turning from one roadway to another are required. Areas for vehicles queuing to exit the site shall not interfere with the operation of vehicles in the remainder of the station site.
- At intersections, designs shall not exceed maximum grade standards and minimum cross slope requirements (for drainage). Roadways shall be designed to drain away from pedestrian walkways and curb cuts wherever possible.
- Designs shall provide the most direct roadway access possible between the entrance to the site and the drop-off/pick-up area.

- Designs shall provide convenient loop turnarounds for drop-off and pick-up vehicles (buses, paratransit vehicles, and private automobiles).
- Internal roadways shall be designed to minimize conflicts among vehicles, pedestrians, and bicycles. Landscaping, light poles, and other fixed objects near internal circulation routes shall not impede visibility or promote conflicts.

■

Parking

The following general design criteria will be used as the basis for design of the parking layout within the proposed station site:

- Where possible, parking layout shall be designed to maximize use of the accessible route to platforms.
- Final layout and configuration of the parking lot will be determined by a number of factors including specific site and environmental conditions, circulation requirements, and land availability.
- Designers shall consider the potential for future expansion when laying out parking areas. Designs for parking lot expansions shall be consistent with adjacent existing parking areas to the extent possible, particularly to avoid conflicts in vehicular flow and pedestrian movement.
- Dead-end aisles shall be avoided unless a turnaround is provided. Where turnarounds are not possible in dead-end aisles, one striped space may be provided and signed as a “turning-space-only" to eliminate the need to back out the length of the aisle.
- Adequate space for snow removal shall be provided within parking areas.

■

Pedestrian Circulation

The following general design criteria will be used as the basis for design of the pedestrian circulation within the proposed station site:

- Pedestrian circulation shall be incorporated into the station design in accordance with standard industry practice and the ADA where appropriate.
- Parking fields shall be designed parallel to the direction of pedestrian traffic to maximize safety.

- Slopes shall be maintained at two percent or less in areas designated as ADA routes and parking.
- Sidewalks shall be provided along major circulation corridors.
- The automobile and bus drop-off areas shall be designed and placed on the site to isolate these areas from the normal traffic and pedestrian circulation on the site.

■

Drainage

The following general design criteria will be used as the basis for design of the drainage system within the proposed station site:

- Storm drainage calculations and design shall be performed in accordance with several pertinent guides.
- Each municipality shall be contacted to ascertain the design standards for storm water facilities.
- Two hydrologic methods shall be employed to analyze runoff responses for the sites. The Rational Method will be utilized to develop preliminary peak runoff rates and early approximations of required storm runoff volumes. Technical Release Number 20: Computer Program for Project Formulation Hydrology (TR-20) will be employed during the final design phases of the project. This method generates runoff rates and volumes in the format required for storage calculations.

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Station Inspection

Part of Phase I of the study was a structural evaluation of the former station building, in order to determine if it would be in fair enough to condition to allow reuse without total reconstruction. This chapter summarizes the inspection and analysis results for the existing former station building concrete floor slab, retaining walls, stairs, platforms, and steel girders spanning the tracks that support the main section of the building. This summary is based on a cursory, visual inspection with some non-destructive testing of limited areas of the existing station building, mainly the existing floor slabs and the support girders and columns under the building. It is not intended to be a thorough, complete, detailed evaluation for use in the final design of repairs or strengthening. If the former station site is selected as the preferred alternative, additional detailed inspections and testing would be required prior to entering the design phase of the project.

Background

The building at the former station site was completed in 1916. The building consists of a large waiting room approximately 64′-8″x 92′-0″. The roof, which has an approximate height of 42′-0″ above the finished floor, is supported by steel joists spaced approximately 10′-0″ on-center. Steel columns embedded in the brick walls support the joists. Passageways on either side of the waiting room provided access to the trains via stairs to the abandoned platforms below the building. The waiting room and associated passageways span the tracks below and are supported by eight steel girders. These girders are supported at either end on concrete retaining walls and by two column lines that transfer the building loads to footings below the abandoned train platforms. The remainder of the station is a one or two story structure with slag roofs supported on load bearing brick walls. All floors are constructed of concrete slabs supported by encased steel floor beams. The size of these floor beams is unknown.

No structural drawings of the existing station are available at this time. Therefore, testing and visual inspections were conducted in an attempt to

determine the structural condition of the station floor slabs, building support girders over the tracks, and the associated support columns. This effort was conducted in two steps. First, on April 24, 2006, non-destructive testing was carried out on the existing concrete floor slabs in the waiting room and passageways. This was accomplished using sonic/ultrasonic testing and ground penetrating radar. On May 17 through 19, 2006, visual inspections and field measurements were made of the eight support girders spanning the tracks and their support columns. Photos from the inspection are included in Appendix C.

Summary of Inspection

The inspection of the floor slabs consisted of a visual inspection as well as the non-destructive testing. Floor slab visual inspection was limited inside the building due to the presence of floor tiles in the main waiting room and debris in the south passageway. Sprayed on fireproofing under the building prevented a thorough visual inspection of the underside of the slabs.

The support girders and columns were visually inspected. A preliminary structural analysis was performed to identify areas requiring girder and column strengthening.

■

Floor Slabs

Results of the non-destructive testing indicate the floor slabs in the waiting room area and the adjacent passageways to be approximately 8″ thick. The upper level of the north passageway has an average thickness of 6″. Typical average concrete strengths ranged from approximately 3500 pounds per square inch (psi) to 4800 psi in the waiting room area to approximately 4100 psi to 5900 psi in the passageways. Tests indicate a number of areas where possible debonding of the floor tile, internal cracking within the slab, or other deterioration of the concrete may be present. For details, see "Nondestructive Testing Investigation" report dated May 2006 by NDT Corporation, included in Appendix C.

During the visual inspection of the girders under the building, several areas where the underside of the slab showed exposed reinforcing and water damage were identified. This water damage is caused by numerous roof leaks and broken windows, which allow water to infiltrate the building.

In general, test results indicate the existing floor slabs to be serviceable. Some localized repair of water-damaged areas of the slab would be required. Additional core sampling and testing should be conducted to verify the non-

destructive test results and further investigate the areas where results indicate potential problems.

If the project progresses beyond the feasibility stage, a complete visual inspection of the floor slabs would need to be conducted, after removal of the existing floor tiles and debris from the top of the slab and removal of the fireproofing below the slab. Additional non-destructive and destructive testing would also need to be conducted to obtain a complete condition assessment of the slabs and to obtain information about the size and spacing of reinforcement (this may be unnecessary if the existing plans can be found). This information would then be used to develop repair plans for the damaged areas of the concrete floor slabs.

■

Support Girders

The support beams under the building, which span the tracks, were inspected over a three-day period. Access to the tracks was coordinated with Amtrak and conducted in the evening after track use had ended for the night. Prior to inspecting the beams, power to the train catenaries was cut by Amtrak personnel. A bucket truck was used to gain access to the beams, which are approximately 18 feet above the tracks. Due to scheduling conflicts and other time constraints, only the center span and the west span beams were inspected with the bucket truck. The east span was visually inspected from track level only.

The existing building support girders spanning the tracks are built-up steel plate girders. These beams are constructed with a variety of plates and angles riveted together to create each girder. The upper flange plates of the girders and portions of their associated attachment angles were not visible for inspection due to existing fireproofing applied to the underside of the building.

In general, due to environmental and maintenance conditions, the overall condition of the girders are fair to poor. Besides the general atmospheric effects on the exposed steel, numerous areas of water infiltration from the station have caused significant corrosion of the steel. In areas directly over the tracks, deterioration of the steel and rivets is noticeable. In some areas more than 1/8" of steel has delaminated from each side of the girder webs. Horizontal elements of the girders (angles, flange plates) were heavily corroded due to water leakage. Some connections between girders over support columns show extensive corrosion problems. In one area of girder G8A (east span), the entire bottom flange is missing due to extensive corrosion. Many vertical web stiffeners are heavily corroded with some missing entire flanges. Several bottom flange plates are bent and show signs

of impact damage. Figure C-15 in Appendix C lists each individual girder and a summary of the condition found during our inspection. Figure C-16 in Appendix C shows a graphical representation of the summary of the girder inspection.

A preliminary structural analysis of the girders and columns was performed to identify areas of overstress that may require future strengthening. This analysis includes vertical, gravity loads only (dead loads, live loads, snow loads). A complete lateral load analysis of the existing building (wind and/or seismic) is beyond the scope of this report. Figure C-17 in Appendix C contains a plan view that graphically shows areas where calculated stresses exceed those allowed by code. The calculations are also found in Appendix C.

■

Support Columns

The girders are supported by two rows of steel columns. These are rolled steel sections typically 8″ to 12″ deep. The overall condition of these columns is fair to good with only light to moderate corrosion. These vertical members are less susceptible to water damage than the horizontal girders. The existing column footing construction is unknown. The area along the west column line will require further study. During reconstruction of Track 7 beneath the station, the track elevation was lowered several feet, reducing the fill around the column footings in this area. The effect of this excavation should be investigated.

■

Miscellaneous

The existing retaining walls along the east and west sides of the tracks were visually inspected. The overall condition of the walls is fair. Although there are no noticeable areas of failure or excessive deflections, there are numerous cracks and other areas of deterioration that should be repaired. The effect of the recent FRIP track construction, which lowered the grade in front of the west wall, should be evaluated.

Originally, four sets of stairs provided access from the station passageways to the train platforms. All but one of these stairs has been removed. The remaining stairway from the north passageway is completely deteriorated. New stairways would be required at this site.

The abandoned station platforms are also completely deteriorated. Current MBTA design requirements specify raised platforms for all new stations. Therefore, new platforms would be required for this site.

Recommendations and Conclusions

The following conclusions were made based upon the non-destructive testing of the slabs and the visual inspection of the existing support girders spanning the tracks.

■

Floor Slabs

- Non-destructive testing indicates the floor slabs to be in generally satisfactory condition with potential repairs limited to isolated areas.
- After removal of the existing floor tiles and other debris in the station and the fireproofing under the building, a thorough visual inspection of the slab should be conducted.
- Core samples should be taken to verify the non-destructive test results and to check areas where potential problems may exist.
- Additional non-destructive and destructive testing should be performed to obtain a complete assessment of the floor slabs and to obtain more details on the slab reinforcement.
- Repair plans for damaged slab areas should be prepared after additional testing is complete.

■

Girders

- In general, the existing girders are in fair to poor condition with significant corrosion problems.
- Most of the girders require at least minimum repairs. Approximately half of the girders require extensive repairs and/or strengthening. Repairs consist of replacing worn rivets, replacing or adding bottom flanges and their connecting attachment angles, replacing damaged web stiffening angles, adding additional web plates, and replacement of connection plates and angles at columns.

- Girders require sandblasting or other methods to remove existing corrosion.
- A detailed inspection of each girder to map specific repairs and limits of reinforcement should be undertaken prior to final design.

■

Columns

- The existing columns are in generally fair to good condition.
- Sandblasting of the corroded sections should be performed.
- Severely corroded column/girder connections should be repaired.
- Column footings should be investigated during the final design phase.
- An analysis should be performed to assess the effect of the recent FRIP track construction on the western line of column footings.

■

Miscellaneous

- Cracks and deteriorated areas of the existing east and west retaining walls should be repaired.
- An analysis should be performed to assess the effect of the recent FRIP track construction on the west retaining wall.
- New stairs from the station passageways to the new platforms would be required.
- Existing deteriorated train platforms would be replaced with new raised platform.

7

Former Station Alternative

As part of Phase II, conceptual layouts for each alternative were developed, to understand what a stop at each site might look like and to aid in the evaluation of site alternatives. This chapter introduces one possible conceptual layout for a Pawtucket/Central Falls commuter rail facility located at the site of the former station. The features of the site plan of the contemplated facility are described first, followed by sections on railroad operations impacts, traffic impacts, Phase I Environmental Site Assessment, and costs.

Concept Design

The conceptual site plan for a commuter rail facility located at the former station site is shown in Figure 7-1. Key features include:

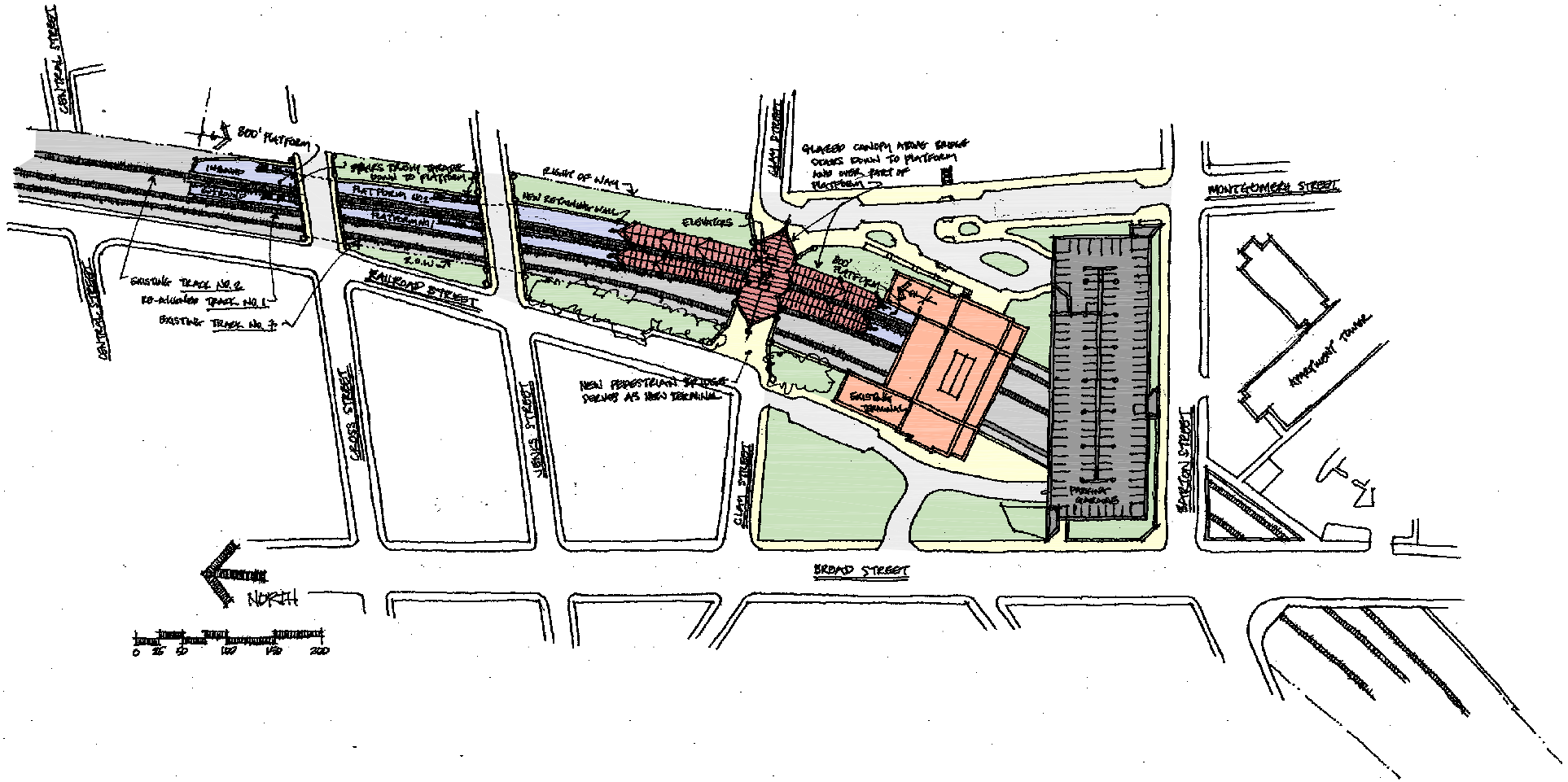
- Platform Location: Both platforms would be located on the outside of their respective tracks. Platforms begin near Clay Street, near the city line, and extend north into Central Falls under Jenks Street and Cross Street. Platforms cannot be located under the historic building without a design waiver from Amtrak. The location of the platforms would require reconstruction of the Clay Street, Jenks Street, and Cross Street bridges, as well as a new retaining wall along the eastern side of the right-of-way for the full platform length. The 800-foot long platforms would be full-length, high-level platforms.

- Platform Access: Primary access to the platforms would be from stairways and elevators located at the Clay Street bridge. Secondary access to the platforms could be provided via stairways at Jenks Street and/or Cross Street. Providing primary access via the former station building using new stairways and new elevators in the existing passageways could also be feasible. The access stairs and elevators would be connected to the platforms by fenced walkways.

- Automobile Circulation and Parking Structure: Automobile circulation would be split between the two sides of the site. A garage structure would span the right-of-way along the southern side of the site, with primary entrance and egress on Montgomery Street between Barton Street and Clay Street. A secondary entrance would be provided on Broad Street. The garage would accommodate over 700 cars on six or seven levels. Kiss-and-Ride areas would be provided on both sides of the station building; on the east side, access would be to and from Montgomery Street, while on the west side, autos would enter from Broad Street and exit onto Clay Street. This concept would facilitate traffic flow by making Clay Street a one-way exit from the site on both sides of the right-of-way, with the Clay Street Bridge becoming a pedestrian area.

- Pedestrian Circulation: Safe and comfortable movement of pedestrians within the facility was a major consideration in the development of the site concept. Sidewalks would be included throughout the site, making it easy to access the stop from any direction. In addition, secondary access points as previously described would facilitate access to the platform from surrounding neighborhoods.

- On-Site Development Opportunities: Regardless of whether primary access is from Clay Street or from the former station building, there is opportunity for new commercial development or redevelopment in the historic building, in additions to the building, or on the lower-level street front of the parking garage. The most suitable use for these spaces is likely to be high-volume commercial uses, such as a coffee shop or other commuter services.



0 80 160 Feet

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 7-1

Pawtucket/Central Falls
Commuter Rail Feasibility Study
Historic Site Concept

Operations Impact

Permanent operations impacts are discussed in Chapter 3. Of the 30 trains passing through Pawtucket/Central Falls on a normal weekday, 23 can stop without having any schedule impact on existing operations. Therefore, it is not expected that service at this site would have a permanent impact on operations.

Temporary impacts are anticipated during construction, related to the need to complete the following activities in the vicinity of the right-of-way:

- Construction of a new retaining wall along east side of right-of-way
- Construction of platforms, canopies, stairs, and elevators
- Reconstruction of Clay Street, Jenks Street, and Cross Street bridges
- Relocation of catenary poles
- Construction of the parking garage spanning right-of-way
- Modification of former station building

Traffic Impact

As explained in Chapter 4, a Pawtucket/Central Falls commuter rail facility would initially attract up to 1175 riders, of whom up to 1025 would access the stop vehicle. To assess off-site traffic impacts, existing traffic conditions were observed, evaluated, and projected to 2010. The traffic volumes expected from the former station site were overlaid on this background traffic to determine the impact of trips to and from the stop. Volumes include only traffic projected from ridership, not from any associated development on- or off-site.

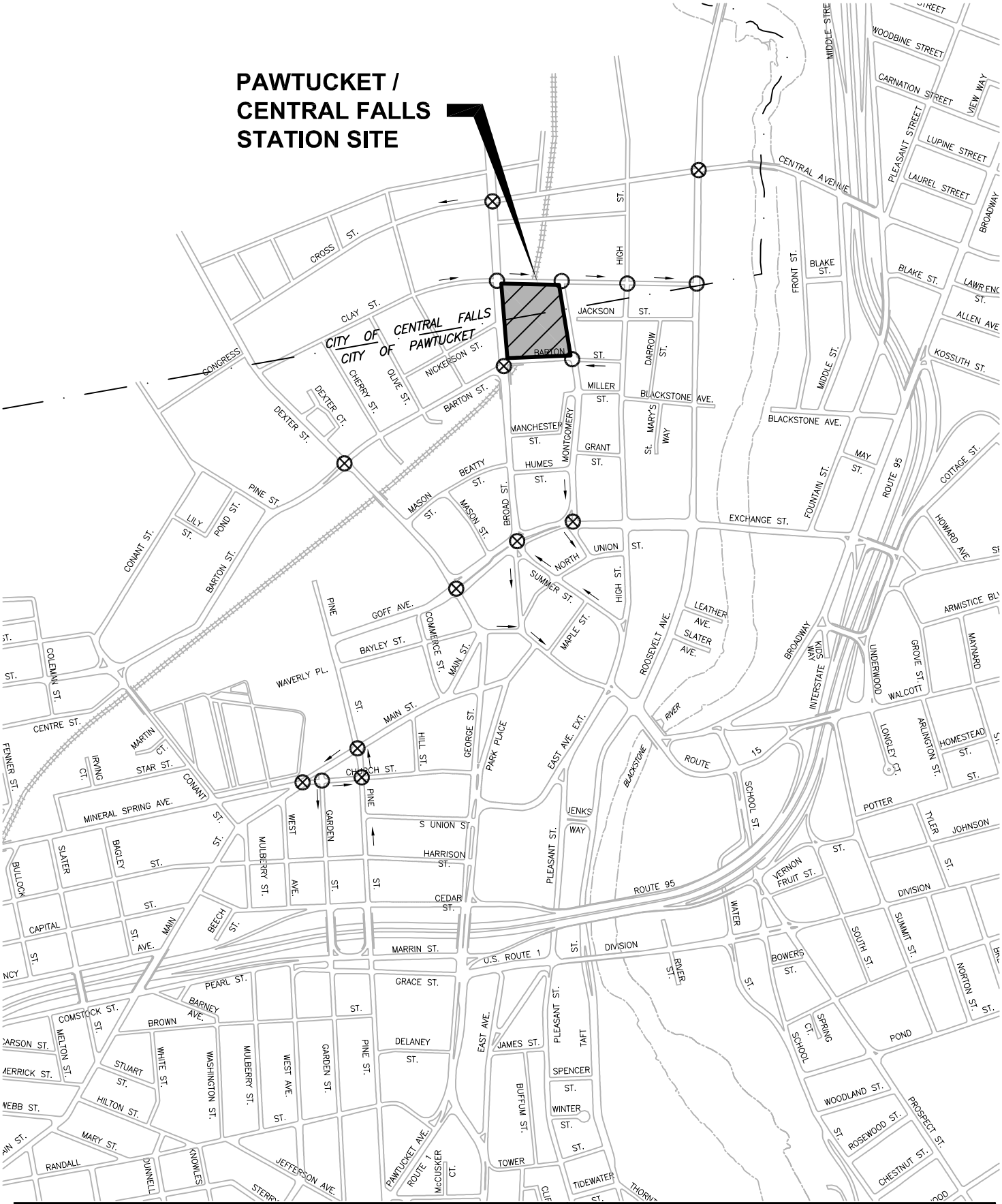
Pawtucket and Central Falls are urban areas, so intersections on the street grid are the primary restriction on traffic flow. Therefore, the traffic analysis was focused on 10 signalized and 6 unsignalized intersections in the vicinity of the site, as shown in Figure 7-2.

Under this alternative, one signalized intersection would fail, the intersection of Broad Street, Goff Avenue, and Exchange Street. This intersection is projected to have overall Level of Service (LOS) E during both morning and afternoon rush hour, with the Broad Street approaches having LOS F during

afternoon rush hour. The intersection of Broad Street and Cross Street would experience overall LOS D during afternoon rush hour, and therefore would not fail, but the Broad Street northbound approach has LOS E. The intersection of Dexter Street and Barton Street would have LOS F on the Dexter Street northbound approach during afternoon rush hours, but this condition would be expected even if the commuter rail stop is not constructed, and traffic from the stop would have no impact on LOS at this intersection. Of the six unsignalized intersections, only the intersection of Broad Street and Clay Street would experience LOS F, on the Clay Street approach. This condition would occur both during morning and afternoon rush hours. Based on this analysis, off-site improvements are expected to be required at the following intersections:

- Broad Street and Clay Street: This intersection is currently unsignalized; it is expected that a signal would be needed.
- Broad Street, Goff Avenue, and Exchange Street: Improvements to existing signals would be needed.
- Broad Street and Cross Street: Improvements to existing signals would be needed.

The complete results of the traffic analysis are presented in Appendix D.



⊗ Signalized Intersection

○ Unsignalized Intersection

0 400 800 Feet

Pawtucket/Central Falls Commuter Rail Facility

Feasibility Study and Site Analysis

Figure 7-2

Former Station Site
Traffic Study Area

Phase I Environmental Site Assessment

As part of this study, an ASTM Phase I Environmental Site Assessment (PESA) was performed in order to make a preliminary evaluation of potential environmental issues. The results of this evaluation are described below.

■

Site History Overview

The Site is an approximately 153,331-square foot (3.52-acre) parcel located on the northeast side of the intersection of Broad Street and Barton Street in Pawtucket, Rhode Island. The southern portion of the Site is identified on the City of Pawtucket Tax Assessor's Plat (A.P.) 43B, Lots 602, 603, and 604, and the northern portion of the Site is identified on the City of Central Falls Tax Assessor's A.P. 1, Lot 309.

Based on Sanborn Fire Insurance mapping, in the late 1800s numerous buildings were located at the site and the railroad tracks that currently bisect the site were located east of the site. Based on Sanborn Fire Insurance mapping, in the early 1900s the site was used as a train station and the railroad tracks had been relocated to their present location. Based on aerial photographs and Sanborn Fire Insurance mapping, the railroad station building located at the site was used as a station from the early 1900s until the 1959. The train station building located at the site is currently vacant.

Based on the 1949 Sanborn Fire Insurance Map, a "filling station" was located in the northwest portion of the Site. The "filling station" was depicted as a building and four apparent underground storage tanks (USTs) in the 1949 Sanborn Map. However, in the next chronologically available Sanborn Map dated 1984, the "filling station" was located in the northwest portion of the Site, but the four apparent USTs were no longer depicted. No documentation such as UST registrations or closure certificates was available at RIDEM[1]. A building was located in the same vicinity as the "filling station" depicted in the historical Sanborn Maps during the site reconnaissance.

According to a 1995 Limited Subsurface Investigation Report prepared by Environmental Science Services for Costa's Service Center located at 355 Broad Street, "an apparently inactive Gulf service station" was located at the subject site. The Gulf Station was listed as being located at 309 Broad Street and the 1989 correspondence indicated that the Gulf Station no longer

▼

[1] Based on June 6, 2006 file review.

needed its United States Environmental Protection Agency (USEPA) identification number since the Gulf Station no longer generated waste[2]. No additional files were available for the Gulf Station.

■

Site Reconnaissance Operations

A site reconnaissance was conducted on May 5, 2006 for any indications of recognized environmental concerns (RECs). The reconnaissance was conducted by walking the perimeter of the Site on public sidewalks. Access onto the site and a site contact was not interviewed as part of this PESA.

Two buildings were observed at the site at the time of the site visit. One building was located in the central portion of the site, the vacant former railroad station. The second building was smaller and was located in the northwest portion of the site. This building had the appearance of a former gasoline filling station and had no signs or other markings. At the time of the site reconnaissance, there was no pavement or asphalt surface located adjacent to the apparent filling station building. The area to the south of the apparent filling station was a gravel surface.

A loading dock was located in the northeast portion of the former passenger station building. Since the Site reconnaissance was conducted from off-site, no observations could be made of potential staining in the vicinity of the loading dock.

Solid waste including food wrappers, cans and bottles, tires, plastic bags, and miscellaneous debris was observed throughout the Site. The solid waste appeared limited in nature and no staining or stressed vegetation were observed in the vicinity of the solid waste.

■

Findings

The following RECs were identified at the subject Site:

- Former Filling Station: A "filling station" building and four apparent USTs were depicted in historical Sanborn Fire Insurance mapping at the Site. No documentation such as UST registrations or closure certificates was available at RIDEM[2].

▼

[2] Based on June 6, 2006 file review.

- Historical Use as a Train Station: Based on aerial photographs and Sanborn Fire Insurance mapping, the Site was used as a train station from the early 1900s to the 1980s.

Though not considered an REC in accordance with ASTM 1527-05 due to its limited nature, several areas of soil waste were observed through out the Site including food wrappers, cans and bottles, tires, plastic bags, and miscellaneous debris.

Costs

The costs for the Pawtucket/Central Falls Commuter Rail Facility can be broken into two categories: Capital Costs and Operations and Maintenance Costs. The following are descriptions of these costs as they apply to the project:

- Capital Costs: This category includes the costs of constructing the parking structure and foundation, retaining walls, platforms, canopies, stairways, walkways, elevators, catenary pole relocation, bridge reconstruction, site roadways, landscaping, and off-site traffic improvements. It also includes modifications to the historic building, if required.

- Operations and Maintenance Costs: This category includes annually recurring costs, such as platform and garage maintenance, removal of snow, insurance, staffing (if applicable), and maintenance of any passenger facilities.

The estimating procedure included the following steps:

- Cost data on parking structures was obtained from prior data from recent commuter rail facility projects. The additional cost of spanning the right-of-way was accounted for by considering other parking structures with special conditions, such as soil conditions requiring deep foundations.

- Quantity take-offs for site improvements, platforms, canopies, and retaining walls were estimated based on the concept plan of Figure 7-1.

- Unit costs for site improvements, off-site traffic improvement, bridge reconstruction, platforms, canopies, and retaining walls were based on recent industry data including Massachusetts Highway Department bid price tabulations and costs of site improvements at other commuter rail facilities.

- A construction cost contingency and an allowance for design costs were added, at percentages consistent with FTA guidelines for cost estimating at the conceptual design level of project development. The FTA allows up to a 30% construction contingency and up to a 20% contingency for design, survey, and construction services at this level of project development.

- Rail equipment acquisition costs are not included in these estimates, but are assumed to be the similar for both alternatives based on the projected ridership.

■

Capital Costs

Table 7-1 provides a summary of the conceptual capital costs for the Pawtucket/Central Falls Commuter Rail Facility Former station site Alternative. Capital costs total approximately $58 million for this alternative.

Table 7-1: Summary of the Capital Cost Estimate (2006 Dollars)

Cost Component	Capital Cost
Station Facilities	$ 8,595,000
Parking Garage	$ 16,905,000
Train Platforms	$ 1,920,000
Railroad Improvements	$ 1,300,600
Civil/Site & Off-Site Improvements	$ 1,312,850
Bridges & Retaining Walls	$ 8,973,000
Sub-Total Cost	$ 39,006,450
Contingency (30%)	$ 11,701,935
Design (20%)	$ 7,801,290
Total Capital Costs	**$ 58,510,000**

The following is a summary of the Capital Cost Estimate in Table 7-1:

- Station Facilities: This item covers all costs of repairing and refurbishing the existing station building or constructing new station facilities in lieu of renovating the former station building. It includes stairs, ADA ramps, elevators, any station enclosure, repairs to the station structure, and associated work.

- Parking Garage: This item includes all costs of constructing the new parking garage, with 6 to 7 levels and parking for between 700 and 750 vehicles. This includes foundation systems, stairs, elevators, pre-cast and/or cast-in-place concrete, lighting, and fire protection. It contains a

cost premium for the expense of constructing a parking garage over the active railroad right-of-way.

- Train Platforms: This item covers all costs of platforms, including concrete, reinforcement, tactile warning strips, and platform canopies.

- Railroad Improvements: This item includes all costs of relocating supports for the overhead catenary system, modifying the existing signal system, and constructing high-speed train passenger warning systems.

- Civil/Site & Off-Site Improvements: This item covers all costs of site work, including parking lots, sidewalks, driveways, utilities, and landscaping. It also includes all off-site traffic improvements, such as sidewalk improvements and signal modifications.

- Bridges & Retaining Walls: This item includes all work associated with reconstructing the Clay Street, Jenks Street, and Cross Street bridges to provide adequate width for platforms on the east side of the right-of-way, such as abutments, substructure, superstructure, and traffic management. This item also includes all costs associated with excavation, temporary bracing, concrete, reinforcement, and formwork for the construction of a new retaining wall on the east side of the right-of-way for the entire length of the platform.

■

Operations and Maintenance Costs

Table 7-2 provides a summary of the conceptual operations and maintenance costs for the Pawtucket/Central Falls Commuter Rail Facility Former station site Alternative. Annual operations and maintenance costs are estimated to total $1,040,000.

Table 7-2: Summary of the Operations and Maintenance Cost Estimate (2006 Dollars)

Cost Component	O&M Cost
Facilities Operations and Maintenance	$ 40,000
Parking Garage Operations and Maintenance	$ 960,000
Railroad Costs	$ 40,000
Total Operations and Maintenance Costs	**$ 1,040,000**

The following is a summary of what is included in the Operations and Maintenance Cost Estimate in Table 7-2:

- Facilities Operations and Maintenance: This item includes the costs of providing utilities, street sweeping, cleaning, sidewalk snow removal, and general upkeep for the commuter rail facility.

- Parking Garage Operations and Maintenance: This item includes the costs of providing utilities, street sweeping, garage snow removal, structural maintenance, and general upkeep for the parking garage. It is based on an average cost-per-space.

- Railroad Costs: This item covers platform upkeep costs, such as platform snow removal, canopy and lighting maintenance, concrete and tactile warning strip maintenance, and stairway and elevator maintenance.

8

Rail Yard Alternative

As part of Phase II, conceptual layouts for each alternative were developed, to understand what a stop at each site might look like and to aid in the evaluation of site alternatives. This chapter introduces one possible conceptual layout for a Pawtucket/Central Falls commuter rail facility located at the site of the Providence and Worcester Railroad (PWRR) Pawtucket Yard. The features of the site plan of the contemplated facility are described first, followed by sections on railroad operations impacts, traffic impacts, Phase I Environmental Site Assessment, and costs.

Concept Design

The conceptual site plan for a commuter rail facility located at the rail yard site is shown in Figure 8-1. Key features include:

- Platform Location: Both platforms are located on the outside of their respective tracks. Platforms would begin near Conant Street and extend north towards Dexter Street. Unlike the former station alternative, the platforms would be entirely within the City of Pawtucket. The 800-foot long platforms would be full-length, high-level platforms.

- Platform Access: Primary access to the platforms would be from stairways and ADA accessible ramps located at the Conant Street bridge. Secondary access to the inbound platform would be provided directly from the parking lot. Additional access to the outbound platform, not shown in this concept, could be provided via a stairway over the mainline tracks at the northern end of the platform.

- Automobile Circulation and Parking Structure: Automobiles would enter and exit the site at the intersection of Pine Street and Goff Avenue. The main parking lot entrance and egress would comprise the west leg of the intersection, with an auxiliary exit forming the north leg. Surface parking would provide enough space for only about 250 vehicles, so a parking structure would be necessary. The structure is not shown on this concept,

but a wide variety of heights and configurations are possible on this site, all for approximately the same cost and all providing approximately 500 parking spaces.

- Pedestrian Circulation: Safe and comfortable movement of pedestrians within the facility was a major consideration in the development of the site concept. Sidewalks would be included throughout the site, making it easy to access the stop from any direction.

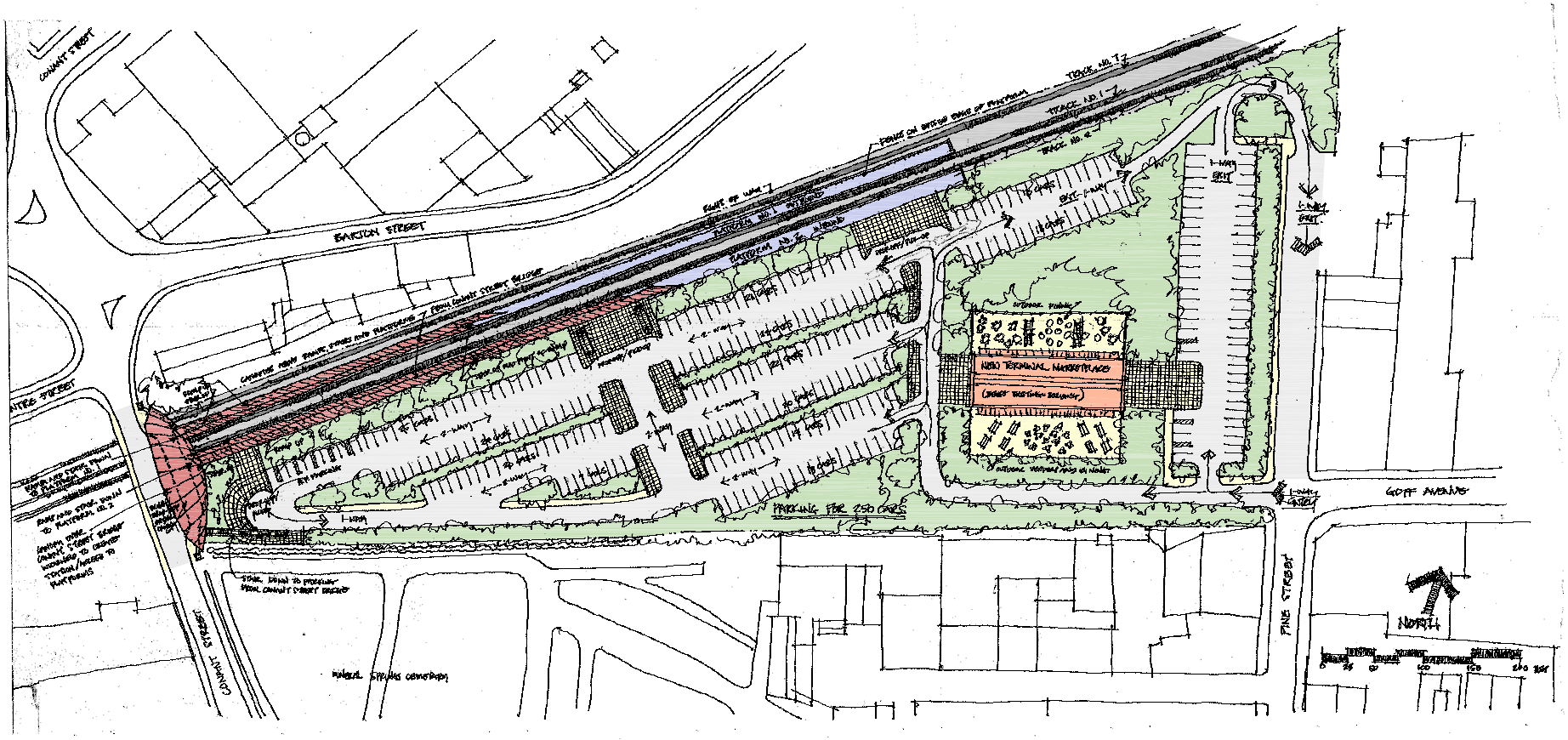
- On-Site Development Opportunities: There would be the potential to redevelop the existing warehouse building on the rail yard, as well as development of new structures on site. This concept shows both reuse of the warehouse building and new kiosks near the inbound platform. The most suitable use for these spaces is likely to be high-volume commercial uses, such as a coffee shop or other commuter services.

Operations Impact

Permanent operations impacts are evaluated in Chapter 3. Of the 30 trains passing through Pawtucket/Central Falls on a normal weekday, 23 can stop without having any schedule impact on existing operations. Therefore, it is not expected that service at this alternative site would have a permanent impact on operations.

Temporary impacts are anticipated during construction, related to the need to complete the following activities in the vicinity of the right-of-way:

- Construction of platforms, canopies, stairs, and ADA accessible ramps
- Reconstruction or modifications to Conant Street bridge
- Relocation of catenary poles
- Construction of a secondary access stairway across the right-of-way at the northern end of the platform



0 80 160 Feet

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 8-1

Pawtucket/Central Falls
Commuter Rail Feasibility Study
Rail Yard Site Concept

Traffic Impact

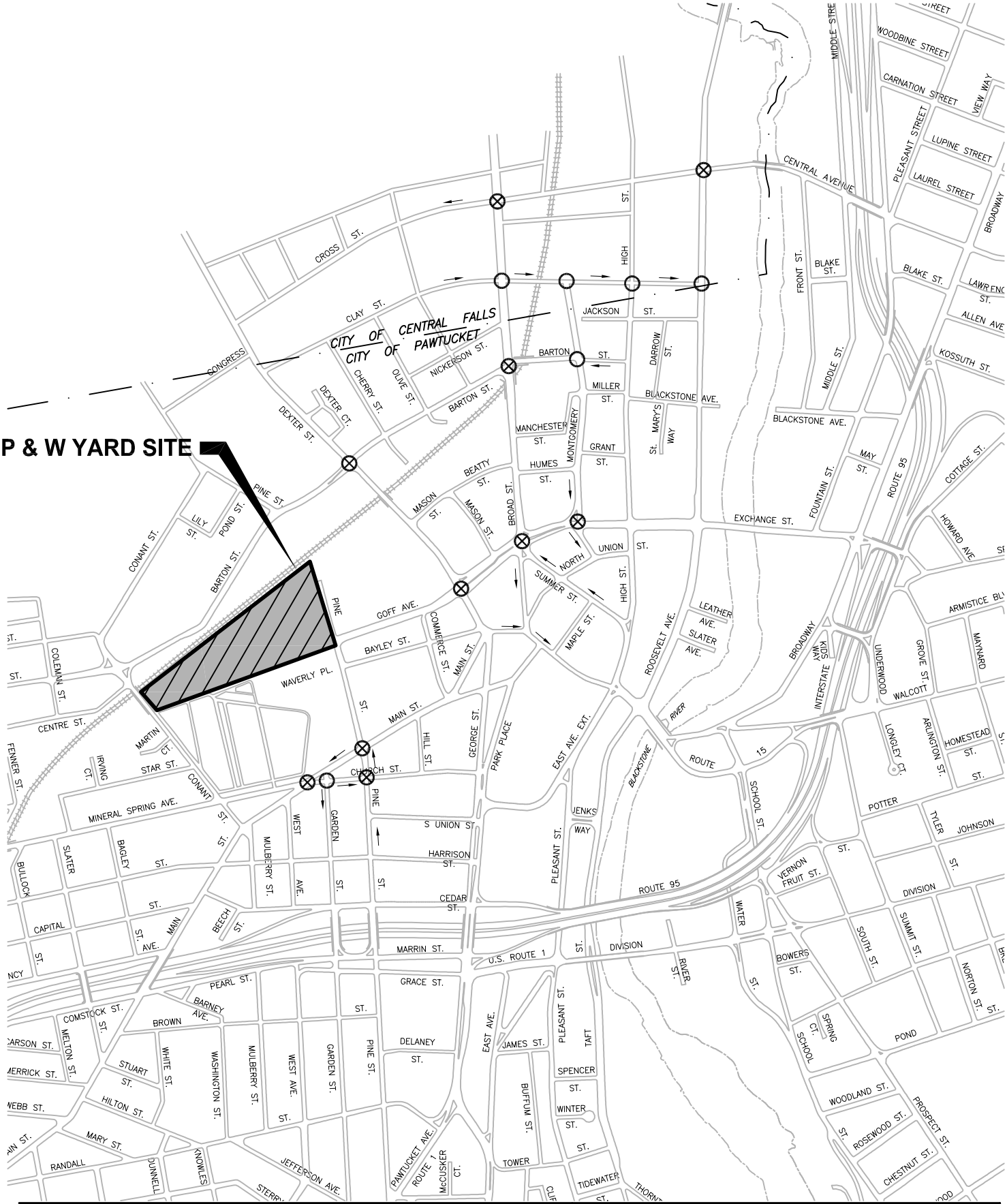
As explained in Chapter 4, a Pawtucket/Central Falls commuter rail facility would initially attract up to 1175 riders, of whom up to 1025 would access the stop by parking at the stop or by kiss-and-ride. To assess off-site traffic impacts, existing traffic conditions were observed, evaluated, and projected to 2010. The traffic volumes expected from the rail yard site were overlaid on this background traffic to determine the impact of trips to and from the stop. Volumes include only traffic projected from ridership, not from any associated development on- or off-site.

Pawtucket and Central Falls are urban areas, so intersections on the street grid are the primary restriction on traffic flow. Therefore, the traffic analysis focused on 10 signalized and 6 unsignalized intersections in the vicinity of the site, as shown in Figure 8-2.

Under this alternative, one signalized intersection would fail, the intersection of Broad Street, Goff Avenue, and Exchange Street. This intersection is projected to have overall Level of Service (LOS) E during both morning and afternoon rush hour, with the Broad Street approaches having LOS F during afternoon rush hour. The intersection of Dexter Street and Barton Street would have LOS F on the Dexter Street northbound approach during afternoon rush, but this condition is expected even if the commuter rail stop is not constructed, and traffic from the stop would have no impact on LOS at this intersection. Of the six unsignalized intersections, only the intersection of Broad Street and Clay Street would experience LOS F, on the Clay Street approach. This condition occurs during morning rush hour only. Based on this analysis, off-site improvements are expected to be required at the following intersections:

- Broad Street and Clay Street: This intersection is currently unsignalized; it is expected that a signal would be needed.
- Broad Street, Goff Avenue, and Exchange Street: Improvements to existing signals would be needed.

The complete results of the traffic analysis are presented in Appendix D.



Signalized Intersection

Unsignalized Intersection

0 400 800 Feet

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 8-2

Rail Yard Site
Traffic Study Area

Phase I Environmental Site Assessment

As part of this study, an ASTM Phase I Environmental Site Assessment (PESA) was performed in order to make a preliminary evaluation of potential environmental issues. The results of this evaluation are described below.

■

Site History Overview

The site is an approximately 270,756-square foot (6.22-acre) parcel located at 280 Pine Street in Pawtucket, Rhode Island. The site is further identified by the City of Pawtucket Tax Assessor as Plat (A.P.) 44A, Lot 559.

Based on aerial photographs and Sanborn Fire Insurance mapping of the site, it appears that a rail yard has operated at the site since the late 1800s. During site reconnaissance, the site was observed to be an active rail yard used to unload railroad containers. A brick warehouse building, which according to the Pawtucket Tax Assessor's field card was built in 1900, is also present.

■

Site Reconnaissance Observations

A site reconnaissance was conducted on August 11, 2006 for any indications of recognized environmental concerns (RECs). The reconnaissance was conducted by walking the site with a site contact, Mr. Bernard Cartier of the Providence & Worcester Railroad Company.

According to Mr. Cartier, the site is currently leased and occupied by Pawtucket Transfer Operations, LLC. Mr. Cartier stated that the site tenants unload railroad containers with a crane that remains on-site. According to Mr. Cartier, steel is the item most often unloaded at the site. Mr. Cartier had no additional information as to other types of cargo that arrives at the site. Mr. Cartier said that only the railroad containers get unloaded at the site; the cargo does not get unloaded from the railroad containers at the site. Additionally, the containers are not washed on-site, according to Mr. Cartier. Cargo leaves the site on tractor trailers that park along Pine Street, which is adjacent to the site to the east.

The adjacent property to the south, Roberts Chemicals, had several railroad cars that were labeled as "hazardous materials". According to Mr. Cartier, the railroad tracks that Roberts Chemicals uses are part of the subject Site. At the time of the site reconnaissance, the railroad tracks used by Roberts

Chemicals were separated from the remaining portion of the site with a fence. Mr. Cartier had no information regarding the types of materials used at Roberts Chemicals. According to Mr. Cartier, Roberts Chemical has unloaded chemicals for approximately the last 5 to 6 years. These railroad tracks were not inspected as part of this PESA and a contact familiar with Roberts Chemical was not interviewed as part of this PESA.

One building was located on the site at the time of the site reconnaissance. The building was brick and was constructed on a concrete slab foundation with no basement. According to Mr. Cartier, the building was not heated and had not been historically heated. At the time of the site visit, the building was empty except for five unlabeled 55-gallon drums, a table, a large cardboard box, and some tools.

Approximately 10 to 12 years ago, the eastern portion of the building, adjacent to Pine Street, was demolished after being hit by a truck, according to Mr. Cartier. The slab foundation associated with the razed portion of the building was still present.

The majority of the site was not paved and the subsurface soil was exposed. Solid waste was observed throughout the site and included an abandoned boat, numerous 55-gallon unlabeled drums, antifreeze containers, motor oil containers, abandoned tractor trailers, demolition debris, and stockpiles of apparent urban fill. Apparent petroleum staining was observed in the vicinity of several of the 55-gallon drums including staining on the subsurface soil.

■

Findings

The following RECs were identified at the site:

- Historical Use as a Rail Yard: Based on historical aerial photographs and Sanborn Fire Insurance mapping, the site has been used as a rail yard since the late 1800s.

- Former 15,000-gallon Diesel UST: A 15,000-gallon diesel underground storage tank (UST) was removed from the Site in 1998.

- 55-gallon drums: Approximately ten 55-gallon drums were observed throughout the site. The 55-gallon drums were closed and unlabeled. Therefore, the contents or former contents of the 55-gallon drums were not determined at the time of the Site visit; however, two of the 55-gallon drums had a red "flammable" sticker posted on the exterior.

- Solid Waste: Solid waste including an abandoned boat, antifreeze containers, motor oil containers, abandoned tracker trailers, demolition debris, and stockpiles of apparent urban fill were observed throughout the site. The majority of the solid waste observed at the site was located on areas of bare soil.

- Catch Basins: Catch basins were observed along the railroad tracks located at the site. According to the site contact, these catch basins discharge to Narragansett Bay.

- Adjacent Properties: Roberts Chemicals, which is adjacent to the site to the south, uses on-site railroad tracks, according to the site contact. At the time of the site visit, railroad containers labeled "hazardous materials" were observed on the Roberts Chemical property. Likewise, according to a 2005 Site Investigation Report (SIR) prepared by Jacques Whitford Company at Roberts Chemical, arsenic, lead, and polynuclear aromatic hydrocarbons (PAH) were detected at concentrations in soil that exceeded applicable RIDEM regulatory criteria. Groundwater was located approximately 5 to 8 feet below grade at the property and flowed southeasterly, according to the 2005 SIR. No volatile organic compounds (VOCs) were detected in groundwater collected from three groundwater monitoring wells located at the property. Based on October 11, 2005 correspondence from RIDEM, an Environmental Land Usage Restriction (ELUR) will be recorded on the deed for the entire Roberts Chemical property.

Costs

The costs for the Pawtucket/Central Falls Commuter Rail Facility can be broken into two categories: Capital Costs and Operations and Maintenance Costs. Cost categories and estimating procedures are the same as described in Chapter 7.

Capital Costs

Table 8-1 provides a summary of the conceptual capital costs for the Pawtucket/Central Falls Commuter Rail Facility Rail Yard Site Alternative. Capital costs total approximately would $45 million for this alternative.

Table 8-1: Summary of the Capital Cost Estimate (2006 Dollars)

Cost Component	Yard Site
Parking Garage	$ 8,500,000
Train Platforms	$ 1,920,000
Railroad Improvements	$ 2,050,600
Civil/Site & Off-Site Improvements	$ 1,931,500
Cross Track Pedestrian Access	$ 1,500,000
Acquisition and Relocation of PWRR Yard	$ 14,159,000
Sub-Total Cost	$ 30,061,100
Contingency (30%)	$ 9,018,330
Design (20%)	$ 6,012,220
Total Capital Costs	**$ 45,092,000**

The following is a summary of what is included in the Capital Cost Estimate in Table 8-1:

- Parking Garage: This item includes all costs of constructing a new parking garage, with parking for approximately 500 vehicles. This includes foundation systems, stairs, elevators, pre-cast and/or cast-in-place concrete, lighting, and fire protection.

- Train Platforms: This item covers all costs of platforms, including concrete, reinforcement, tactile warning strips, and platform canopies.

- Railroad Improvements: This item includes all costs of relocating supports for the overhead catenary system, modifying the existing signal system, constructing high-speed train passenger warning systems, and relocating the signal block boundary that is currently located on the mainline adjacent to the yard.

- Civil/Site & Off-Site Improvements: This item covers all costs of site work, including parking lots, sidewalks, driveways, utilities, and landscaping. It also includes all off-site traffic improvements, such as sidewalk improvements and signal modifications.

- Cross Track Pedestrian Access: This item includes all costs associated with constructing stairways and ramps across the mainline tracks near Conant Street to provide access to both the inbound and outbound platforms.

- Acquisition and Relocation of PWRR Yard: This item includes all real estate and legal costs associated with the purchase of the rail yard site from private ownership. It also includes the costs of acquiring the land for and constructing a facility of similar operational capabilities

somewhere else in Pawtucket or a nearby municipality, and relocating existing tenants to the new facility.

■

Operations and Maintenance Costs

Table 8-2 provides a summary of the conceptual operations and maintenance costs for the Pawtucket/Central Falls Commuter Rail Facility Rail Yard Site Alternative. Annual operations and maintenance costs are estimated to total $780,000 for this alternative.

Table 8-2: Summary of the Operations and Maintenance Cost Estimate (2006 Dollars)

Cost Component	Yard Site
Surface Parking Operations and Maintenance	$ 90,000
Parking Garage Operations and Maintenance	$ 650,000
Railroad Costs	$ 40,000
Total Operations and Maintenance Costs	**$ 780,000**

The following is a summary of what is included in each of the individual components of the Operations and Maintenance Cost Estimate in Table 8-2:

- Surface Parking Operations and Maintenance: This item includes the costs of providing utilities, street sweeping, parking lot snow removal, and general upkeep for the surface parking lot. It is based on an average cost-per-space.

- Parking Garage Operations and Maintenance: This item includes the costs of providing utilities, street sweeping, garage snow removal, structural maintenance, and general upkeep for the parking garage. It is based on an average cost-per-space.

- Railroad Costs: This item covers platform upkeep costs, such as platform snow removal, canopy and lighting maintenance, concrete and tactile warning strip maintenance, and stairway and elevator maintenance.

9

Identification of Preferred Alternative

The final step of Phase II was the selection of the preferred alternative site for a Pawtucket/Central Falls commuter rail stop. This chapter summarizes the process that was undertaken to screen the two alternative sites for a commuter rail stop. The first section describes the method of evaluating and comparing the sites. The following section introduces the criteria by which the suitability of each site was assessed. The last section presents the results of the analysis and identifies the preferred alternative.

Screening Process

The Pawtucket/Central Falls commuter rail facility evaluation process was conducted using a matrix to evaluate the two alternative sites against a set of evaluation criteria developed by the study team. For every one of the criteria, each alternative was given a score of -10, -5, 0, +5, or +10, as summarized below:

- - 10 indicates that the alternative has a very negative rating for that criterion
- - 5 indicates that the alternative has a somewhat negative rating for that criterion
- 0 indicates that the alternative is neutral or does not have a noticeable rating for that criterion
- + 5 indicates that the alternative has a somewhat positive rating for that criterion
- + 10 indicates that the alternative has a very positive rating for that criterion

Rankings are absolute, not relative, so it is possible for both alternatives to have the same score for a given criterion.

Screening Criteria

Evaluation criteria were established for the purpose of selecting a preferred alternative. The evaluation criteria have been developed based the Federal Transit Administration's (FTA's) New Starts project justification criteria with the objective of incorporating all the key indicators appropriate for a project of this type at this stage of project development. In some cases, evaluation criteria from the FTA have been consolidated or renamed, but their intent remains consistent with the source documents. Criteria were identified that address transportation, environmental, and constructability considerations. The following are brief descriptions of the criteria that were used in evaluating the alternative sites for the commuter rail facility.

Transportation

The following criteria related to transportation considerations were used to evaluate and screen the site alternatives:

- Traffic impacts: Is it anticipated that the trips generated by commuters driving to the stop could cause significant operational impacts on the adjacent city streets?
- Accessibility: Could the site be accessed by other modes of transportation, such as walking or cycling? How many potential riders are close enough to walk or cycle to the commuter rail stop?
- Impact on rail operations: Would the alternative cause permanent impacts to existing rail operations, such as platform clearance issues or speed restrictions?
- Parking supply: Could the alternative provide enough parking to prevent overflow parking in the surrounding neighborhoods?
- Ridership: How many riders would the alternative attract, and how would those riders access the commuter rail stop?
- Access to opportunity: Would the alternative make additional employment, cultural, and educational opportunities available to the neighborhoods in which it is located?

- Consistency with transportation planning policies: Is the alternative consistent with city and state transportation plans?

■

Environmental

The following criteria related to environmental considerations were used to evaluate and screen the site alternatives:

- Hazardous materials: Is it anticipated that hazardous materials are present at the alternative site?
- Noise and vibration: Would a commuter rail stop create unacceptable levels of noise or vibration at sensitive receptors?
- Air quality: Would a stop at the alternative cause a change in local air quality? Would it cause a change in regional air quality?
- Compatibility with land use: Are current and proposed land uses on and around the alternative compatible with a commuter rail facility?
- Economic effects: Would the alternative affect municipal tax revenue through the conversion of taxable land to publicly held land? Would the alternative stimulate housing and economic development in the cities?
- Relocations: Does the alternative require acquisition of privately owned property or relocation of tenants, owners, or users of privately owned property?
- TOD opportunities: Does the site present opportunities for transit-oriented development, both on-site and in the surrounding community?
- Environmental justice: Does the alternative create unfair impacts for an economically disadvantaged community?

■

Constructability

The following criteria related to constructability considerations were used to evaluate and screen the site alternatives:

- Constructability: Does the alternative exhibit characteristics that may adversely affect construction cost and schedule, such as difficult subsurface conditions or restricted work hours?

- Impact on rail operations (during construction): Would construction of the alternative cause temporary impacts to existing rail operations, such as delays or speed restrictions?

- Business relocations: Is the alternative dependent on relocating existing privately held facilities?

Identification of Preferred Alternative

Based on the site evaluation criteria described in the previous section, the two site alternatives were evaluated to identify a preferred alternative. The study team conducted the evaluation based on site visits, information gained from Stakeholder Committee and public meetings, the reports developed as part of Phase I of this project, and the conceptual layouts summarized in Chapters 7 and 8.

The following is a brief summary of the rationale used in assigning the ratings for each criterion:

- Traffic impacts: Because most riders would access the stop by car, both alternatives will cause an increase in traffic on local streets. Therefore, both alternatives were given a -5 rating.

- Accessibility: For both alternatives a considerable portion of riders would walk or take transit to the facility. However, based on the ridership analysis summarized in Chapter 4, it is expected that the former station site would have about twice as many riders walking to the facility as would the rail yard site. Therefore, the former station site was given a +10 rating and the rail yard site was given a +5 rating.

- Impact to rail operations: The rail corridor is owned by Amtrak at both alternative sites. Amtrak is unlikely to approve any design which permanently affects intercity or freight service on the corridor. As shown in Chapter 3, a facility at either site could be designed such that no permanent impacts to rail operations would be generated, so both alternatives were given a 0 rating.

- Parking supply: Both sites have sufficient room for enough parking to accommodate riders who would access the stop by car. Therefore, both sites were given a +5 rating.

- Ridership: Approximately the same level of ridership is expected at either site. This figure represents a considerable increase in transit ridership, so both sites were given a +5 rating.

- Access to opportunity: Both alternatives would make the educational, cultural, and employment opportunities of Boston and Providence more accessible to the community. The former station site is more centrally located in residential neighborhoods, in particular neighborhoods where many households have one or no automobile. The former station site therefore provides more of a benefit to these communities than the rail yard site. The former station site was given a +10 rating and the rail yard site was given a +5 rating.

- Consistency with transportation policies: Both sites will attract significant new transit ridership. This is consistent with the transportation policies of Pawtucket, Central Falls, and Rhode Island; all are trying to encourage use of public transit to reduce automobile dependence. Both sites were given a +5 rating.

- Hazardous materials: Based on the PESA reports from Phase I, it is likely that hazardous materials will be encountered at both sites. The former station site includes an abandoned gas station, which may have generated some contamination. The station also included a coal room that was probably used to store fuel for the facility's boiler. It is likely that the rail yard site is contaminated from its use as a rail yard. In addition, the PESA site investigation revealed the presence of stained soil, abandoned 55-gallon drums, and an active unloading facility for hazardous chemicals. Because the rail yard site appears to have more potential for contamination, it was given a -10 rating, while the former station site was given a -5 rating.

- Noise and vibration: Both sites are located on an active rail corridor. The trains that would be providing service to a Pawtucket/Central Falls commuter rail facility already pass both alternative sites en route between Providence and South Attleboro. Stopping these trains at a commuter facility would not cause a noticeable change in noise or vibration at sensitive receptors, so both alternatives were given a 0 rating.

- Air quality: While both alternatives would improve regional quality by encouraging new transit ridership, they are also expected to have an adverse impact on local air quality due to the increased automobile traffic in the immediate vicinity of the site. It is expected that more riders will access the facility by car for the rail yard site; therefore, it was given a -10 rating, while the former station site was given a -5 rating.

- Compatibility with land use: Both alternatives are consistent with the surrounding urban development. The former station site is closer to existing residential areas, making it more compatible. Therefore, the former station site was given a +10 rating, while the rail yard site was given a +5 rating.

- Economic impact: Both sites would be likely to provide an economic benefit to Pawtucket/Central Falls, by improving access to employment. Both would also create the possibility of Pawtucket/Central Falls as a destination. Therefore, both sites were given a +5 rating.

- TOD opportunities: Both sites would have significant potential for on-site transit-oriented development. Off-site, the former station site presents opportunities for urban infill in existing residential neighborhoods and the prospect for increased residential density. The rail yard site has substantial off-site potential as well, with under-utilized mill and warehouse buildings that could be converted to residential, commercial, or mixed-use development. Therefore, both sites were given a +5 rating.

- Environmental justice: The former station site is located in an economically disadvantaged neighborhood, while the rail yard site is located in a mainly commercial and industrial area. Therefore, the former station site was given a +5 rating, and the rail yard site was given a 0 rating.

- Constructability: The former station site is more constrained, and would be more difficult to build, especially if work is needed under the existing slab spanning the right-of-way. The rail yard site is all at-grade, facilitating construction. Therefore, the former station site was given a -5 rating and the rail yard site was given a 0 rating.

- Impact on railroad operations (temporary): Both sites would require temporary impacts to rail operations during construction. This impact would be necessary to construct platforms on the mainline and relocate catenary poles. The former station site would require extensive retaining wall work, and perhaps work under the slab supporting the historic station. Therefore, the former station site was given a -10 rating, and the rail yard site was given a -5 rating.

- Business relocations: The former station site and the rail yard site are both currently in private ownership. FTA guidelines require that when a business is taken, a reasonable effort must be made to relocate the establishment to a suitable facility. The rail yard would have to be relocated to another site along the Northeast Corridor, suitable to PWRR. The difficulty of relocating a rail yard in an urban area such as Pawtucket makes this alternative more difficult to implement. Therefore, the former station site was given a -5 rating and the rail yard site was given a -10 rating.

The final Site Evaluation Matrix is shown in Table 9-1. As the matrix shows, the former station site emerged as the site with the highest rating, and is

therefore recommended as the Preferred Alternative for the Pawtucket/Central Falls commuter rail facility.

Table 9-1: Site Evaluation Matrix

	Former station site	P&W Yard Site
Transportation		
Traffic impacts	-5	-5
Accessibility	+10	+5
Impact on railroad operations (permanent)	+0	+0
Parking supply	+5	+5
Ridership	+5	+5
Access to opportunity	+10	+5
Consistency w/ transportation policies	+5	+5
Environmental		
Hazardous materials	-5	-10
Noise and vibration	+0	+0
Air quality	-5	-10
Compatability w/ land use	+10	+5
Economic impact	+5	+5
TOD opportunities	+5	+5
Environmental justice	+5	+0
Constructability		
Constructability	-5	+0
Impact on railroad operations (temporary)	-10	-5
Business relocations	-5	-10
Total Score	**+25**	**+0**

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10

Preferred Site Concept

After completion of the alternatives analysis and selection of a preferred site, the team proceeded to commence Phase III activities. The first step of Phase III was to develop a 10 percent design plan for the preferred site, which serves as a basis for analysis in other Phase III tasks.

This chapter provides an overview of the 10 percent design plan for a Pawtucket/Central Falls commuter rail facility at the preferred site, the former station site. The features of the design are summarized, followed by sections on environmental impact, capital costs and funding strategies, and operating costs and funding strategies. Finally, an overview of economic impacts is presented.

Concept Design

During the course of the study, it became apparent that the desire for a commuter rail stop and the desire to redevelop the former station site were issues that might be addressed on separate schedules. Therefore, the 10 percent design plan was developed with a focus on providing maximum flexibility. Three potential approaches to development were outlined to allow a commuter rail stop to be constructed either in conjunction with or independent of the redevelopment of the former station site. In addition, to allow for a more gradual level of investment, a phased approach for parking at the stop was considered.

The three approaches to development are the Jenks Street Option, the Clay Street Option, and the Station Development Option. The commuter rail stop improvements for all three are shown in Figure 10-1. The scenarios are described in more detail in the following sections.

■

Jenks Street Option

The 10 percent design plan for the Jenks Street Option of the preferred site alternative is shown in Figure 10-1, as indicated in the legend. The following is a summary of the key features of the Jenks Street Option.

- Platform Location: Both platforms are located on the outside of their respective tracks. The platforms begin just south of Jenks Street and extend 800' north into Central Falls under Cross Street to the vicinity of Pacific Street. The location of the platforms requires reconstruction of the Jenks Street and Cross Street bridges, as well as a new retaining wall along the eastern side of the right-of-way for the full length of the platform. The 800-foot long platforms are full-length, high-level platforms.

- Platform Access: Primary access to the platforms is from stairways and elevators located at the Jenks Street bridge. Secondary access to the platform could be provided via stairways at any combination of Cross Street, Central Street, and Pacific Street, as shown on the plan. No direct connection to Clay Street or the former station building would be provided under this scenario.

- Automobile Circulation and Parking: No central parking structure is as part of this scenario. Instead, parking locations are flexible, with the opportunity for several small surface lots near the stop. This significantly reduces initial capital expenditures, and has the added benefit of dispersing facility-related traffic.

- Pedestrian Circulation: Secondary access points, as previously described, facilitate access to the platform from surrounding neighborhoods. An additional pedestrian crossing over the right-of-way could be provided at Central Street to further improve pedestrian connections, though this is not shown on the plans.

- On-Site Development Opportunities: The Jenks Street Option includes only the infrastructure necessary to support the development of the commuter rail stop. No public investment in the development of the former station site is incorporated into this option.

■

Clay Street Option

The 10 percent design plan for the Clay Street Option of the preferred site alternative is shown in Figure 10-1, as indicated in the legend. The Clay

Street Option includes all of the improvements described as part of the Jenks Street Option, plus extension of platforms south to the vicinity of Clay Street and the northern side of the former station building. The following is a summary of the key features of the Clay Street Option.

- Platform Location: The useable portions of the platforms, shown in Figure 10-1 as indicated in the legend, are located as described under the Jenks Street Option. South of Jenks Street, the platforms extend to the vicinity of Clay Street and the former station building. The platform extensions south of Jenks Street would not be used for boarding and alighting due to the platform gap resulting from track geometry; rather, they provide a direct connection from the platforms to the area around Clay Street and the former station building. The edges of the platform extensions facing the track would be fenced off. In addition to the bridges to be reconstructed on under the Jenks Street Option, the extension of the platforms requires reconstruction of the Clay Street bridge. New retaining walls are required along the eastern side of the right-of-way for the full length of the platform including the extension.

- Platform Access: Primary access to the platform is from stairways and elevators located in the vicinity of the Clay Street bridge, as shown in Figure 10-1. Secondary access to the platform could be provided via stairways at any combination of Jenks Street, Cross Street, Central Street, and Pacific Street, as shown on the plan. Elevators are not provided at Jenks Street in this scenario, as handicap access is provided at the primary access point.

- Automobile Circulation and Parking: Automobile circulation and parking are as described under the Jenks Street Option.

- Pedestrian Circulation: Pedestrian circulation is as described under the Jenks Street Option, with the additional benefit of a direct pedestrian connection between the platforms, Clay Street, and the former station site. Access to Clay Street could increase the potential for redevelopment at and around the former station site.

- On-Site Development Opportunities: The Clay Street Option includes only the infrastructure necessary to support the development of a commuter rail stop with connection to Clay Street and the former station site. No public investment in the development of the former station site is incorporated into this option.

■

Station Development Option

The 10 percent design plan for the Station Development Option of the preferred site alternative is shown in Figure 10-1, as indicated in the legend, and in Figure 10-2. The Station Development Option includes all of the improvements included in the Clay Street Option, plus redevelopment of the former station building, a new parking garage, and new retail on-site. The following is a summary of the key features of the Station Development Option.

- Platform Location: Platform location is as described in the Clay Street Option.

- Platform Access: Platform access is as described in the Clay Street Option.

- Automobile Circulation and Parking: Automobile access onto the site is provided by entrances on Broad Street and Montgomery Street, both of which provide access to a new 7-story parking garage with approximately 700 parking spaces. The Broad Street entrance also provides access to short-term parking in front of a pharmacy proposed by a private developer, and access to the pharmacy drive-through window. The Montgomery Street entrance provides access to a pick-up/drop-off area and provides space for bus operations. Both entrances exit onto Clay Street. Short-term parking is provided on Montgomery Street.

- Pedestrian Circulation: Pedestrian circulation is as described under the Clay Street Option. In addition, sidewalks are provided throughout the redeveloped station site, allowing pedestrians to access the site and stop from any direction. Pedestrians can also cross between the two sides of the right-of-way using the former station building.

- On-Site Development Opportunities: The rehabilitation of the former station building provides the opportunity for retail/commercial development. Space is also provided for retail/commercial development on the first floor of the garage building, facing Barton Street and Broad Street. Also shown in Figure 10-2 is a proposed pharmacy, expected to be constructed by private developers regardless of the progression of the commuter rail stop and any other redevelopment activities.

0 80 160 Feet

All Options

- Platform
- Stairs & Elevators
- Bridge
- Sidewalk

Clay Street & Station Development Options

- Platform Extension
- Stairs & Elevators
- Bridge
- Sidewalk

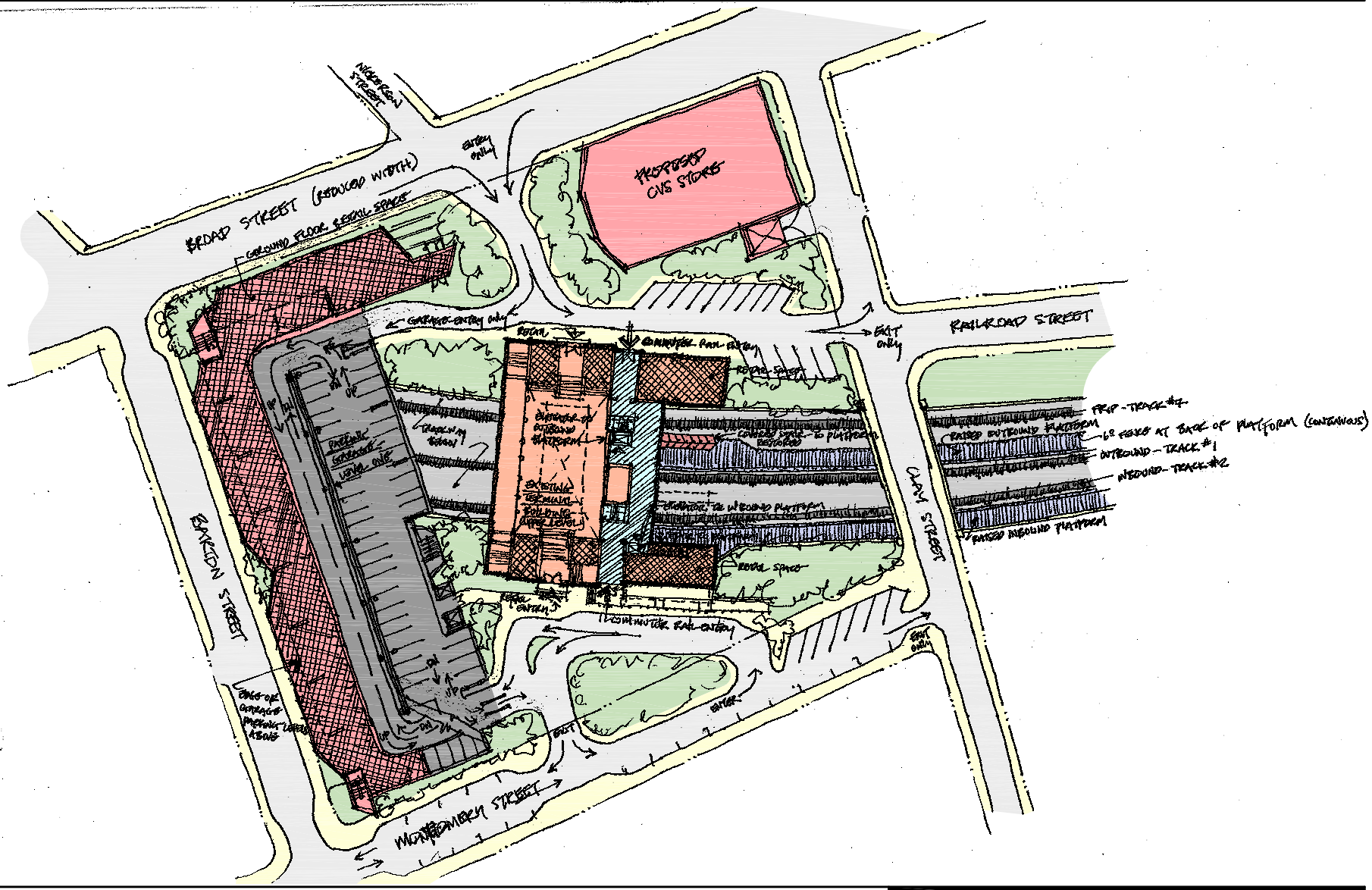
Station Development Option Only

- Stairs & Elevators

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 10-1

Pawtucket/Central Falls Commuter Rail Stop
Preferred Site Concept
Platform Level



0 50 100 Feet

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 10-2

Pawtucket/Central Falls
Commuter Rail Stop
Preferred Site Concept
Station Development Option Street Level

Operations Impact

Temporary impacts are anticipated during construction, related to the need to complete activities in or around the right-of-way.

■

Jenks Street Option

For the Jenks Street Option, the following activities will have temporary impacts to railroad operations:

- Construction of retaining wall along east side of right-of-way
- Construction of platforms, canopies, stairs, and elevators
- Reconstruction of Jenks Street and Cross Street bridges
- Relocation of catenary poles

■

Clay Street Option

For the Clay Street Options, all the temporary impacts of the Jenks Street Option are expected. The following additional activities will also have temporary impacts to railroad operations:

- Construction of additional retaining wall along east side of right-of-way
- Reconstruction of Clay Street bridge
- Relocation of catenary poles in addition to those relocated under the Jenks Street Option

■

Station Development Option

For the Station Development Option, all the temporary impacts of the Clay Street Option are expected. The following additional activities will also have temporary impacts to railroad operations:

- Reconstruction of retaining wall at and/or under the station building

- Reconstruction of retaining wall along west side of right-of-way at the former station site
- Construction of a new parking garage spanning the right-of-way
- Relocation of catenary poles in addition to those relocated under the Clay Street Option
- Rehabilitation and structural modification of the former station building, regardless of whether primary access is provided through the building

Environmental Impact

Since the proposed commuter rail stop would likely be constructed with Federal capital funding, it is defined as a "Federal action" and would require an appropriate level of NEPA environmental documentation. While this NEPA documentation is not included in the Feasibility Study process, at this stage it is appropriate to identify potential environmental impacts and permits that may be required if the project were to proceed to the NEPA stage. These findings are subject to further investigation and verification during the NEPA process.

The following is a list of environmental resources and considerations that may be affected by development of the Former Station Alternative for the Pawtucket/Central Falls Commuter Rail Facility:

- Air Quality: the stop will be a benefit to regional air quality, but many potential passengers would access the stop by car. Therefore, an air quality analysis will be required to determine impacts of additional traffic on local air quality.
- Noise/Vibration: because trains already travel along the corridor frequently, and no additional trains are required, no noise or vibration impacts are expected. However, a noise analysis may still be required.
- Environmental Justice: the proposed commuter rail facility will provide improved transit access to an environmental justice community, and is therefore expected to have a positive impact in this area.
- Wetlands/Floodplains: it appears that there are no wetlands or floodplains at the former station site.
- Hazardous Materials: a review of RIDEM files did not indicate any historical information showing the presence of spills, USTs, or hazardous

waste mitigation sites at the former station site. However, the presence of the former gas station indicates some potential for hazardous wastes.

- Water Resource Protection: it is not anticipated that water resources are present at the former station site.
- Wildlife: owing to the long history of development at the site and the fact that there is very little natural vegetation at the site, there should be no issues related to wildlife with the proposed project.
- Archeological/Historical: if the project were to be funded in whole or in part by Federal funding, a formal sign-off of the project would be necessary by the State Historic Preservation Office (SHPO) and the sponsoring agency, FTA. The former station itself may be eligible for the National Register of Historic Places and may be affected by the project.
- Important Farmland Soil: the former station site parcel is zoned for transportation or commercial development and has a history of development; therefore, the project is not subject to Farmland Conversion Analysis (through the Federal Department of Agriculture).

As noted above, the project would require an appropriate level of NEPA documentation if Federal funds are used. Based on a review of the former station site and an understanding of the project's conceptual design, it appears that an Environmental Assessment (EA) should provide the appropriate level of review.

Capital Costs and Funding Strategies

A capital cost estimate has been prepared based on the 10 percent design plans shown in Figures 10-1 and 10-2. The estimating procedure was similar to that described in Chapter 7. Based on the estimated capital costs, a financial analysis was performed to prepare a capital funding strategy.

Capital Costs

Table 10-1 provides a summary of the conceptual capital costs for the Pawtucket/Central Falls Commuter Rail Facility preferred site 10 percent design. Estimates are provided for each of the three approaches to development as previously described. Capital costs are total approximately $24 million for the Jenks Street Option, $33 million for the Clay Street Option, and $70 million for the Station Development Option.

Table 10-1: Summary of the Capital Cost Estimate (2007 Dollars)

Cost Component	Jenks Street Option	Clay Street Option	Station Development Option
Renovate Existing Station Structure	$ -	$ -	$ 6,800,000
Parking Garage	$ -	$ -	$ 17,000,000
Train Platforms	$ 2,000,000	$ 3,200,000	$ 3,200,000
Platform Access	$ 2,800,000	$ 2,800,000	$ 2,800,000
Bridges & Retaining Walls	$ 5,800,000	$ 9,700,000	$ 9,700,000
Railroad Improvements	$ 3,000,000	$ 3,700,000	$ 3,700,000
Acquisition of Land for Parking	$ 125,000	$ 125,000	$ -
Acquisition of Former Station Site	$ -	$ -	$ 425,700
Other	$ 2,300,000	$ 2,300,000	$ 3,600,000
Sub-Total Cost	**$ 16,025,000**	**$ 21,825,000**	**$ 47,225,700**
Contingency (30%)	$ 4,807,500	$ 6,547,500	$ 14,167,710
Design (20%)	$ 3,205,000	$ 4,365,000	$ 9,445,140
Total Capital Costs	**$ 24,000,000**	**$ 32,700,000**	**$ 70,800,000**

The following is a summary of what is included in the Capital Cost Estimate in Table 10-1:

- Renovate Existing Station Structure: This item includes the cost of repairing and refurbishing the existing station building, including repairs to structural elements, repairs to floor slabs, stairways, elevators, ADA accessibility improvements, renovation of utilities, rough interior refinishing, and exterior repair. It does not include the cost to finish out the interior space for retail, office, or other uses. This item applies only to the Station Development Option, where the former station building is redeveloped as part of the commuter rail stop project.

- Parking Garage: This item includes the cost of constructing the new parking garage, with seven levels and parking for approximately 700 vehicles. This includes foundation systems, stairs, elevators, pre-cast and/or cast-in-place concrete, lighting, and fire protection. It contains a cost premium for the expense of constructing a parking garage over the active railroad right-of-way. This item applies only to the Station Development Option, as the Jenks Street Option and Clay Street Option do not include a parking garage.

- Train Platforms: This item covers the cost of platforms, including concrete, reinforcement, tactile warning strips, and platform canopies. For the Jenks Street Option, this includes two 800-foot high-level platforms. For the Clay Street Option and Station Development Option, this includes two 800-foot high-level platforms and two 500-foot platform

extensions to connect the platforms to the Clay Street and former station site area.

- Platform Access: This item consists of providing stairs and elevators to connect the street level to the platform level. For all options, it includes one primary access point with stairs and elevators, and two secondary access points with stairs only.

- Bridges & Retaining Walls: This item includes the work associated with reconstructing bridges to provide adequate width for platform construction on the east side of the right-of-way. This work includes abutments, substructure, superstructure, and traffic management. For all options, reconstruction of the Jenks Street and Cross Street bridges is required. For the Clay Street Option and the Station Development Option, reconstruction of the Clay Street bridge is also required.

  This item also includes the cost associated with excavation, temporary bracing, concrete, reinforcement, and formwork for the construction of new retaining walls along the edges of the right-of-way. For the Jenks Street Option, this consists of 800 feet, the entire platform length, along the east side of the right-of-way. For the Clay Street Option and Station Development Option, this consists of 1300 feet, the entire platform and platform extension length, along the east side of the right-of-way.

- Railroad Improvements: This item includes the cost of relocating supports for the overhead contact system, modifying the existing signal system, track changes, and constructing high-speed train passenger warning systems.

- Acquisition of Land for Parking: This item represents the cost of acquiring parcels for surface parking. It does not include acquisition of the former station building or site. It applies only to the Jenks Street Option and Clay Street Option. It was based on the cost of acquiring one acre of land at the same cost per acre as the cost of acquiring the former station site.

- Acquisition of Former Station Site: This item represents the estimated cost of acquiring the former station parcel, and applies only to the Station Development Option. It was based on a 2003 appraisal of the parcel by the Pawtucket Redevelopment Authority, inflated by 10 percent total to 2007 dollars.

- Other: This item covers the cost of site work, including parking lots, sidewalks, driveways, utilities, and landscaping. It also includes all off-site traffic improvements, such as sidewalk improvements and traffic signal upgrades.

■

Proposed Capital Funding Sources

Funding the construction of a commuter rail stop is beyond the mean of the cities of Pawtucket and Central Falls. Typically, transit projects of this scale are funded by cost sharing agreements between the states and the Federal Transit Administration (FTA). Other federal, state, and local funds may be also be available to supplement the usual state and federal sources. The following sections explain FTA funding mechanisms, introduce capital funding strategies for the project, and outline potential sources of additional funding.

It is proposed that project development be supported using federal transportation funds available through the FTA's Section 5309 Capital Investment Grant Program ("New Starts"). This program provides discretionary grants for new fixed guideway improvements. Projects with total estimated costs of less than $250 million *and* requesting less than $75 million in federal funds are considered "Small Starts"; projects with total estimated costs of less than $50 million may be considered "Very Small Starts". Potential projects are evaluated by FTA based on overall cost-effectiveness and a range of other factors, and ranked against other competing applications from across the country. Projects requesting to cover less than 50% of total project costs with federal funds are given higher cost-effectiveness ratings.

Use of FTA's Section 5309 funding would require a local match contribution representing at least 20% of total project costs. The State of Rhode Island typically relies on the issuance of general obligation debt to provide the required state match for federal transportation funds. A portion of the state's gas tax is dedicated for the payment of debt service on general obligation bonds issued to match federal funding.

Award of Section 5309 New Starts funding is contingent upon FTA approval following a competitive evaluation process, as well as inclusion in Rhode Island's Statewide Transportation Improvement Program. The issue of General Obligation Bonds to match these federal funds would require approval by the RI General Assembly and subsequent voter referendum. Bond referenda are slated every two years, with the earliest opportunity for future bond approval anticipated in November, 2008.

Three capital investment scenarios are presented below, based on the assumption that funds from these two sources could be programmed to meet project needs. No funds have been budgeted or committed at this stage of the project.

If a FTA New Starts funding request were to provide a lower than anticipated level of federal support, additional funds could be pursued from other federal sources as outlined below under *Additional Funding Sources to be Considered*. Furthermore, any additional state or local grant contributions would reduce overall bonding obligations and debt service payments.

■

Jenks Street Option – Capital Funding Strategy

This scenario assumes federal contributions would support 80% of project costs, or an estimated $19.0 million. Federal funding would be pursued as a "Very Small Start" through FTA's Section 5309 Capital Investment Grant program.

These federal funds would be matched by state-issued General Obligation Bonds in the amount of $4.7 million. Under this scenario, the bonds would be financed over 25 years assuming annual debt service payments of approximately $339,400. This strategy is summarized in Table 10-2. The total debt service for this alternative is approximately $8.4 million (see Attachment A in Appendix E).

Table 10-2: Jenks Street Option – Capital Funding Strategy

Capital Revenue	Funding Amount	% of Funding
Federal / FTA Secton 5309	$19.0 m	*80%*
State / General Obligation Bonds	$4.7 m	*20%*
Finance Charges/Bond Interest	$3.4 m	
Total Project Costs	**$27.1 m**	

Notes:
1. All costs in $2007.
2. *All funds proposed. No funds have been budgeted or committed at this stage of the project.*

■

Clay Street Option – Capital Funding Strategy

This scenario assumes federal contributions would support 80% of project costs, or an estimated $26.0 million. Federal funding would be pursued as a "Very Small Start" through the Section 5309 Capital Investment Grant program.

These federal funds would be matched by state-issued General Obligation Bonds in the amount of $6.5 million. The bonds would be financed over 25 years assuming annual debt service payments of approximately $462,900.

This strategy is summarized in Table 10-3. The total debt service for this alternative is approximately $11.45 million (see Attachment B in Appendix E).

Table 10-3: Clay Street Option – Capital Funding Strategy

Capital Revenue	Funding Amount	% of Funding
Federal / FTA Secton 5309	$26.0 m	*80%*
State / General Obligation Bonds	$6.5 m	*20%*
Finance Charges/Bond Interest	$4.7 m	
Total Project Costs	**$37.2 m**	

Notes:
1. All costs in $2007.
2. All funds proposed. No funds have been budgeted or committed at this stage of the project.

■

Station Development Option – Capital Funding Strategy

With total project costs exceeding $50 million, this scenario would be considered a "Small Start" under FTA's Section 5309 program. In order to maximize FTA's cost-effectiveness rating of this higher cost alternative, it is assumed that federal contributions would be pursued to support only 40% of project costs, or an estimated $27.9 million.

These federal funds would be matched by state-issued General Obligation Bonds in the amount of $41.8 million. This strategy is summarized in Table 10-4. Under this scenario, annual debt service payments would be approximately $2.9 million for an aggregate debt service of approximately $71.9 million for the life of the bond (see Attachment C in Appendix E).

Table 10-4: Station Development Option – Capital Funding Strategy

Capital Revenue	Funding Amount	% of Funding
Federal / FTA Secton 5309	$27.9 m	*40%*
State / General Obligation Bonds	$41.8 m	*60%*
Finance Charges/Bond Interest	$30.1 m	
Total Project Cost	**$99.8 m**	

Notes:
1. All costs in $2007.
2. All funds proposed. No funds have been budgeted or committed at this stage of the project.

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Additional Funding Sources to be Considered

The capital funding strategies presented above assume that FTA Section 5309 New Starts funding will be pursued and matched by state issued General Obligation Bonds. The following section identifies a number of additional capital funding sources that may also be considered in support of the project.

Several of the programs listed below are intended to support the acquisition, rehabilitation or restoration of properties listed on the National Register of Historic Places. While the former train station building has been determined to be eligible for National Register listing, the application process would need to be completed prior to taking advantage of these particular programs under the Station Development Option.

Additional Federal Funding Sources

In the event that FTA Section 5309 New Starts funding is not approved and programmed at the levels requested and outlined above, the following additional federal funding programs may be considered as supplemental funding sources.

- High Priority Discretionary Projects: Certain high priority transportation projects may be identified and funded by specific Congressional appropriation, rather than competitive process or formula. A 20% local match is typically required.

- Federal Highway Administration (FHWA) Transportation Enhancement (TE) Program: Ten percent (10%) of each state's Surface Transportation Program (STP) funds must be set-aside and used exclusively for transportation enhancement activities and projects that will increase mobility, protect the human and natural environment, and preserve and increase the livability of communities. Eligible projects include the acquisition of historic properties, historic preservation and the operation of historic transportation facilities. The Transportation Enhancement set-aside in Rhode Island averages about $4 million per year in the FY07-FY11 Statewide Transportation Improvement Program (STIP). A 20% local match is required.

    - FHWA Congestion Mitigation / Air Quality Program (CMAQ): The CMAQ Program allocates funds to states having areas classified as being in non-attainment of national air quality standards under the federal Clean Air Act. Eligible activities include projects that expand or initiate transportation services with air quality benefits, including operational

support during the first three years of service. In RI, proposals for new CMAQ projects are reviewed by the State Planning Council's Air Quality/Transportation Subcommittee, in conjunction with RIDOT. CMAQ funding levels average about $11 million per year in Rhode Island's FY07-FY11 STIP. A 20% local match is required.

- FHWA Transportation, Community and System Preservation (TCSP) Program: This program (with a total of $60 million in annual authorization) supports projects that improve the efficiency of the transportation system, reduce the impacts of transportation on the environment, provide efficient access to jobs and services, and encourage private sector development consistent with local community development plans. Eligible projects include urban revitalization projects such as transit access, capital improvements in station areas to promote TOD, and renovation of historic transit stations. Priority is given to those governmental entities that have instituted coordinated preservation or development plans.

- National Preservation Loan Fund: Offered through the National Historic Preservation Trust, this fund provides loans for a variety of preservation projects. While both for-profit and non-profit entities are eligible, preference is given to non-profit and public sector organizations. Eligible projects involve the acquisition, stabilization, rehabilitation and/or restoration of historic properties; the maximum loan amount is $350,000.

One additional federal source that bears mention, but is not recommended as a result of this analysis, is the use of financing through the Transportation Infrastructure Finance and Innovation Act (TIFIA). This program is intended to support nationally or regionally significant surface transportation projects which generate significant economic benefits or leverage private capital. TIFIA credit instruments must also be supported in whole or in part by dedicated non-federal funding sources. While it would be possible to dedicate station and/or garage retail lease revenues towards this end, introducing private capital to the project would require engaging a private development partner up front and generating revenues through private operation of the station and/or garage facilities.

Additional State Funding Sources

This section describes three potential state grant sources that could be considered to supplement capital project funding and potentially offset the total debt service amount anticipated to match federal funding. The fourth program identified below is a state loan program which could be used to supplement acquisition and renovation of the former station building under the Station Development Option.

- RI Capital Fund: Surplus state revenues are deposited into the RI Capital Fund, a budget reserve account. In the event that this account surpasses 5% of the annual state budget, the excess funds may be used to fund capital projects as approved by the RI General Assembly. While annual expenditures from this fund are not consistent, total capital funding provided over the FY05 to FY07 time period has averaged $58.8 million per year. A future decision by the RI General Assembly to devote future RI Capital Funds towards this project would reduce overall project debt service costs.

- RI State Preservation Grant Program: This program funds capital preservation projects for public historic sites located in Rhode Island. Applicants must be non-profit or public entities and must own or operate the facilities for which the grant is sought. This is a matching grant program, with an average of $1 million in grants -- typically ranging from $20,000 to $100,000 -- awarded each year. Voter approval of a new bond referendum is required to continue this program beyond 2007.

- RI Economic Development Council (EDC) Grants: RI EDC Community Economic Development Grants are awarded to assist local cities and towns as catalyst funding for economic development projects. Historically, grant awards have been in the $10 - $25K range.

- RI Historical Preservation Loan Fund: The RI Historical Preservation & Heritage Commission offers low interest loans for the acquisition, rehabilitation or restoration of properties listed on the State Register of Historic Places or contributing as part of a state historic district. Adjustable rate loans are offered to public, non-profit and private owners; interest rates are currently set at 2 percent less than the prime rate with a floor of 5 percent. Rates are adjusted at no more than 3 percent over the life of the loan. The maximum loan is $200,000 to be repaid within five years.

Potential Local Funding Sources

Any contribution from local grant programs or other local sources could be used to offset total debt service amounts needed to match federal funding.

- Community Development Block Grants (CDBG): Pawtucket is an entitlement community under the US Department of Housing and Urban Development's CBDG program. Eligible activities include land acquisition, construction and rehabilitation for publicly or privately owned facilities that improve public services or economic development opportunities. Historic preservation is also a specifically eligible activity. In FY07, Pawtucket awarded about $2 million in CDBG grants.

Tax Increment Financing (TIF)

The Rhode Island Tax Increment Financing Act authorizes cities and towns to use Tax Increment Financing to support community revitalization or enhanced commercial development. Eligible projects include the acquisition or construction of public facilities. Cities and towns must first prepare a redevelopment plan that estimates the tax increment to be generated as a result of the project and a sets forth a method for calculating future tax increments. These identified tax revenues may then be used to pay the principal and interest on special obligation bonds.

Tax Increment Financing bonds would be secured solely from Project Revenues (which are the tax increments and may include any other revenues generated by the project) and would not be a pledge of the faith and credit of the cities of Pawtucket and Central Falls.

If this approach were considered to finance the local match for rail stop development, Pawtucket and Central Falls would need to identify current assessed values and tax revenues within an established redevelopment area around the facility. Any future increases in tax revenues from this district would be used as a revenue stream to finance the special obligation bonds issued to construct the commuter rail stop. Debt could be amortized to allow for lower debt service payments in the early years, with increasing payments as the economic impact of the public improvements are realized and tax revenues increase.

Tax Increment Financing would be a viable approach for providing the local match under the Jenks Street Option or Clay Street Option, with the estimated incremental revenue amounts required to pay debt service shown in Table 10-5. This approach would not be recommended for the Station Development Option, due to the higher capital costs associated with this scenario.

Table 10-5: Estimated Tax Increments Required for TIF Financing

	Jenks Street Option	Clay Street Option
Principal Amount	$4.7 m	$6.5 m
Avg. Debt Service Payment: Years 1 - 10	$235,000	$325,000
Avg. Debt Service Payments: Years 11 - 25	$425,000	$650,000
Total Aggregate Debt Service	**$7.9 m**	**$10.8 m**

Note:
1. All costs in $2007.

Current commercial tax rates are $18.96 (per $1,000 in value) in Pawtucket and $36.77 in Central Falls. Assuming these rates remain at current levels,

TIF financing of the Jenks Street Option would require commercial property values within the redevelopment district to increase by about $4 million in each city during the initial 10 years of debt repayment (or some alternative distribution, e.g. $8 million in Pawtucket and $2 million in Central Falls). The final 15 years of debt service payments would necessitate that commercial property values increase by about $8 million over existing levels within each city. The Clay Street Option would require about $6 million in increased commercial property values within each city during the initial 10 years, and a total of $12 million in increased values within each city during the subsequent 15 year period.

To put these required tax increments into perspective, private renovation of the former train station building would increase the value of this property by an estimated $6.8 million (the value of improvements). Reassessment of the improved property would then generate incremental tax revenues of about $200,000 annually, covering a significant portion of debt service payments within the first 10 years of payment under either the Jenks Street Option or the Clay Street Option.

Private Equity Considerations

Under the Jenks Street Option and the Clay Street Option, there would be an opportunity for future private development of the former station building. With private ownership maintained, renovation of the former station facility could take advantage of available federal and state historic tax credits. This approach would require completing the process to list the train station building on the National Register of Historic Places.

A RI Historic Preservation Investment Tax Credit equal to 30% of qualified historic rehabilitation expenses may be provided to the business or entity incurring such expenses. Applications must be submitted to, and approved by, the RI Historic Preservation & Heritage Commission, and the building must be for business purposes and considered a depreciable asset.

A Federal Historic Preservation Tax Credit equal to 20% of qualified rehabilitation expenditures may also be applied for through the RI Historic Preservation & Heritage Commission. As with the state credit, the property must be income generating or used in trade or business.

Assuming station renovation costs of about $6.8 million, the state tax credit could have a value of up to $2.0 million and the federal credit could have a value of up to $1.3 million. These tax credits, with a potential combined value of $3.3 million ($2007), could be taken directly by the private owner or syndicated through the National Trust Community Investment Corporation, a for-profit subsidiary of the National Trust for Historic Preservation.

Under any of the development scenarios considered, there would also be the potential to solicit private foundation contributions to support public renovation of the former station building and/or to support urban revitalization efforts. Two examples include:

- The Champlin Foundations: This is a group of private foundations based in Rhode Island which make direct grants to tax exempt organizations for capital needs, including property acquisition, construction and the renovation of historic structures. While grant awards range from several thousand dollars to over $3 million, average awards have been in the $200,000 to $750,000 range.

- The Urban Revitalization Fund of Rhode Island (TURF-RI): This non-profit entity supports the revitalization of real estate in urban areas of Rhode Island, including Pawtucket. Loans or equity investments may be provided to both profit and non-profit developers, with amounts averaging $250,000.

Operating Costs and Funding Strategies

Understanding the yearly expenses and revenues from operating a commuter rail stop, and developing a strategy to meet these obligations, is no less important than developing a financial plan for constructing the stop. To complete the financial analysis, annual costs for the operation and maintenance of the commuter rail stop and supporting facilities were projected.

For each option, an operating cost and revenue estimate was prepared, based on the level of development of that option. Based on the estimated operating costs and revenues, a financial analysis was performed to prepare an operating funding strategy.

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Operating Cost and Revenues

Table 10-6 provides a summary of the conceptual operating costs and revenues for the Pawtucket/Central Falls Commuter Rail Facility preferred site alternative. Net operating costs total $20,000 annually for the Jenks Street Option and Clay Street Option. Net operating costs total $320,000 annually for the Station Development Option.

Table 10-6: Summary of the Annual Operating and Maintenance Cost Estimate (2007 Dollars)

Operating & Maintenance Costs	Jenks Street Option	Clay Street Option	Station Development Option
Platform Maintenance	$40,000	$40,000	$40,000
Facilities Operation / Maintenance			
Station Building (31,200 SF)			$312,000
Garage Retail Space (21,000 SF)			$180,600
Elevator Maintenance Contract	$3,000	$3,000	$3,000
Parking Operation / Maintenance			
Garage (735 spaces)			$955,500
Surface (110 spaces)	$38,500	$38,500	
Total	**$81,500**	**$81,500**	**$1,491,100**

Annual Operating & Maintenance Costs are based largely on unit costs developed for existing New Haven Line commuter rail stations in Connecticut and presented in the *Connecticut Rail Governance Study, Phase One Report (*prepared for the CT Department of Transportation by Urbitran Associates, Inc., 2004*)*. Facility Operating & Maintenance costs are also based actual costs for Union Station in Worcester, Massachusetts (*Worcester Fiscal 2008 Budget Overview*, as prepared by the Worcester City Manager.) Specific assumptions include:

- Platform Maintenance: Platform maintenance expenses include platform cleaning, lighting, shelter and canopy maintenance, electricity, and intercom communications. Based on an evaluation of similar station costs in Connecticut, average platform-related maintenance costs are estimated to be $40,000 annually. Similar annual costs would be incurred under all three alternatives.

- Facility Operations & Maintenance: Operating and maintenance costs budgeted in FY2008 for the 90,000 SF Worcester Union Station building are $775,000, or about $8.60 per SF. A slightly higher cost of $15 per SF was identified for station buildings along the New Haven Line in Connecticut. A mid-range estimate of $10 per SF was applied to estimate the annual facility operating and maintenance costs for the proposed 31,200 SF station building in Pawtucket/Central Falls. The lower figure of $8.60 per SF was used to estimate the cost of operating the 21,000 SF of garage retail space under the Station Development Option. Annual elevator maintenance costs can range from $1,500 to $4000 per year. For this analysis, an estimated annual cost of $3,000 per year is assumed,

based on an annual elevator maintenance contract currently in place at the Rhode Island Public Transit Authority.

- Parking Operations & Maintenance: The average annual operating and maintenance costs identified for parking along the New Haven Line in Connecticut were $350 per surface space and $1,300 per structure space. Surface parking maintenance costs were applied to the 110 surface spaces in the Jenks Street Option and Clay Street Option; structure parking maintenance costs were applied to the 735 garage spaces in the Station Development Option.

There would be no new net operating costs or track maintenance costs, as these activities are already incurred and funded by the MBTA/Amtrak along this section of right-of-way. It is assumed that the cities of Pawtucket and Central Falls would continue to perform plowing and trash removal duties along any public right-of-way used as a passenger drop-off area.

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Estimated Annual Project Revenues

Annual Project Revenues have been estimated for the three options. These include parking revenues and, for the Station Development Option, revenues from leased space in the renovated station building and adjacent garage. Fare revenues would be collected directly by the MBTA in support of commuter rail operations and are not considered as Project Revenue.

Under the Jenks Street Option and Clay Street Option, total Project Revenues would be $57,200 annually. Under the Station Development Option, total projected revenues would be $1.10 million annually.

Table 10-7: Annual Operating Revenue Forecast

Estimated Project Revenues	Jenks Street Option	Clay Street Option	Station Development Option
Parking Revenues (year 2015)	$57,200	$57,200	$573,300
Lease Revenues			
Station Building (19,900 SF)			$278,600
Garage (21,000 SF)			$252,000
Total Revenues	**$57,200**	**$57,200**	**$1,103,900**
Total O & M Costs	**$81,500**	**$81,500**	**$1,491,100**
Net Difference	*($24,300)*	*($24,300)*	*($387,200)*

Note: *All costs in $2007.*

Assumptions used to estimate future Project Revenues include:

- Daily parking rates in the 110-space surface lot(s) developed under the Jenks Street Option and Clay Street Option would be set at $2 per day. Based on ridership estimates, this lot would be fully utilized in the opening year, generating approximately $57,000 per year (or 110 cars per day * $2 per day * 260 days per year).

- Daily parking rates in the garage structure developed under the Station Development Option would be set at $3 per day. Assuming straight-line ridership growth between 2000 and 2030, an estimated 1,300 passengers would board at the stop in 2015. Assuming 55% of these passengers drive to the stop and park, the garage would be at full utilization. Estimated annual parking revenues in 2015 would be $573,300 (735 cars per day * $3 per day * 260 days per year).

- Leasing rates are based on a review of currently advertised market rates in the Pawtucket/Central Falls area. Average lease rates were found to be in the range of $10 to $12 per SF per annum for retail space and $14 per SF for office space. For the Station Development Option, these rates were applied to the proposed 21,000 SF of retail space to be included in the first story of the garage and the 19,900 SF of office/institutional space to be included in the renovated station building.

Under the Jenks Street Option and Clay Street Option, total annual operating and maintenance costs would be anticipated to exceed project revenues by about $24,000. Under the Station Development Option, total annual operating and maintenance costs would be anticipated to exceed project revenues by about $387,200.

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Transit-Oriented Development Analysis

This chapter presents the results of the transit-oriented development (TOD) analysis, conducted as part of this study to help understand potential benefits and impacts to the surrounding neighborhood. TOD is a broad concept, but can be generally defined as mixed-use residential and commercial development centered on a public transit stop. It is frequently higher density than typical suburban development, and includes features designed to encourage transit ridership, such as narrow streets, restricted parking, and good pedestrian access.

Overview

A high-quality and lasting transit-oriented development (TOD) should blend into the surrounding neighborhood, knitting the community together instead of creating boundaries that only new residents cross. All residents should be able to take advantage of TOD, so careful consideration must be given to what type of TOD should be encouraged and how TOD can be designed to feel like a part of the existing community. To study the prospect of successful TOD around the proposed Pawtucket/Central Falls commuter rail stop, the project team analyzed local traffic and parking conditions, multi-modal access corridors, RIPTA transit connections, socioeconomic characteristics, and existing land uses to assess how housing and employment would be encouraged by development of a transit center at the historic train station site. The team approached these subjects with the understanding that the areas around the train station already contain established neighborhoods, unlike some TODs, in which developers place transit in undeveloped areas in the hope of incurring growth.

Education and Public Participation

Many communities are unaware of the policies that the local government could adopt to encourage the type of development the community would like. In addition, the term "TOD" may draw concerns about parking, traffic, and other problems that new development could bring. Through extensive public outreach and education, the community can become aware and informed of development options and have the chance to provide its own input; after all, residents know their community best. The goals of the TOD study included providing information and making sure it reached all of the various ethnicities in the local community. To do this, two community workshops were held at the YWCA in Central Falls.

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Stakeholder Interviews

Phone interviews were conducted with local stakeholders to identify critical issues in the neighborhood. Suggestions for infrastructure and policy changes were received, and these have been reflected to large extent in the TOD recommendations for Pawtucket and Central Falls.

Table 11-1: TOD Interviews

Name	Organization
Paul Redkovich	Blackstone Valley Community Action Program
Joseph G. Nield, Director	City of Central Falls Department of Public Works
John J. Garrahy	Moses Afonso Jackvony
Paul L. Ouellette	Northern Rhode Island Chamber of Commerce
Donald Grebien, President	Pawtucket City Council
Nancy Whit, Executive Director	Pawtucket Citizens Development Corporation

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Public Workshop #1, May 10, 2007

The first community workshop was a 2-hour session consisting of presentations and breakout discussion groups. The workshop began with a

project update, followed by an overview of the proposed commuter rail platforms and access, and an overview of TOD principles and best practices.

The second part of the workshop gave all participants an opportunity to speak with each other and with the facilitators about their concerns and visions for the future of the historic train station site. For both break-out sessions, small groups gathered around a large aerial photo of the study area and wrote their ideas on the map. Break-Out Session 1 was intended to elicit responses to the question: What do you like and dislike about the area around the station? After 20 minutes, the large group reconvened and a representative from each small group reported on what had been discussed. Break-Out Session 2 gave participants 20 minutes to talk about their vision for the area, after which the large group heard what all the small groups envisioned.

The community listed the following concerns during Break-Out Session 1:

Likes	
Transportation & Access • Feel safe walking • Central location • On bus line	**Neighborhood Resources** • Drugstore on corner/local services • Mom and pop stores • Barton Street improved with new housing • Neighborhood crime watch • Cleanups/block parties • Rents are affordable? • PCDC--$14 million into the community (earth day, block party, got rid of prostitutes) • Homey environment

Dislikes	
Transportation • Traffic after work • On-street parking for tenants • High-speed traffic is dangerous • Snow?? • Too much traffic between 2 and 6 p.m. on Broad and Dexter, also at Barton • Unsafe streets for kids to walk unsupervised and elderly to walk too • Congestion—station is in the heart of the neighborhood • Traffic congestion will increase • Pedestrian safety from cars	**Safety** • Montgomery Street feels unsafe • Dark empty around depot • People who hang around Walgreens • Getting honked at • Prostitutes/johns • Violence • 204 Broad Street—fence it in? • Prostitutes want train riders for higher clientele • Poor lighting everywhere—on Broad St. & around the station
Economic Development • Not enough jobs today or from station • Station isn't economically feasible • Fear of landlords buying up properties and gentrifying the area • Fear of taxes going up • PCDC efforts will be for nothing if train ruins all their progress • Gentrification will push low-income and elderly residents out of their homes	**Public Process** • So much $$ already gone into station, why not put it into community improvements that you are saying will happen as result of station? • Want to see a medical facility—where are city priorities? • Don't want outsiders, who don't live there but scream "Save the building!" Why should they have a say in what happens in our neighborhood? • Process hasn't had residents' interest at heart, they are an afterthought • Schools need $$, why not invest in them? • Priority for Boston commuters, not us
Environment • Noise from traffic and train • Fear of losing neighborhood feel • Fear of losing the unity of community to outsiders	

The community listed the following visions during Break-Out Session 2:

Housing Affordability

- Affordable housing
- A rent control-type program
- Different tax rates for multiple-property owners vs. single-property owners
- Tax stabilization
- Homestead protection
- Concern about gentrification

Economic Development

- More retail (small businesses)
- New jobs
- Protect existing small businesses
- No empty storefronts – retail mall
- Use the revenue from the TOD to fund community improvements

Driving Environment

- Potholes fixed
- Better design of traffic patterns
- No parking at train station (so it won't create new traffic)
- Prevent overflow commuters from South Attleboro park-and-ride

Pedestrian Environment

- Lighting
- Clear signage
- Regular street cleaning
- Better sidewalks to avoid tripping

Community Amenities

- Parks and other types of green space
- Public pool, playground
- Benches
- Place for teens to hang out, such a recreation center
- Make the area livelier, with tourist attractions about the history of Pawtucket (jewelry, etc.)
- Community programs for kids

Proposed Train Station Site

- Tear down the train station
- Preserve the train station building
- Use the proposed site as a train station
- Use Cumberland/Smithfield Ave. locations
- University Campus
- Education programs
- Arts programs
- Johnson and Wales program
- Medical facility
- Community center
- Do something with the vacant building at the proposed site
- Find creative solutions to fix it

Other

- Scholarship money for kids who take the train to URI
- Fast development schedule
- Don't attract outsiders
- No more crime
- More undercover cops
- Want private security
- Create a feeling of safety
- Get rid of prostitution in the area
- Keep the character of the neighborhood the same
- Preserve the residents' existing way of life
- Concern for fellow neighbors
- People come first
- Recognize that there are two issues: the historic train station building and the platform below
- Use City money to benefit residents, not commuters

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Public Workshop #2, May 24, 2007

At the second community workshop, the public had an opportunity to expand on its concerns and hear answers to its questions about five topic areas related to the Pawtucket/Central Falls Commuter Rail Facility: traffic and parking, jobs and housing, neighborhood safety, details of the proposed commuter rail stop, and options for reuse of the historic train station site.

The format of this workshop was an informal 2-hour open house during which members of the public could drop by at any time. Upon entering the room, people were given dots to place on a list of concerns identified in Workshop #1 to rank the most important issues. Figure 11-1 shows how the community ranked its concerns, and Figure 11-2 summarizes these concerns into categories with relative percentages. While this sample is not statistically representative of the population of the surrounding neighborhoods, it is very useful for demonstrating the breadth of concerns neighbors have about the proposed commuter rail stop and TOD. This base of concern demonstrates that the surrounding neighborhoods are genuinely interested in doing what is right to preserve the unique community feel of the area while promoting improvements to safety, transportation, and economic development.

Figure 11-1: Community Survey Results

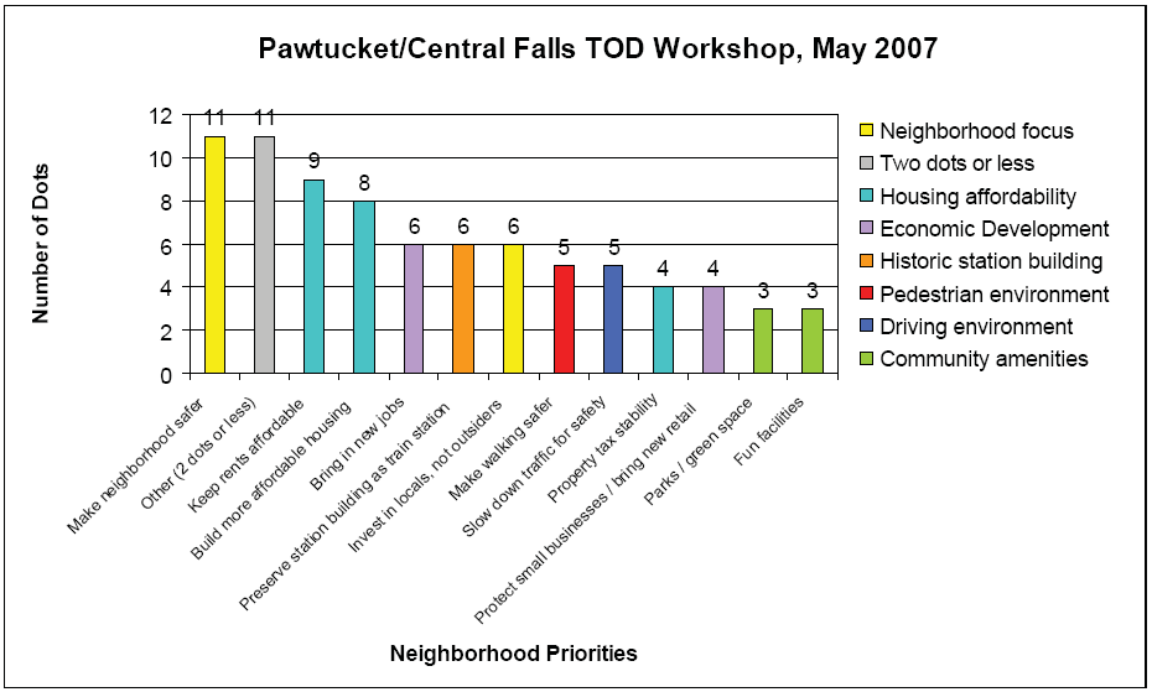
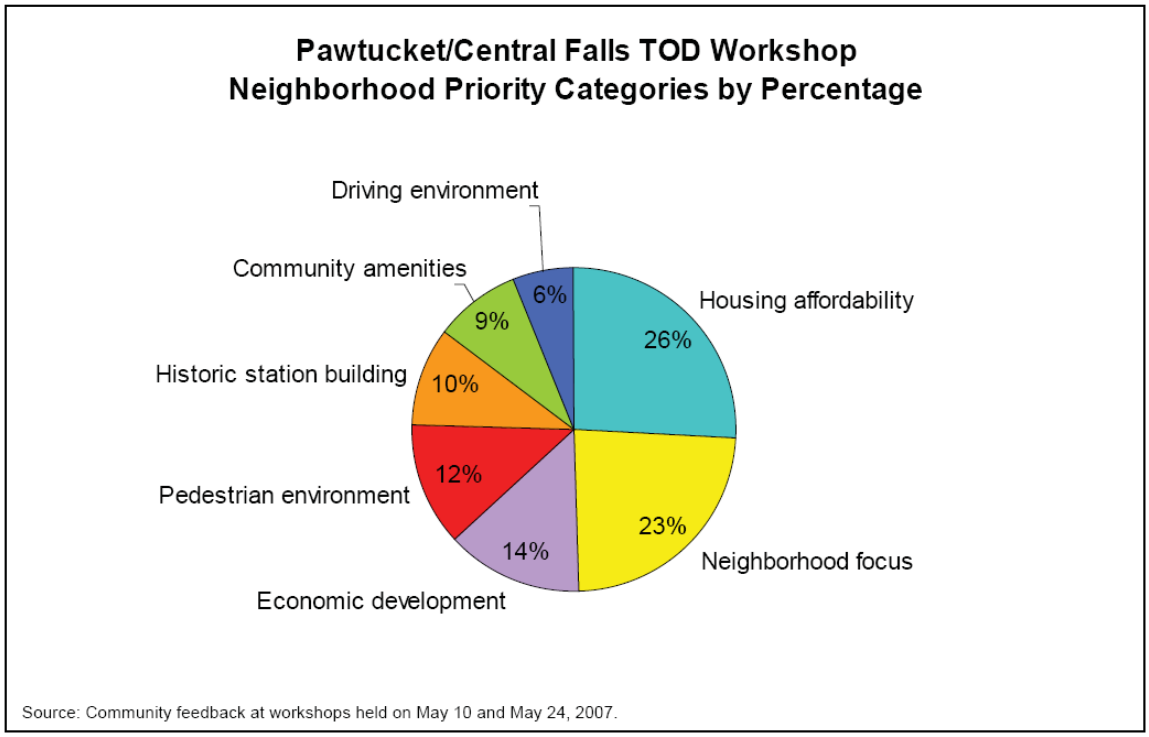


Figure 11-2: Summary of Survey Results by Category



The public was also invited to circulate through five informational tables. At the traffic and parking table, attendees were encouraged to talk about their concerns related to traffic congestion, driving speed, and on-street parking availability. The community learned about options for avoiding traffic congestion at TODs, such as minimizing commuter parking, improving pedestrian and bicycle access, de-emphasizing automobile access, accommodating bus access, providing a mix of uses nearby, and increasing density. Members of the community placed dots on a map of the study area to show the locations where they encounter the worst traffic congestion and parking problems, as well as where they would consider parking if the lots were publicly available. Tables 11-2, 11-3, and 11-4 list the identified traffic congestion areas, parking problems, and potential parking areas.

Table 11-2: Traffic Congestion Locations

Degree of Congestion	Location
Worst	Broad Street and Jenks Street
Moderate	Broad Street and Central Street
Moderate	Broad Street and Cross Street
Moderate	Broad Street and Clay Street
Moderate	Dexter Street and Barton Street
Mild	Broad Street and Fales Street
Mild	Broad Street and Charles Street
Mild	Broad Street and Summit Street
Mild	Broad Street and Pacific Street
Mild	Broad Street and Exchange Street
Mild	Summer Street and North Union Street
Mild	Goff Avenue and Mason Street
Mild	Dexter Street and Goff Avenue
Mild	Dexter Street and Rand Street
Mild	Dexter Street and Central Street
Mild	Washington Street and Summit Street

Source: Identified at the public workshop on May 24, 2007.

Table 11-3: Parking Problem Locations

Location
Broad Street and Barton Street
Jackson Street and Montgomery Street
Summit Street between Washington Street and Broad Street – too narrow for parking

Source: Identified at the public workshop on May 24, 2007.

Table 11-4: Potential Parking Areas

Location
Charles Street and Roosevelt Avenue
Central Street, just east of the Northeast Corridor (railroad tracks)
High Street between Central Street and Cross Street
Clay Street, just east of the Northeast Corridor (railroad tracks)
Clay Street and High Street
Blackstone Avenue and High Street
Beatty Street, between Dexter Street and Mason Street

Source: Identified at the public workshop on May 24, 2007.

Community comments at this table included:

- Intersections are wide and difficult for pedestrians to cross at Goff Avenue and Dexter Street, as well as at Broad Street, Goff Avenue, and Exchange Street.
- Barton Street between High Street and Broad Street is one-way and narrow. It's too narrow for two-way traffic and on-street parking.
- Synchronize traffic lights on Broad Street, Dexter Street, Goff Avenue, and Exchange Street to facilitate traffic flow away from the station.

At the jobs and housing table, neighbors expressed concerns over needing more job opportunities and preventing gentrification from occurring after construction of a new train stop. They learned about existing and future efforts by the PCDC to build affordable housing in the neighborhood, as well as economic development tools such as zoning incentives, special districts, tax increment financing, neighborhood improvement bonds, and marketing programs.

The safety table, staffed by two Pawtucket police officers, addressed unsafe pedestrian environments and unsafe activity in the neighborhood. Safety near TODs can be improved by residents and businesses having their eyes on the street, developing a mix of uses to generate 24-hour activity, improving the pedestrian environment by eliminating dark or remote areas, and walking police patrols. The community identified the following issues that need improvement:

- Vagrants breaking into commuters' cars
- Poor sidewalk condition and street lighting
- Poor road condition from Clay Street to High Street
- Speeding through-traffic and trucks on Lonsdale Avenue

Community members placed dots on an aerial map to identify specific areas of concern. Multiple dots indicated and area concern, and have been used to rank locations in the following Table 11-5.

Table 11-5: Areas of Safety Concern

Degree of Concern	Location
Very Concerned	Empty lot between Conant Street, Mineral Spring Avenue, and Main Street
Very Concerned	Block south of Main Street between Roosevelt Avenue and School Street
More Concerned	Clay Street and Hawes Street
More Concerned	Railroad Street and Clay Street
Concerned	Railroad Street and Jenks Street
Concerned	Clay Street and Roosevelt Avenue
Concerned	Montgomery Street and Jackson Street
Concerned	Barton Street and Jackson Street
Concerned	Barton Street in general from Broad Street to Montgomery Street
Concerned	Northwest block at Dexter Street and Goff Avenue

The commuter rail stop information table included draft engineering drawings of the proposed commuter rail platforms and access stairs as detailed in Chapter 10. The historic station table contained architectural drawings and renderings of the historic station site.

Parking and Traffic Analysis

An important part of successful TOD is proper control of parking supplies and traffic. An abundance of cheap or free parking encourages automobile use; for TOD, it is desirable to provide less parking than the development would normally require, increasing parking utilization and promoting transit use. The efficient flow of traffic at safe speeds is necessary for creating pedestrian-friendly and bicycle-friendly streets.

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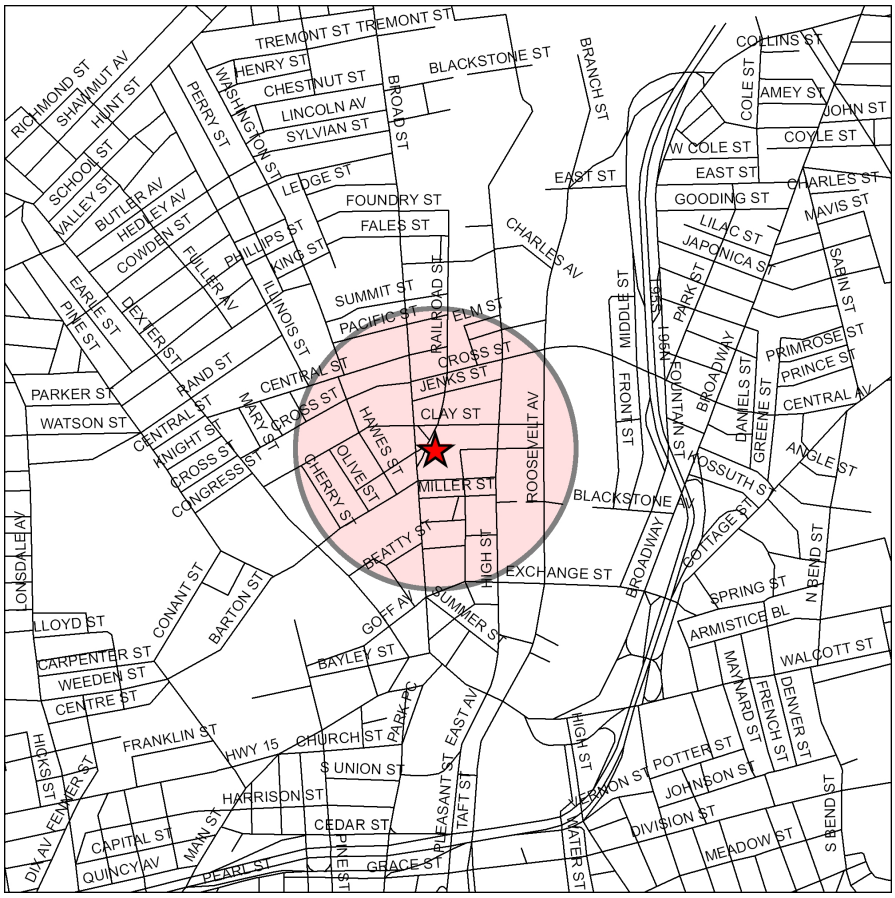
Parking Survey

A parking survey was conducted for the proposed site of the Pawtucket/Central Falls Commuter Rail Facility. The parking survey was conducted on May 30, 2007 between 9 AM and 4 PM. The parking survey was conducted in a one-quarter mile radius of the historic station site. The survey area is shown shaded Figure 11-3.

Figure 11-3: Parking Survey Area



The inventory did not include off-street public parking areas. The off-street parking in this area consists of private lots, serving the adjacent residential and commercial sites. There are no off-street parking areas available for general public parking.

There are a total of 561 on-street parking spaces within one-quarter of a mile of the proposed commuter rail stop, serving both the residential and the commercial land uses. The on-street parking spaces were identified on a block-by-block basis. The inventory revealed several locations with time-restricted on-street parking. A summary of the on-street parking is provided in Table 11-6. The block-by-block detail is included in Appendix D.

In the non-residential areas, there are street sweeping signs posted, which read "NO PARKING TOW ZONE, MONDAYS 8 AM TO 3 PM, APRIL-NOVEMBER, STREET SWEEPING." It appears that these signs are generally ignored by the public.

Table 11-6: Summary of On-Street Parking Inventory

Restriction Type	Number of Spaces
Unrestricted	445
15 Minute Parking	11
1 Hour Parking	49
90 Minute Parking	3
2 Hour Parking	32
3 Hour Parking	16
Handicap Parking Only	3
Nurses Parking Only	2
Total	**561**

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Traffic Improvements

As described in Chapters 7 and 10, a traffic inventory and analysis was conducted to understand the impact of commuter traffic on local streets in Pawtucket and Central Falls. This section introduces conceptual improvements aimed at mitigating commuter traffic generated by the proposed commuter rail stop.

Potential Locations for Improvements

In selecting the locations for potential improvement, the results of the accident and capacity components of the traffic analysis were considered. Key intersections in the study area with accident rates greater than 1.5 accidents per million entering vehicles (MEV) were identified. Of these locations, intersections that would be affected by the proposed commuter rail stop were identified as potential improvement locations:

- Broad Street and Cross Street
- Broad Street and Clay Street
- Broad Street and Barton Street
- Barton Street and Dexter Street

Capacity analyses were conducted for key intersections in the study area for the projected 2010 traffic volumes with the proposed commuter rail stop at the historic station site. Traffic signals were evaluated by Level of Service (LOS), a measure which assigns a letter grade between A and F to the signal based on the average delay experienced by motorists. The results of these analyses identified key intersections with poor projected LOS as potential locations for improvements:

- Broad Street and Clay Street

- Broad Street, Goff Avenue, and Exchange Street

Intersections were also identified as potential locations for improvements if LOS declined by more than one level. One intersection was identified:

- Broad Street/Cross Street

Proposed Conceptual Traffic Improvements

A wide range of traffic improvements were considered for the locations cited in the previous section, including new or improved traffic signals, conversion of two-way streets to one-way streets, traffic signal coordination, the provision of additional capacity, and pedestrian improvements. The overall benefit of each improvement was assessed and the various improvements were compared. The improvements that achieved the greatest traffic benefit were recommended.

The proposed commuter rail stop is expected to draw traffic from many directions. The trips are distributed fairly evenly in a radial manner, so the impact of the additional traffic is also fairly evenly dispersed (see Appendix D for detail). There is not any one area of the City street system that bears the majority of the burden. As a result, traffic operations in the project area are generally at an adequate LOS for an urbanized area despite the additional traffic expected to be generated by the commuter rail stop. There are two intersections with poor levels of service and improvements are recommended at each of these intersections.

Broad Street, Goff Avenue, and Exchange Street

The intersection of Broad Street, Goff Avenue, and Exchange Street is expected to operate at LOS E during the peak hours with the commuter rail stop traffic. This intersection carries large volumes of traffic. With the exception of the Broad Street southbound approach, each approach has at least two approach lanes. If the Broad Street southbound approach were widened to accommodate two approach lanes at this intersection, the overall intersection LOS would improve to LOS C. Therefore, this improvement is recommended. Note that right-of-way may be required to implement this traffic improvement.

Broad Street and Clay Street

The intersection of Broad Street and Clay Street is currently unsignalized and the Clay Street approach is expected to reach capacity by 2010. With the addition of commuter rail stop traffic, the Clay Street approach would be reduced to LOS F. Signalization was considered at this intersection. The Federal Highway Administration (FHWA) publishes warrants for the installation of traffic signals in the Manual on Uniform Traffic Control Devices (MUTCD). The warrants are based upon a variety of factors including traffic volumes, lane arrangements, speed, pedestrian activity,

systems, and accident history. Due to the limited data available for this location, all of the warrants could not be evaluated. The intersection does meet the Peak Hour Warrant based upon the 2010 peak traffic volumes with the commuter rail stop. Given that the Peak Hour Warrant is met and that the intersection could operate as part of a coordinated signal system, traffic signal installation is recommended for Broad Street and Clay Street.

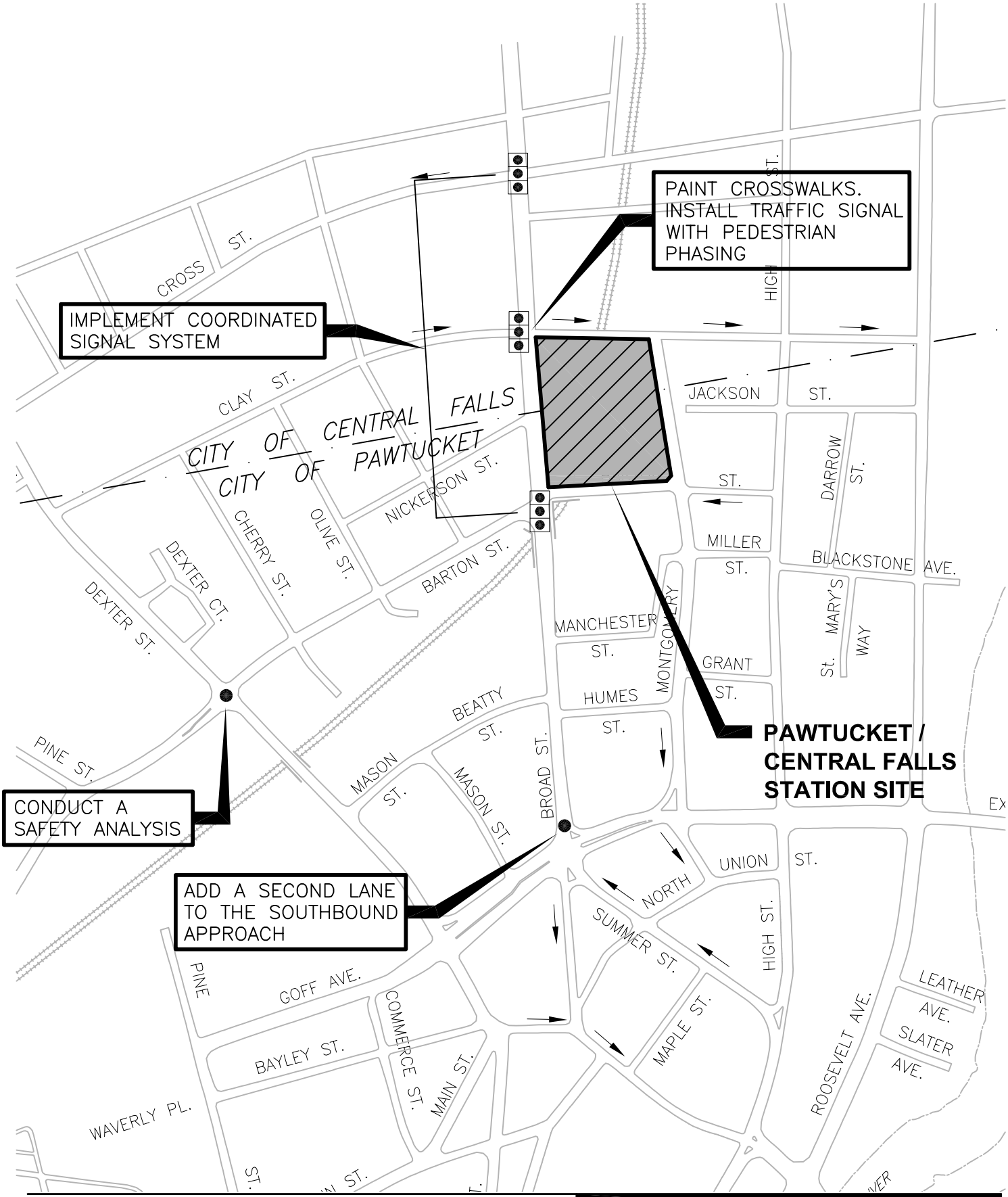
Signal Coordination along the Broad Street Corridor

Clay Street intersects Broad Street between two signalized intersections; Broad Street and Barton Street, and Broad Street and Cross Street. The three intersections were evaluated for signal coordination. Coordinatability analysis reports were run for these intersections. Coordinatability factors, ranging from 0 to 100, are a means of evaluating the benefit of connecting a series of traffic signals to work together. Higher factors indicate more beneficial coordination. Coordination is generally recommended for locations with coordinatability factors greater than 50. The factors are based on a number of elements including travel time, storage space, main street volume, cycle lengths, and the proportion of traffic in the group that gets all green signals. The coordinatability factors for these intersections were between 65 and 81 in the AM peak hour and between 70 and 100 in the PM peak hour. Based upon these results, signal coordination on Broad Street at Barton Street, Clay Street and Cross Street is recommended.

Pedestrian Accommodation

Pedestrian access is good throughout most of the study area. The major roadways have adequate sidewalks and most of the traffic signals have pedestrian signal heads and phasing. At the intersection of Broad Street and Clay Street, crosswalks should be painted and the proposed traffic signal should include pedestrian signal heads and pedestrian phasing.

The locations of the recommended conceptual traffic improvements are presented in Figure 11-4. The improvements were evaluated in terms of capacity analyses. The results were compared to the previously projected LOS and are shown in Table 11-7.



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 11-4

Conceptual Traffic Improvements

Table 11-7: Summary of Signalized Intersections Capacity Analysis (2010, with Pawtucket/Central Falls Commuter Rail Stop)

Signalized Intersections	AM Peak		PM Peak	
	without improvements	with improvements	without improvements	with improvements
Broad Street & Cross Street				
Cross Street WB	C/21.7	E/78.1	C/28.7	E/77.5
Broad Street NB	D/45.3	D/47.1	E/64.9	D/36.2
Broad Street SB	B/12.2	A/9.9	B/11.6	B/12.6
Overall Intersection	C/26.4	D/37.9	D/37.0	D/36.2
Broad Street & Clay Street				
Clay Street EB	unsignalized	C/25.6	unsignalized	C/31.2
Broad Street SB	intersection	A/3.6	intersection	A/8.1
Broad Street NB		A/5.8		A/5.5
Overall Intersection		A/9.3		B/10.0
Broad Street & Barton Street				
Barton Street EB	B/17.5	B/18.1	C/20.2	C/33.2
Barton Street WB	B/13.1	B/13.7	B/13.4	B/18.0
Broad Street NB	B/10.3	B/17.9	B/11.4	B/15.7
Broad Street SB	B/13.3	B/11.9	C/24.8	B14.5
Overall Intersection	B/12.9	B/15.7	B/18.6	B/19.0
Broad Street & Goff Ave/ Exchange Street				
Goff Ave EB	C/33.5	C/27.3	B/13.5	B/11.8
Exchange Street WB	D/54.8	C/20.8	D/35.9	C/31.9
Broad Street NB	E/71.6	C/33.8	F/102.7	D/39.9
Broad Street SB	E/76.6	D/50.9	F/114.3	D/50.2
Overall Intersection	E/58.0	C/32.5	E/76.7	D/36.3

As the results indicate, the recommended improvements result in adequate levels of service at these intersections based on 2010 traffic volumes with the commuter traffic. Note that the signal coordination on Broad Street at Barton Street, Clay Street, and Cross Street results in a slight decrease in overall LOS at Cross Street. The timings of the coordinated signal system are set to optimize the main street traffic flow. Sometimes, the traffic operations of the minor street are sacrificed for the good of the arterial flow when a system is coordinated. The LOS on Broad Street through the coordinated signal system is shown in Table 11-8.

Table 11-8: Broad Street – Arterial Level of Service

Time Period	Northbound	Southbound
AM Peak Hour	LOS D	LOS C
PM Peak Hour	LOS D	LOS C

Additional improvement concepts were considered. For example, the conversion of two-way roadways to one-way traffic would consolidate conflict points and allow more on-street parking. However, the commuter

benefits of such conversions are outweighed by the impacts to the surrounding community.

While most of the recommended improvements were identified based upon the results of capacity analyses, improvements were also considered for intersections with a high occurrence of accidents. As discussed previously, four intersections were identified as potential improvement locations based upon the accident rates. Improvements have been proposed at three of these intersections: Broad Street and Barton Street, Broad Street and Clay Street, and Broad Street and Cross Street. These three intersections are in close proximity to the proposed commuter rail stop and would be affected by the traffic generated by commuters.

The fourth intersection with a high accident rate is Barton Street and Dexter Street. Although this intersection is not in the immediate proximity of the proposed commuter rail stop, it would carry some additional traffic generated by the stop. The additional traffic does not reduce the intersection LOS (see Appendix D). Based on the existing conditions and accident history, further study of Barton Street and Dexter Street is recommended. Collision diagrams should be prepared to determine whether there are discernable patterns of accidents at this location. The need for additional study at this intersection is not a result of the proposed commuter rail stop, so no improvements are proposed in this study.

Designing for Multimodal Streets

The transportation network associated with a TOD must be carefully balanced to create a safe and inviting environment for non-motorized transportation modes and buses. Walkable environments include not just sidewalks, but elements like seating, signage, and trees that make the area inviting. To help plan this environment, the team analyzed the current road network and traffic data to map out locations for a pedestrian and bicycle network. The team also identified possible bus stop locations, pedestrian amenities, and traffic calming measures.

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Existing Pedestrian Network

Pedestrian access maintains the urban vitality needed to support the dense mixed-use character and high transit ridership that mark a thriving TOD. Successful pedestrian networks offer high levels of pedestrian service in four key measures:

- Safety: Keep vehicle speeds, pedestrian exposure to traffic, and vehicle volumes down to levels that reduce conflicts between cars and people.

- Convenience: Delineate clear paths to the commuter rail stop through design features and helpful wayfinding.
- Comfort: Provide adequate walking paths and sidewalks.
- Attractiveness: Draw people in by providing use, beauty, and company.

Currently, the study area contains a dense network of sidewalks and crosswalks that facilitates pedestrian movement. Sidewalks are continuous, and several major sidewalks feature attractive brick borders that enhance the pedestrian environment. However, some key deficiencies exist:

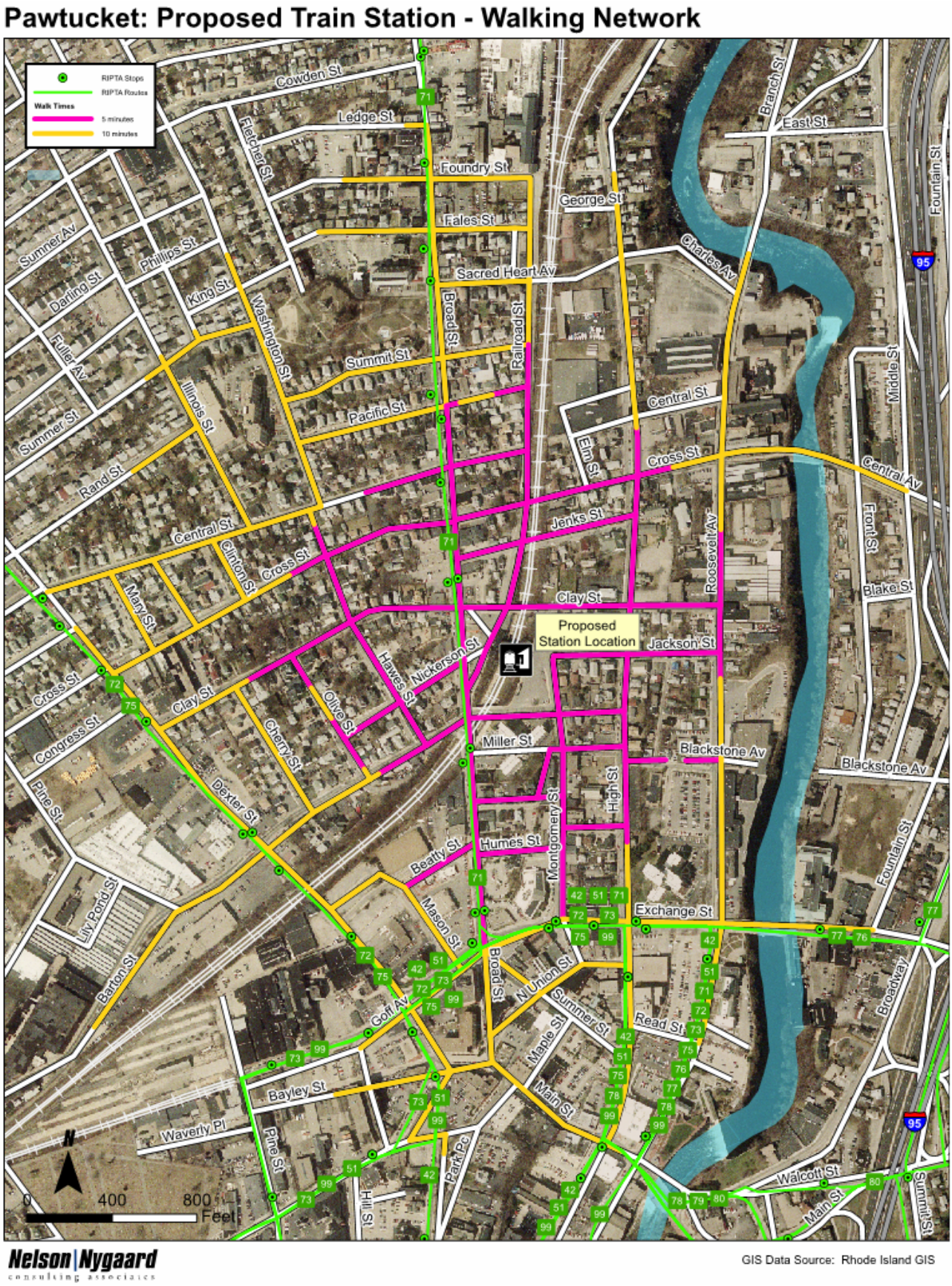
- ADA-compliant curb ramps are not found at all intersections. This presents challenges for those with mobility impairments.
- Crosswalk markings are occasionally worn away due to motorized traffic or missing altogether.
- Motorists often do not yield to pedestrians in crosswalks, despite laws requiring motorists to do so.

Table 11-9 is an inventory of sidewalk conditions on most local streets near the historic station site. Figure 11-5 shows walking distances around the historic station site.

Table 11-9: Sidewalk and Crosswalk Conditions

	Crosswalks				Sidewalks		
Street	Location	Striping	Condition	Ped Signals	Condition	Curb Ramp	ADA Compliance
Broad (north - south)							
Cowden - Charles/Sacred Heart	Cowden	standard	Needs repainting	none (flashing yellow traffic lights)	Good	Y	Y
	Ledge	zebra	Needs repainting	none	Good	Y	Y
	Foundary	zebra (west side broad only)	Needs repainting	none (stop sign)	Good	Y	Y
	Fales	standard, 4-way	Needs repainting	signalized walk	Good	Y	Y
	Sacred Heart/Charles	none	NA	none	Good	Y	Y
Charles/Sacred Heart - Summit	Cross	Standard	Needs repainting	signalized walk			
Summit - Clay	Clay	Standard					
Clay - Barton	Barton	standard, 4-way	Good	signalized walk			
Barton - Grant	Grant						
Grant - Humes	Humes	zebra, standard, 2-way	Good	none			
Humes - Exchange	Exchange	zebra	Good	signalized walk	Good	Y	Y
Exchange - Main	Main	standard	Good	none	Good	Y	Y
High Street (north - south)							
Charles - Cross	Charles	standard	needs repainting	none (traffic lights)	Good	Y	Y
	Central	standard	Good	none	Good	Y	Y
Clay - Jackson	Cross	standard	needs repainting	none (traffic lights)	Good	Y	Y
Jackson - Miller mid-block	Jenks	standard, 2-way E - W			Good	Y	Y
Miller mid-block - Exchange	Clay	standard	needs repainting	none (stop sign)	Good	Y	Y
Exchange - Main	Miller	standard	needs repainting	none	Good	Y	Y
Main - East					Good	Y	Y
Railroad St (north - south)							
Foundry (deadend) - Central (deadend)					Good	N	Y
Dexter (north - south)							
Garfield - Cross	Mowery	standard	good	none (traffic light)	Good		Y
	Rand	standard	good	none	Good		Y
Cross - Goff (Exhange)	Cross	standard, 4-way	needs repainting	none (traffic light)	Good		Y
	Barton	standard, 4-way	good, textured paving	signalized walk	Good		Y
Roosevelt Ave (north - south)							
Charles - 1/2 to Central	Charles (mid-block)	zebra	good	signalized walk	Good	Y	Y
1/2 to Central - Jackson	Cross	standard	needs repainting	none	Good	Y	Y
Jackson - Exchange	Blackstone	standard	needs repainting	none	Good	Y	Y
	Mid-block btw Blackstone & Exchange	zebra, ped crossing yellow triangle sign	good	signalized walk	Good	Y	Y
Exchange - Main	Exchange	standard, 4-way	good	signalized walk	Good, brick paving and concrete	Y	Y: ramp from river to sidewalk
	Police Station (mid-block)	standard w/ brick paving	good	signalized walk			
	mid-block btw Main & Exchange	zebra	good	none			
	Main	standard, 4-way	good	signalized walk			
Exchange St (east-west)							
Roosevelt - High	High	standard, 4-way	good	signalized walk	Poor	Y	N: not always 3ft clearance, trees uprooting sidewalk
High - Montgomery	Montgomery	standard, 4-way	good	signalized walk	Good	Y	Y
Montgomery - Broad	Broad/Summer	standard, 5-way	good	signalized walk	Good	Y (North) N (South)	N: on south no continuous sidewalk path
Broad - Dexter	Dexter	standard, 4-way	good	signalized walk	Good	Y	Y
Main St (west - east)							
Dexter - Broad	Dexter	standard, 4-way	good	signalized walk	Good	Y	Y
Broad - Maple	Broad	standard	good	none	Good	Y	Y
Maple - High	Park Place	standard	good	none	Good	Y	Y
High - Roosevelt	Maple	standard & zebra, 3-way	good	none	Good	Y	Y
	High	standard, 4-way	good	signalized walk	Good	Y	Y
Clay St (west - east)							
Dexter -Broad	Dexter	zebra, 3-way	good	none	Good	N	N: not always 3 ft clearance
Broad - High	Broad	standard, 2-way	needs repainting	none			
Central St (west - east)							
Dexter - Railroad st (deadend)	Broad	standard	needs repainting	none			
Railroad tracks - High	High	zebra, 4-way	good	none			
Cross St (west - east)							
Dexter - Broad	Dexter	standard, 4-way	needs repainting	signalized walk	Good	Y	Y
Broad - High	Hawes	standard	needs repainting	none	Good	Y	Y
High - Roosevelt	Broad	none	NA	signalized walk	Good	Y	Y

Figure 11-5: Pawtucket/Central Falls Walking Network



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Existing Bicycle Network

Integrating bicycles is beneficial for transit-oriented developments, as bicycles increase travel options in a low-cost and low-impact manner. There are three fundamental components to integrating bicycles into TOD:

- Bicycle network connections: TOD stations must be woven into the bicycle network, which may include on and off-street routes.
- Safe storage: Include safe and secure bicycle parking at stations so that riders can lock up their bikes at the station.
- Bikes on transit: Ensure that bicycles can be brought on board transit so that they may be used at both ends of a journey. RIPTA sponsors a Rack n' Ride program, with racks fitting two bikes on each of its buses, a good way of encouraging bicycle use. The MBTA allows bikes on the commuter rail, but not during rush hour trips.

Currently, bicycle accommodation is adequate throughout most of the study area. Traffic volumes are moderate and street widths are adequate to accommodate both motorists and bicyclists. However, some key bicycle accommodations are lacking. For instance, there is a lack of designated bicycle facilities on some of the more heavily-traveled key routes, and "share the road" signage is lacking throughout the study area. Additionally, bike parking is often insufficient at key bicycle destinations.

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Existing Transit Access

Aside from cars and walking, people should also be able to access the commuter rail stop via transit, with easy transfers between RIPTA buses and the commuter rail. Current RIPTA service past the train station on Broad Street is provided by route 71, which connects at Main and Roosevelt to the 99 Pawtucket bus to Providence. Several other bus lines run within a 10-minute walk of the proposed commuter rail stop, as shown in Figure 11-6.

Figure 11-6: Transit Frequencies in Study Area

An inventory of bus stops within the study area was conducted in the field. The results are listed in Table 11-10 below.

Table 11-10: Transit Stops in Study Area

Street	Location	Side	Shelter	Location	Side	Shelter
	Northbound Service			*Southbound Service*		
Broad Street	Btw Barton Street and Humes Street	Far	Y	Sheridan Street	Near	N
	Sheridan Street	Far	N	Sacred Heart Avenue	Far	N
				Pacific Street	Near	Y
Roosevelt Avenue	Main Street	Far	Y	Main Street	Near	Y
Dexter Street	Andrew Ferland Way	Far	N	Mowry Street	Far	N
	Barton Street	Far	Y	Cross Street	Far	
	Central Street	Near	N	Goff Avenue	Far	
	Rand Street	Near	N			
	Garfield Street	Far	N			
Park Place				Church Street		Y
	Eastbound Service			*Westbound Service*		
Exchange Street	Main Street	Far	Y	Main Street	Near	Y
	Summer Street	Far	Y	Broad Street	Far	Y

Recommended Improvements to Multimodal Network

A successful TOD starts at the focus of activity, which is the commuter rail stop. The stop must be accessible to pedestrians, bicycles, buses, and cars in order to integrate it effectively into the surrounding neighborhood and promote successful TOD, safe spaces, and positive reinforcement of the existing built environment. Many train stations that have been built in existing neighborhoods are completely out of character with their surroundings. A successful station includes compatible architectural elements, similar scales to surrounding buildings, pedestrian-friendly and transparent facades on all sides, and welcoming entries near all possible points of approach by all modes of transportation.

The design of the commuter rail access points and the possible use of the historic station site have not been finalized, but these principles should be followed to the greatest extent feasible. The goal is to create a great place in the community, not a stand-alone incongruous structure.

■

Pedestrians

Clear pedestrian access to the station area is critical to the success of TOD. In order to create a welcoming, active environment to support safe residential areas and local supporting retail activity, pedestrians must find walking to and from the station an easy, pleasurable, and straightforward experience. Several pedestrian accommodation principles should be followed in the study area. These principles are described below.

Circulation

The needs of all users should be factored into a circulation plan for the study area. This includes all modes of transportation, including pedestrians. Pedestrians should have a well defined sidewalk or path network and frequent opportunities for crossing at designated intersection and mid-block crosswalks.

Balance

All features of the street network should work together to balance the needs of all users: motorists, pedestrians, and bicyclists.

Connectivity

The roadway system should provide overall connectivity. For pedestrians, this means a continuous sidewalk or side-path network with frequent street-crossing opportunities, so that pedestrians do not need to travel out of their way to reach destinations. Once a pedestrian has reached a crosswalk, a series of design characteristics should be followed:

- Clarity: The crosswalk should make it obvious to motorists that pedestrians should be expected, and pedestrians should be guided to the designated crosswalk.
- Predictability: Crosswalk placement should be predictable, and should be more frequent with increased proximity to the commuter rail stop, where more pedestrians would be expected to cross.
- Visibility: In the TOD area, crosswalks should be clearly marked, signed, and illuminated so that motorists and pedestrians are visible to each other.
- Limited Exposure: There should be limited conflicts with traffic, and crossing distances should be reasonably short. Crossing distances can be reduced through the incorporation of curb extensions or pedestrian refuges.
- Clear Crossing: The crosswalk should be free of all obstacles or hazards and accessible to all users.

Safety

To maximize safety, optimal vehicle speeds should be 20 mph, with a posted speed limit of no greater than 25 mph. Features that can encourage adherence to posted speed limits include:

- Rigorous enforcement of existing speed limits
- Utilization of portable or permanent radar devices that show the posted speed limit and motorists' actual speeds
- Traffic calming features such as narrowing the roadway and including curb extensions, center medians, and on-street parking
- Striping or other visual treatments to visually reduce travel lane widths, including bicycle lanes, curb lines, and other innovative treatments

Sight distance and sight lines are another consideration. Vehicles parked near crosswalks create sight line restrictions. To resolve this issue, a minimum no-parking zone of 20 feet on the near and far sides of the crosswalk is recommended at all intersection legs. This no parking zone can also be created by curb extensions, which physically prohibit vehicles from parking too close to the crosswalk, and also allow pedestrians to step out into the intersection to see around parked cars. Curb extensions also reduce crossing distance, which improves pedestrian compatibility.

Ensuring adequate lighting is another crucial component of providing adequate pedestrian safety. Lighting should be placed at regular intervals along a roadway to provide a uniform level of light, and should be present at all crosswalks to maximize pedestrian visibility. In TOD districts, pedestrian-scale lighting should be considered to increase security and create a sense of place.

Design elements such as shorter blocks, narrower rights-of-way, curb extensions at intersections, less frequent curb-cuts, and driveways that give visual emphasis to the continuation of the sidewalk are a few basic design elements that can minimize pedestrian risk exposure. Vehicle turns should be minimized along key pedestrian routes to prevent conflicts. Transportation Demand Management (TDM) can be effective in managing auto traffic volumes in TOD districts.

Accessibility

The needs of all users should be accounted for when designing pedestrian facilities. This means that all Americans with Disabilities Act (ADA) requirements must be met and that the needs of individuals with mobility limitations are given proper consideration. This is particularly critical in curb ramp and driveway design.

Traffic Engineering Elements

Traffic elements such as traffic and crosswalk signals, crosswalk and curb ramp treatments, and signal timings should be designed with pedestrians in

mind to maximize convenience, comfort, and safety. Cycle lengths should be minimized so that pedestrians do not have to wait an unreasonably long time to cross a street. Crossing times should also be adequate to allow pedestrians to cross a street in a practical amount of time (assuming the average pedestrian walks at 4 feet per second).

The use of concurrent and protected pedestrian crossing phases is preferred over push-button actuated pedestrian phases that can cause significant delays to pedestrians. Concurrent pedestrian crossing occurs where pedestrians and cars moving in the same direction go at the same time, while protected pedestrian crossing occurs where pedestrians receive a "Walk" light only when there are no vehicle conflicts. Any concurrent phase should also have a leading pedestrian interval (LPI), meaning that the pedestrians receive a "Walk" light a few seconds before traffic moving in the same direction receives a green light. This allows pedestrian to begin crossing the intersection before turning vehicles create conflicts. Where concurrent or protected phases are not feasible, exclusive pedestrian phases should be accommodated on recall without the use of actuation buttons.

Landscaping and Aesthetics

Aesthetics play an important role in supporting TOD. Sidewalks and plazas should be visually appealing and physically inviting. Appealing streetscape design can be an effective means of announcing the uniqueness of the TOD environment and encouraging initial visits to the area. When combined with quality land uses, aesthetics play an important role in drawing and maintaining the more crowded urban vitality that marks successful TOD.

Convenience

Pedestrian walkways leading to the commuter rail stop should be well-maintained, safe, and well-lit. They should be sufficiently broad to comfortably handle the expected pedestrian traffic volumes. Signage should be adequate to lead individuals, especially those unfamiliar with the area, to the stop. Pedestrian levels of service along connecting routes between major origins and destinations should be emphasized. TOD development should provide the local community with daily needs, minimizing regular out-of-area trips for goods and services and minimizing automobile usage. TOD development should be mixed-use to maximize the opportunity to run several errands on one trip and encourage longer area visits. Different uses should also be strategically placed to maximize pedestrian-trip efficiency, such as locating dry cleaners and day care facilities near transit nodes.

Comfort

Sidewalks should be wide enough for two pedestrians to walk abreast. The minimum width for two people to walk comfortably side by side is about 5 feet. For strolling pairs to be able to pass each other in stride, a minimum of 10 feet of sidewalk width is necessary. In places defined by high pedestrian volumes and buildings that directly abut sidewalks, widths up to 20 feet are

commonly recommended, though a more modest width of 10-15 feet can add a sense of vitality. Places to sit and to wait are also a key component of a pedestrian friendly environment. Figure 11-7 shows an example of sidewalks in an urban village.

Figure 11-7: Adequate Sidewalk Width in Urban Village

Fair Lawn, New Jersey

Examples & Resources:

1. Calgary, Alberta - The City of Calgary's "TOD Policy Guidelines" provides detailed principles on pedestrian access in its "Pedestrian Oriented Design" section including:

- Providing quality pedestrian connections
- Emphasizing a compact development form
- Locating pedestrian-oriented uses at the ground level
- Producing architecture on a human scale
- Incorporating all-season design

2. Kansas City, KS – The city developed a pedestrian Level of Service model based on five measures:

- Directness – pedestrian connections between key destinations and transit
- Continuity – conditions of pedestrian pathways
- Street Crossings – ease and safety of pedestrian crossings
- Visual Interest and Amenity – aesthetics and environment
- Security – lighting and sight lines

Possible Pedestrian Network Improvements

Specific locations for pedestrian improvements may change as concept plans are developed and shared with stakeholders, residents, and business owners. A few areas are primary candidates for future infrastructure planning.

Broad Street between Summit Street in Central Falls and Exchange Street in Pawtucket

Broad Street serves as the primary corridor for connections between downtown Pawtucket and Central Falls, has existing bus service, and conveniently passes in front of the proposed commuter rail stop. It contains many retail establishments, as well as several parcels available for commercial or residential TOD. Sidewalks exist on both sides for its entire length, and most street crossings have pedestrian signals, wheelchair ramps, and marked crosswalks.

Broad Street is important for the success of TOD in the study area because it handles a mix of modes of transportation and has a mix of land uses. Pedestrian amenities along Broad should be well-maintained and repaired where needed. Stronger safety features could be installed, including wide international-standard or "zebra" crosswalk bars, LED countdown pedestrian signals, detectable warning panels on wheelchair ramps, and pedestrian-level lighting. This could be supplemented by street trees, benches, and trash receptacles where width permits. On-street parking could be allowed at all possible locations to buffer pedestrians from vehicle traffic. A clear wayfinding system could also be installed on Broad Street. A sample wayfinding sign is shown in Figure 11-8

Figure 11-8: Wayfinding Map

Philadelphia, PA (Michael King)

Two locations represent significant barriers to pedestrians on Broad Street. Pedestrian crossing at Exchange Street is difficult due to the size and configuration of this intersection. A pedestrian safety analysis of this intersection should be conducted. Some possible improvements include

median refuges, reduced corner radii to slow right-turning vehicle speeds, placing the pedestrian phase on recall, or accommodating concurrent crossings with an LPI, depending on left-turn volumes. Since this intersection is a critical link at the gateway to downtown Pawtucket, every effort to improve its pedestrian amenity should be taken.

The Broad Street bridge across the railroad tracks is an intimidating environment for pedestrians due to the wide roadway, lack of protection from passing cars, and lack of spatial enclosure. Efforts can be taken to improve this bridge by allowing on-street parking, adding lighting, and providing wayfinding or other informational signing that can also add color and interest to the bridge. Pedestrian improvements to the bridge will be helpful for TOD, as the bridge must be used to access some of the closest retail destinations from the historic station site.

Barton and Clay Streets between Dexter Street and High Street

Barton and Clay Streets are important east-west connections between nearby residential neighborhoods and the proposed commuter rail stop. While other neighborhood streets approach the stop, these streets extend further into the surrounding residential areas. Existing and new housing along each street are served by good sidewalks, but lighting is a concern on parts of Clay Street. Both streets experience a fair amount of vehicle traffic, and each has a sidewalk directly against the vehicle travel lane. Efforts can be taken to improve the quality of these connections through street trees, lighting, additional on-street parking, and wider sidewalks.

Montgomery Street

The built character and pedestrian amenities of Montgomery Street make it the most leisurely connection between downtown Pawtucket and the commuter rail stop. However, the viability of this street as the most direct connection is hindered by safety concerns and the poor vista at the southern end of the street. Residents have expressed concern about illicit activities on Montgomery Street. If the historic station site is revitalized, this will create an active destination in view of much of the street, which will help alleviate safety concerns. The southern end of the street, which terminates in the middle of a built block on North Union Street, could be improved through creative signing, lighting, and building fenestration to direct pedestrians to High or Summer Streets. Marketing features of the downtown arts district could be utilized to help improve this terminus.

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Bicycles

While bicycle use in the study area today is low, most successful TODs see a significant increase in bicycle activity as a result of the improved accommodations and mix of nearby uses. Every effort should be taken today

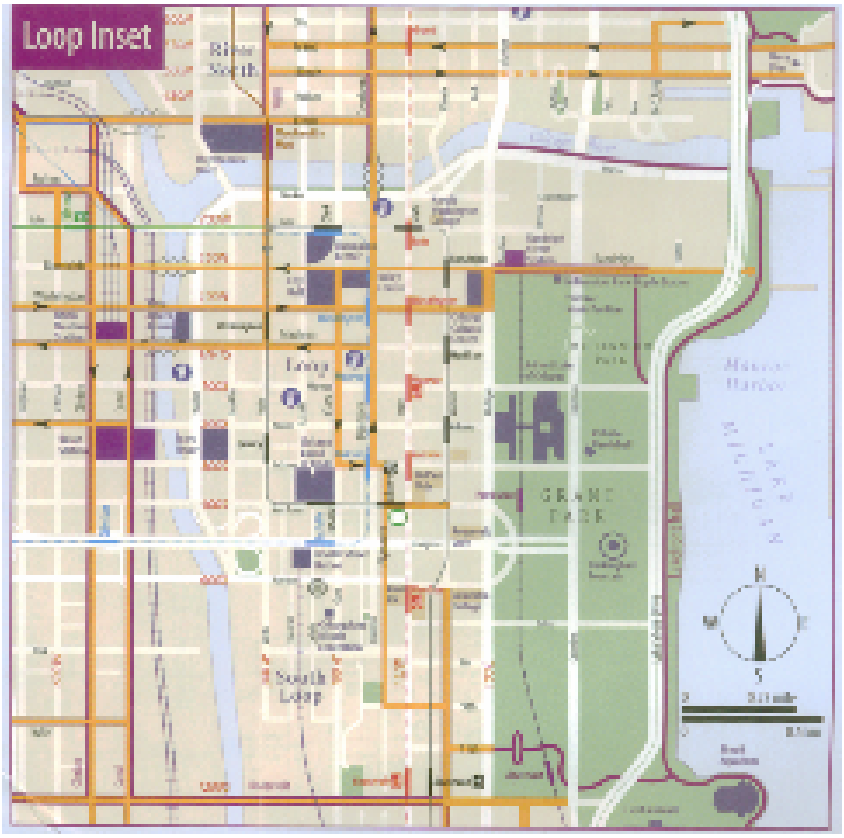
to safely accommodate bicycles on most roadways. The following principles should guide bicycle accommodation in a TOD.

Connecting Transit to Bikes

Dedicated bicycle facilities should connect to the commuter rail stop, but not conflict with pedestrian movements. Signage near the stop should direct cyclists to bike parking, local points of interest, and distant destinations, in much the same way that wayfinding is provided for pedestrians and drivers.

Maps and information kiosks are useful at disseminating information. The transit map should contain information about bicycle facilities; the local bicycle map should show where the transit stops and lines are. The goal is one map per journey, not one map per mode. A sample bike and transit map is shown in Figure 11-9.

Figure 11-9: Bike and Transit Map



Chicago, IL Bike Map
Note: the map identifies preferred bike routes, transit services and transit stations that offer secure bike parking.

Bike Parking

Lack of secure parking keeps many people from using their bikes for basic transportation. Leaving a bicycle unattended, even momentarily, is not an option for most urban bicyclists. A bike rack that doesn't work or isn't conveniently located discourages future bike use. The design and placement of appropriate bicycle parking should be incorporated into TOD planning

throughout the study area, as well as at the commuter rail stop. This can include special zoning requirements for the provision of bike storage for new developments, including locker and shower facilities at larger employers. Bike racks should be as close as possible to the commuter rail stop and the front door of businesses for security and convenience. Figure 11-10 shows an example of a bike parking facility at a transit stop.

Figure 11-10: Bike Parking at Transit

Washington, DC

Shared-Use Lanes

Shared-use lanes are an effective method for designating bicycle routes to and from a transit stop in urban downtowns like Pawtucket and Central Falls. Signing and chevron pavement markings are easy retrofits that provide great value to bicyclists and motorists, especially where full bike lanes cannot be accommodated in the available right-of-way.

The American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities describes signed shared roadways (bike routes) as "those that have been identified by signing as preferred bike routes" and goes on to describe the reasons why routes might be so designated:

- Continuity between bicycle lanes, trails, or other bicycle facilities
- Marking a common route for bicyclists through a high-demand corridor
- Directing cyclists to low-volume roads or those with a paved shoulder
- Directing cyclists to particular destinations (e.g. park, school or commercial district)

In addition, designation indicates that there are particular advantages to using the route rather than an alternative. It is important to note that signed shared roadways generally do not succeed in diverting cyclists away from routes that are more direct, faster, and more convenient, even though they may be on quieter streets. Indeed, the Oregon Department of Transportation (ODOT) bicycle manual graphically shows how such efforts can actually

create greater danger and inconvenience for bicyclists by requiring them to cross major roads just to use a designated bicycle route. ODOT goes on to say:

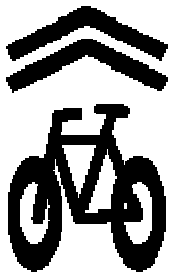
> "Directional signs are useful where it is recommended that bicyclists follow a routing that differs from the routing recommended for motorists. This may be for reasons of safety, convenience, or because bicyclists are banned from a section of roadway (the routing must have obvious advantages over other routes)."

The AASHTO guide recommends considering a number of factors before signing a route:

- The route should provide through and direct travel.
- The route should connect discontinuous segments of shared use paths or bike lanes.
- Bicyclists should be given greater priority on the signed route than on the alternate route.
- Street parking should be removed or limited to provide more width.
- A smooth surface should be been provided.
- Regular street sweeping and maintenance should be assured.
- Wider curb lanes should be provided, as compared to parallel roads.
- Shoulders should be at least four feet wide.

In all cases, shared use roadway signing should include information on distance, direction, and destination, and should not end at a barrier such as a major intersection or narrow bridge. Figure 11-11 shows an example of pavement markings.

Figure 11-11: Shared Use Bike Marking



Bike Lanes

In several locations within the study area, bike lanes are a preferable method for safely defining bicycle routes, especially close to the historic station site on Broad Street. The designation also has the advantage of reducing through vehicle speeds by better defining the vehicle travel lane. Bike lanes are defined as "a portion of the roadway which has been designated by striping,

signing, and pavement marking for the preferential or exclusive use by bicyclists". Bicycle lanes make the movements of both motorists and bicyclists more predictable and, as with other bicycle facilities, there are advantages to all road users in striping lanes on the roadway.

Bicycle-friendly cities such as Madison, Eugene, Davis, Gainesville, and Palo Alto have developed extensive bike lane networks since the 1970s. More recently, large cities such as Tucson, Chicago, Houston, Philadelphia, Portland, and Seattle have begun to stripe bike lanes on their arterial and collector streets as a way of encouraging bicycle use.

In general, bicycle lanes should always be:

- One-way, carrying bicyclists in the same direction as the adjacent travel lane
- On the right side of the roadway
- Located between the parking lane (if there is one) and the travel lane

Critical bike facility dimensions

- 4 feet (1.2m): minimum width of bike lane on roadways with no curb and gutter
- 5 feet (1.5m): minimum width of bike lane when adjacent to parking, from the face of the curb or guardrail
- 11 feet (3.3m): shared bike lane and parking area, no curb face
- 12 feet (3.6m): shared bike lane and parking area with a curb face

Examples & Resources:

1. Metro Commuter Services, St. Paul, MN - installed bicycle lockers for safety and protection from inclement weather.
2. CalTrans operates a highly successful bikes-on-board program. It is so popular that requests for more access are driving equipment purchase decisions, see http://www.caltrain.com/caltrain_bike_FAQs.html.

Possible Bicycle Facility Improvements

Biking should be encouraged and made safe on every street within the study area. A few key connections to surrounding neighborhoods should be emphasized.

Broad Street

As the primary connection through Central Falls, past the historic station site and proposed commuter rail stop, and into downtown Pawtucket, Broad Street is a natural and necessary connection for bicyclists to and from the stop. The higher vehicle volumes warrant providing clear bicycle facilities to protect cyclists and warn motorists. Where dedicated lanes are not possible,

shared-use markings could be installed. Extending facilities beyond the downtowns along Main Street and Walcott Street in Pawtucket and along Broad Street into Cumberland to the north would be an added benefit.

Central Avenue / Cross Street

These streets provide a good connection between the station area and neighborhoods across the Blackstone River without significant interference from I-95 ramps and traffic.

■

Transit

Beyond the commuter rail stop connection central to the TOD district, connectivity to feeder transit services is also important. These services encourage development of the TOD as a hub, and provide a focal point where services can locate to take advantage of high daily pedestrian volumes. The following practices are recommended to maximize the advantages of feeder services on the development of the TOD community.

Interservice connectivity

Effective feeder service must connect the TOD to other areas where people want to go. Feeder service should be focused on remote locations that do not provide the same retail and commercial services as the TOD itself, so that travelers come to utilize not only the commuter rail service, but the businesses that aren't available to them at the remote location.

Transfers between different transit modes or routes frequently require travelers to change grade (e.g., from the depressed train platforms to an at-grade bus line). Each change of grade adds a disincentive to travelers, as it increases travel time and effort, and increases the potential to miss the connecting service. Connections points should be developed to minimize the number of grade changes. Where grade change is necessary, escalators and elevators should be installed along the most direct alignment to bus stops.

In addition, transit connections should always provide a safe and active environment, both actual and perceived. Placing commercial developments along the connection route provides travelers with services and offers an opportunity for businesses to serve highly trafficked areas, while allowing security personnel to maximize their focus on a particular area.

Interservice coordination

Scheduled transfers between modes should include sufficient time for travelers to connect without having to run. Peak period service should be frequent enough so that missing a connection does not require a long wait.

Off-peak service should include timed transfers between multiple operators, to allow TOD developments to function as hubs.

Interservice information exchange

A critical part of modal connectivity is providing information that draws on all transit services, so riders do not need to know in advance or even care which service will take them where they want to go. Comprehensive information should be provided at the commuter rail platforms and at station-area bus stops so that riders perceive all transit as one linked system. This information should include schedules, maps, service bulletins, and real-time information about all routes accessed from the commuter rail stop area, as well as information about all routes that can be accessed in downtown Pawtucket, Providence, and Boston at a minimum. In this way, travelers can plan their trip at their origin, instead of making forced decisions mid-trip.

Possible Transit Service Improvements

There are a number of possible adjustments that would improve interservice connectivity between existing RIPTA bus routes and the proposed Pawtucket/Central Falls commuter rail stop. The following section describes existing RIPTA bus routes in the vicinity of the proposed stop and identifies possible adjustments that would improve service to the site without significantly increasing transit operating costs.[1]

Current Services

RIPTA's Pawtucket downtown bus terminal, located one-half mile south of the proposed Pawtucket/Central Falls stop on Main Street and Roosevelt Avenue, is a major regional transfer point. The terminal is served by 12 RIPTA bus routes, including #71-Broad, which operates directly past the proposed commuter rail stop. Two additional RIPTA routes operate in close proximity to the stop, including #72-Weeden/Central Falls and #75-Dexter/Lincoln Mall. Both operate on Dexter Street, passing through the Barton Street intersection approximately 0.2 mile west of Broad Street.

Route #71 operates predominantly north-south service along Broad Street between Ann Hope Way in Central Falls and downtown Pawtucket. Scheduled bus travel times between the Pawtucket Terminal and the train station site via Route #71 are four minutes on most northbound trips and three minutes on all southbound trips. The weekday timetable contains 30 trips running in each direction, serving the site at approximately 20-25 minute headways during peak periods and 40-45 minute headways during midday hours. The Saturday timetable includes 20 northbound and 18

[1] For purposes of this assessment, a significant cost increase is assumed if a potential service change requires either a commitment of one or more additional buses to maintain current service frequencies on a given route during peak hours, or if additional trips or route extensions greater than five minutes per one-way trip are needed.

southbound trips operating every 40 minutes, and the Sunday timetable includes 9 northbound and 8 southbound trips operating every 80 minutes. Route #71 trips are interlined through Pawtucket Terminal with Route #99-Providence, meaning that Route #71 passengers can continue directly to Kennedy Plaza in downtown Providence on Route #99 without changing buses. The resulting one-way onboard travel time between the historic station site and downtown Providence is 26-28 minutes at peak times.

Route #72 operates north-south service primarily along Dexter Street to West Hunt Street, and continues generally west and south via Hunt Street, Lonsdale Avenue, Weeden Street, Power Road, Mineral Spring Avenue, and Smithfield Avenue toward downtown Providence. Buses serve the Barton Street intersection every 38-45 minutes during weekday peak hours, 75-80 minutes during midday hours, 60-65 minutes on Saturdays, and 85-95 minutes on Sundays in both directions. Northbound timetables contain 16 weekday, 13 Saturday, and 8 Sunday trips, while southbound timetables include 17 weekday, 13 Saturday, and 7 Sunday trips.

Route #75 operates north-south service primarily along Dexter Street and Lonsdale Avenue between downtown Pawtucket, Central Falls, and the Lincoln Mall. Buses serve the Barton Street intersection every 65-70 minutes in both directions. Northbound timetables contain 12 weekday, 11 Saturday, and 9 Sunday trips, while southbound timetables include 11 weekday, 10 Saturday, and 9 Sunday trips.

Improving Interservice Connectivity

Depending on the timing of commuter rail departures and arrivals at the proposed Pawtucket/Central Falls commuter rail stop, realignment of RIPTA Routes #72 and #75 could be considered as a means of enhancing transit connectivity between the Pawtucket Bus Terminal and the stop. Together with the #71, these routes could provide a relatively frequent shuttle connection to downtown Pawtucket for commuters using RIPTA bus service. This could be accomplished either by rerouting peak trips via the current #71 alignment, or by realigning the routes via Barton Street between Dexter Street and Broad Street. These options must be discussed in greater detail with RIPTA before any preliminary recommendation can be made. Important variables that should be considered include:

- Commuter rail schedules proposed by MBTA
- The number of #72 and #75 passenger boardings and alightings occurring on Dexter south of Barton
- Impacts of additional running time, estimated at three to four minutes in each direction, on the #72 and #75 operating cycle times in the event that the route realignment option is selected

Tables 11-11 and 11-12 illustrate the cumulative morning and afternoon peak frequencies of RIPTA bus service operating between the Pawtucket Terminal and the train station site, assuming the existing schedules of Routes #71, #72

and #75. Cumulatively, the three routes operate 18 trips arriving at the intersection of Broad Street and Barton Street between 5:23 am and 8:43 am. The headway between these buses ranges from 1 to 24 minutes, and averages 15.6 minutes.

Table 11-11: RIPTA Routes #71/72/75 Northbound Weekday AM Peak Bus Arrivals at Broad Street and Barton Street, Assuming #72 & #75 are Rerouted

Route #	Depart Kennedy Plaza	Depart Main & Roosevelt	Arrive Broad & Barton	Headway (Minutes)
72	--	5:20 am	5:23 am	--
99/71	5:29 am	5:48 am	5:51 am	24
72	--	6:00 am	6:03 am	12
99/71	5:41 am	6:00 am	6:03 am	0
75	--	6:20 am	6:23 am	20
99/71	6:03 am	6:22 am	6:25 am	2
72	--	6:38 am	6:41 am	16
99/71	6:25 am	6:44 am	6:47 am	6
99/71	6:47 am	7:06 am	7:10 am	23
72	--	7:15 am	7:18 am	8
75	--	7:30 am	7:33 am	15
99/71	7:09 am	7:31 am	7:35 am	2
99/71	7:31 am	7:53 am	7:57 am	22
72	--	7:55 am	7:58 am	1
99/71	7:42 am	8:04 am	8:08 am	10
99/71	8:00 am	8:22 am	8:26 am	18
72	--	8:34 am	8:37 am	11
75	--	8:40 am	8:43 am	6

Similarly, the three routes collectively operate 20 southbound trips departing from Broad Street and Barton Street between 3:36 pm and 8:19 pm. The headway between these buses ranges from 1 to 32 minutes, and averages 14.2 minutes. Particularly during the PM peak, service frequency between the station and the Pawtucket Terminal would be significantly improved over Route #71 service operating alone.

Table 11-12: RIPTA Routes #71/72/75 Southbound Weekday PM Peak Bus Arrivals at Broad Street and Barton Street, Assuming #72 & #75 are Rerouted

Route #	Depart Broad & Barton	Arrive Main & Roosevelt	Arrive Kennedy Plaza	Headway (Minutes)
71/99	3:36 pm	3:40 pm	4:04 pm	--
72	3:50 pm	3:54 pm	--	14
71/99	3:58 pm	4:02 pm	4:26 pm	8
75	4:19 pm	4:23 pm	--	21
71/99	4:20 pm	4:24 pm	4:48 pm	1
72	4:33 pm	4:37 pm	--	13
71/99	4:42 pm	4:46 pm	5:10 pm	9
71/99	5:04 pm	5:08 pm	5:32 pm	12
72	5:10 pm	5:14 pm	--	6
75	5:29 pm	5:33 pm	--	19
71/99	5:30 pm	5:34 pm	5:58 pm	1
72	5:50 pm	5:54 pm	--	20
71/99	6:03 pm	6:06 pm	6:26 pm	13
72	6:28 pm	6:32 pm	--	25
75	6:34 pm	6:38 pm	--	6
71/99	6:38 pm	6:41 pm	7:01 pm	4
72	7:07 pm	7:11 pm	--	29
71/99	7:25 pm	7:28 pm	7:48 pm	18
72	7:47 pm	7:51 pm	--	22
71/99	8:19 pm	8:22 pm	8:42 pm	32

■

Policy Framework

Support for investments in the alternative transportation modes necessary to create a successful TOD needs to be backed up with government policies to help frame future discussions and analyses of parking and access. Financial policy statements that support a recognized mobility asset for the study area, such as the commuter rail platforms or bus bays at the historic station site, can shape decision-making by illustrating the benefits of multi-modal investment options in comparison with the other investment options. TODs experience the most success when paired with progressive government policies specifically targeted toward TOD. For example, when San Diego, CA added a 16-mile light rail link, the Tijuana Trolley, in 1981, the service experienced huge ridership, but no development whatsoever took place

surrounding the stations. When the city proposed another extension, the Mission Valley Trolley, in 1982, it also enacted policies to foster a TOD environment, such as offering incentives for infill development near proposed trolley stops. By 1995, development surrounding the Mission Valley trolley was significant: 7,000 new housing units, 2,375 hotel rooms, 1.6 million square feet of retail, and 6 million square feet of office.[2]

Housing and Employment

A TOD becomes a place by containing a mix of residents, train riders, and shoppers. Therefore, the team examined the market feasibility for retail and housing near the historic station site. Development at the train station will also have ripple effects on the larger communities of Pawtucket and Central Falls, spurring economic growth and new home construction. It will also facilitate access to businesses in the cities and increase the number of employment opportunities available to residents. An examination of current land uses and local demographics helps reveal what types of development the market can support.

Socioeconomic Characteristics

Current market conditions for housing, jobs, and overall economic growth will inform the type of development possible around the commuter rail stop. Research shows that TOD does not directly cause growth; it instead redistributes growth already poised to occur.[3]

The study area (a 10-minute walking radius of the historic train station site) covers portions of nine Census Tracts and contains more than 50 percent of Pawtucket's population. Around one quarter of the population in the study area and in Pawtucket overall work in Pawtucket, with nearly another three-quarters working in Providence County (Table 11-13). This data suggests that a new commuter rail stop in Pawtucket/Central Falls would increase accessibility for local residents to the large employment base in Providence. It is also likely that the commuter rail will facilitate access to the larger job pool in downtown Boston for area residents.

[2] TCRP 102 Report 102: Transit Oriented Development in the United States. 2004. Page 168.
[3] TCRP Report 102. Page 168.

Table 11-13: Population and Place of Work

	Study Area	Percent	Pawtucket	Percent
Population	37,659		72,958	
Workers	14,455		32,241	
Work in Pawtucket	3,370	23%	9,057	28%
Work in Providence County	10,477	72%	22,700	70%

Source: 2000 Census

A comparison of 1990 and 2000 U.S. Census data for Pawtucket and Central Falls is shown in Table 11-14. Both cities demonstrated limited growth, with Pawtucket, four times the size of Central Falls, adding just over 1,000 residents in the 15 years between 1990 and 2005. At the state level, population increased at 0.5 percent on an average annual basis, while both Central Falls and Pawtucket grew at just under half that rate, 0.2 percent on an average annual basis during the same time period.

Table 11-14: Population Trends in Pawtucket and Central Falls

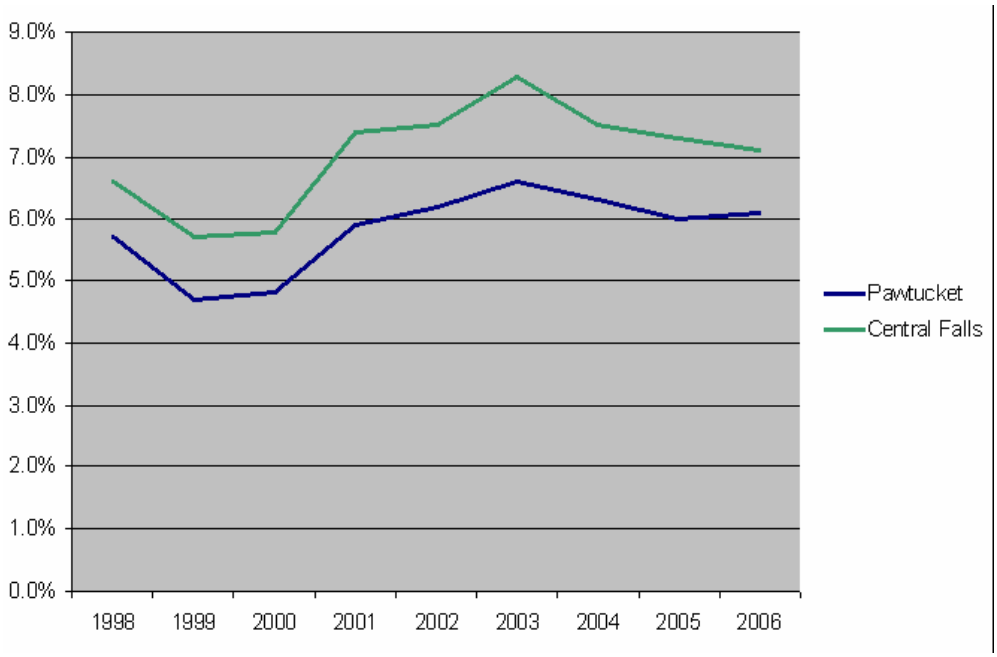
Area	1990	AAPC	2000	AAPC	2005
Central Falls	17,637	0.7%	18,928	0.2%	19,159
Pawtucket	72,644	0.0%	72,958	0.2%	73,742
Rhode Island	1,003,464	0.4%	1,048,319	0.5%	1,073,579

Source: U.S. Census Bureau
AAPC = Average Annual Percent Change

Unemployment levels in both Central Falls and Pawtucket have fluctuated over time due to the impact of the economic boom of late 1990's and the subsequent recession, with unemployment for both cities peaking in 2003 and then declining slightly, as shown in Figure 11-12.

While not directly comparable due to different data collection methodologies, the 2000 US Census data suggests that there are pockets of higher unemployment near the proposed station site, where approximately 12 percent of the residents were unemployed at that time, more than double the rate for each city.

Figure 11-12: Unemployment Rates in Pawtucket and Central Falls



Likewise, both cities currently have higher unemployment rates than the average for the state of Rhode Island, as shown in Table 11-15, for the period from 2004 through the first quarter of 2007.

Table 11-15: Recent Unemployment Trends

Area	2004	2005	2006	2007 Q1
Central Falls	7.5%	7.3%	7.1%	6.6%
Pawtucket	6.3%	6.0%	6.1%	5.7%
Rhode Island	5.1%	5.2%	5.1%	4.4%

Source: Bureau of Labor Statistics

A review was also conducted of average wage data at the state level for Rhode Island, Massachusetts and New England. As shown in Table 11-16, the rate of average wage growth has been very close for the three regions. However, average wages in Rhode Island are 26 percent less than average wages in Massachusetts and 21 percent less than average wages in New England.

Table 11-16: Average Wages

Area	1996	AAPC	2005
Rhode Island	$26,124	4.4%	$37,064
Massachusetts	$33,765	4.9%	$50,419
New England	$32,130	4.7%	$47,138

Source: Rhode Island Department of Labor and Training
AAPC = Average Annual Percent Change

Discretionary income in Central Falls and Pawtucket is limited, as the median household income for Pawtucket and Central Falls is significantly lower than median household income for the state of Rhode Island, as shown in Table 11-17. In Central Falls, median household income is 46 percent less than the median for the state, while Pawtucket is 25 percent less than the state.

Table 11-17: Median Household Income in 1999 dollars

Area	2000
Central Falls	$22,628
Pawtucket	$31,775
Rhode Island	$42,090

Source: US Census Bureau

This data suggests that Pawtucket and Central Falls would benefit greatly from TOD development and increased transit access to job markets in Boston, Providence, and T.F. Green Airport.

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Land Uses

Existing land uses in the study area are very well mixed and ideal for supporting a largely captive market of transit users that would support TOD. This lends great support to the community's objective of keeping the existing neighborhood fabric together without seeing the adverse safety and traffic impacts of a commuter rail stop placed within a single-use employment or residential center.

Existing establishments draw mainly on local customers. Examples include an American Video rental outlet, a Walgreen's pharmacy, Market Union Fruit, and a branch of Family Dollar Stores. One block south is a branch of a fast food chain and within a half mile are several more restaurants, coffee shops, and pubs. Blackstone Valley Community Health Care has several offices within half a mile including administration and dental services. Memorial Hospital of Rhode Island is also approximately ¾ of a mile away.

An existing land use map for the greater region is depicted in Figure 11-13. A more detailed assessment of existing uses was conducted through a windshield survey of the local streets in the immediate study area. The results of that survey, in Table 11-18, clearly demonstrate a wide variety of residential, retail, office, and institutional uses within a 10-minute walk of the proposed commuter rail platforms. This mix is very supportive of TOD.

Figure 11-13: Pawtucket/Central Falls Land Use

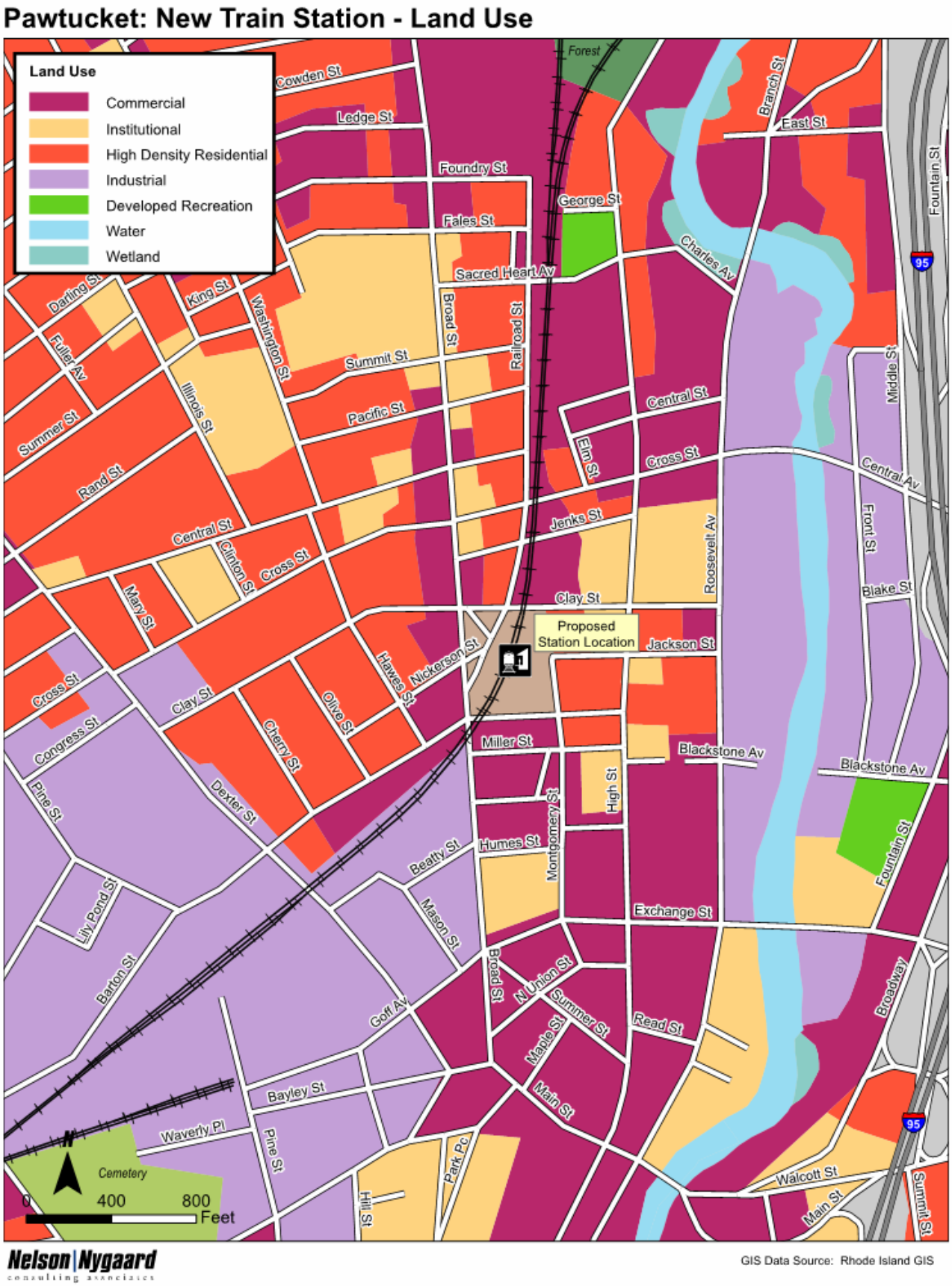

Table 11-18: Land Uses in Study Area

Street	Land Use: Residential	Office	Retail*	Institutional	Industrial	Parking Lot
Broad (north - south)						
Cowden - Charles/Sacred Heart		Y: insurance	Y: R, S			
Charles/Sacred Heart - Summit			Y	Y: church		
Summit - Clay			Y			
Clay - Barton			Y			
Barton - Grant			Y			
Grant - Humes			Y			
Humes - Exchange			Y			
Exchange - Main	Y		Y			
High Street (north - south)						
Charles - Cross	Y		Y			Y
Cross - Clay						
Clay - Jackson	Y		Y:Funeral Home	Y: Church		Y
Jackson - Miller mid-block	Y					
Miller mid-block - Exchange	Y					
Exchange - Main		Y	Y	Y: Public Library		Y
Main - East	Y	Y	Y			
Railroad St (north - south)						
Foundry (deadend) - Central (deadend)	Y				Y: next to train tracks	
Dexter (north - south)						
Garfield - Cross			Y			
Cross - Goff (Exhange)			Y			
Goff - Church			Y			
Roosevelt Ave (north - south)						
Charles - 1/2 to Central			Y		Y	Y
1/2 to Central - Jackson			Y		Y	
Jackson - Exchange	Y	Y				Y
Exchange - Main				Y: Police Station,		Y
Exchange St (east-west)						
Roosevelt - High	Y: Housing High Rise	Y: Electric Company				Y
High - Montgomery			Y: R, S	Y: Religious	Y: gas station	
Montgomery - Broad			Y: R, S, vacancies	Y: Social security		Y
Broad - Dexter	Y: Slater house highrise, Cientenial Towers	Y: BVCAP non-profit	Y: walgreens			Y
Main St (west - east)						
Dexter - Broad	Y: highrise			Y:School Dept		
Broad - Maple		Y	Y	Y:School Dept		
Maple - High		Y	Y			
High - Roosevelt		Y	Y	Y:Visitor Center		
Clay St (west - east)						
Dexter -Broad	Y					
Broad - High	Y		Y: R at Broad			Y at Broad
High - Roosevelt	Y					
Jackson St (west - east)						
Railroad tracks - Roosevelt	Y					
Central St (west - east)						
Dexter - Railroad st (deadend)	Y				Y: Gas station at Broad	
Railroad tracks - High	Y					Y
High - Roosevelt			Y	Y: perfomance theater	Y	
Foundry St (west - east)						
Fletcher - Railroad St (deadend)	Y				Y	
Fales St (west - east)						
Broad - Railroad St (deadend)	Y				Y	
Eastwood St (north - south)						
Fales St - Sacred Heart	Y				Y	
Cross St (west - east)						
Dexter - Broad	Y					
Broad - High	Y		Y			Y
High - Roosevelt			Y			Y
Charles St (west - east)						
Broad - railroad overpass	Y					
railroad overpass - Roosevelt	Y		Y			Y

*R=Restaurants, S=Shops

Average commercial vacancy rates in the neighborhood of the proposed station are in the same range as vacancy rates for Central Falls, and less than the current rate in Pawtucket, as shown in Table 11-19. The commercial rent per square foot in all three locations are similar, in the $10 to $12 range, however these rates are lower than rents charged elsewhere in northern Rhode Island.

Table 11-19: Commercial Real Estate Indicators

Area	Vacancy Rates	Commercial rents per Square Foot
Neighborhood of Proposed Station	5% to 7%	$10 to $12
Central Falls	6%	$10 to $12
Pawtucket	10%	$10 to $12
Northern Rhode Island	5%	$15

Sources: Bureau of Labor Statistics: CPS Household Survey, Hayes & Sherry, CB Richard Ellis.

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Housing

One core purpose of TOD is providing housing near transit to get people to work efficiently without the use of a car. This actually saves households money, since the cost to ride transit is a great deal less than the cost to own a car. The Center for Transit Oriented Development conducted research on the subject of housing and transportation affordability, creating a "Housing Affordability Index" that takes into account both housing and transportation costs.[4] The center found through subsequent data collection that an average family spends 19 percent of the household budget on transportation, but for households with good access to transit, this number drops to 9 percent.[5] Transit access is especially important for lower income families, who spend proportionally more of their money on transportation than higher income people. The average high-income family spends 9 percent of its budget on transportation, while the average low-income family spends over half its budget – 55 percent – to pay for transportation. Therefore, focusing new housing development near the station and on the station site will provide homes with low transportation costs.

Research shows that successful TODs raise land values and, in turn, raise rents. For example, near Mockingbird station in Dallas, retail space rents for $40 per square foot, a number 40 percent above market rate. Residential rents stood at $1.60 per square foot in 2003, while properties not within walking

[4] For the complete report, see "The Affordability Index: A New Tool for Measuring the True Affordability of a Housing Choice." Brookings Institute. January 2006.
[5] Zimmerman, Maria. "Preserving Affordability." Center for Transit Oriented Development. www.reconnectingamerica.org, viewed 4/23/07.

distance of the station rented 20 percent lower.[6] The rising land values are not necessarily a detriment to affordability, because they allow developers to include affordable housing units in TODs by generating high rents from market rate units to offset the affordable unit subsidies. However, it is essential that public policies require affordable housing to be constructed, as the free market would not typically do so on its own.

The nonprofit Good Jobs First, which advocates for smart growth and economic development for working families, produced a profile of 25 TODs that specifically focused efforts on provision of affordable housing and access between jobs and housing. One example of a pioneering affordable housing project occurred at the Ohlone-Chynoweth station in San Jose. Prices for single family homes in San Jose were very high, at more than $500,000 in 2002. The station provided excellent transit service, with access to the Guadalupe corridor light rail (operated by the Santa Clara Valley Transportation Authority - VTA) and the Caltrain heavy rail connecting to San Francisco. The TOD at Ohlone-Chynoweth occurred against the backdrop of San Jose's housing initiative, begun in 1989, which focused on higher-density housing in the Guadalupe corridor. The development site, half owned by VTA and half owned by a private company, was an underutilized station parking lot. On the privately owned portion, Bridge Housing Corporation built 10.6 acres of medium and high density housing called Ohlone Court, which contained 135 very low income units and was completed in 1997.[7]

The other portion of the site was leased to Eden Housing and consisted of 7.3 acres of housing, a small amount of retail, and 4.3 acres for 200 parking spaces and bus bays. Ohlone-Chynoweth Commons contained 194 very low and low income units, partially submerged parking, 4,400 square feet of retail and a 4,000 square foot community center. The housing was targeted toward people earning 30 to 60 percent of the median income. An important aspect of the development was the community center, which contained child care, after school programs, literacy training, tax assistance, and computer labs. Ohlone-Chynoweth Commons cost $31 million, with funds received from a variety of sources such as the City of San Jose, the Metropolitan Transportation Commission (the Bay Area's MPO), Fannie Mae, and the Federal Home Loan Bank. The state, federal, and city governments awarded substantial tax exemptions, and Eden Housing also took out loans with the city and Wells Fargo. These housing developments increased transit ridership and also spurred new development. Upscale, luxury apartments called Pear Place were built in 2003 just south of Ohlone-Chynoweth Commons.[8]

[6] TCRP 102. Page 161, 164.
[7] Dittmar, Hank and Gloria Ohland. The New Transit Town. Island Press: Washington, 2004. Page 193.
[8] Grady, Sarah and Greg LeRoy. Making the Connection: Transit Oriented Development and Jobs. Good Jobs First, 2006. Page 51.

Current Housing Characteristics

Most residents of the densely populated neighborhood around the historic station site live in multi-family housing, including a multistory apartment tower one block south of the proposed station site and many 3-4 unit buildings. Over 95 percent of the neighborhood's housing was built before 1990. The types of housing available in the neighborhood around the historic station site are shown in Table 11-20.

Table 11-20: Neighborhood Housing in 2000

Building size	Number of households	Percentage of households
1-unit, detached	194	5.3%
1-unit, attached	16	0.4%
2 units	396	10.8%
3 or 4 units	1,007	27.3%
5 to 9 units	509	13.8%
10 to 19 units	168	4.6%
20 or more units	1,392	37.8%
Total	3,682	100.0%

Source: U.S. Census Bureau

The neighborhood is divided between the Central Falls School District and Pawtucket School District, with the closest school located one block northwest of the proposed station site. There are three parks each several blocks away from the site: Jenks, Slater, and Wilkinson. Slater Park includes the Slater Mill Historic Site museum. In addition, 18 churches are within half a mile of the project site, including New City Church, located one block south, and Holy Cross, located one block east.

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Employment

TOD's economic development benefits should help lift up all income levels, and should not simply provide a wealthy enclave of luxury condominiums and high-end retail. Many people recently have chosen the lifestyle embraced by TOD because they wish to avoid driving and prefer to live in a community environment; for others, TOD offers a way of drastically reducing household costs.

One way to ensure that job creation and retention make up part of a TOD is through Community Benefit Agreements between a community leader and the developer. Ballpark Village in San Diego, to be completed by 2012, consists of a 3.2 million square feet mixed use village centered on a trolley

and bus hub, and will include 1,600 residential units, 136 affordable units, office space, and retail shops. The developer, JMI Realty, entered into a CBA with A Coalition Organized for Responsible Development (ACCORD) under the belief that without the CBA, ACCORD would try and block the project at the San Diego City Council. JMI included many provisions geared toward employment at the TOD, including:

- Employers must pay a living wage.
- The developer hired a unionized chain for the TOD's grocery store.
- Emphasis was placed on local hire and on hiring recently-rehabilitated locals.
- The developer provided a job placement center on-site.
- The developer provided $1.45 million for an off-site job training program.
- To evaluate the ripple effects of TOD on other areas, the developer undertook a $100,000 economic development study.[9]

In Columbus, OH, an urban-infill TOD project focused on providing access to jobs through transit. Linden, a depressed neighborhood in northern Columbus, is an Empowerment Zone with 10 percent unemployment and 25 percent of residents without access to a car. In 1997, the nonprofit Building Responsibility, Equality, and Dignity (BREAD) convinced the Central Ohio Transit Authority (COTA) and the Mayor to provide better jobs and housing through transit connections. At the time, COTA was applying for a federal Livable Cities grant to build a transit center in the suburbs. BREAD convinced COTA to amend its grant application and attain funds for a sister transit center in the city. COTA received $2.1 million from Livable Cities for the Linden Transit Center, as well as $270,000 from the Ohio DOT. The transit center, completed in 1999, connects eight bus lines and includes a bank, daycare, and children's clinic. The center has become a community meeting place and is heavily utilized. Two more transit centers have opened since that time. COTA and BREAD used the grants to plan bus routes specifically based on worker needs, and even hired a Jobs Access Coordinator. COTA implemented many jobs access programs, including subsidized service through major employers directly to job sites and better connections between suburban and inner city routes, although funding cuts have forced the agency to reduce many initiatives.[10]

Existing Business Development Policies

Both Pawtucket and Central Falls offer a series of public business incentives to attract business, as summarized in Table 11-21. These incentives for small businesses could be utilized to attract retail and commercial businesses to the proposed station site.

[9] Making the Connection. Page 10.
[10] Making the Connection 38.

Table 11-21: Public Business Incentives

City	Commercial or Industry Property Tax Benefits	Other Programs and Incentives
Central Falls		• Entire city is a state-designated Enterprise Zone • Job Creation Incentive program • Business loan programs available
Pawtucket	The city offers a financial incentive for new and existing businesses to construct and/or substantially renovate industrial and commercial facilities. New or additional municipal property tax assessments are phased-in according to a schedule that is directly related to the creation of new or expanded employment opportunities for Pawtucket residents.	• Portion of city [although not including the project site] is a state-designated Enterprise Zone • Local business loan programs available

Source: Rhode Island Economic Development Corporation

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Possible Housing and Employment Policies

A review of best practices at TODs across North America reveals some policy suggestions that could be adopted by the Cities of Pawtucket and Central Falls in cooperation with the State, local housing developers, and neighborhood groups.

Changes to Zoning

Inclusionary Zoning

In order to ensure and preserve affordability of housing around a TOD, requirements and incentives for housing developers are necessary. Typical inclusionary zoning provisions require a certain percentage of new development over a certain size to be available to households below the median income in the area. Some communities grant additional bulk or height to the developer in return for meeting the inclusionary requirement. Regardless of the details, developers in a TOD will attempt to maximize profits by selling or renting all units at a market rate without an inclusionary requirement. Fortunately, land values typically increase in a TOD, enabling developers to recover the cost of building below-market-rate housing.

Increased Density

In order to create a successful walking environment with a mix of uses in a TOD, greater density is necessary. Many communities are fearful of the size

and impacts of greater density. However, greater density is typically only allowed in close proximity to a transit station. Policies that allow developers to build additional units near a transit station will enable the necessary critical mass of residents and retail shops to sustain TOD.

Reduced Parking Minimums

One of the most expensive parts of any development project is parking, whether that is in the form of costly garage structures or paved surfaces that cannot be developed for other purposes. To encourage the necessary density and affordability, parking requirements are often reduced in a TOD. This is easy to support operationally, as mixed-use typically draws users who share their parking, requiring less overall. In addition, the convenience of transit reduces auto ownership among residents. Many employees and customers travel to the TOD by means other than a car, further supporting the reduced parking minimums and allowing increased density and affordability.

Special Districts

Overlay Districts

Communities often employ special powers of government through the use of an overlay district or redevelopment area designation. When established, a TOD-supportive district can allow more changes to traditional zoning to occur in order to achieve the necessary level of development and infrastructure. Generally, a neighborhood board or elected body oversees the decisions made in an overlay district or redevelopment area.

Parking Benefit Districts

Where financing for TOD-related infrastructure improvements is difficult to obtain, parking benefit districts have been used successfully in many North American cities to generate the necessary revenue. By charging nominal fees for on- and off-street parking consistently across a downtown area, many communities have generated revenue while controlling parking problems, such as poor turnover, meter-feeding, and excessive vehicle trips. Pricing controls force motorists to treat parking as a commodity, not as a freedom. All revenues created in a parking benefit district are turned directly back into the district to pay for amenities like sidewalk improvements, street trees, and trash collection.

Financing Programs

Location Efficient Mortgages

In areas where development is slow to occur due to lower incomes and property values, a new TOD can be the necessary catalyst for jobs and increased property value. However, many existing residents may be no more

capable of buying property than they were before the TOD was constructed. Location Efficient Mortgages (LEMs) have proven successful in several North American cities. Recipients are subject to easier qualification criteria and get lower rates on account of their properties being located in a TOD, where personal transportation costs are significantly lower than areas dependent on automobile transportation only. More and more lenders are working to develop these programs in reaction to the growth of housing near transit stations in the United States.

Façade Enhancement Loans

Many communities offer low interest loans and free design services for façade improvements to local businesses, especially in business districts near transit stations. These programs enable TODs to develop attractive pedestrian environments that encourage walking and shopping, while helping existing businesses look new.

Marketing Programs

In order to stimulate interest in new TODs and attract visitors, residents, and businesses, many communities invest in marketing tools that advertise the special amenities of the TOD. Pawtucket already has an active arts marketing campaign and the Pawtucket Red Sox. These marketing campaigns can be utilized to attract activity to the proposed TOD district. Communities can easily take advantage of public infrastructure that provides free marketing space for community programs associated with a TOD. By creating a sense of excitement or importance, new and existing members of the community seek to explore the TOD area amenities, stimulating the necessary activity for job creation.

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12

Development and Implementation

This chapter describes the next steps of the project development process and makes recommendations for advancing the Pawtucket/Central Falls Commuter Rail Facility.

Project Development Process

Following the completion of this study, the next steps in the project process are as follows:

- Railroad Agreements: Negotiate with railroad stakeholders and reach agreements concerning the establishment of a commuter rail stop in Pawtucket/Central Falls.
- NEPA: Complete the appropriate environmental analysis for the project.
- Preliminary Design: Advance the design through preliminary engineering.
- Final Design: Advance the design through final engineering, producing construction documents, specifications, and bid packages.
- Construction: Bid and construct project contracts.

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Railroad Agreements

There is heavy volume of rail traffic along the Northeast Corridor, and agreements must be reached with railroad stakeholders who operate along the corridor, including the following:

- Amtrak: Amtrak operates intercity service along the corridor, and owns and maintains the corridor in the vicinity of Pawtucket/Central Falls. A new commuter rail stop must be approved by Amtrak, and the project team will need to get Amtrak to agree that a new mainline stop will not impact intercity service.

- MBTA: The MBTA operates the existing commuter service that passes through Pawtucket/Central Falls, and is the only practical operator to serve a new stop at that location. An operating agreement with the MBTA will be needed.

- PWRR: The PWRR operates freight service. Agreements concerning coordination of freight and passenger service will need to be updated.

- RIDOT: RIDOT will be responsible for reaching operating agreements with the MBTA. In addition, the team will need to coordinate service with RIDOT commuter rail to Warwick, Wickford Junction, and South County.

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NEPA

The NEPA process is designed to ensure that the environmental consequences of actions taken by the federal government are studied. The Pawtucket/Central Falls Commuter Rail Facility is expected to require an Environmental Assessment (EA) level of documentation.

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Preliminary Design

Preliminary design includes advancing the engineering to a 30% level and developing a commensurate cost estimate.

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Final Design

Final design includes advancing the engineering to a 100% level and producing a final cost estimate. It also includes developing specifications, bid documents, and any related documents.

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Construction

Construction includes putting the project out to bid, selecting a contractor, and supervising construction of the station.

Implementation

Based on engineering judgment, city input, stakeholder comments, and the results of public participation efforts, the project team recommends that the cities advance the project based on the Base Case Plus scenario described in Chapter 10. This option presents a modest public investment that will tie the historic station site to a new commuter rail stop, helping to initiate redevelopment of the station parcel and new development in the surrounding neighborhood.

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