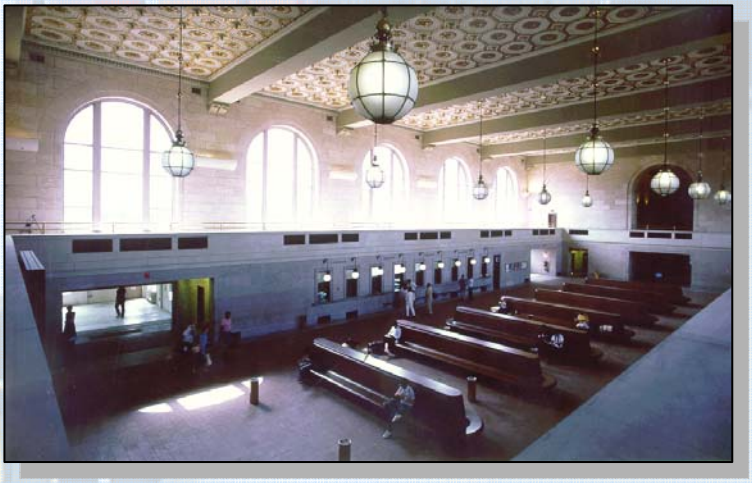
FINAL REPORT

New Haven – Hartford – Springfield Commuter Rail Implementation Study



CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

June 2005

FINAL REPORT

New Haven – Hartford – Springfield Commuter Rail Implementation Study

Prepared for:

Prepared by:

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Wilbur Smith Associates

In association with:

Washington Group International
KKO and Associates
URS Corporation
Fitzgerald & Halliday

June 2005

Table of Contents

Figures

Tables

ES

Executive Summary

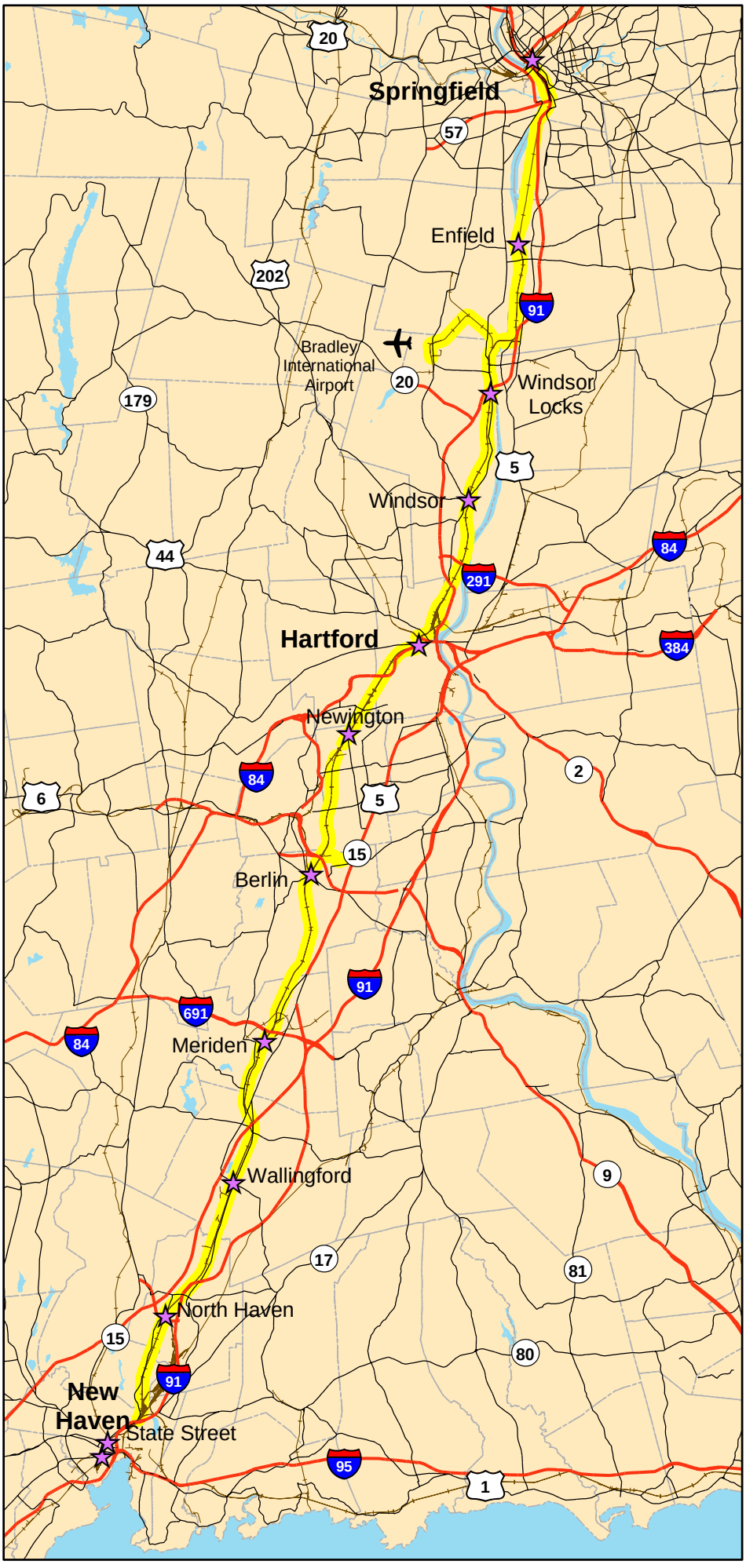
The Connecticut Department of Transportation (ConnDOT), with the support of the Transportation Strategy Board, is developing an implementation plan for commuter rail service between New Haven and Hartford, CT, and Springfield, MA. In addition to serving commuters traveling between the towns and cities along the corridor, the service could provide a connection to:

- Bradley International Airport
- Multiple links to Amtrak Intercity service
- Direct links to the existing Metro North and Shore Line East Commuter Rail in New Haven
- Links to the proposed New Britain – Hartford Busway.

This document is the executive summary of the final report for this study. The complete study report and associated technical documents can be obtained by contacting ConnDOT, Office of Intermodal Planning, 2800 Berlin Turnpike, P.O. Box 317546, Newington, CT 06131-7546.

The study area corridor is 62 miles of existing rail line, which is owned and operated by The National Railroad Passenger Corporation (Amtrak), beginning in New Haven at Union Station, continuing through several towns and the cities of Meriden and Hartford, and ending at Union Station in Springfield, Massachusetts. This rail corridor line is commonly referred to as the "Springfield Line." An existing freight spur line to Bradley Airport in Windsor Locks is also included in consideration of passenger connections to that facility. Figure ES-1 illustrates the study corridor location.

The only existing passenger rail service on the Springfield Line is a regional service operated by Amtrak. There are four freight carriers using the Springfield Line, including Connecticut Southern, Boston and Maine Corporation, CSX Transportation, and Providence and Worcester Railroad. In addition to the existing Amtrak service between stations in the corridor, connections to other Amtrak rail service areas is available in New Haven and Springfield. Connections with Metro North's New Haven Line and the Shore Line East commuter rail are also available from New Haven's Union Station and State Street Station.



Recommended Action Stations

New Haven - Hartford - Springfield
Commuter Rail Feasibility Study

Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

Legend

- Rail Study Corridor
- Highways
- Major Roads
- Recommended Action Stations

N W E S

0 5 10 Miles

Figure ES-1

ES.1 Alternatives

As a first step in determining the alternatives to be evaluated for implementation of commuter rail along the Springfield Line, a "minimum" and "maximum" build were identified as the initial two base scenarios to be considered. Using the costs, ridership, and other analysis from the minimum and maximum build scenarios, four additional possible service implementation alternatives were created for consideration. The following section is a description of the minimum build, maximum build and each of the implementation service alternatives.

ES.1.1 Minimum and Maximum Build Scenarios

The initial vision of a minimum build scenario was to begin service with minimal capital investment. Therefore, an attempt was made to develop a bi-directional schedule with service every 30 minutes using only existing stations and no additional tracks. The initial vision of a maximum build scenario was to provide service that would attract the highest possible ridership. Therefore, a frequent 15 minute schedule, several additional stations and double track on the entire line were included in the scenario. The complete analysis of these two scenarios is available in a separate Alternatives Technical Report. Table ES-1 is a summary of the minimum and maximum build scenario service and results.

Table ES-1
Minimum and Maximum Build Commuter Rail Scenarios

	Min Build	Max Build
Scenario	No additional tracks	Double track entire line
Stations	Nine Existing with limited additional parking	Existing plus Seven New – all improved with high-level platforms, pedestrian crossing and buildings
Peak Hour Train Frequency	30 – 35 minute	15 minute
Off-Peak Service	No - Only Amtrak	Hourly Weekday plus Weekend
Estimated Daily Trips	1,767 (not including Amtrak)	4,983 (including Amtrak)
Capital Cost	$86 million	$558 million
Operating Cost	$7.1 million	$48.3 million
Operating Deficit	$6.2 million	$44.7 million
Per Passenger Subsidy	$13.81	$32.56

Upon evaluation of the minimum and maximum build scenarios, both were found to have a number of issues of concern. The minimum build schedule was found to be unreliable due to the high degree of schedule adherence necessary. Reliable bi-directional service can only be provided by double tracking at least some additional segments of the rail line. The maximum build was found to have a number of costly elements that may not be necessary for the initial implementation of commuter service, including 15 minute peak hour service frequency, weekend service, and a number of additional new stations.

ES.1.2 Implementation Alternatives

Using the costs, ridership, and other analysis from the minimum and maximum build scenarios, four implementation alternatives were derived with varying service plans. Other elements of the maximum build scenario were broken down into a menu of additional elements that can be added initially or in the future as funding or other benchmarks are in place. The following is a summary of each of the alternatives considered to be feasible for initial service implementation. The resulting service characteristics, ridership, costs and performance measures are summarized in Table ES-2.

All of these potential implementation alternatives include only existing stations on the line with existing low level platforms and at-grade pedestrian crossings. These alternatives include peak hour service only and a shuttle bus connection with Bradley Airport at Windsor Locks station. Enhancements such as high level platforms, new station locations and off-peak service can be added to any implementation alternative from the menu of additional options as described in the next section.

ES.1.3 Menu of Additional Options

The items in the following menu of additional options can be added initially or as funding or other benchmarks are in place. These items can be added to any implementation alternative with the cost and impacts shown below:

- Off-peak Service
  - $1.3 million per round-trip run (5 days per week)
  - Maximum build = 577 additional trips daily (using 8 added trains)
- Weekend Service
  - $550,000 per round-trip run (2 days per week)
  - Maximum Build = 1,964 additional trips daily (using 10 added trains)
- Rail Airport Connection (alternatives include shuttle bus connection)
  - Estimated $28 million capital cost
  - No appreciable ridership difference
- Full high level platforms at all stations
  - $3.85 million per station (cost based on SLE)
- Grade-separated pedestrian facilities at all stations
  - $3.85 million per station (cost based on SLE)

Table ES-2
Commuter Rail Implementation Alternatives Service Characteristics and Performance

Alternative	CT1	CT2	Bi-State1	Bi-State2
Service Area	Windsor Locks to New Haven	Windsor Locks to New Haven	Springfield to New Haven	Springfield to New Haven
Headways	30 minute peak hr one-directional service (SB AM, NB PM)	30 minute peak hr bi-directional service	30 minute peak hr bi-directional service	30 minute peak hr bi-directional service
Double Track	No new double track	Double track sections added where needed	Double track sections added where needed	Double track sections added where needed
Amtrak Schedule Adjustment	No adjustments to Amtrak schedule, but fares would be adjusted for commuter use	No adjustments to Amtrak schedule, but fares would be adjusted for commuter use	No adjustments to Amtrak schedule, but fares would be adjusted for commuter use	Amtrak schedule adjusted to accommodate ideal meet times in urban centers
One-way train trips	6	14	14	14
New track required	None	12.4 miles	15.6 miles	15.6 miles
Capital cost	$80.8 million	$121.4 million	$139.4 million	$139.4 million
Annual Operating cost	$3.0 million	$7.0 million	$8.8 million	$8.8 million
Annual Revenue	$368,000	$667,000	$869,000	$869,000
Annual Operating deficit	$2.6 million	$6.3 million	$7.9 million	$7.9 million
Projected Ridership (new daily trips)	872	1,485	1,767	1,767
Per passenger subsidy	$11.82	$16.71	$17.71	$17.71
Farebox recovery	12.3%	9.6%	9.9%	9.9%

- New or updated station buildings at all stations
  - $0.8 million per station (cost based on National experience)
- New Stations:
  - Enfield = estimated 210 daily trips
  - Newington = estimated 250 daily trips (with busway)
  - Wharton Brook = estimated 156 daily trips
  - North Haven = estimated 138 daily trips
  - Capital cost
  - $1.4 - $2.2 million per station for minimum (similar to existing stations)
  - $9.5 - $10.3 million per station for maximum (including high level platforms, grade separated pedestrian crossings, station buildings and expanded parking)

ES.2 Commuter Rail Service Implementation Plan

Upon review of the alternatives, the study team and the Steering Committee developed a recommended action plan for New Haven-Springfield initial and potentially future commuter rail service on the Springfield Line.

ES.2.1 Start-up Service Recommended Action

The start-up service recommended by the Steering Committee is based upon the Bi-State service option. This Start-up Service would include the following:

- Service would operate bi-directionally, Monday through Friday on a 30 minute peak hour schedule (at least 14 one-way trips).
- Service would be between New Haven and Springfield.
- A minimum of 18 miles of extended double track sections will be added to improve reliability and provide 30 minute headways meeting critical times in New Haven, Hartford and Springfield;
- Service would supplement existing Amtrak service on the corridor. Adjustments to Amtrak's schedule would be attempted when possible in conjunction with operating agreements with Amtrak.
- Along with the existing nine passenger stations being served along this corridor, three additional stations would be added at North Haven, Newington and Enfield.
- The existing Windsor Locks station would be enhanced to provide facilities to accommodate a waiting area and transfers between the train and the shuttle bus to Bradley Airport.
- Local bus service will be modified to provide appropriate service to the stations;
- All stations would have high level platforms and grade-separated pedestrian facilities, considered to be necessary from an operational standpoint.

The Start-up Service described includes three additional new stations and improvements to the existing station areas. The station locations for this scenario, which include those new stations not in use today (are *italicized* below), are shown in Figure ES-1.

- New Haven Union Station
- State Street Station
- *North Haven / Hamden Station (at Route 40 connector)*
- Wallingford Station
- Meriden Station
- Berlin Station
- *Newington Station (adjacent to New Britain Busway station)*
- Hartford Union Station
- Windsor Station
- Windsor Locks Station
- *Enfield Station (at Bigelow Commons in Thompsonville)*
- Springfield Union Station

All stations would include high-level platforms, pedestrian amenities with grade separated crossings, bicycle storage and racks, and any additional parking required to accommodate projected ridership.

The suggested 30-minute frequency schedule with stops at all stations demonstrates one potential plan for commuter rail stopping at each station along the line. During further development and refinement of this plan, consideration can be given to including express service directly from the New Haven Line to Hartford and Springfield. The average travel time from New Haven to Springfield, including all stops is 1 hour 30 minutes. If an express train were to operate with stops only in New Haven, Hartford and Springfield (eliminating intermediate stops), the average travel time would be reduced by approximately 15 minutes. However, with the limited stops, corresponding ridership may also be substantially reduced along the line. Further analysis would have to be conducted for such service.

ES.2.2 Commuter Rail Ridership Levels

The New Haven to Springfield commuter rail service has the ability to attract the following four different types of potential users:

1. Commuters accessing employment hubs in New Haven, Hartford and Springfield;
2. Intercity rail ridership to points off the corridor, specifically connections to the Amtrak service in New Haven and Springfield;
3. Users that would have access to Bradley International Airport (BDL); and
4. Off-peak non-commuter and weekend users.

The breakdown of total weekday year 2025 ridership for the Start-up Service is shown in Table ES-3.

Table ES-3
Components of Total Weekday Year 2025 Ridership

Commuters	2,208
Off-peak (non-commuter)	220
Total New Trips	**2,428**
Amtrak (not including Vermonter)	616
Total Trips	**3,044**

The ridership projections presented in Table ES-3 and financial estimates developed for this Start-up implementation plan are based upon a rigorous evaluation process and a customized application of ConnDOT's Statewide Travel Model. However, in response to a concern by some stakeholders that these ridership projections may be conservative, additional analysis was conducted to identify a potential high range of ridership for the service. The resulting high range in ridership is 5,000 daily trips. This higher range is anecdotal and so would be viewed as an optimistic figure. It should be noted that this recommended service is to initiate commuter rail along this corridor and that the opportunity remains to enhance the initial service (with additional scheduled trains and stations) as the demand warrants and funding allows.

ES.3 System Integration Plan

An integral part of the commuter rail service would be the integration with other freight service on the line, passenger rail service both on the line and connecting, and connecting bus services.

ES.3.1 Freight Integration

While the Springfield Line route is an important passenger corridor and can become more so with provision of frequent commuter service during peak travel times, freight service remains an important consideration. The freight service is provided by short line carriers, operating over the line under contractual agreements with Amtrak, which owns the route. The simulations of passenger and freight service confirmed that freight service would need to be operated at times other than the prime commuter hours. Building a commuter and intercity service pattern with frequent trains in each direction make it impractical to run slower freight trains during the period from about 5:30 AM to 9:00 AM, and again from about 3:00 PM to 7:00 PM.

ES.3.2 Transit Integration

New Haven-Springfield commuter rail is planned to connect with bus services provided by seven public transit operators (including different **CT**TRANSIT divisions), and with three other rail services. This can be accomplished by coordinating schedules, implementing joint fares, using rail stations as hubs for local bus services, and by combining marketing and information efforts.

Trips involving New Haven-Springfield commuter rail service and one or more connecting service will involve two or more transit operators. Ideally, regular riders would be able to use a single fare media on corridor rail service, and on all connecting transit services. These would include:

- New Haven – Hartford – Springfield commuter rail
- Amtrak service between New Haven and Springfield
- Pioneer Valley Transit Authority (PVTA) bus service
- **CT**TRANSIT bus service (Hartford, New Britain, Meriden, Wallingford, and New Haven divisions
- Greater New Haven Transit District Trolley
- Metro-North commuter rail
- Shore Line East commuter rail

The existing joint fare arrangements would also provide a framework for pass handling procedures, and for cost and revenue sharing. As long as New Haven-Springfield commuter rail service used the same fare collection practices as Shore Line East service, the same fare media could be used as on that service. Fare handling for the UniTicket option on connecting bus services would be the same as at present, where the pass is simply used as a flash pass. The financial agreements that have been developed for the UniRail and UniTicket programs would provide a framework from which to expand these programs within Connecticut and to Massachusetts services (New Haven - Hartford - Springfield rail and PVTA bus service in Massachusetts).

ES.4 Commuter Rail Start-up Service Capital and Operating Costs and Performance Measures

Capital costs for the recommended Start-up Service consist of five rail-related components: train set equipment (locomotives and cars), a maintenance facility for the equipment, parking and station costs, cost to double track portions of the line, and bridge costs. For this analysis, it is assumed that ConnDOT would require a minimum of 6 train sets, plus two spare locomotives, trailer coaches and cab coaches.

For the Start-up Service, the Springfield Line would essentially remain a single-track railroad with a bi-directional signaling / train control system and multiple controlled passing sidings similar to the existing configuration. However, five existing double track sections would require a minimum of approximately 18-miles of track extensions to provide additional double track on the Springfield Line to accommodate the increase in train movements without impacting planned service trip times. The recommended Start-up Service would require (at a minimum) the following major track changes:

- Extend existing double track from MP 7.3 (Cedar) to MP 11.0 (south of Wallingford) with a new interlocking at MP 11.0. This requires double track across the Quinnipiac River and differs from the Bi-State 1 Alternative.
- Extend existing double track from MP 20.6 (Quarry) through the industrial track to MP 22.5 with a new interlocking at MP 22.5.

- Extend existing double track from MP 28.2 to 31.1 (New), and from MP 33.4 (Wood) to MP 35.2 (Parkville) with a new interlockings at MP 28.2. Some track through Hartford may be redesignated as a running track instead of a passing track, however this issue requires further study and coordination with Amtrak operations staff.
- Extend existing double track from MP 38.9 (Fry) to MP 43.0 (Windsor) with a new interlocking at MP 38.9 (Fry).
- Extend existing double track from MP 51.5 (east side of Connecticut River) to MP 54.7 (Field) with a new interlocking at MP 51.5.

ES.4.1 Total Start-up Service Recommended Action Capital Costs

A summary of total capital costs for the Start-up commuter rail service appears in Table ES-4.

Table ES-4
Commuter Rail Start-up Service Recommended Action Capital Costs

Element		**Cost**
Train Equipment		$70,140,000
Maintenance facility		20,696,000
Stations		80,966,000
Double Track		33,235,000
Bridges		505,000
Amtrak Flagmen		2,500,000
Subtotal		**$208,042,000**
Contingency	40%	$83,217,000
Total		**$291,259,000**

Source: Wilbur Smith Associates, URS Corporation, Washington Group International

The cost estimate includes necessary train sets, spares, the maintenance facility, parking and station costs, double track costs, and bridge rehabilitation or replacement costs. Design, construction service (including Amtrak flagmen) and inspection costs have been applied to each individual estimate. The estimate also includes right-of-way and environmental cost allowances that may be associated with station and maintenance facility construction; however these costs will require refinement in the next phase of implementation. Therefore, to be conservative, a contingency of 40% has been used to reflect unforeseen costs, per Federal Transit Administration guidelines at this phase of implementation. The estimated total capital cost for the Start-up commuter rail service is $291.26 million.

ES.4.2 Commuter Rail Operating Costs

This analysis calculates annual operating costs by multiplying the Springfield Line service's projected annual train miles for its Start-up Service times a representative cost per train mile.

Using 8 round trips or 16 one way trips would generate 992 revenue train miles per weekday. Annual train miles are thus calculated: 992 train miles multiplied by 254 days produces 251,968 annual train miles, exclusive of any shop moves or deadheading for maintenance purposes.

A unit cost estimate of $40 per train mile has been applied, based upon Shore Line East commuter rail experience. Accordingly, an annual operating cost for the recommended Start-up rail service would be $10,079,000.

ES.4.3 Commuter Rail Revenue

Based on the fare structure and weekday ridership presented, revenue from the Start-up commuter rail service would be $4,400 per day. Using 254 days of weekday service per year, the annual revenue would be $1,117,600.

ES.4.4 Connector Bus Costs

Operating costs for connecting bus services would require an additional expenditure of approximately $3.8 million per year, and bus vehicle requirements would increase by 12, at a cost of $3.6 million (see Table ES-5).

Table ES-5
Projected Annual Operating Costs and Vehicle Requirements

	Increase in Operating Costs	Increase in Vehicle Requirements
CTTRANSIT-New Haven	$1,158,001	6
CTTRANSIT-Wallingford	$230,912	0
CTTRANSIT-Meriden	$624,448	0
CTTRANSIT-New Britain	$1,077	0
CTTRANSIT-Hartford	$1,736,323	6
CTTRANSIT Total	$3,750,761	12
Pioneer Valley Transit Authority	$6,101	0
Total	$3,756,863	12

Note: $2002, per year

Applying the 2004 CTTransit farebox recovery rates, the annual operating deficit for the connecting bus service, as a component of the commuter rail implementation plan, would be approximately $2,750,000.

ES.4.5 Cost Summary

A summary of the performance revenue calculations is shown in Table ES-6. Given the Start-up Service Recommended Action is projected to cost $10,078,000 to operate using conventional rolling stock with revenues at $1,117,600, the operating deficit would be

$8,960,000 annually. This is in addition to the capital costs of $291.26 million. Using a total of 4,215,384 passenger miles estimated by the ConnDOT model, the revenue per passenger mile was calculated to be $0.26, the fare box recovery was calculated to be 11.0% and the productivity was calculated to be 16.73. Productivity, a calculation of passenger miles per vehicle miles, is often used to determine the efficiency of the service.

Table ES-6
Commuter Rail Ridership, Costs, Revenue and Performance Measures

Total Weekday Trips	2,428
Annual Passenger Miles	4,215,384
Annual Revenue	$ 1,117,600
Annual Rail Operating Cost	$ 10,079,000
Annual Rail Operating Deficit	$ 8,960,400
Revenue per Passenger Mile	$0.26
Fare box Recovery	11.0%
Productivity (Passenger Miles per Vehicle Miles)	16.73

Connecting bus capital ($3.6 million) and annual operating costs ($3.8 million) would be in addition to the commuter rail capital and annual operating costs.

ES.5 Environmental Resource Review

A preliminary review of the potential environmental issues associated with the construction of the passenger stations and track has been completed. A detailed evaluation will be required to determine the social and environmental impacts and mitigation, in accordance with the National and Connecticut Environmental Policy Acts. Areas that must be addressed include floodplains, coastal boundaries, farmland soils, wetlands, stream channels, threatened or endangered species, historic structures and archeological sites. The addition of the double track sections would be within the existing railroad right-of-way and would not be expected to result in any significant adverse environmental impacts.

Potential 100-year floodplain impacts should be coordinated with the Connecticut Department of Environmental Protection (CTDEP) at New Haven State Street Station, Meriden Station, Newington Station, Windsor Station and Windsor Locks Station. New Haven State Street Station and North Haven Stations are located within the coastal boundary and are therefore subject to the Connecticut Coastal Management Act. At Berlin Station, proposed project activities on land with farmland soils require review by the Natural Resources Conservation Service.

Potential wetland impacts identified at Windsor Station and Windsor Locks Station should be further evaluated and if impacts cannot be avoided, construction of the stations would require an Inland Wetlands and Watercourses permit from the CTDEP and possibly a U.S. Army Corps of Engineers permit. Similarly, the CTDEP's Stream

Channel Encroachment Lines list indicates that encroachment lines exist along the entire stretch of the Connecticut River within Windsor Locks. The Future Wharton Brook Station, Windsor Locks Station, and Enfield Station sites fall within the Natural Diversity Database records; therefore coordination with CTDEP regarding the status and/or presence of any threatened, endangered, and/or special concern species would be necessary.

Plans near the historic Wallingford Railroad Station, potentially historic Berlin Railroad Station, historic property at 160 Willard Avenue in Newington, historic Union Station in Hartford, Broad Street Historic District in Windsor Locks, and potentially historic Connecticut Casket Company in Enfield will be coordinated with the State Historic Preservation Office. A Section 4(f) Evaluation, Section 106 documentation, and various mitigation activities may be necessary. Given the proximity of the Windsor and Windsor Locks Station sites to the Connecticut River, it is recommended that the sites be investigated by the State Archeologist as an archeologically sensitive area prior to any ground disturbance according to Section 106 Regulations of the Advisory Council on Historic Preservation.

ES.6 Implementation Next Steps

The purpose of this study is to develop an implementation plan for commuter rail service between New Haven, Connecticut and Springfield, Massachusetts. The next steps needed to pursue the recommended Start-up Service implementation plan would include:

1. **Develop a funding plan** – The funding and financing of the service are the most controversial issues remaining before implementation given the current Connecticut and federal fiscal situation. Section 8.2 in the Final Report presents the timeline required for future funding. Section 8.4 in the Final Report gives further information about federal funding options available.

2. **Complete the environmental process outlined in the Connecticut and National Environmental Policy Act** – This process must be undertaken by the State of Connecticut with Federal Transit Administration (FTA) guidance before service can begin. This is a key to obtaining any federal funding for the project as well. Further details about the environmental documentation likely required are available in Section 8.3 in the Final Report.
3. **Complete preliminary design** – This report gives conceptual station plans and double track section locations necessary for the development of cost estimates for future funding. The next stage in implementation of service will require refinements of these plans to the preliminary design level (10% design), including exact locations for station platforms, station parking, new track and maintenance facilities. This is typically done in conjunction with the environmental process.

4. **Make necessary refinements to the operating plan** – Based upon the results of the preliminary design and environmental process, refinements should be made to the overall operating plan outlined in this document.

5. **Execute operating agreements** – As the State of Connecticut does not currently own the track over which the service would operate, preliminary operating agreements with Amtrak, other commuter rail operators (as needed), freight operators, and transit operators should be executed early in the process to ensure buy-in for the service before capital funds are expended.

6. **Complete final design and property acquisition** – The final design of stations, double track sections, bridges and the maintenance facility should be undertaken simultaneously with the necessary acquisition of property for these facilities (anticipated to be required only for station parking and the maintenance facility).

7. **Procure rolling stock** – The decision as to the type of rolling stock that best fits this service will be a key aspect of the implementation. Section 8.6 in the Final Report gives guidelines on the positive and negative aspects of self-propelled rail car trains compared to traditional locomotive-hauled push-pull coach trains. The procurement of rolling stock for the service requires substantial turn-around time due to the fact that rail equipment is made to order.

8. **Hire an operator** – Although Amtrak currently owns the line between New Haven and Springfield, there are a number of possible operators for the future service. Section 8.5 in the Final Report discusses potential operators for the service in greater detail.

9. **Construct new facilities** – This involves the construction of station areas (including parking and platforms), new track segments (including track, interlockings, signals and bridges), and maintenance facilities.

10. **System testing** – As a final step to opening the system, final debugging modifications and improvements are made prior to start-up. This includes checks of the rolling stock, stations, track and signal improvements, and all other elements of the project to ensure all components are working correctly prior to commencement of revenue service.

ES.7 Future Full Build Scenario

The previous sections describe the elements of the Start-up Service Recommended Action for a New Haven to Springfield commuter rail service. In addition to these elements, a number of improvements may be considered for future enhanced service on the line as demand is demonstrated. These enhancements include elements that were not

deemed necessary for start-up service, double tracking the entire line and a station in the Wharton Brook area. Several comments were received in the public involvement phase of the study requesting that the cost of providing double track on the last segments of the New Haven to Springfield line be calculated and included in the Final Report. Therefore, additional future enhancements to the corridor may include:

- Double-track the remaining 20.6 miles of single track sections to improve reliability and allow service at least as frequent as every 15 minutes;
- Construct second high-level platforms and grade-separated pedestrian facilities at Wallingford, Berlin and Windsor Locks Stations. It is of note that these stations were on single-track segments in the start-up service and therefore only one platform and no grade-separated pedestrian facilities were necessary. With the additional double-tracking of the entire line, these elements would be necessary.
- Construct an additional station in the Wharton Brook area on the former Pratt and Whitney property as development takes place;
- Provide new commuter rail parking in the new Meriden parking structure to be constructed with downtown development plans in Meriden.

The additional costs associated with these future full-build elements appear in Table ES-7. The cost estimate includes additional parking and station costs, double track costs, and bridge rehabilitation or replacement costs. Design, construction service and inspection costs have been applied to each individual estimate. Amtrak flagmen will be required for construction within 25 feet of the rail line, including platforms, overhead structures, and double tracking segments. A contingency of 40% has been used to reflect unforeseen costs, per Federal Transit Administration guidelines at this phase of implementation. The estimated total additional capital costs for the future Full-build scenario are $96 million.

Table ES-7
Additional Full-build Capital Costs

Element		**Cost**
Stations		$26,020,000
Double Track		$30,159,000
Bridges		$10,005,000
Amtrak Flagmen		$2,500,000
Subtotal		**$68,684,000**
Contingency	40%	$27,474,000
Total		**$96,158,000**

Chapter 1
Introduction

The Connecticut Department of Transportation (ConnDOT) is developing an implementation plan for commuter rail service between New Haven and Hartford, CT, and Springfield, MA. The Capitol Region Council of Government's (CRCOG) Regional Transit Strategy (RTS) identified the corridor as a key component in meeting the goals of improving and sustaining the regional economic vitality and improving regional livability. This was further recognized by the Connecticut Transportation Strategy Board (TSB), which has allocated funding to undertake this implementation study as an important first step in implementing a statewide strategic transit plan. In addition to serving commuters traveling between the towns and cities along the corridor, the service could provide a connection to:

- Bradley International Airport
- Multiple links to Amtrak Intercity service
- Direct links to the existing Metro North and Shore Line East Commuter Rail in New Haven
- Links to the proposed New Britain – Hartford Busway.

This document is the final report for this study. It includes a summary of the existing conditions and alternatives evaluation reports in Chapters 2 and 3. Chapters 4 through 7 describe the vision for start-up and full-build service, the integration of this service with the existing system, the operating plan costs and revenue, and a preliminary identification of the potential environmental impacts associated with the service. Chapter 8 describes potential financing for the service and necessary next steps to implementation.

1.1 Project Team

Wilbur Smith Associates, a transportation planning and engineering firm, is leading the study efforts for ConnDOT. In addition, a team of consultants has been assembled to aid Wilbur Smith, including:

- *Fitzgerald & Halliday* – Environmental and Social Resource Assessment
- *KKO and Associates* – Transit Connections
- *URS Corporation* – Structural and Architectural Elements

- *Washington Group International* – Railroad Signal and Grade Crossing Warning Device Elements

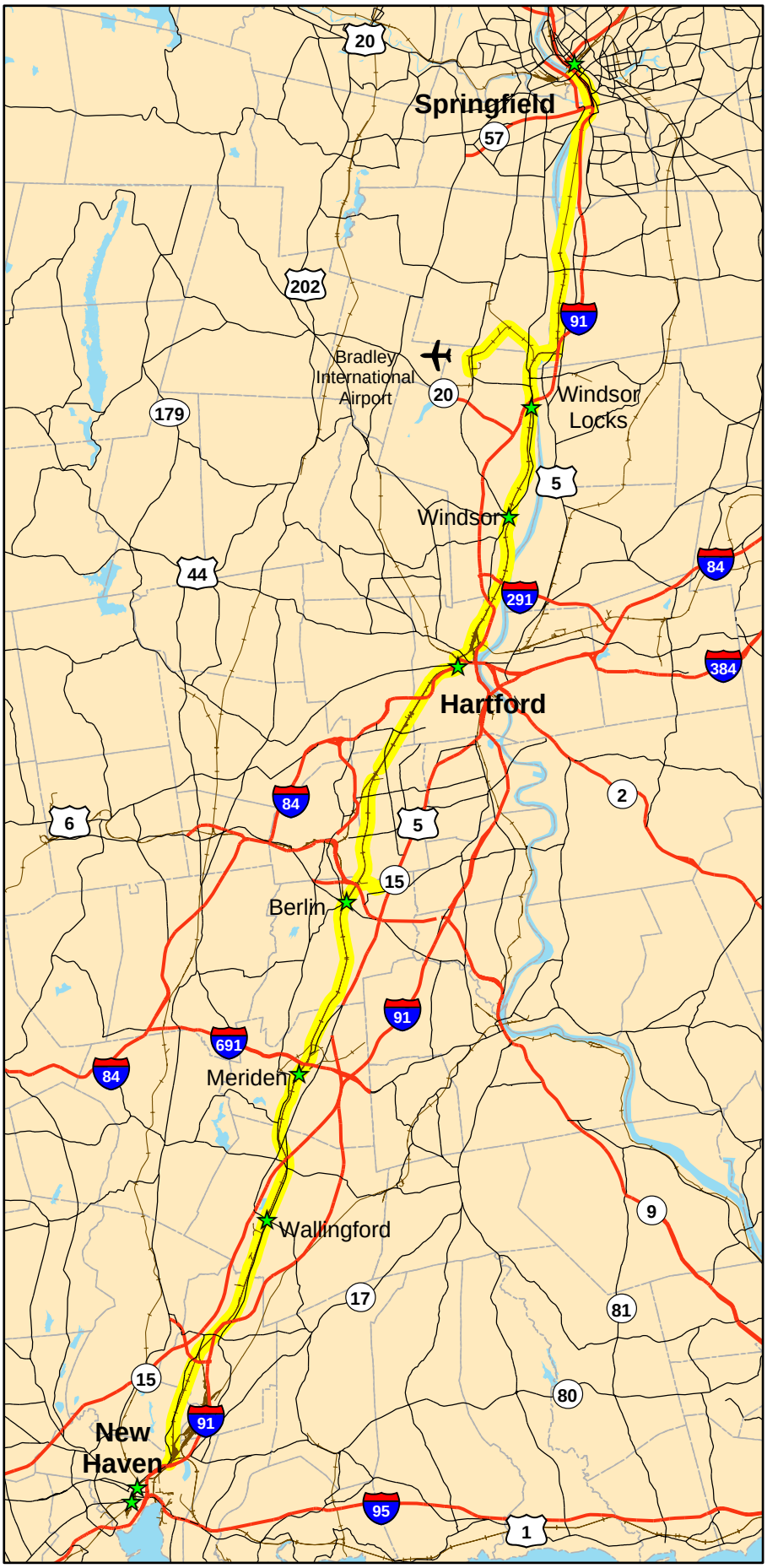
1.2 Study Area Definition

The study area corridor is 62 miles of existing rail line, which is owned and operated by The National Railroad Passenger Corporation (Amtrak). It begins in New Haven at Union Station and continues through several towns and the cities of Meriden and Hartford, ending at Union Station in Springfield, Massachusetts. This rail corridor line is commonly referred to as the "Springfield Line." An existing freight spur line to Bradley Airport in Windsor Locks is also included in consideration of passenger connections to that facility. Figure 1-1 illustrates the study corridor location.

1.3 Project Steering Committee

A project Steering Committee (SC) was established to oversee the study's development and provide information to key decision makers throughout the process. In addition to appropriate ConnDOT staff, the following groups are members of the project's Steering Committee:

- Federal Transit Administration (FTA)
- Federal Railroad Administration (FRA)
- Federal Highway Administration (FHWA)
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- Connecticut Department of Environmental Protection (DEP)
- Connecticut Office of Policy and Management
- Connecticut State Historic Preservation Office
- Connecticut Department of Economic and Community Development
- Transportation Strategy Board
- I-91 Transportation Investment Area
- South Central Regional Council of Governments
- Central Connecticut Regional Planning Agency
- Capitol Region Council of Governments
- Pioneer Valley Planning Commission
- City of New Haven
- Town of North Haven
- Town of Wallingford
- City of Meriden
- Town of Berlin
- Town of Newington
- City of Hartford



Study Area

New Haven - Hartford - Springfield
Commuter Rail Feasibility Study

Legend

- Rail Study Corridor
- Highways
- Major Roads
- Existing Rail Stations

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0 5 10 Miles

Figure 1-1

- Town of Windsor
- Town of Windsor Locks
- Town of Enfield
- City of Springfield
- Peter Pan Bus Lines
- Connecticut Southern Railroad
- Providence and Worcester Railroad
- Guilford Rail Systems
- CSX Railroad
- Metro North Railroad
- Amtrak (National Railroad Passenger Corporation)

All Steering Committee meetings were open to the public and presentations and minutes are available on the project's website, http://www.nhhsrail.com. The first Steering Committee meeting took place on October 16, 2002 at Hartford Union Station to introduce the committee to the project goals and schedule and discuss existing conditions. A rail trip for the Steering Committee was held on December 4, 2002 to view the existing conditions and identify potential alternative station locations. The second Steering Committee meeting took place on March 24, 2003 at Hartford Union Station to review the existing conditions report and discuss potential minimum and maximum build scenarios. The third Steering Committee meeting took place on October 16, 2003 to discuss the results of the minimum and maximum build scenarios and determine additional alternatives to evaluate. The fourth Steering Committee meeting took place on June 30, 2004 at the Connecticut Department of Transportation to discuss alternative results and determine a recommended action.

1.4 Public Involvement

To serve the large number of communities and stakeholders associated with this study corridor, public outreach has included meetings in various forms, a website (http://www.nhhsrail.com), electronic and printed mailings and advertisements.

Meetings held during the course of the study have included public informational meetings, local official / town meetings, and other interested stakeholder meetings. The purpose of all of these meetings has been to provide information and solicit input into the development of the recommended action.

Public meetings were held twice during the course of the study, with the first set of meetings taking place in April and May 2003 and the second set of meetings taking place in November 2004. The first set of meetings consisted of a presentation and discussion of the existing conditions and the minimum and maximum build scenarios with meetings taking place as follows:

- April 29, 2003 - Windsor Town Hall

- April 30, 2003 - Meriden City Hall
- May 6, 2003 - Hartford Union Station
- May 7, 2003 - North Haven Recreation Center
- May 22, 2003 - Enfield Town Hall

The second set of meetings consisted of a presentation and discussion of the alternatives evaluated and recommended action with meetings taking place as follows:

- November 3, 2004 - North Haven Recreation Center
- November 9, 2004 - Windsor Locks Town Offices
- November 10, 2004 - Berlin Town Hall
- November 16, 2004 - Wallingford Town Hall
- November 17, 2004 - Enfield Town Hall

During the course of the study, a website, http://www.nhhsrail.com, has been maintained to provide information and feedback during the course of the study. Initially, the website provided project background and scope information, a map of the corridor, links to related sites, and study team contact information. As the study progressed, meeting announcements were updated, meeting minutes and presentations were added and all technical reports were made available. The website is hosted by Rideworks, the rideshare agency in greater New Haven, and updated by Wilbur Smith Associates.

Two newsletters have been created and mailed out during the course of the study, both in advance of the public meetings. In order to reach out to the public not already on the mailing list, paid public advertisements in local newspapers were used to advertise the public information meetings, as well as flyers and press releases.

The public commented to this report in the form of e-mails, mail, fax, phone and meeting attendance. All written public comments received during the course of the study appear in Appendix A of this report.

Chapter 2
Existing Conditions Summary

This chapter is a summary of the existing conditions report, necessary for comprehension of the remaining chapters. The entire report can be found in Appendix B of this report.

2.1 Existing Passenger Services on the Line

The only existing passenger rail service on the Springfield Line is a regional service operated by Amtrak. Schedules for alternatives in Chapter 3 and the Recommended Action in Chapter 4 include current Amtrak service. Most Amtrak service on the line is shuttle trains, running between Springfield and New Haven, where they connect with other Amtrak Northeast Corridor trains. One round-trip train each day operates through the corridor to Boston to the north and Washington to the south. One round trip train each day operates to and from St. Albans, Vermont from New Haven. The trains also permit connections at New Haven with Amtrak's Northeast Corridor (Washington to Boston) service, as well as Metro North service to New York, and Shore Line East local commuter service to New London. Departures are spread throughout the day, with trains typically operating at intervals of two to three hours. Springfield line services are designed as extensions of Amtrak's Northeast Corridor service, and are not scheduled to serve local commuter trips (home to work trips).

The Amtrak fare structure was substantially reduced in price since this study began. The original fare structure from November 2002 was shown in the existing conditions report, which can be found in Appendix B. Table 2-1 provides a complete listing of the Amtrak fares within the corridor as of April 2003, which is similar to the fare structure in early 2005 as this report is being finalized. 10-ride tickets and monthly passes are also available for the Amtrak service. Although the one-way fare structure for Amtrak is approximately twice the one-way fare structure proposed for start-up commuter rail service, the proposed monthly pass fares for the start-up commuter rail service are approximately the same as the monthly pass fares for current Amtrak service.

Table 2-1
Amtrak One-Way Fare Table for Intra-Corridor Travel

Station	New Haven	Walling-ford	Meri-den	Berlin	Hart-ford	Wind-sor	Windsor Locks	Spring-field
New Haven	NA							
Wallingford	$5.00	NA						
Meriden	$6.00	$5.00	NA					
Berlin	$8.00	$5.00	$5.00	NA				
Hartford	$12.00	$8.00	$7.00	$5.00	NA			
Windsor	$14.00	$11.00	$8.00	$7.00	$5.00	NA		
Windsor Locks	$14.00	$12.00	$10.00	$8.00	$5.00	$5.00	NA	
Springfield	$19.00	$17.00	$14.00	$12.00	$9.00	$7.00	$6.00	NA

Source: www.Amtrak.com for travel on April 16, 2003.

Ridership on the Amtrak service within the corridor is collected in terms of boardings and alightings at each station. New Haven was the most frequently used station because of its connection s to other Amtrak and commuter services. As shown in Table 2-2, the other seven stations reported 138,141 passenger boardings in Amtrak's 2002 fiscal year (October 2001 through September 2002). This yields an average of 378 boardings on the line north of New Haven on a "typical" day.

Table 2-2
Detailed Amtrak Ridership, FY 2002 (October 2001 – September 2002)

Station	Milepost	Boardings	Alightings	Annual Total	Average Daily Total	Percent of Total
New Haven*	0	205,385	205,728	411,113	1,126	59%
Wallingford	12.6	1,545	2,120	3,665	10	1%
Meriden	18.6	5,304	6,116	11,420	31	2%
Berlin	25.9	7,550	7,766	15,316	42	2%
Hartford	36.6	62,044	62,313	124,357	341	18%
Windsor	43.1	2,929	3,553	6,482	18	1%
Windsor Locks	47.3	4,856	5,536	10,392	28	2%
Springfield	61.9	53,913	54,888	108,801	298	16%
	Total	**343,526**	**348,020**	**691,546**	**1,895**	**100%**

*New Haven boardings and alightings include data from the Northeast Corridor.

Source: Amtrak's Fiscal Year 2002 Ridership Data for the Springfield Line

Amtrak ticket sales data were obtained showing the destination station for tickets sold at Springfield, Hartford, Berlin, and Meriden for the first six months of 2002. There are no ticket sales at Windsor, Windsor Locks, or Wallingford stations. These stations are unstaffed and do not have Quick-Trak ticketing machines. The data were useful for gaining a general understanding of current travel patterns between communities on the

Springfield line and the rest of the Amtrak system. The data do not reflect total travel between stations, because tickets may be purchased at locations other than the trip origin or trip destination. Recent data showing total Amtrak passenger volumes at Connecticut stations are shown in Table 2-3. These represent total passengers boarding or alighting at each station.

Table 2-3
Change in Annual Amtrak Station Passenger Volumes at Connecticut Stations, Fiscal Years 1998 – 2000*

Station	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
New Haven**	255,935	251,130	289,765	370,496	411,113
Wallingford	9,601	8,331	7,885	6,002	3,665
Meriden	27,331	25,066	20,039	16,353	11,420
Berlin	28,569	28,246	25,109	20,326	15,316
Hartford	151,849	151,249	147,043	142,276	124,357
Windsor	8,174	7,994	7,980	7,670	6,482
Windsor Locks	13,747	13,390	13,686	10,704	10,392

*Fiscal Years run from October of the previous calendar year to September of the current one.
**Volumes for New Haven station includes all Amtrak Northeast Corridor Riders.
Source: Amtrak Fiscal Year Ridership Data

The current Amtrak service is too limited to draw conclusions about potential commuter ridership within the corridor. The ticket sales data indicate that some local travel occurs between stations on the Springfield line, but the overwhelming travel pattern served by the weekday trains is travel to New York City. Philadelphia, Washington, and New Haven also attract rail riders, but in decreasing numbers. Table 2-4 below shows the 20 top destinations for tickets purchased at the four stations based on ticket sales January to June, 2002.

Table 2-4
Top 20 Destinations of Springfield Line Riders

From Berlin to:		From Hartford to:		From Meriden to:		From Springfield to:	
New York	1223	New York	9414	New York	452	New York	7623
Philadelphia	279	Philadelphia	2283	Washington	130	Philadelphia	1435
New Haven	230	New Haven	1910	Philadelphia	124	Washington	1211
Washington	193	Washington	1622	New Haven	123	New Haven	1041
Metropark	57	Stamford	594	Newark	41	Chicago	685
Windsor Locks	46	Newark	537	Newport News	38	Newark	515
Trenton	45	Metropark	388	Hartford	33	Trenton	317
Springfield	44	Trenton	375	Orlando	31	Boston	307
Chicago	36	Springfield	368	Trenton	28	Stamford	275
Wilmington	36	Wilmington	282	Wilmington	27	Metropark	274
Hartford	31	Chicago	267	Chicago	26	Wilmington	218

From Berlin to:		From Hartford to:		From Meriden to:		From Springfield to:	
Windsor	29	Baltimore	234	Baltimore	20	Baltimore	187
Orlando	25	Boston South	220	Springfield	19	St. Albans	155
Newark	24	New Rochelle	203	New Carrolton	19	New Rochelle	151
Baltimore	18	Bridgeport	197	Metropark	16	Windsor Locks	147
Baltimore Washington Airport	18	St. Albans	164	Baltimore Washington Airport	15	Amherst	145
Boston	16	Windsor	161	Wallingford	15	Orlando	141
New Carrolton	14	Orlando	152	Stamford	10	Toledo	127
Montreal	13	Windsor Locks	108	Buffalo	10	Albany	126
Richmond	13	New Carrolton	107	Boston	8	Bridgeport	110

* Note-- Excludes tickets purchased at a station with the destination being the same station. For example, 1,141 tickets were sold at Berlin with a destination of Berlin. These represent sales of return tickets from another location to Berlin.

2.2 Existing Freight Services on the Line

There are four freight carriers using the Springfield Line between Springfield (Milepost 62.0) and New Haven Union Station (Milepost 0.0). They include Connecticut Southern (CSO), Boston and Maine Corporation (B&M), CSX Transportation (CSXT), and Providence and Worcester Railroad (PWRR).

Connecticut Southern - The Connecticut Southern Railroad (CSO) is a short-line operator running trains on the line between Springfield and CSX Transportation's Cedar Hill Yard (Milepost 7). Part of the RailAmerica Inc. short-line family of railroads, the carrier is the major freight operator on the line. CSO hauls its own traffic and traffic for CSX Transportation (see below) between Springfield and Cedar Hill. CSO management reported the following train movements.

CSO has four trains on the line Monday through Saturday, with occasional use on Sunday. These trains are:

- ***CSO-1,*** southbound, departing Springfield at about 6:00 AM, working toward Cedar Hill. The train returns to Springfield in the afternoon.
- ***CSO-2,*** southbound, departing Hartford at about 7:00 PM working toward Wallingford. The train returns to Hartford at 4:30 AM the next day.
- ***CSO-3,*** northbound, departing Hartford at about 7:00 AM, working north to Enfield. The train returns to Hartford between 2:00 and 6:00 PM.
- ***CSO-4,*** northbound, departing about 5:00 PM, working between Hartford and Enfield. The train returns to Hartford in the early morning of the next day.

Traffic on the CSO is growing. When Conrail turned over operations on the line to CSO, Conrail's activity on the line was 20,000 carloads a year, with volumes declining. According to CSO, Conrail was not actively developing traffic on the line. The lowest traffic volume was in 1996, when there were only 16,000 carloads. Presently the annual

total is about 18,000 carloads per year, and rising, with customers returning. By 2007, CSO forecasts that there will be between 22,000 and 23,000 carloads per year, if the construction debris haulage market remains stable.

Growth commodities include trash, hazmat and "dirty dirt", i.e. the construction debris market. CSO indicated that CSXT has targeted removing trash, or solid municipal waste, as a market that may grow faster than the economy. Markets that will grow with the economy include chemicals (hauled in tank cars), lumber (box cars and flat cars), plastics (hopper cars), paper and pulp (box cars), steel (gondolas), and scrap paper (box cars).

CSO management reported the following concerns over a new commuter rail service on the Springfield line:

- Commuter rail service would restrict the time windows available for freight operations, making it more difficult to run freight trains. Freight transit time would increase.
- Sidings are not in strategic locations to facilitate the passing of freight and passenger trains.
- Sidings are not long enough. The typical train length for the CSO-1 service is 60 to 100 cars, or about 4,000 to 6,000 feet long. According to CSO, sidings need to be 8,000 feet long. (If the route were double-tracked, these concerns would no longer exist.)
- Traffic on the Suffield Branch (the potential rail link to Bradley International Airport from Windsor Locks) is increasing. Customers include wood pulp and special paper shippers and aviation-related shippers. There is also potential for construction debris removal.
- A new commuter rail service would require new maintenance windows (during which time trains cannot operate), which would hinder freight movement on the line.
- The CSO-1 service needs to return to Springfield before 2:00 PM in order to avoid waiting for CSXT and Amtrak operations to clear the CSXT Albany-Boston line before the train can enter CSXT's West Springfield Yard (the train's origin and destination).

Boston & Maine Corporation - Boston & Maine is a short-line railroad operating on the Springfield line between Springfield and Berlin (Milepost 26) and a switch to Waterbury. B&M is part of the Guilford Rail System. Guilford management declined to comment on either its train volumes, traffic, or concerns over a new commute rail service. According to Amtrak dispatching records, B&M has two trains operating on the line. These are:

- ***PLED***, northbound, operating twice a week with no set schedule between Berlin and Springfield.
- ***EDPL***, southbound, operating twice a week with no set schedule between Springfield and Berlin.

Reportedly, B&M has operating rights as far south as the Cedar Hill Yard (Milepost 7).

CSX Transportation - CSXT is one of the largest rail systems (a "Class 1" railroad) in the United States. It has operating rights on the entire Springfield Line; however, it relies on CSO to haul its traffic between Springfield and Cedar Hill. According to Amtrak dispatching records, CSXT operates two trains serving shippers on the south end of the line between Cedar Hill and Mill River (Milepost 1.5) Monday through Friday. These are ***B-748*** and ***B-747***, a mid-day train.

CSXT trains can enter Cedar Hill Yard from the south via Mill River. CSXT has operating rights on the New Haven Line (Metro North). CSXT trains exiting the New Haven Line northbound can use the Springfield line between New Haven Union Station and Mill River. At Mill River, CSXT trains can enter the southern end of Cedar Hill Yard.

Providence and Worcester Railroad - The Providence and Worcester Railroad (PWRR) is a short-line railroad operating several lines in Connecticut and Massachusetts. One of these lines enters the CSXT Cedar Hill Yard from the north. PWRR has rights to run on CSXT between Cedar Hill and Mill River, on the Springfield Line between Mill River and New Haven Union Station, and on the New Haven Line between New Haven Union Station and the Devon neighborhood in Milford, where it runs north to Waterbury.

According to PWRR management, five to six days a week there are typically two southbound (or westbound) trains leaving Cedar Hill between 7:00 and 8:00 PM headed to the New Haven Line and ultimately to Waterbury. One returns at 5:00 AM the next day and the other returns at 11:00 AM.

2.3 Existing Stations

The following is a list of existing passenger stations on the line:

New Haven Union Station

Platforms: 6 high platforms
Tracking: 12 tracks
Structure: historic station building

State Street Station

Note: serves Shore Line East, not Amtrak
Platforms: 2 high platforms
Tracking: 5 tracks
Structure: station structure below street level, station opened in June 2002

Wallingford Station

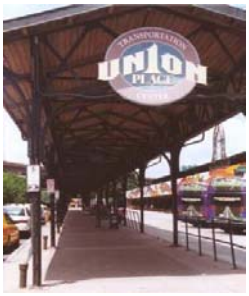
Platforms: 1 low platform
Tracking: 1 track
Structure: historic station structure

Meriden Station

Platforms: 2 low platforms
Tracking: 2 tracks
Structure: enclosed station with seating

Berlin Station

Platforms: 1 low platform
Tracking: 1 track
Structure: historic station structure



Hartford Union Station

Platforms: 1 low platform
Tracking: 1 track
Structure: historic station structure

Windsor Station

Platforms: 1 low platform
Tracking: 1 track
Structure: historic station structure

Windsor Locks Station

Platforms: 1 high platform (newly reconstructed)
Tracking: 1 track
Structure: none

Springfield Union Station

Platforms: 4 low platforms.
Tracking: 4 tracks
Structure: minimal shelter; Union Station to be restored

2.4 Station Parking and Access for Cars

The existing stations within the study area corridor are served by parking facilities in use by Amtrak passengers, other transit passengers and park and ride users. Table 2-5 provides the existing number of parking spaces and usage rates.

Significant parking is available at the three Union Stations. Most of the parking at these stations is filled, however some parking is typically available. As has been noted in other studies, parking is often difficult to find at New Haven Union Station, with parking at the station filled at a very early hour of the morning rush. Currently, a Temple Street Garage Shuttle bus allows parking at other area facilities. The pending construction of a second garage at New Haven Union Station would increase parking, but would temporarily reduce the number of available spaces by 300 due to the loss of the surface lot. Hartford Union Station and Springfield Union Station have nearby privately-owned parking facilities that are within walking distance of the stations.

Table 2-5
Station Parking Availability and Use

Station	Parking Spaces	Average 10-Year Use	Highest Use in 10 years	Available spaces at highest use
New Haven Union Station	1153[1]	N/A[2]	N/A[2]	0[3]
New Haven State Street	0[4]	N/A[4]	N/A[4]	N/A[4]
Wallingford	96	25	65 (1993)	31
Meriden	16	7	16 (1993)	0
Berlin	60	28	43 (1998)	17
Hartford Union Station	197	81	125 (1998)	72
Windsor	86	8	16 (2001)	70
Windsor Locks	100	17	23 (1996)	77
Springfield Union Station	0[5]	N/A	N/A	N/A

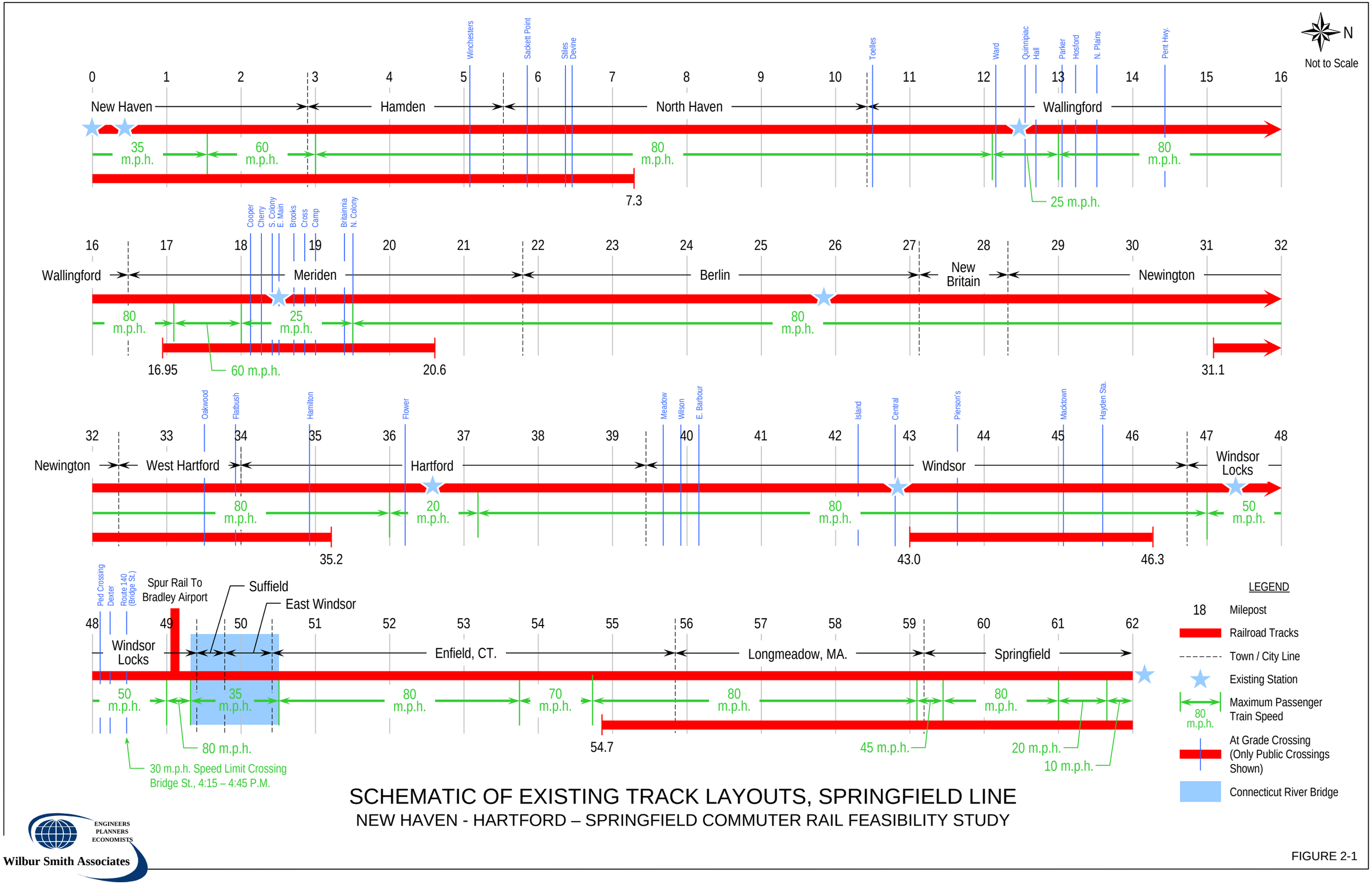
[1]This figure only includes the New Haven Union Station parking structure and adjoining surface parking lot. It does not include a private parking structure (unknown number of spaces) across Union Avenue, nor does it include 600 available spaces at the Temple Street Garage, a quarter-mile away, which is served by a free bus shuttle. An additional parking structure is planned at New Haven Union Station.
[2]This figure is not available for New Haven Union Station because the 10-year data available did not break down availability at Union Station as listed above in footnote 1.
[3]Current utilization for year 2003, using assumptions in footnote 1.
[4]There are 300 private parking spaces in downtown surface lots near the State Street station that are not exclusively dedicated for station use. The State Street Station opened for operation in June, 2002.
[5]There is no dedicated parking available at this station at this time, although on-street parking is available, and a total of 3,170 spaces in structures, surface lots, and on-street were inventoried within a few blocks of the station in 1999 . After renovation, the station is planned to have 1,100 new spaces available.
Sources: ConnDOT Parking Survey, Union Station [Springfield] Draft Environmental Impact Report/Environmental Assessment (Feb. 2000), PVTA web site

2.5 Existing Track Evaluation

Two segments of track were reviewed as part of this study, the New England Subdivision Springfield line and the Suffield Industrial track. Figure 2-1 provides a schematic of the track layout for the Springfield Line.

New England Subdivision Springfield Line

This trackage is owned and operated by the National Railroad Passenger Corporation (Amtrak). The segment is described as the Springfield Line of the New England Division. It is primarily a single-track system that starts at New Haven, Connecticut, milepost 0.00 and extends to Springfield, Massachusetts, milepost 62.00. It is operated at a maximum speed of 80 miles per hour (though there are speed restrictions in specific locations as described below). It is therefore maintained as Class IV trackage as defined by the Federal Railroad Administration (FRA) Track Safety Standards. This was at one



SCHEMATIC OF EXISTING TRACK LAYOUTS, SPRINGFIELD LINE

NEW HAVEN - HARTFORD – SPRINGFIELD COMMUTER RAIL FEASIBILITY STUDY

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

FIGURE 2-1

time a double-track railroad but has since been rationalized for centralized traffic control. Train dispatching is handled out of Boston, Massachusetts.

As is illustrated in Figure 2-1 the corridor contains 23.7 miles of double track and 38.2 miles of single track. Double track is available:

- Through New Haven into North Haven (7.2 mi)
- Most of Meriden (3.5 mi)
- A small segment in Newington and West Hartford (2.3 mi, not including Parkville industrial track)
- Windsor to Windsor Locks stations (3.6 mi)
- Enfield Station area into Springfield (7.1 mi)

There are 54 at-grade crossings, of which 36 grade crossings are equipped with active warning devices, and 10 Grade Crossings without active warning devices. At-Grade crossings can have various levels of treatments depending upon such factors as traffic volumes, roadway speeds, and whether the roadway being crossed is a public highway or private property access

The track structure is predominately 119 LB RE continuous welded rail on wood ties fastened by two cut spikes. Double shoulder plates are secured with two spikes. The track is anchored in accordance with standard plans.

An inspection of the line was made on January 6, 2003. As of that date there are two temporary speed restrictions on the line. The first restriction is a 60 mph limit located at milepost 7.1 on track #1. This order has been in effect for several years because of bridge conditions. The second temporary speed restriction is 30 mph located at milepost 43.08 on track #2. This order has also been in effect for several years because of bridge conditions.

There are a number of permanent speed restrictions that are related to signal design, bridge design or track geometry. There appear to be several restrictions placed at the request of local communities. Speed restrictions may also have been instituted because of a high concentration of at-grade crossings in a short distance, or because other geometric or structural limitations (curves or bridge loadings) require that trains maintain a slower speed through specific segments. Areas with speed restrictions are pictured in Figure 2-1 and include:

- New Haven (35 mph)
- Wallingford (25 mph)
- Meriden (25 mph)
- Hartford (20 mph)
- Windsor Locks (50, 30 mph)
- Connecticut River Bridge (35 mph)
- Springfield (20, 10 mph)

Ride quality over main line switches and road crossing is generally fair to poor. Rail condition is very good as is the general condition of track ties. Ballast sections are full and comply with standards. There are no significant vegetation concerns relative to the track structure.

The overall ride quality of this line segment is best described as good. There are, however, concerns regarding line and surface conditions at numerous road crossings and switches. In addition, there are a number of bridge approaches with line and surface defects.

Suffield Industrial Track

The Suffield Industrial Track (spur line), shown in Figure 2-2, was visited on January 6, 2003. This track originates at milepost 49.0 on the Springfield line and continues for about 8 miles through the Suffield Industrial Area, the Turnpike Industrial Park, Bradley and International Airport to Crown Industrial Park. The spur crosses and recrosses Route 75 to reach Crown Industrial Park, the end of the line.

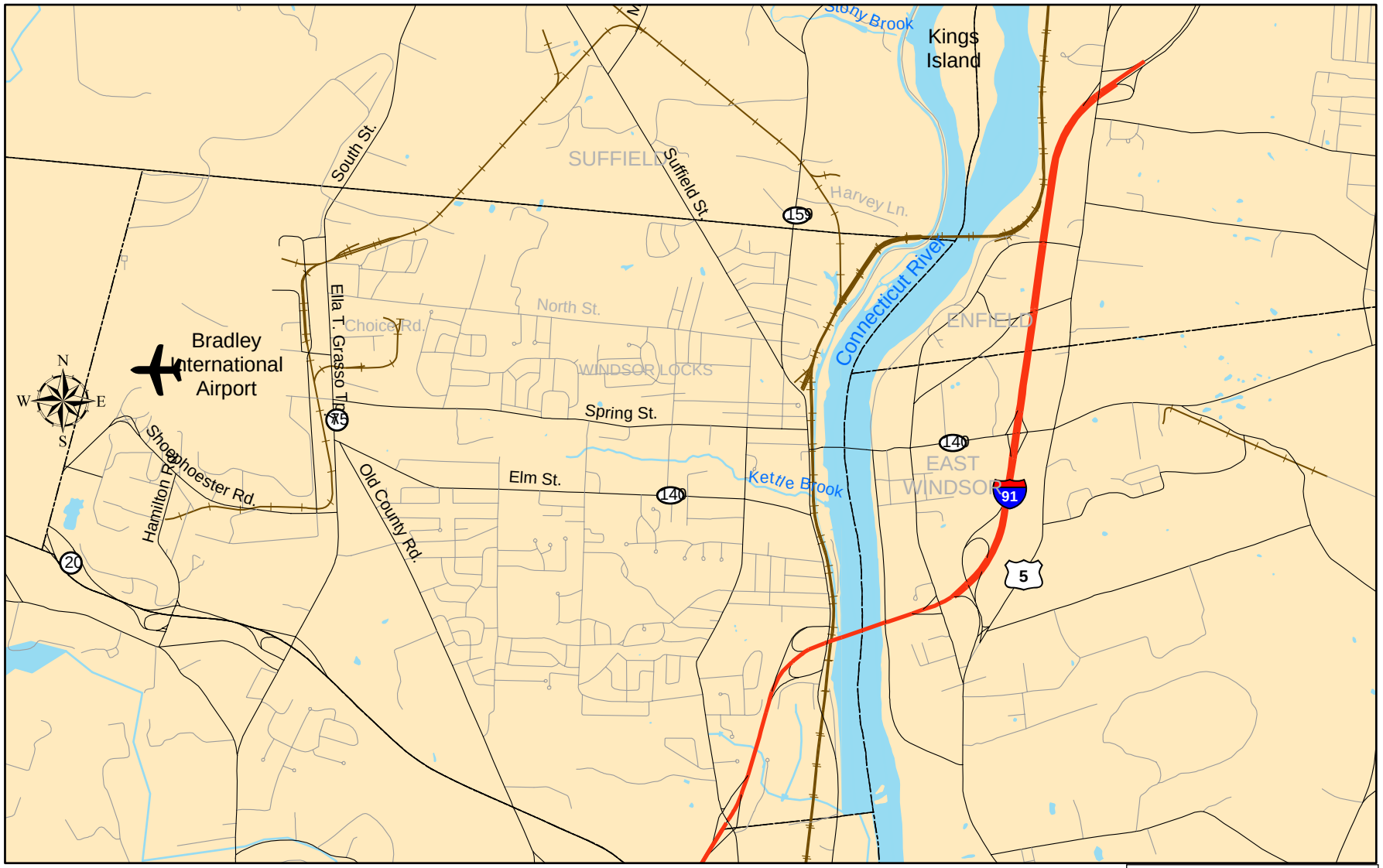
Connecticut Southern (CSO) operates on the line at least three days a week. The CSO Train Number 4, a local (a "local" is a train that picks up and delivers cars at and to shippers located along lines between yards; locals have the lowest priority of trains on a line) works the track. Shippers are located all along the spur. Shippers on the line generate between 400 and 500 carloads a year. CSO anticipates that the line's traffic will increase.

CSO maintains the track for a maximum 10 mph operation (excepted track). The industrial track is actually part of the Suffield Branch, which extends beyond the spur (switch near Mather Street) to Suffield. However, that track is presently out of service due to a trestle that is in need of repairs. CSO owns the Suffield Branch, and leases about 2 miles of the industrial track near the airport from the State of Connecticut.

The line is non-signaled. Most grade crossings are equipped with passive warning devices (crossbuck signs). The track is constructed with bolted rail on wood ties.

There has been no production program work performed on this line for many years. Accordingly, tie condition is marginal, switches are in poor condition and grade crossing surfaces are low and rough. Vegetation growth is excessive and drainage conditions are poor.

The Suffield Industrial Track would require a major capital investment to achieve FRA Class IV condition, having a maximum allowable operating speed for passenger trains of 80 miles per hour.



Legend

- Secondary Roads
- Major Roads
- Highways
- Rail Line

Study Area Corridor
Bradley Airport Spur

New Haven - Hartford - Springfield
Commuter Rail Feasibility Study

Figure 2-2

2.6 Existing Communications and Signal Systems Evaluation

Amtrak's 62-mile Springfield Line operationally begins in New Haven at Mill River interlocking, railroad Mile Post 1.5, and continues north to Springfield, MA, to milepost 61.7. Mill River interlocking is a key communications and signal control point location that comprises the physical junction of the Springfield Line which operates North / South and the Amtrak-owned Shore Line portion of the Northeast Corridor that operates East / West from New Haven to Boston, MA. At Mill River interlocking, trains leaving New Haven bound for points on the Springfield Line are diverted north and trains bound for points on the Shoreline are diverted east. The operational end of the Springfield Line is at the north limits of "Spring" interlocking, milepost 61.7, where it then connects to the CSX-owned Boston and Albany Main Line at Springfield Station.

Unlike the Northeast Corridor from New Haven to Boston and from New Haven to Washington, D.C., the Springfield Line is not electrified through an overhead catenary system. Originally a two-track "main line," the Springfield Line is now a single-track line with remote controlled passing sidings that allow trains to safely pass each other in different directions, or for one train to pass another traveling in the same direction.

Primary Springfield Line Communications & Signal system elements include:

- Cab Signal System (CSS) and Automatic Block Signal (ABS) train control system with 10 controlled passing sidings; bi-directional or "261" signaling to accommodate train movements in either direction; Springfield Line train dispatchers are located in Amtrak's Centralized Traffic and Electrification Control (CETC) facility in South Station, Boston, MA.
- 36 grade crossings equipped with active warning devices
- 10 grade crossings without active warning devices
- 6 radio repeater sites for train dispatching, maintenance-of-way, and Amtrak Police use; local passenger station services radio use
- 2 local telephone system exchanges (New Haven and Hartford); leased telephone lines for remote supervision of primary signal control points
- Fiber-optic cable is installed in some sections of the Springfield Line but it is owned and maintained by communications service providers (AT&T, MCI, Sprint) and not by Amtrak

Amtrak maintains primary 480-volt AC and 2200-volt AC power distribution systems that provide lower voltage service feeds to all communications & signal facilities, including grade crossings.

2.7 Maintenance Facilities

There are two railroad equipment maintenance facilities in the New Haven area, which were reviewed as potential maintenance facilities for diesel-powered Springfield Line commuter rail rolling stock. Both are owned by the Connecticut Department of Transportation (ConnDOT). One is for the maintenance of Shore Line East equipment and the other is for Metro North equipment.

The Shore Line East facility is approximately 2 years old. The facility has four tracks inside the shop structure. At any given time, 2 diesel-powered train sets (locomotive and cars) can be serviced inside the structure, while 2 others remain outside the shop. In addition to the track, the facility has three overhead cranes, a drop table, a small machine shop, and a welding area. The car wash machine has been decommissioned at this time.

Amtrak currently maintains Shore Line East equipment under contract to ConnDOT. The facility maintains a total of 6 train sets, comprised of 8 locomotives and 22 cab-cars (cars with an operator's compartment at one end) and coaches, including spares. Amtrak reported that it has no available space at this facility for maintaining additional diesel-powered Springfield Line commuter rail equipment. While the Shore Line East shop operates on a six-day, two-shift schedule, maintenance of additional equipment associated with a potential New Haven – Hartford – Springfield Commuter Rail service could not be accommodated at this facility because of limitations in the number of tracks to store and service additional equipment.

ConnDOT recently constructed a storage area to conduct running repairs adjacent to the facility. With these tracks, Shore Line East cars can have their vacuum systems cleaned near the maintenance facility rather than at the New Haven Union Station platform tracks.

At the present time, the yard and maintenance facility currently have limited capacity for expanded commuter operations.

Attached to the Shore Line East facility is another facility for the maintenance of Metro North commuter equipment. The equipment maintained here are electric powered train sets. As this facility is an electric equipment maintenance shop, ConnDOT does not consider that this facility would be appropriate for maintenance of diesel-powered Springfield Line commuter rail equipment.

Plans are being developed to provide additional and improved maintenance facilities in New Haven for both the near and long-term needs of the Shore Line East services. The study team does not anticipate that this will impact the need for a New Haven to Springfield Rail shop.

2.8 Amtrak Bridges Evaluation

The evaluation of existing conditions of Amtrak bridges in the study corridor is based solely on the review of Amtrak bridge inspection reports. No site visits, inspections, or other field activities were performed. Based on advisement by Amtrak officials, available bridge load rating reports for structures located on the Springfield Line were deemed outdated and to have inconsequential information for the evaluation of each bridge. Therefore, load rating reports were not used in this Existing Condition Assessment.

The study team reviewed the Amtrak 2002 bridge and culvert inspection reports for the Springfield Line, from milepost 0.76 to milepost 62.08. Following review, the team selected the 33 railroad bridges having the largest total length and summarized the bridge inspection report information. The furnished bridge and culvert inspection reports included:

- 14 culverts with span lengths from 5 ft to 6 ft
- 5 overhead signal bridges
- 10 overhead utility bridges
- 4 overhead pedestrian/foot bridges
- 2 undergrade pedestrian bridges
- 69 overhead bridges (highway or foreign railroad)
- 60 undergrade bridges (railroad) with total lengths from 7 ft to 1516 ft
- 174 culverts with span lengths from 1 ft to 5 ft

During review of all available data, multiple bridge types were omitted. These bridge types include overhead signal bridges, overhead utility bridges, pedestrian/foot bridges, all overhead structures in which Amtrak crosses under the structure, bridges not currently in use, and culverts (span length less than 6 ft). The 33 railroad bridges with the largest total length were then selected for inclusion in the report. These 33 railroad bridges vary from single spans up to 25 spans and have total lengths ranging from 28 feet to 1,541 feet. The 33 railroad bridges consisted of the following types:

- Concrete Arch
- Concrete Encased Through Girder
- Deck Girder
- Concrete Box Beam
- Stone Arch
- I-Beam
- Through Girder
- Concrete Encased I-Beam
- Concrete Box
- Through Truss

Bridge inspection reports contain the results of annual field reviews of each bridge by Amtrak staff. The reports contain subjective ratings of substructure and superstructure components based on a rating scale of 1 to 6, with 1 being excellent, 5 being serious and 6 being failed. The 33 bridges were grouped by their overall structural condition. These conditions were based on a comprehensive look at all pertinent (substructure and superstructure) structural items on the Amtrak bridge inspection reports. There were no bridges in excellent condition. Approximately 43% (14 of 33 bridges) of the railroad bridges studied had computed ratings of good condition. Approximately 39% (13 of 33 bridges) of the railroad bridges studied had computed ratings of fair condition. Approximately 15 percent (5 of 33 bridges) of the railroad bridges had computed ratings of poor condition. These bridges are listed in Table 2-6:

Table 2-6
Bridges on Springfield Line Rated as "Poor"

Bridge Number (Milepost)	Location	Bridge Type
1.61	Humphrey Street, New Haven	Encased Through Girder
26.39	Willow Brook, Berlin	Stone Arch
35.51	Capitol Avenue, Hartford*	Through Girder
61.71	East Columbus Avenue, Springfield	Through Girder
61.98	Dwight Street, Springfield	Through Girder

*To be replaced as part of the New Britain – Hartford Busway project.

Approximately six percent (2 of 33 bridges) of the railroad bridges had computed ratings of serious condition. These bridges are listed in Table 2-7:

Table 2-7
Bridges on Springfield Line Rated as "Serious"

Bridge Number (Milepost)	Location	Bridge Type
1.48	Mill River, New Haven	Concrete Arch
36.66	Church Street, Hartford	Deck Girder

There were no bridges in a failed condition.

The structural condition of bridges rated "Fair", "Poor" or "Serious" can be attributed mainly to:

- The type of structure built – certain types of structures are more susceptible to deterioration due to exposure of critical structural members to weather.
- The age of the structure – there are many structures which have outlived their useful design life.

- The level of maintenance performed on the structure to date.
- The presence of highway salt spray.

Presently, six of the 33 bridges studied are now in the category of "Poor" or "Serious". Of the remaining bridges, 13 are currently rated "Fair". In general, all bridges will continue to deteriorate. Rates of deterioration will depend on current condition and future maintenance activities. It should be noted that this evaluation was limited to the 33 longest bridges on the Springfield Line.

2.9 Connecting Rail Service

In addition to the existing Amtrak service between stations in the corridor, connections to other Amtrak rail service areas is available in New Haven and Springfield. From Springfield Union Station, service is available westward to Albany, eastward to Boston, and northward to Vermont.

From New Haven Union Station, intercity rail service is available southbound to New York City (and ultimately Washington DC), and northbound to Rhode Island and Boston.

Connections with Metro North's New Haven Line and the Shore Line East commuter rail are also available from New Haven's Union Station and State Street Station.

Amtrak

Effective October 28, 2002, southbound Northeast Corridor service on Amtrak stopping at New Haven includes eight Acela Express and nine other trains during Monday through Thursday (ten on Fridays). On weekends, there are six southbound Acela Express trains and eight other trains on Saturdays (nine on Sunday). Northbound Acela Express service includes seven trains on weekdays with nine other trains Monday through Thursday (ten on Friday). Weekend southbound service includes five Acela Express along with 10 other trains.

Springfield and Hartford are both served by five southbound Amtrak trains on weekdays, five southbound trains on Saturdays, and six southbound trains on Sundays. Northbound, both cities are served by six trains on weekdays, five trains on Saturdays, and six trains on Sundays. Most of these trains also serve intermediate Amtrak stations in Wallingford, Meriden, Berlin, Windsor and Windsor Locks, although several bypass those towns.

Springfield is also served by east-west Amtrak trains between Albany and Boston (Lake Shore Limited service). Two eastbound trains to Boston are offered daily, (at 4:00 PM, 6:55 PM weekdays and 7:55 weekends) and one westbound train is offered daily to Albany (at 12:10 PM).

Metro North

For Metro North Service, from Union Station, there are 34 weekday trains heading towards Stamford or New York and 38 weekday trains arriving from New York or Stamford. From the State Street Station, weekday service towards New York is limited to two morning trains ending at Stamford (shared with Shore Line East), and four trains arriving at New York's Grand Central Station. Weekday service from points west is limited to two morning trains arriving at State Street, (one from Bridgeport and one from Grand Central) and two evening trains (one from Bridgeport and one from Stamford). The Bridgeport and Stamford trains are shared with Shore Line East Service.

On Saturdays, New Haven Metro North service includes 23 trains, only from Union Station, heading into New York, and 24 trains returning from Union Station. On Sundays, 21 trains serve Union Station into New York, and 22 trains return from New York.

Shore Line East

Shore Line East service connects New Haven and New London, with several additional trains per day serving Bridgeport and Stamford directly in express service from New Haven (and allowing shared service with Metro North passengers on those trains). There is no Shore Line East service on weekends. The following schedule was effective October 28, 2002.

Weekday westbound Shore Line East Service includes seven morning trains between Old Saybrook and New Haven. (Two of those trains also serve New London). Those trains arrive in New Haven between 6:15 AM and 10:00 AM. Service does not resume until the afternoon. Westbound evening trains include five express trains from Old Saybrook directly to New Haven (three of which also serve New London). The non-express trains all serve State Street Station in addition to Union Station. One additional special train is run on Friday afternoons in the summer to Old Saybrook.

For eastbound Shore Line East Service, three trains express in the morning from Union Station in New Haven (between 5:05 AM and 8:19 AM) directly to Old Saybrook (one continuing on to New London). Eight trains are provided in the afternoon and evening to Old Saybrook, three of which continue on to New London. One special train to Old Saybrook is provided on Friday afternoons in the summer. After the last eastbound train has left New Haven at 7:48 PM, Shore Line East passengers can also use a CTTransit bus that stops at Shore Line East stations through Old Saybrook, leaving New Haven at 8:42 PM.

2.10 Other Transportation Corridor Services

The following section highlights the existing transportation network that serves the Springfield Line study area. The infrastructure that is discussed includes roadways, livery service, intercity bus, local bus transit, para-transit services, and ride-sharing services.

2.10.1 Parallel Roadway Traffic Volumes, Speed and Levels of Service

I-91 is the primary parallel roadway competing with potential commuter rail service along the Springfield Line. Route 5, which also serves the corridor, primarily provides local access to commercial land uses, residential land uses and town centers. Table 2-8 shows average daily traffic at selected locations along I-91.

Table 2-8
I-91 2004 Average Daily Traffic at Continuous Count Stations

Location	Northbound	Southbound
Wallingford	41,600	43,300
Wethersfield	62,500	75,900
Enfield	52,700	52,000

Source: ConnDOT Traffic Count Locator

2.10.2 Livery Services

Bradley International Airport in Windsor Locks, Connecticut provides Central Connecticut and Central/Western Massachusetts with airline service. Nine operating surface transportation (seven limousine) services operate at the airport. These limousine services are listed in Table 2-9.

Table 2-9
Livery Services at Bradley International Airport

Service (listed Alphabetically)	Service Area	Service Type
Advantage Limousine, Inc.	Passenger Destination	Private limousine
Bradways Limo Service	Western Massachusetts	Private limousine
Connecticut Limo	West to Danbury, South to Bridgeport	Van share
Joshua's Limousine Service	Connecticut, New England	Private limousine
Lindsey Limousine	Passenger Destination	Private limousine
Thomas Transportation	Mass, New Hampshire, Vermont	Van share
Valley Transporter	Passenger Destination	Van share

Source: http://www.bradleyairport.com/easy/transportation.shtml.

2.10.3 Intercity Bus Operations

Intercity bus service is provided within the study corridor, generally using I-91. The major bus stations in the corridor are in New Haven, Hartford, and Springfield; however, stations in Meriden, Enfield and Windsor Locks also are served by some intercity bus service. East-West intercity bus routes also serve all of the major cities in the corridor. Routes on the I-95 corridor serve New Haven; routes on the I-84 corridor serve Hartford; and routes on the I-90 corridor serve Springfield.

Greyhound and Peter Pan - Greyhound and Peter Pan coordinate operations, mostly along I-91 within the New Haven - Springfield corridor. Intercity bus passengers may buy tickets from either company and use them for almost all trips between Springfield and New Haven. Peter Pan is the principal service provider to points east of Springfield. The corridor has six intercity bus terminals: New Haven, Meriden, Hartford, Bradley International Airport (Windsor Locks), Enfield, and Springfield. Peter Pan serves Windsor Locks and Enfield exclusively and Greyhound and Peter Pan both serve the other four stations. The combined services offer approximately 20 bus trips daily in each direction on the corridor. As of October 2002, sample fares included $19.00 from Springfield to New Haven or Merdien and $8.00 from Springfield to Hartford. Bus service for Bradley International Airport is limited to trips from Bradley Airport to Hartford and between Bradley Airport and Springfield. Neither Peter Pan nor Greyhound offer bus service to Bradley from Hartford. Private livery services, such as Connecticut Limousine, offer transit services to and from Bradley.

Bonanza - Bonanza provides bus service to Hartford and Springfield, but does not offer service in the North-South corridor. These two stations are used as intermediate stops on services to Providence, Albany and New York City that use regional highways such as Interstates 84 and 90 and Route 6. For the most part, services to and from Hartford and Springfield charge passengers about $20 one way. Twenty Bonanza buses serve Hartford and four buses serve Springfield everyday.

Arrow - Arrow Line, Inc, a Coach USA company, provides some intercity bus service within the New Haven-Springfield Corridor. Hartford is served by several of Arrow's various services. Routes that serve Hartford include bus service between Farmington and Foxwoods and commuter service between Willimantic and Hartford and Meriden and Hartford. Connecticut DOT subsidizes the commuter services. CTTransit accepts Arrow monthly bus passes for service within Downtown Hartford.

DATTCO - DATTCO, headquartered in New Britain, provides a variety of bus services in Connecticut. Among the different types of services offered by DATTCO, two bus routes make stops in communities within the study corridor. One service, called the S-Route, operates buses between Madison and New Haven on weekdays. DATTCO's "Commuter Express" provides bus service between Hartford and Old Saybrook, with stops in Old Saybrook, Essex, Chester, Middletown and Hartford. This route is served with three morning and three evening peak direction trips on weekdays.

2.10.4 Transit Service and Ridership

CTTransit provides local and express bus service in the greater Hartford and New Haven areas. Fifteen routes serve New Haven, with service to the two railroad stations in New Haven and a parking shuttle between New Haven Union Station and the Temple Street garage nearby. The S route serving Madison from downtown New Haven is operated by DATTCO. Hartford is a major hub that is served by a myriad of local and express routes. Several of these routes provide service to the rail corridor.

CTTransit serves Wallingford on one intercity route out of New Haven and one local route provided by Northeast Transportation Company (NET). Northeast Transportation (NET) under contract to CTTransit and ConnDOT operates three routes in Meriden, Routes A, B, and C. Meriden's Amtrak train station is the focal point of the city's bus network. CTTransit Hartford also provides bus service to Meriden with an express route to Hartford, and the New Britain Transportation Company (NBTC) serves Meriden with one route. Berlin is also served by NBTC on one local route to downtown New Britain.

Springfield, Massachusetts is the principal hub for PVTA service. Every bus route in Springfield stops at the intermodal center in Downtown Springfield. The intermodal center allows people to connect to Amtrak service and intercity bus service. Eighteen PVTA routes serve the Springfield area, linking Springfield with Enfield, Connecticut, Longmeadow, East Longmeadow, West Springfield, Agawam, Chicopee, Holyoke and Ludlow, Massachusetts.

Table 2-10 to Table 2-13 list the corridor local and express bus routes and daily or monthly ridership.

Table 2-10
CTTransit New Haven Bus Routes with 2001 Weekday* Ridership

Route	Route Name	Headways	Weekday Boardings
B	Whalley Avenue	5 to 15 minutes	4,364
	Congress Avenue	5 to 20 minutes	3,083
C	North Haven	15 to 60 minutes	1,093
D	Grand Avenue	10 to 20 minutes	3,491
	Dixwell Avenue	10 to 30 minutes	4,644
F	West Chapel Street	10 to 30 minutes	2,007
	East Haven	15 to 30 minutes	980
G	Shelton Ave/ East Chapel Street	20 to 30 minutes	780
J	Whitney Avenue	10 to 60 minutes	1,370
	Kimberly Avenue	5 to 35 minutes	2,065
L	North Branford	65 minutes	98
M	Washington Ave/ State Street	9 to 75 minutes	2,225
O	Winchester Avenue	15 to 62 minutes	1,045

Route	Route Name	Headways	Weekday Boardings
	Sylvan Avenue[1]	10 to 60 minutes	1,991
Q	State Street/ Edgewood Ave.	15 to 60 minutes	1,914
S[2]	Route 1 Madison	30 to 95 minutes	N/A
Z	Goffe Street/ Sargent Drive	5 to 30 minutes	2,027
CC	Commuter Connection Downtown New Haven	25 to 80 minutes	306
	Commuter Connection Sargent Drive	23 to 85 minutes	39
	Temple Street Parking Shuttle	5 to 39 minutes	N/A

*2001 ridership reflects a single day's boardings **Source:** CTTransit and Connecticut DOT data.

Table 2-11
Wallingford, Meriden and New Britain Transit Routes with 2001 Weekday* Ridership

Route	Route Name	Headways	Weekday Boardings
Wallingford	Wallingford Local	60 minutes	51
Meriden A	Yale Acres – Westfield Shopping Town	60 minutes	133
Meriden B	Kohl's – South Meriden	60 minutes	158
Meriden C	West Main St. – East Main St.	60 minutes	203
NBTC A	Arch Street – Meriden Square Mall	60 minutes	155
NBTC BK	Berlin Kensington	60 minutes	195

*2001 ridership reflects a single day's boardings **Source:** CTTransit and Connecticut DOT data.

Table 2-12
CTTransit Hartford Bus Routes with 2001 Weekday* Ridership

Route	Route Name	Headways	Weekday Boardings
A	Hillside Avenue	7 to 30 minutes	1,181
E	Farmington Avenue	10 to 75 minutes	6,439
F	Ashley Street	12 to 85 minutes	2,073
K	North Main Street	20 minutes	3,746
K	Park Street	5 to 10 minutes	4,510
L	Tower Ave Crosstown	60 minutes	289
N	Windsor	25 to 60 minutes	1,196
Q	New Britain Avenue	9 to 34 minutes	3,364
S	Granby St./Garden St.	7 to 28 minutes	1,730
T	Blue Hills Avenue	10 to 80 minutes	4,663
T	Franklin Avenue	60 minutes	3,377
P	New Britain	30 minutes	805
W	Capitol Avenue	15 to 60 minutes	627

[1] Includes two one way trips of Post Mall Flyer (PMF)
[2] Route operated by DATTCO.

Route	Route Name	Headways	Weekday Boardings
W	Weston St.	15 to 30 minutes	417
2	Corbins	20 to 25 minutes	208
5/13	Enfield/ Windsor Locks Express	10 to 50 minutes peak	866
7	Newington Commuter Express	20 to 50 minutes	98
9	Unionville	30 to 31 minutes	76
15	Windsor Express	30 minutes	N/A
BTF	Berlin Turnpike Flyer	10 to 85 minutes	N/A
BDL	Bradley Flyer	60 minutes	410
WND/ BMF	Windsor/ Bloomfield Industrial	22 to 50 minutes	104

*2001 ridership reflects a single day's boardings **Source:** CTTransit and Connecticut DOT data.

Table 2-13
Pioneer Valley Transit Springfield Bus Routes Monthly Ridership June 2002

Route	Route Name	Weekday Headways	Monthly Riders
1	Fairfield Mall/ Sumner – Allen	10 to 85 minutes	68,425
2	Carew-East Springfield/ Belmont-Dwight Rd.	10 to 105 minutes	77,360
3	Springfield Plaza via Liberty/ King- Westford	20 to 90 minutes	40,525
4	Plainfield/ Walnut Street- Springfield College	20 to 40 minutes	20,030
5	Dickinson-Jewish Home/ Springfield Bus Terminal	20 to 90 minutes	10,010
6	Ludlow via Bay	20 to 90 minutes	34,315
7	State-Boston Road/ Eastfield Mall	15 to 60 minutes	89,845
8	Orange-Plumtree/ Springfield Bus Terminal	60 minutes	9,225
9/15	St. James Avenue/ Worthington Street	10 to 60 minutes	7,140
10	Westfield State College/ West Springfield	20 to 60 minutes	27,920
11	Holyoke Community College Express	60 to 105 minutes	0*
12	Stonybrook Express	120 minutes	2,150
13	Maple Street/ East Longmeadow	30 to 60 minutes	14,830
14	Feeding Hills/ Springfield	30 to 60 minutes	8,770
16	Longmeadow/ Enfield	70 to 180 minutes	1,835
17	Eastfield Mall via Parker-Wilbraham Road	30 to 60 minutes	23,100
20	Holyoke/ Springfield via Holyoke Mall	15 to 85 minutes	64,420
21	Holyoke/ Springfield via Chicopee	30 minutes	35,435

*With school out of session in June, the bus' demand pool is significantly decreased. Over the first five months of the year the service attracted 24,175 riders.
Source: Sandra Sheehan of the PVTA. Ridership data collected by First Transit in June 2002

2.10.5 ADA Paratransit Services

Several agencies offer ADA (Americans with Disabilities Act) paratransit services for the mobility impaired and aged in the study corridor. The Greater New Haven Transit District provides ADA and dial-a-ride service for people within CTTransit's New Haven service area. Northeast Transportation provides ADA service within Wallingford and Meriden. The Greater Hartford Transit District provides paratransit service in

CTTransit's Hartford service area. The PVTA provides paratransit service within greater Springfield. ADA trips can be made to any points within three-quarters of a mile of regular bus service for all four services during normal bus operating hours.

2.10.6 Ridesharing

Two rideshare agencies operate in the New Haven - Springfield corridor, including Rideworks in New Haven and the Rideshare Company in Hartford. Massachusetts ridesharing programs are more focused on Boston than on the Springfield area, however some of the Hartford ridesharing options include connections to Springfield.

2.11 Ridership, Revenue and Cost Database

The following section is an inventory of how other commuter rail systems perform, and will serve as a baseline for evaluation of service in the study corridor. Data was collected from 15 transit agencies that operate commuter rail service and was assembled, where available, for the years 1999, 2000, and 2001. Data was collected by way of the National Transit Database (NTD), a program sponsored by the Federal Transit Administration (FTA), and by contacting the specific transit agency where necessary. The NTD is a large compilation of data reported by agencies nationwide that operate various modes of transit including commuter rail. More specific information on types of data obtained for purposes of this study is discussed below. The specific information collected from each agency includes the following:

- Total annual passengers – the total number of fare paying passengers boarding a service vehicle in a fiscal year
- Average daily ridership – the average daily number of fare paying passengers boarding commuter rail service vehicles in a fiscal year
- Passenger miles per year – the total distance each fare paying passenger travels on passenger carrying vehicles per fiscal year
- Total annual fare revenue – the total amount of revenue received by a transit agency for a given service each year from fare paying passengers
- Annual revenue train miles – the total number of miles per year each entire commuter train travels with fare paying passengers aboard
- Annual revenue vehicle miles – the total number of miles per year each passenger carrying vehicle in a commuter rail system travels with fare paying passengers aboard
- Annual operating costs – the total amount of money per year required to operate and maintain a transit service

2.11.1 Overview of Commuter Rail Systems

To compare ridership, service characteristics, and performance for a New Haven-Hartford-Springfield commuter service, information was collected from other agencies that operate commuter rail service. Data was collected from a range of agencies operating a range of commuter rail services from a large network such as Metro North or Long Island Railroad, to smaller systems such as Shore Line East in Connecticut. A summary of the transit agencies surveyed, listed in alphabetical order, is shown in Table 2-14.

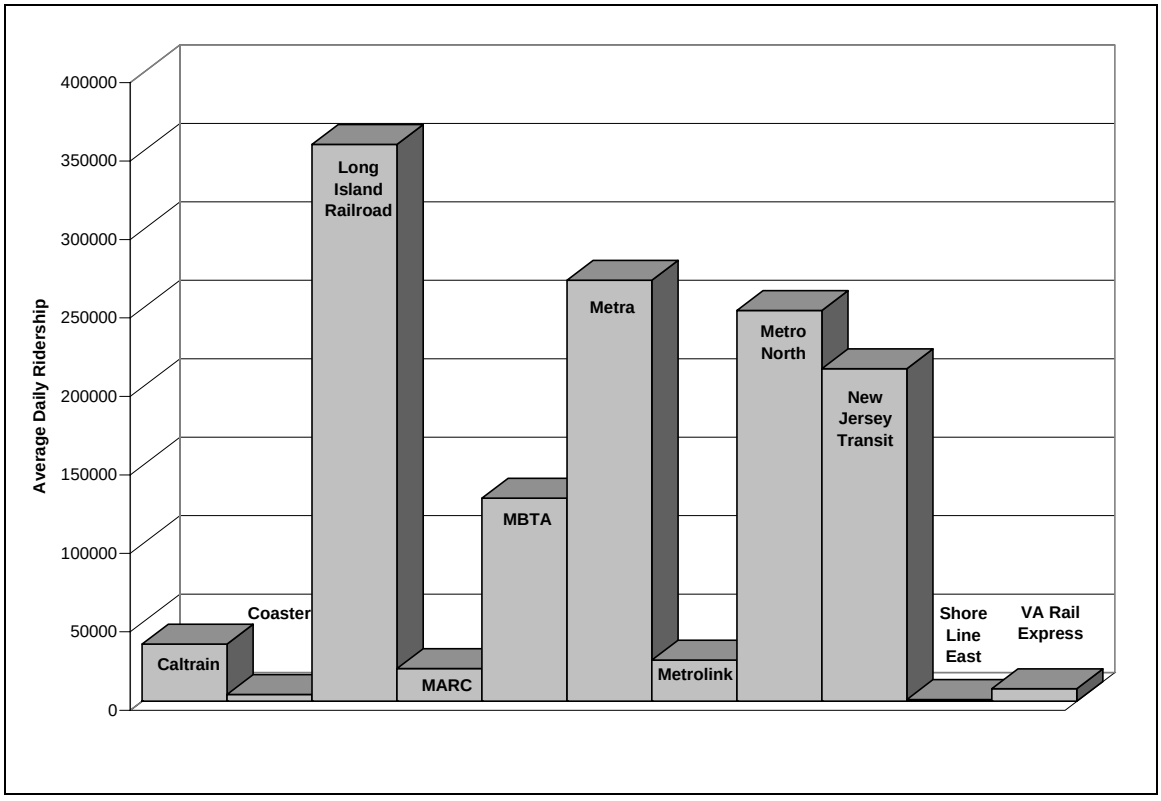
Table 2-14
Summary of Commuter Rail Systems Surveyed

Commuter Rail System	Operating Agency	Metro Area Served	Total Annual Passengers (2000)	Average Daily Ridership (2000)
Caltrain	Caltrain	San Francisco/San Jose, CA	9,821,725	39,290
Long Island Railroad	Metropolitan Transportation Authority	New York/Long Island, NY	105,148,000	355,000
MARC Commuter Rail	Mass Transit Administration, MD Dept. of Transportation	Baltimore,MD /Washington, DC	5,317,006	20,851
MBTA Commuter Rail	Massachusetts Bay Transportation Authority	Boston, MA	36,416,816	129,474
Metra Commuter Rail	Northeast Illinois Commuter Railroad Corporation	Chicago, IL	72,342,624	268,381
Metrolink	Southern California Regional Rail Authority	Los Angeles, CA	6,978,588	26,300
Metro North	Metropolitan Transportation Authority	New York, NY	71,735,218	249,142
New Jersey Transit	New Jersey Transit Corporation	New Jersey	63,894,352	212,037
San Diego Coaster	North San Diego County Transit Development Board	San Diego, CA	1,206,839	4,327
SEPTA	Southeastern Pennsylvania Transportation Authority	Philadelphia, PA	29,774,426	104,232
Shore Line East	Connecticut Dept. of Transportation	New Haven, CT	285,427	1,115
Sounder Commuter Rail	Central Puget Sound Regional Transit Authority	Seattle, WA	100,360	1,120
Trinity Rail Express	Dallas Area Rapid Transit Authority	Dallas/Ft. Worth, TX	667,577	2,369
Tri-Rail	Tri-County Commuter Rail Authority	South Florida	2,232,497	7,381
Virginia Rail Express	Virginia Rail Express	Washington, DC/Northern VA	2,014,339	8,057

Source: National Transit Database

The commuter rail systems inventoried represent a wide range of services from a single rail line, to a network of several lines serving a major metropolitan area. A key statistic that highlights the size of a commuter rail network is ridership. Table 2-14 shows the average daily ridership among commuter rail systems, and this data is shown graphically for selected systems in Figure 2-3.

Figure 2-3
Average Year 2000 Daily Ridership for Selected Commuter Rail Systems

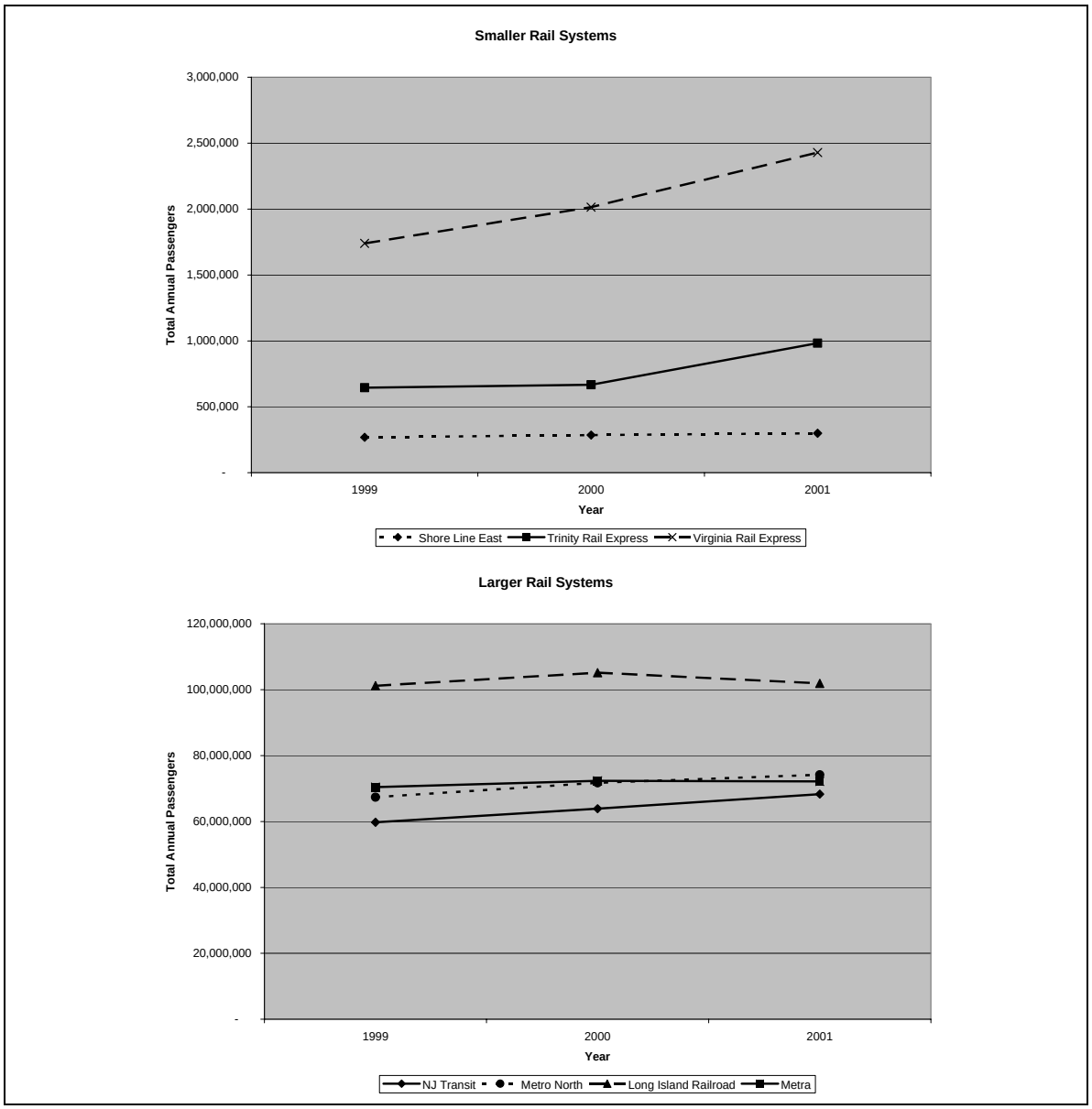


Source: National Transit Database

As shown in the above figure, the range of daily ridership in systems surveyed varies greatly, from just over 1,000, to over 350,000 passengers per day. The smallest system surveyed was Shore Line East in Connecticut, with a year 2000 average daily ridership of 1,115. The largest system surveyed was Long Island Railroad in New York, with a year 2000 average daily ridership of 355,000.

In addition to daily passenger data, annual ridership numbers were obtained. Figure 2-4 shows annual ridership trends for several commuter rail systems from 1999 to 2001. The reason that results are displayed separately for smaller and larger commuter rail systems is for clarity of scale in the chart, and to illustrate smaller trends.

Figure 2-4
Annual Ridership per Year



Source: National Transit Database

As shown above, all of the commuter rail systems had an overall increase in ridership from 1999 to 2001. Between 2000 and 2001, Metra and Long Island Railroad showed a slight decrease. Some systems such as Virginia Rail Express and Trinity Rail Express have shown a fairly substantial rise in ridership from 1999 to 2001. Other systems such as Shore Line East and New Jersey Transit have experienced a more modest increase over the same period.

2.11.2 Performance Measures

The ridership, revenue, and cost data assembled from the various transit agencies can be evaluated in a manner such that the relationship between cost and revenue shows certain performance measures. These measures include; revenue per passenger mile, operating cost per passenger mile, operating cost per train mile, farebox recovery ratio, and productivity ratio. Revenue per passenger mile is determined by the ratio of total fare revenue per year to total passenger miles per year. An average figure for this performance measure is approximately 12 cents per mile. Operating costs per train mile and per passenger mile are determined by similar ratios. Average costs are approximately $45 per mile and 30 cents per mile respectively. The farebox recovery ratio is given by the ratio of total fare revenue to total operating costs. It is a measurement of how much of a passenger fare goes toward the costs associated with operating a transit system. This ratio is usually found to be between 20% and 40%. Finally, an overall productivity ratio measures annual passenger miles against annual vehicle miles. The result of this productivity ratio yields an average of the number of passengers per vehicle. A summary of performance measures for the commuter rail systems surveyed is found in Table 2-15.

As shown in the table, the amount of revenue a commuter rail service can expect per mile from each pare paying passenger can vary from $0.08 on the Tri-Rail system for the 1999 fiscal year to as much as $0.91 for Trinity Rail Express for the same year. On some of the larger systems such as Metro North and Long Island Railroad, revenue per passenger mile was anywhere from $0.15 to $0.17. For the Shore Line East service revenue per passenger mile was $0.13 in the fiscal year 1999, and rose to $0.16 in 2001.

The cost of operating commuter rail service per train mile was also found to have a wide range. SEPTA was found to have the lowest cost per train mile at $30.52 in the fiscal year 2001. For the same year, Long Island Railroad cost $103.95 per train mile to operate service. The cost per train mile in 2001 on Shore Line East was $37.94.

Cost per passenger mile is an effective way of looking at the relationship between ridership and the cost to operate a commuter rail service. This value was found to be as low as $0.23 in 2001 on the MBTA system, to as high as $1.14 on Shore Line East for the same year. Those same values for Metro North and Long Island Railroad were $0.26 and $0.36 per passenger mile respectively.

The farebox recovery ratio was found to have a fairly large variation from one rail system to another. The value was as low as 13% for Shore Line East to as high as 61% for Metro North in 2000. The overall trend shows that the larger commuter rail networks had a higher farebox recovery ratio, meaning that their fares went further toward operating costs.

The productivity ratio also showed a significant variance among commuter rail systems. Shore Line East, for example, had a productivity ratio of just over 16 passengers per

vehicle in 2000. In the same year, Caltrain had a productivity ratio of over 42 passengers per vehicle.

Table 2-15
Year 2000 Annual Operating Costs for Selected Commuter Rail Systems

Rail System	Year	Revenue per Passenger Mile	Operating Cost per Train Mile	Operating Cost per Passenger Mile	Farebox Recovery Ratio	Productivity
Caltrain	1999	$0.13	$42.82	$0.25	51%	24.89
	2000	$0.13	$44.95	$0.23	58%	48.27
	2001	$0.14	$48.62	$0.26	54%	45.41
Long Island Railroad	1999	$0.16	$92.70	$0.32	51%	37.66
	2000	$0.15	$95.00	$0.29	51%	41.95
	2001	$0.17	$103.95	$0.36	47%	37.05
MARC	1999	$0.11	$48.51	$0.29	39%	33.32
	2000	$0.12	$48.63	$0.27	44%	35.29
	2001	$0.12	$54.67	$0.28	42%	39.48
MBTA	1999	$0.10	$46.65	$0.24	41%	32.62
	2000	$0.10	$47.86	$0.25	40%	32.75
	2001	$0.11	$47.53	$0.23	49%	35.72
Metra	1999	$0.12	$59.57	$0.25	49%	43.79
	2000	$0.12	$62.67	$0.25	48%	43.95
	2001	$0.12	$64.98	$0.26	46%	42.70
Metrolink	1999	$0.12	$45.84	$0.30	39%	37.75
	2000	$0.12	$47.19	$0.32	39%	39.54
	2001	$0.13	$40.41	$0.27	48%	40.53
Metro North	1999	$0.17	$79.75	$0.30	57%	39.23
	2000	$0.16	$76.37	$0.27	61%	41.57
	2001	$0.16	$79.28	$0.26	59%	44.22
New Jersey Transit	1999	$0.18	$51.32	$0.31	57%	27.75
	2000	$0.18	$52.48	$0.31	57%	29.62
	2001	$0.18	$53.42	$0.31	56%	29.94
San Diego Coaster	1999	$0.08	$72.37	$0.44	19%	32.34
	2000	$0.09	$54.18	$0.33	28%	31.97
	2001	$0.11	$56.90	$0.35	30%	31.62
SEPTA	1999	$0.18	$29.29	$0.36	40%	28.56
	2000	$0.19	$30.25	$0.38	41%	28.43
	2001	$0.21	$30.52	$0.42	41%	25.77
Shore Line East	1999	$0.13	$35.60	$0.99	14%	12.59
	2000	$0.14	$46.03	$1.03	13%	16.17
	2001	$0.16	$37.94	$1.14	14%	11.85
Trinity Rail Express	1999	$0.91	$49.76	$1.20	76%	20.71
	2000	$0.83	$59.57	$1.41	59%	20.37
	2001	$0.47	$42.80	$1.00	47%	21.19
Tri-Rail	1999	$0.08	$31.30	$0.29	27%	35.94
	2000	$0.08	$33.92	$0.31	25%	36.88
	2001	$0.08	$36.14	$0.29	27%	38.26
Virginia Rail Express	1999	$0.16	$66.94	$0.34	46%	40.50
	2000	$0.13	$57.93	$0.28	47%	43.76
	2001	$0.14	$59.28	$0.29	49%	43.43

Chapter 3
Alternatives Evaluation

As a first step in determining the alternatives to be evaluated for implementation of commuter rail along the Springfield Line, a "minimum" and "maximum" build, were identified as the initial two base scenarios to be considered. Upon evaluation of the minimum and maximum build scenarios, both were found to have a number of issues related to implementation. The minimum build schedule was found to be unreliable without double tracking at least some additional segments of the rail line. The maximum build was found to have a number of costly elements that may not be necessary for the initial implementation of the line, especially 15 minute peak hour service headways. Therefore, using the costs, ridership, and other analysis from the minimum and maximum build scenarios, four additional possible service implementation alternatives were created for consideration. The following section is a description of the minimum build, maximum build and each of the implementation service alternatives. The entire Alternatives Report can be found in Appendix C of this report.

3.1 Minimum and Maximum Build Scenarios

The initial vision of a minimum build scenario was to begin service with minimal capital investment. Therefore, an attempt was made to develop a bi-directional schedule with service every 30 minutes using only existing stations and no additional tracks. The initial vision of a maximum build scenario was to provide service that would attract the highest possible ridership. Therefore, a frequent 15 minute schedule, several additional stations and double track on the entire line were included in the scenario. The complete analysis of these two scenarios is available in the Alternatives Technical Report. Table 3-1 is a summary of the minimum and maximum build scenario service and results.

As discussed above, upon evaluation of the minimum and maximum build scenarios, both were found to have a number of issues of concern. The minimum build schedule was found to be unreliable due to the high degree of schedule adherence necessary. Reliable bi-directional service can only be provided by double tracking at least some additional segments of the rail line. The maximum build was found to have a number of costly elements that may not be necessary for the initial implementation of commuter service, including 15 minute peak hour service frequency, weekend service, and a number of additional new stations.

Table 3-1
Minimum and Maximum Build Scenarios

	Min Build	Max Build
Scenario	No additional tracks	Double track entire line
Stations	Nine Existing with limited additional parking	Existing plus Seven New – all improved with high-level platforms, pedestrian crossing and buildings
Peak Hour Train Frequency	30 – 35 minute	15 minute
Off-Peak Service	No - Only Amtrak	Hourly Weekday plus Weekend
Estimated Daily Trips	1,767 (not including Amtrak)	4,983 (including Amtrak)
Capital Cost	$86 million	$558 million
Operating Cost	$7.1 million	$48.3 million
Operating Deficit	$6.2 million	$44.7 million
Per Passenger Subsidy	$13.81	$32.56

Using the costs, ridership, and other analysis from the minimum and maximum build scenarios, four implementation alternatives were derived with varying service plans. Other elements of the maximum build scenario were broken down into a menu of additional elements that can be added initially or in the future as funding or other benchmarks are in place. The following is a summary of each of the alternatives considered to be feasible for initial service implementation. All implementation alternatives use only existing stations along the line.

3.2 Implementation Alternatives

The following four subsections describe the four implementation alternatives. Schedules for the proposed service follow in Table 3-2 through Table 3-5.

3.2.1 Alternative CT1

The CT1 alternative is an attempt to minimize the initial capital expenditures by adding no additional double track segments while providing a reliable service within the context of existing Amtrak service and using existing stations. As found in the minimum build, reliable two-directional service is not possible with 30 minute headways and existing track configuration. Rather than provide only 60 minute peak hour service or unreliable 30 minute service, reliable service with approximately 35 minute headways will be

accomplished by providing directional service on the line, southbound in the morning peak commute hours and northbound in the afternoon peak commute hours. The CT1 alternative includes the following:

- No new double track will be added;
- The existing Amtrak schedule would experience minor alterations;
- Six one-way trips per weekday, with no off-peak or weekend service;
- The new service will only go to the furthest north station in CT (Windsor Locks);
- The following stations are included;
    - Union Station (New Haven)
    - State Street (New Haven)
    - Wallingford
    - Meriden
    - Berlin
    - Union Station (Hartford)
    - Windsor
    - Windsor Locks (with bus connection to Bradley Airport)
- The service is designed to be reliable and fit within the existing Amtrak schedule;
- Amtrak trains fares would be adjusted to be compatible with the commuter train fares;
- Visual and audio announcement at stations;
- Local bus service will be modified to provide appropriate service to the stations (adding Commuter Connection service at New Haven, etc); and
- Stations will be ADA compliant with either level boarding or on board lifts.

3.2.2 Alternative CT2

The operating assumptions under Alternative CT2 are that the existing Amtrak service would be maintained using existing stations. Furthermore, the new commuter service would be designed for approximately 30 minute headways timed for critical time periods for bi-directional service into New Haven and Hartford (as opposed to only one direction in Alternative CT1). This is essentially the bi-directional 30 minute service envisioned for the minimum build, but in order to provide reliable service, either new or lengthened double track sections would be required. The CT2 alternative includes the following:

- 12.4 miles of new or extended double track sections will be added to improve reliability and provide approximate 30 minute headways meeting critical times in New Haven and Hartford;
- The existing Amtrak schedule would experience minor alterations;
- Fourteen one-way trips per weekday, with no off-peak or weekend service;
- The new service will only go to the furthest north station in CT (Windsor Locks);
- The following stations are included;
    - Union Station (New Haven)
    - State Street (New Haven)

  - Wallingford
  - Meriden
  - Berlin
  - Union Station (Hartford)
  - Windsor
  - Windsor Locks (with bus connection to Bradley Airport)
- The service is designed to be reliable and fit within the existing Amtrak schedule;
- Amtrak trains fares would be adjusted to be compatible with the commuter train fares;
- Visual and audio announcement at stations;
- Local bus service will be modified to provide appropriate service to the stations; and
- Stations will be ADA compliant with either level boarding or on board lifts.

3.2.3 Alternative Bi-State1

In an attempt to save operating costs, Alternatives CT1 and CT2 provided service only to Windsor Locks as the northern-most existing station in Connecticut. Alternative Bi-State1 is similar to Alternative CT2 in that the existing Amtrak service would be maintained and the new commuter service designed for approximately 30 minute headways timed for critical time periods for bi-directional service. The difference is this critical time period service would be provided into New Haven and Hartford, as well as Springfield, Massachusetts. This would once again require either new or lengthened double track sections. The Bi-State1 alternative includes the following:

- 15.6 miles of new or extended double track sections will be added to improve reliability and provide 30 minute headways meeting critical times in New Haven, Hartford and Springfield;
- The existing Amtrak schedule would experience minor alterations;
- Fourteen one-way trips per weekday, with no off-peak or weekend service;
- The new service will go to Springfield;
- The following stations are included;
  - Union Station (New Haven)
  - State Street (New Haven)
  - Wallingford
  - Meriden
  - Berlin
  - Union Station (Hartford)
  - Windsor
  - Windsor Locks (with bus connection to Bradley Airport)
  - Springfield
- The service is designed to be reliable and fit within the existing Amtrak schedule;
- Amtrak trains fares would be adjusted to be compatible with the commuter train fares;

- Visual and audio announcement at stations;
- Local bus service will be modified to provide appropriate service to the stations; and
- Stations will be ADA compliant with either level boarding or on board lifts.

3.2.4 Alternative Bi-State2

Alternative Bi-State2 builds upon Alternative Bi-State1 by redesigning Amtrak's service to provide optimal commuter operations with uniform 30 minute headways timed for critical time periods for bi-directional service into New Haven, Hartford and Springfield. By shifting Amtrak's service that falls in the peak commuter hours, improved arrival times into New Haven, Hartford and Springfield can be scheduled, as well as better connections with Metro North. The Bi-State2 alternative includes the following:

- 15.6 miles of new or extended double track sections will be added to improve reliability and provide 30 minute headways meeting critical times in New Haven, Hartford and Springfield;
- The existing Amtrak schedule will be adjusted to provide optimal times with reliable service;
- Fourteen one-way trips per weekday, with no off-peak or weekend service;
- The new service will go to Springfield;
- The following stations are included;
    - Union Station (New Haven)
    - State Street (New Haven)
    - Wallingford
    - Meriden
    - Berlin
    - Union Station (Hartford)
    - Windsor
    - Windsor Locks (with bus connection to Bradley Airport)
    - Springfield
- Amtrak trains fares would be adjusted to be compatible with the commuter train fares;
- Visual and audio announcement at stations;
- Local bus service will be modified to provide appropriate service to the stations; and
- Stations will be ADA compliant with either level boarding or on board lifts.

Table 3-2
Alternative CT1 Illustrative Schedules

Southbound

	AM							PM			
Station	CDOT #1	Amtrak #141	CDOT #3	Amtrak #495	CDOT #5	Amtrak #471	Amtrak #493	Amtrak #55	Amtrak #437	Amtrak #475	Amtrak #477
Springfield		6:00		7:15		8:40	10:40	12:55	2:10	4:05	6:25
Windsor Locks	5:45	6:20	6:55	7:33	8:10	8:58	10:58		2:28	4:23	6:43
Windsor	5:50	6:26	7:00	7:38	8:15	9:06	11:06		2:33	4:28	6:48
Hartford	5:59	6:38	7:09	7:49	8:24	9:17	11:17	1:30	2:44	4:38	6:59
Berlin	6:11	6:51	7:21	8:00	8:36	9:38	11:28	1:45	2:55	4:53	7:10
Meriden	6:20	7:01	7:30	8:08	8:45	9:36	11:36	1:56	3:03	5:01	7:18
Wallingford	6:28	7:09	7:38	8:15	8:53	9:43	11:43		3:10	5:08	7:25
State Street	6:40	7:24	7:50	8:31	9:05	9:56	11:56		3:26	5:26	7:41
New Haven	6:44	7:28	7:54	8:35	9:09	10:00	12:00	2:23	3:30	5:30	7:45

Northbound

	AM		PM								
Station	Amtrak #490	Amtrak #470	Amtrak #56	Amtrak #474	Amtrak #486	CDOT #2	Amtrak #476	CDOT #4	CDOT #6	Amtrak #494	Amtrak #148
New Haven	8:50	10:15	12:55	2:15	4:10	4:45	5:15	5:55	6:30	7:25	8:30
State Street	8:53	10:18		2:18	4:13	4:48	5:18	5:58	6:33	7:28	8:33
Wallingford	9:03	10:27		2:28	4:23	5:00	5:28	6:10	6:45	7:38	8:44
Meriden	9:10	10:35	1:16	2:35	4:29	5:09	5:34	6:19	6:54	7:45	8:52
Berlin	9:19	10:44	1:26	2:44	4:38	5:18	5:43	6:28	7:03	7:54	9:02
Hartford	9:32	10:57	1:45	2:59	4:52	5:30	5:59	6:40	7:15	8:07	9:16
Windsor	9:40	11:04		3:07	4:59	5:38	6:07	6:48	7:23	8:15	9:24
Windsor Locks	9:45	11:10		3:12	5:05	5:44	6:12	6:54	7:29	8:20	9:30
Springfield	10:10	11:35	2:20	3:35	5:30		6:40			8:45	9:55

Notes: Commuter schedules are illustrative, based on RTC simulation of train operations. Amtrak schedules are March 2004 schedules, with assumed additional stops. Source: Amtrak, Wilbur Smith Associates

Table 3-3
Alternative CT2 Illustrative Schedules

Southbound

	AM								PM						
Station	CDOT #1	Amtrak #141	CDOT #3	CDOT #5	Amtrak #495	CDOT #7	Amtrak #471	Amtrak #493	Amtrak #55	Amtrak #437	CDOT #9	Amtrak #475	CDOT #11	CDOT #13	Amtrak #477
Springfield		6:00			7:15		8:40	10:40	12:55	2:10		4:05			6:25
Windsor Locks	5:55	6:20	6:50	7:20	7:33	8:15	8:58	10:58		2:28	3:55	4:23	4:55	5:25	6:43
Windsor	6:01	6:26	6:56	7:26	7:38	8:21	9:06	11:06		2:33	4:01	4:28	5:01	5:31	6:48
Hartford	6:10	6:38	7:05	7:35	7:49	8:30	9:17	11:17	1:30	2:44	4:10	4:38	5:10	5:40	6:59
Berlin	6:23	6:51	7:18	7:48	8:00	8:43	9:38	11:28	1:45	2:55	4:23	4:53	5:23	5:53	7:10
Meriden	6:32	7:01	7:27	7:57	8:08	8:52	9:36	11:36	1:56	3:03	4:32	5:01	5:32	6:02	7:18
Wallingford	6:40	7:09	7:35	8:05	8:15	9:00	9:43	11:43		3:10	4:40	5:08	5:40	6:10	7:25
State Street	6:52	7:24	7:47	8:17	8:31	9:12	9:56	11:56		3:26	4:52	5:26	5:52	6:22	7:41
New Haven	6:56	7:28	7:51	8:21	8:35	9:16	10:00	12:00	2:23	3:30	4:56	5:30	5:56	6:26	7:45

Northbound

	AM					PM									
Station	CDOT #2	CDOT #4	CDOT #6	Amtrak #490	Amtrak #470	Amtrak #56	Amtrak #474	CDOT #8	Amtrak #486	CDOT #10	Amtrak #476	CDOT #12	CDOT #14	Amtrak #494	Amtrak #148
New Haven	6:05	6:40	7:20	8:50	10:15	12:55	2:15	3:35	4:10	4:45	5:15	5:50	6:20	7:25	8:30
State Street	6:08	6:43	7:23	8:53	10:18		2:18	3:38	4:13	4:48	5:18	5:53	6:23	7:28	8:33
Wallingford	6:20	6:55	7:35	9:03	10:27		2:28	3:50	4:23	5:00	5:28	6:05	6:35	7:38	8:44
Meriden	6:28	7:03	7:43	9:10	10:35	1:16	2:35	3:58	4:29	5:08	5:34	6:13	6:43	7:45	8:52
Berlin	6:37	7:12	7:52	9:19	10:44	1:26	2:44	4:07	4:38	5:17	5:43	6:22	6:52	7:54	9:02
Hartford	6:50	7:25	8:05	9:32	10:57	1:45	2:59	4:20	4:52	5:30	5:59	6:35	7:05	8:07	9:16
Windsor	6:59	7:34	8:14	9:40	11:04		3:07	4:29	4:59	5:39	6:07	6:44	7:14	8:15	9:24
Windsor Locks	7:06	7:41	8:21	9:45	11:10		3:12	4:36	5:05	5:46	6:12	6:51	7:21	8:20	9:30
Springfield				10:10	11:35	2:20	3:35		5:30		6:40			8:45	9:55

Notes: Commuter schedules are illustrative, based on RTC simulation of train operations. Amtrak schedules are March 2004 schedules, with assumed additional stops. Source: Amtrak, Wilbur Smith Associates

Table 3-4
Alternative Bi-State1 Illustrative Schedules

Southbound

	AM								PM						
Station	CDOT #1	Amtrak #141	CDOT #3	CDOT #5	Amtrak #495	CDOT #7	Amtrak #471	Amtrak #493	Amtrak #55	Amtrak #437	Amtrak #475	CDOT #9	CDOT #11	CDOT #13	Amtrak #477
Springfield	5:30	6:00	6:25	6:55	7:15	7:50	8:40	10:40	12:55	2:10	4:05	4:35	5:10	5:40	6:25
Windsor Locks	5:50	6:20	6:45	7:15	7:33	8:10	8:58	10:58		2:28	4:23	4:55	5:30	6:00	6:43
Windsor	5:56	6:26	6:51	7:21	7:38	8:16	9:06	11:06		2:33	4:28	5:01	5:36	6:06	6:48
Hartford	6:05	6:38	7:00	7:30	7:49	8:25	9:17	11:17	1:30	2:44	4:38	5:10	5:45	6:15	6:59
Berlin	6:17	6:51	7:12	7:42	8:00	8:37	9:38	11:28	1:45	2:55	4:53	5:22	5:57	6:27	7:10
Meriden	6:26	7:01	7:21	7:51	8:08	8:46	9:36	11:36	1:56	3:03	5:01	5:31	6:06	6:36	7:18
Wallingford	6:34	7:09	7:29	7:59	8:15	8:54	9:43	11:43		3:10	5:08	5:39	6:14	6:44	7:25
State Street	6:46	7:24	7:41	8:11	8:31	9:06	9:56	11:56		3:26	5:26	5:51	6:26	6:56	7:41
New Haven	6:50	7:28	7:45	8:15	8:35	9:10	10:00	12:00	2:23	3:30	5:30	5:55	6:30	7:00	7:45

Northbound

	AM					PM									
Station	CDOT #2	CDOT #4	CDOT #6	Amtrak #490	Amtrak #470	Amtrak #56	Amtrak #474	CDOT #8	Amtrak #486	CDOT #10	Amtrak #476	CDOT #12	CDOT #14	Amtrak #494	Amtrak #148
New Haven	6:05	6:50	7:30	8:50	10:15	12:55	2:15	3:35	4:10	4:40	5:15	5:45	6:15	7:25	8:30
State Street	6:08	6:53	7:33	8:53	10:18		2:18	3:38	4:13	4:43	5:18	5:48	6:18	7:28	8:33
Wallingford	6:20	7:05	7:45	9:03	10:27		2:28	3:50	4:23	4:55	5:28	6:00	6:30	7:38	8:44
Meriden	6:28	7:13	7:53	9:10	10:35	1:16	2:35	3:58	4:29	5:03	5:34	6:08	6:38	7:45	8:52
Berlin	6:37	7:22	8:02	9:19	10:44	1:26	2:44	4:07	4:38	5:12	5:43	6:17	6:47	7:54	9:02
Hartford	6:50	7:35	8:15	9:32	10:57	1:45	2:59	4:20	4:52	5:25	5:59	6:30	7:00	8:07	9:16
Windsor	6:59	7:44	8:24	9:40	11:04		3:07	4:29	4:59	5:34	6:07	6:39	7:09	8:15	9:24
Windsor Locks	7:05	7:50	8:30	9:45	11:10		3:12	4:35	5:05	5:40	6:12	6:45	7:15	8:20	9:30
Springfield	7:25	8:10	8:50	10:10	11:35	2:20	3:35	4:55	5:30	6:00	6:40	7:05	7:35	8:45	9:55

Notes: Commuter schedules are illustrative, based on RTC simulation of train operations. Amtrak schedules are March 2004 schedules, with assumed additional stops. Source: Amtrak, Wilbur Smith Associates

Table 3-5
Alternative Bi-State2 Illustrative Schedules

Southbound

	AM								PM						
Station	CDOT #1	Amtrak #141	CDOT #3	CDOT #5	Amtrak #495	CDOT #7	Amtrak #471	Amtrak #493	Amtrak #55	Amtrak #437	Amtrak #475	CDOT #9	CDOT #11	CDOT #13	Amtrak #477
Springfield	5:30	6:00	6:30	7:00	7:30	8:00	8:40	10:40	12:55	2:10	4:05	4:35	5:10	5:40	6:15
Windsor Locks	5:50	6:20	6:50	7:20	7:50	8:20	9:00	11:00		2:30	4:25	4:55	5:30	6:00	6:35
Windsor	5:56	6:26	6:56	7:26	7:56	8:26	9:06	11:06		2:36	4:31	5:01	5:36	6:06	6:41
Hartford	6:05	6:35	7:05	7:35	8:05	8:35	9:15	11:15	1:30	2:45	4:40	5:10	5:45	6:15	6:50
Berlin	6:17	6:47	7:17	7:47	8:17	8:47	9:27	11:27	1:45	2:57	4:52	5:22	5:57	6:27	7:02
Meriden	6:26	6:56	7:26	7:56	8:26	8:56	9:36	11:36	1:56	3:06	5:01	5:31	6:06	6:36	7:11
Wallingford	6:34	7:04	7:34	8:04	8:34	9:04	9:44	11:44		3:14	5:09	5:39	6:14	6:44	7:19
State Street	6:46	7:16	7:46	8:16	8:46	9:16	9:56	11:56		3:26	5:21	5:51	6:26	6:56	7:31
New Haven	6:50	7:20	7:50	8:20	8:50	9:20	10:00	12:00	2:23	3:30	5:25	5:55	6:30	7:00	7:35

Northbound

	AM					PM									
Station	CDOT #2	CDOT #4	CDOT #6	Amtrak #490	Amtrak #470	Amtrak #56	Amtrak #474	CDOT #8	Amtrak #486	CDOT #10	Amtrak #476	CDOT #12	CDOT #14	Amtrak #494	Amtrak #148
New Haven	6:05	6:40	7:10	8:45	10:15	12:55	2:15	3:35	4:10	4:40	5:10	5:40	6:10	7:25	8:30
State Street	6:08	6:43	7:13	8:48	10:18		2:18	3:38	4:13	4:43	5:13	5:43	6:13	7:28	8:33
Wallingford	6:20	6:55	7:25	9:00	10:30		2:30	3:50	4:25	4:55	5:25	5:55	6:25	7:40	8:45
Meriden	6:28	7:03	7:33	9:08	10:38	1:16	2:38	3:58	4:33	5:03	5:33	6:03	6:33	7:48	8:53
Berlin	6:37	7:12	7:42	9:17	10:47	1:26	2:47	4:07	4:42	5:12	5:42	6:12	6:42	7:57	9:02
Hartford	6:50	7:25	7:55	9:30	11:00	1:45	3:00	4:20	4:55	5:25	5:55	6:25	6:55	8:10	9:15
Windsor	6:59	7:34	8:04	9:39	11:09		3:09	4:29	5:04	5:34	6:04	6:34	7:04	8:19	9:24
Windsor Locks	7:05	7:40	8:10	9:45	11:15		3:15	4:35	5:10	5:40	6:10	6:40	7:10	8:25	9:30
Springfield	7:25	8:00	8:30	10:05	11:35	2:20	3:35	4:55	5:30	6:00	6:30	7:00	7:30	8:45	9:50

Notes: Commuter and Amtrak schedules are illustrative, based on RTC simulation of train operations. Amtrak schedules are variations on March 2004 schedules, with assumed additional stops and departure times adjusted for optimum coordination with commuter schedules.
Source: Amtrak, Wilbur Smith Associates

The difference in the level of service provided by the implementation alternatives is described in Table 3-6.

Table 3-6
Implementation Alternatives Service Characteristics

Alternative	CT1	CT2	Bi-State1	Bi-State2
Service Area	Windsor Locks to New Haven	Windsor Locks to New Haven	Springfield to New Haven	Springfield to New Haven
Headways	30 minute peak hr one-directional service (SB AM, NB PM)	30 minute peak hr bi-directional service	30 minute peak hr bi-directional service	30 minute peak hr bi-directional service
Double Track	No new double track	Double track sections added where needed	Double track sections added where needed	Double track sections added where needed
Amtrak Schedule Adjustment	No adjustments to Amtrak schedule, but fares would be adjusted for commuter use	No adjustments to Amtrak schedule, but fares would be adjusted for commuter use	No adjustments to Amtrak schedule, but fares would be adjusted for commuter use	Amtrak schedule adjusted to accommodate ideal meet times in urban centers

3.3 Service Alternative Evaluation

3.3.1 Ridership Comparison

Ridership for the four alternatives is estimated as follows:

Alternative CT1 = 872 daily trips (+Amtrak)
Alternative CT2 = 1485 daily trips (+Amtrak)
Alternative Bi-State1 = 1767 daily trips (+Amtrak)
Alternative Bi-State2 = 1767 daily trips (+Amtrak)

The major difference between Alternative CT1 and CT2 is the improved headways/increased number of trains because of double tracking. The difference between Alternative CT2 and Bi-State1 is the inclusion of Springfield in Alternative Bi-State1. The reason there is no difference between Alternative Bi-State1 and Bi-State2 is the modeling methodology is not able to respond to the differences in the timing of service.

3.3.2 Capital Cost Comparison

Capital costs for the alternative service patterns vary, because the alternatives provide differing levels of service, require different track and facility improvements, and attract different levels of ridership. The common cost elements are stations and parking, layover and maintenance facilities, and rolling stock.

Capital costs were identified initially for a minimum build service scenario ($86 million) and a maximum build scenario ($558 million). These costs represented probable outside ranges for minimum and maximum service levels. The costs calculated for these scenarios have been reviewed and adapted to determine estimated costs for the four potential implementation alternatives. These projected costs are summarized and discussed below in Table 3-7.

Platform improvements at stations on the Springfield line are minimal at most stations. An allowance of $25,000 per station is included to renew or improve paving, curbs, lighting, pedestrian walkways, and signage at each of the 6 stations from Wallingford north to Windsor Locks.

Table 3-7
Summary of Capital Costs

	Alt CT1	Alt CT2	Alt Bi-State1	Alt Bi-State2
Station Improvements	$4,200,000	$4,200,000	$4,200,000	$4,200,000
Parking Improvements	$1,925,000	$3,395,000	$3,570,000	$3,570,000
Windsor Locks Layover	$2,500,000	$2,500,000	$2,500,000	$2,500,000
New Haven Maintenance	$16,000,000	$16,000,000	$16,000,000	$16,000,000
Track Extensions	$0	$9,920,000	$12,480,000	$12,480,000
Control Points	$0	$6,000,000	$7,500,000	$7,500,000
Bridges	$0	$3,015,000	$3,051,000	$3,051,000
Train Sets	$33,070,000	$41,680,000	$50,290,000	$50,290,000
Subtotal	*$57,695,000*	*$86,710,000*	*$99,591,000*	*$99,591,000*
Contingency – 40%	$23,078,000	$34,684,000	$39,836,400	$39,836,400
Total Capital Costs	**$80,773,000**	**$121,394,000**	**$139,427,400**	**$139,427,400**

Station Improvements

There is currently double track through the Meriden station, but a passenger platform is provided only on the east side, adjacent to the station building. This requires all trains stopping at Meriden to use the easterly track. The greater frequency of service on the line will require some trains to meet another train at this location, forcing some trains to operate on the westerly track where there is no platform. A second platform will be required at Meriden, at a minimum estimated cost of $50,000. However, a high-level platform may be required if new platforms are constructed due to ADA regulations.

Ideally, all commuter trains and all Amtrak trains on the Springfield line should stop at the State Street station in New Haven. Passenger volumes at State Street may require adjustments or improvements to the platform layout. Alternatively, use of the State Street station may require Springfield line trains to use different tracks into the New Haven station than current operations allow. An allowance of $4,000,000 for platform and track improvements is estimated based on the contractor bids for the current Shore Line East station construction. (This study did not include a detailed analysis of track occupancy and train movements at New Haven).

Parking Facilities

Expansion or provision of station parking was analyzed for the four implementation alternatives based on station ridership. There are currently 360 parking spaces available at the Wallingford, Meriden, Berlin, Windsor and Windsor Locks stations. At New Haven, Hartford and Springfield stations, no additional parking would be constructed in conjunction with this project. Of these 360 spaces, utilization rates show that 240 spaces would typically be available for commuter rail service. Therefore, in order to accommodate the predicted station ridership, approximately 275 to 510 additional parking spaces are needed. The cost per space was estimated at $7,000, including land acquisition for surface parking. At comparable ratios, parking costs for the four implementation alternatives would range from $1.93 million to $3.6 million, as shown in Table 3-8.

Table 3-8
Parking Costs

Alternative	Daily Trips	Total Spaces	Spaces to be Constructed	Cost
CT1	872	515	275	$1,925,000
CT2	1,485	725	485	$3,395,000
Bi-State1	1,767	750	510	$3,570,000
Bi-State2	1,767	750	510	$3,570,000

Maintenance and Layover Facilities

Under Alternatives CT1 and CT2, commuter service would operate only between Windsor Locks and New Haven. A small facility, sufficient for storing 2 trains sets overnight or during mid-day layovers, would be required north of the Windsor Locks Station. The facility should provide about 800 feet of track, electric power connections, and a small building for storing cleaning and overnight servicing supplies. The facility should be fenced and lighted for security purposes, and needs to be accessible from a nearby roadway. Including a power switch into the main track, the facility would cost approximately $2.5 million.

The primary maintenance and storage facility for the system would be in New Haven. The maintenance facility would cost approximately $16.0 million, inclusive of land, to handle the maintenance requirements for any minimum build option under Alternatives CT1 through Bi-State2.

Track Extensions

The limited operation of only 6 trains per day under Alternative CT1 would not require additional double track segments, based on the Rail Traffic Controller (RTC) simulations performed for this study. Therefore, there would be no capital cost for new mainline trackage. Alternatives CT2, Bi-State1, and Bi-State2 provide for reverse direction commuter service (running northbound from New Haven at the same time the primary service is operating southbound). To provide sufficient double trackage for dependable operation, several extensions of the current double track would be needed. These include:

- Extend 2nd track from milepost 17.0 (Holt) to milepost 13.3 (Wall), and provide a new control point at Wall.
- Extend 2nd track from milepost 31.1 (New) to milepost 28.2, and provide a new control point at milepost 28.2.
- Extend 2nd track from milepost 33.4 (Wood) to milepost 35.2, and provide a new control point at milepost 35.2.
- Extend 2nd track from milepost 43.0 (Windsor) to milepost 39.0 (Fry) and provide a new control point at Fry.
- Extend 2nd track from milepost 54.7 (Field) to milepost 51.5, and provide a new control point at milepost 51.5. (This extension required only for Alternatives Bi-State1 and Bi-State2, which envision service to Springfield).

Alternative CT2 would involve 12.4 miles of new track at $800,000 per mile, plus 4 new control points at $1.5 million each. The total cost would be $15.92 million. Alternatives Bi-State1 and Bi-State2 would add 3.2 additional track miles and one control point, bringing the total to $19.98 million. Control point costs include related signal system improvements.

Bridge Costs

Bridge costs were evaluated as part of the maximum build scenario. The costs are presented in Table 3-9. For a start-up service, it is assumed that short-term bridge costs would be encountered only where a new second main track is to be constructed, and that all other bridge costs would be considered long term maintenance costs to renew the existing infrastructure. On this basis, the bridge costs shown in Table 3-9 could be assigned to the initial commuter service.

Table 3-9
Bridge Costs

Bridge Number	Description	Short Term Cost
15.26 Yalesville	58 ft. Conc. Box Beam over Falls Brook	$31,000
16.78 Meriden	28 ft. I-Beam over Gypsy Lane	$2,599,000
30.99 Newington	74 ft Encased I-Beam over Newington River	$86,000
35.15 Hartford	79 ft Through Girder over Park Avenue	$176,000
42.65 Windsor	29 ft Deck Girder over Batchelder Road	$123,000
Total for Alternative CT2		**$3,015,000**
53.98 Thompsonville	35 ft Encased I-Beam over Main Street	$36,000
Total for Bi-State Alternatives		**$3,051,000**

Train Sets

For Alternative CT1, the commuter service would require 3 train sets plus a spare locomotive, trailer coach, and cab coach. Alternative CT2 would require 4 train sets plus spare equipment, while Alternatives Bi-State1 and Bi-State2 (operating to Springfield instead of Windsor Locks) require 5 train sets plus spare equipment. Rolling stock costs for the four alternatives are shown in Table 3-10. It is of note that these costs were refined for the final estimate.

Table 3-10
Rolling Stock Costs

		Alt. CT1		Alt. CT2		Bi-State Alt.	
	Cost/Unit	Units	Cost	Units	Cost	Units	Cost
Locomotive	$4,500,000	4	$18,000,000	5	$22,500,000	6	$27,000,000
Coach	$1,370,000	7	$9,590,000	9	$12,330,000	11	$15,070,000
Cab Car	$1,370,000	4	$5,480,000	5	6,850,000	6	8,220,000
Total Cost			$33,070,000		41,680,000		$50,290,000

Note: Per unit costs revised for final estimate in Chapter 6

3.3.3 Operating Cost Comparison

Operating costs for the minimum and maximum build scenarios were based on a typical unit cost of $40 per train mile, derived from examination of current costs of the Shore Line East commuter service. The same cost factor was applied to the four start-up alternatives. The resulting annual operating costs are projected in Table 3-11.

Table 3-11
Operating Cost Comparisons

	Alternative CT1	Alternative CT2	Bi-State Alternatives
Service Limits	Windsor Locks To New Haven	Windsor Locks To New Haven	Springfield To New Haven
Service Level	3 Southbound AM 3 Northbound PM	4 Southbound AM 3 Southbound PM 3 Northbound AM 4 Northbound PM	4 Southbound AM 3 Southbound PM 3 Northbound AM 4 Northbound PM
Annual Train Miles	74,676	174,244	220,472
Cost/Train Mile	$40.00	$40.00	$40.00
Annual Operating Cost	$2,987,040	$6,969,760	$8,818,880

3.3.4 Revenue Comparison

Revenue for Alternatives CT1 through Bi-State2 was calculated in the same manner as for the minimum and maximum build scenarios discussed earlier in this chapter. A fare structure similar to Shore Line East and Metro North was developed by ConnDOT. As for the two original scenarios, it was assumed that 80 percent of the riders would use monthly passes. Annual revenue was based on a typical 254 days of weekday operation, excluding holidays.

Forecasts for each of the four alternatives are shown below in Table 3-12. Alternatives Bi-State1 and Bi-State2 are identical because they would attract the same ridership volume. (Alternative Bi-State2 would have more uniform headways between trains by adjusting current Amtrak schedules).

Table 3-12
Revenue Comparison

	Alternative CT1	Alternative CT2	Bi-State Alternatives
Total Weekday Trips	872	1,485	1,767
Annual Revenue	$ 367,930	$ 667,121	$ 868,903
Annual Operating Cost	$ 2,987,000	$ 6,970,000	$ 8,819,000
Fare box Recovery	12.3%	9.6%	9.9%

Ridership and Revenue Variables

This analysis of initial implementation alternatives has treated the added commuter rail service separately for the purposes of projecting ridership and resulting revenue. However, the service is envisioned as co-existing with Amtrak's current service on the Springfield line. Ideally, the Amtrak schedules during the peak hours could be adjusted

to make the same station stops as the commuter trains, and subject to seating availability, the Amtrak trains could serve commuter needs. Similarly, the commuter schedules provide added opportunities for connections at New Haven with Amtrak intercity trains as well as connecting travel via Metro North and Shore Line East.

Metrolink, the commuter rail service in the Los Angeles area, shares routes both north and south from Los Angeles with Amtrak's Surfliner route, a state-supported corridor service with up to 12 round trips per day on some days. Metrolink and Amtrak initiated a "Rail 2 Rail" program over a year ago, which allows Metrolink monthly pass holders to ride Amtrak's Surfliner trains. The fares on Amtrak are typically higher than Metrolink, and the Amtrak trains serve fewer stations. A funding transfer agreement between Metrolink and Amtrak reimburses Amtrak for a portion of the "loss" incurred because of the lower commuter fares. The program has been extremely successful, producing annual ridership gains on both services because of the greater number of trip opportunities. A similar program was recently instituted in the Shore Line East corridor to cut costs.

A cooperative effort between a ConnDOT service and Amtrak service on the Springfield line would likely have similar results. Amtrak's mid-day trains could be used for one direction of a round trip outside the peak hours, inducing more travel than would be expected if the systems were operated independently. No attempt is made here to project the ridership levels that such a synergy would produce, or to project the resulting revenue increases. At such time as commuter service is initiated, it would be appropriate to test the concept by accepting commuters on selected Amtrak trains, and expanding the program if it proves beneficial to both agencies.

3.3.5 Summary

The resulting service characteristics, ridership, costs and performance measures are summarized in Table 3-13. All of these implementation alternatives include only existing stations on the line with existing low level platforms and at-grade pedestrian crossings. These alternatives include peak hour service only and a shuttle bus connection with Bradley Airport at Windsor Locks Station. Enhancements such as high level platforms, new station locations and off-peak service can be added to any implementation alternative from the menu of additional options as described in the next section.

Table 3-13
Implementation Alternatives Results

	CT1	CT2	Bi-State1 & 2
One-way train trips	6	14	14
New track required	None	12.4 miles	15.6 miles
Capital cost	$80.8 million	$121.4 million	$139.4 million
Annual Operating cost	$3.0 million	$7.0 million	$8.8 million
Annual Revenue	$368,000	$667,000	$869,000
Annual Operating deficit	$2.6 million	$6.3 million	$7.9 million
Projected Ridership (new daily trips)	872	1,485	1,767
Per passenger subsidy	$11.82	$16.71	$17.71
Farebox recovery	12.3%	9.6%	9.9%

3.4 Menu of Additional Elements

The alternatives described in the previous section are considered the first phase of implementation of a new commuter service in the New Haven Hartford Springfield corridor. There are, however, a number of other elements that can be included in the initial implementation or at a later time. These additional elements include:

- Off-peak service
- Weekend service
- New Stations including:
  - Enfield Station
  - Newington Junction Station
  - North Haven Station
  - Wharton Brook Station
- Rail connection to Bradley International Airport
- Full high-level platforms at all stations
- Grade separated pedestrian facilities at all stations
- Station buildings at all stations

- Access Walkway to the Legislative Office Building in Hartford

Each of these additional elements is described in this section with associated costs and ridership.

3.4.1 Off-peak Service

Capital Cost – There is no capital cost associated with off-peak service as the peak service train sets can be used to provide the service.

Operating Cost – For the Bi-State Alternatives using an estimate of $40 per train mile, each round-trip run would cost $4,960 for 124 miles. Therefore, for each round-trip added to the schedule 254 non-holiday weekdays per year, the cost would be $1.3 million per year. 8 round-trips to provide approximately hourly off-peak service would cost $10.1 million per year in operating costs. For Alternative CT2, with service only to Windsor Locks, the comparable cost would be $8 million.

Ridership – Ridership for off-peak service will depend on the amount and hours of the service. In the minimum build alternative, approximately 160 off-peak boardings were expected with the limited schedule. In the maximum build, 577 off-peak boardings were expected. The existing Amtrak schedule provides off-peak service at approximately two-hour intervals midday and one southbound and two northbound later evening trains. Airport ridership can also be considered off-peak ridership. In order to accurately serve the airport, service must be provided throughout the entire day, including off-peak times. The expected 350 weekday airport boardings will only be realized with adequate all-day service, especially during the peak air travel windows.

Revenue – The revenue for off-peak service would depend on the ridership experienced on the line. Using the assumed service level, fares and resulting ridership from the maximum build, annual revenue for off-peak service would be about $1,783,080 per year.

3.4.2 Weekend and Holiday Service

Capital Cost – There is no capital cost associated with weekend service as the peak service train sets can be used to provide the service.

Operating Cost – For the Bi-State Alternatives, using an estimate of $40 per train mile, each round-trip run would cost $4,960 for 124 miles. Assuming each trip was added 111 days per year (Saturday, Sunday and holidays), for each round-trip run, the cost would be $550,560 per year. The weekend schedule presented in the maximum build with 10 trains at approximately two hour intervals would cost $5.5 million per year in operating costs. Alternative CT2 service only to Windsor Locks would have a comparable cost of $4.3 million.

Ridership – Ridership for weekend service will depend on the amount and hours of the service. No weekend service was provided in the minimum build. In the maximum build, weekend service every two hours, including Amtrak ridership, was expected to yield approximately 1,964 trips. The current Amtrak schedule provides seven trains in each direction on both Saturday and Sunday. Weekend service would also affect airport ridership, although to a lesser degree than weekday off-peak service.

Revenue – The revenue for weekend service would depend on the ridership experienced on the line. Using the assumed service level, fares and resulting ridership from the maximum build, annual revenue for weekend service would be about $326,000 per year.

3.4.3 Possible New Stations

The alternatives presented in this chapter would utilize existing stations, with only essential improvements to provide adequate parking and meet passenger service requirements. Analysis of the maximum build scenario identified potential additional stations that would contribute additional riders to the service. Station locations were identified to serve Enfield, Newington Junction, Wharton Brook, and North Haven. At a minimum, each station would require parking, auto and transit access, two low-level platforms to accommodate double track operation, and related canopies, lighting, and signage. Mini-high level platforms may be required at new stations to accommodate handicapped access. The maximum development of each station potential could involve full length high-level platforms and a grade-separated pedestrian crossing, plus a station building with enclosed waiting area.

Table 3-14 presents the probable range of costs for these new stations.

Table 3-14
Possible New Station Costs

Station	Enfield	Newington Jct	Wharton Brook	North Haven
Parking Spaces	175	225	150	125
Parking Cost	$ 1,427,000	$ 1,821,000	$ 1,232,000	$ 1,033,000
Low-Level Platforms	$ 400,000	$ 400,000	$ 400,000	$ 400,000
Minimum Cost	**$ 1,827,000**	**$ 2,221,000**	**$ 1,632,000**	**$1,433,000**
High-Level Platforms with Canopy & Lighting	$ 3,850,000	$ 3,850,000	$ 3,850,000	$ 3,850,000
Pedestrian Crossing	$ 3,850,000	$ 3,850,000	$ 3,850,000	$ 3,850,000
Station Building	$ 800,000	$ 800,000	$ 800,000	$ 800,000
Maximum Cost	**$ 9,927,000**	**$ 10,321,000**	**$ 9,732,000**	**$ 9,533,000**
Weekday Boardings (Maximum Build)	210	250	156	138

Note: Costs include 10% design and 40% contingency costs

These potential new stations present no significant increases in operating costs of the rail service, but would incur some costs for routine maintenance, trash collection, and policing. Each additional passenger stop would add approximately 2 minutes to the overall running time of each train. Relative ridership potential, based on the original maximum build scenario, is shown in terms of weekday boardings.

3.4.4 Rail Connection to Bradley International Airport

Capital Cost – As estimated in the maximum build scenario, the cost to improve the Suffield Industrial Spur and construct an airport station is $28 million, including 10% design and 40% contingency.

Operating Cost – Train operations would incur a cost of about $40 per train mile. Total amount would depend on the number of trains operated. Since initial ridership volumes can be handled by low-cost bus shuttle, no attempt is made to project train costs.

Ridership and Revenue - No appreciable difference in ridership or revenue is expected with a rail connection to the airport due to the similar travel time experienced by the shuttle bus. As congestion builds on the airport connector road, and the travel time required by the rail connection becomes better than the shuttle bus connection, a rail connection is expected to be beneficial to airport ridership.

3.4.5 Full High-Level Platforms at All Stations

Capital Cost – The estimated cost for a full high-level platform is $3.85 million per station, including 10% design and 40% contingency costs.

Ridership and Revenue – Although there is no estimated difference in ridership from the modeling results or revenue with the implementation of high level platforms, many industry leaders believe that there are ties between station amenities and ridership. Attractive and user-friendly stations give the impression of a higher-level service and therefore attract more ridership. In addition, high level platforms can make boarding faster and more efficient, which may save travel time on the line, thus increasing ridership by providing more prompt service.

3.4.6 Grade Separated Pedestrian Crossing Facilities at All Stations

Capital Cost – The estimated cost for grade-separated pedestrian crossing facilities $3.85 million per station, including 10% design and 40% contingency costs.

Ridership and Revenue – Although there is no estimated difference in ridership from the modeling results or revenue with grade-separated pedestrian facilities, as with full high-level platforms, any station amenities can have a positive effect on ridership by improving the perception of the station in the eyes of riders.

3.4.7 Station Buildings at All Stations

Capital Cost – The estimated construction cost for a new station building is $0.8 million per station, not including property costs. Many stations along the line have existing buildings that are currently serving another purpose, the purchase or lease of these buildings back from the current user would have to be negotiated.

Ridership and Revenue – Although there is no estimated difference in ridership from the modeling results or revenue with station buildings, as with full high-level platforms, any station amenities can have a positive effect on ridership by improving the perception of the station in the eyes of riders. This is especially true with station buildings, which often contain restrooms and heated / cooled waiting areas.

3.4.8 Access Walkway to the Legislative Office Building

Capital Cost – The direct accessibility of the Hartford Union Station to the Legislative Office Building has been of great interest to potential users of the NHHS service. Due to the close proximity of these two locations, an additional rail station at the Legislative Office Building is not feasible. Both the economics of constructing the $7 million facility on a curved section of track, and the operational disadvantages in time, speed, and perception for stopping twice within 800 yards, make improving access from Hartford Union station preferable. To enhance access and ensure a safe pedestrian-friendly environment between the two locations, improvements ranging from lighting, landscaping, and walkway pavement architecture to a covered walkway with road-crossing signaling could be constructed. The estimated construction cost for these improvements ranges from $250,000 for enhanced lighting and landscaping to $2.0 million for these improvements with the addition of a covered walkway.

Ridership and Revenue – Similar to other station enhancements, there is no estimated difference in ridership or revenue from the modeling results, however such improvements will have a positive effect on ridership by improving the perception of the station in the eyes of riders. The LOB location could also fill the function of an overflow garage for Union Station.

Chapter 4
Service Implementation Plan

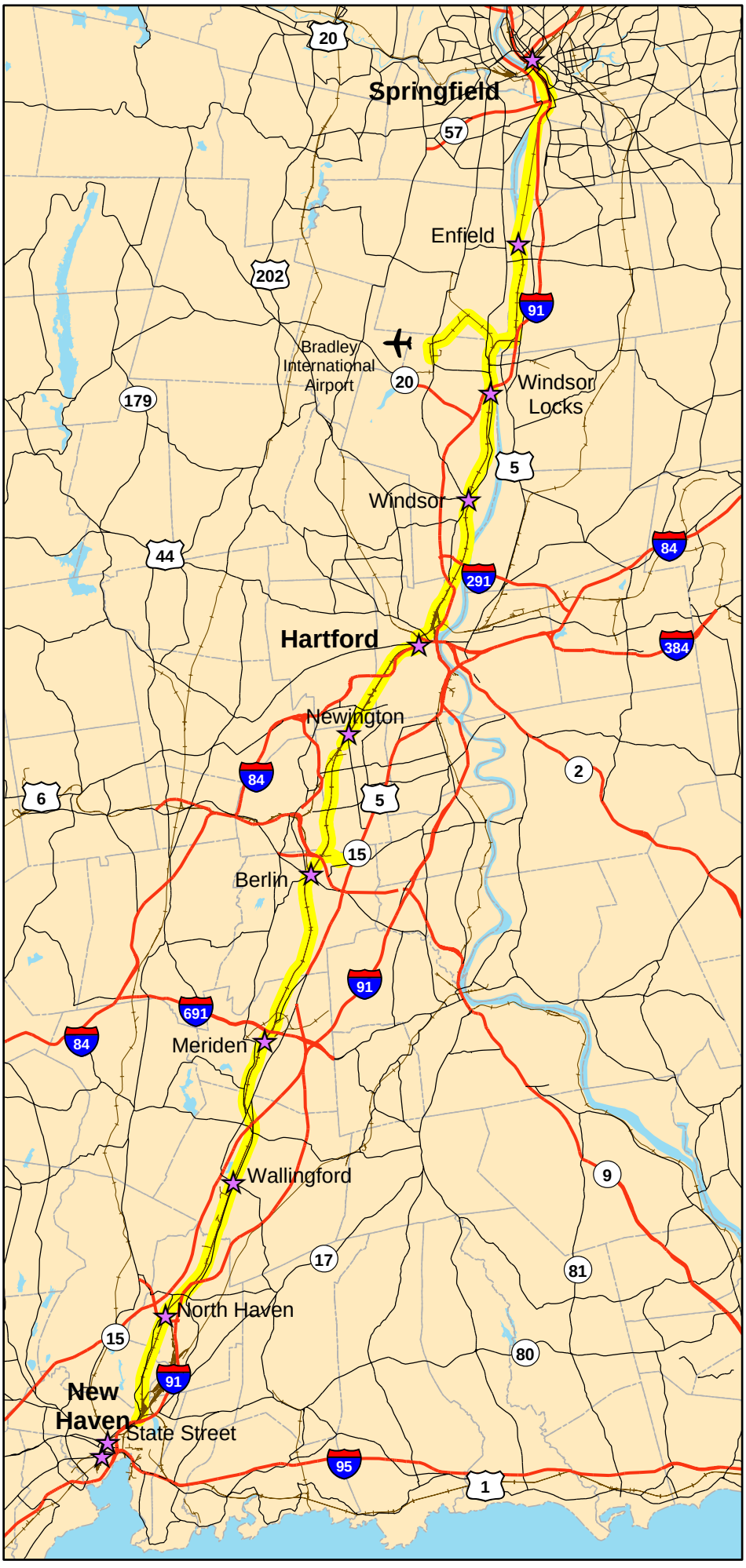
Upon review of the alternatives, the study team and the Steering Committee developed a recommended action plan for initial and potentially future commuter rail service on the Springfield Line. The start-up service recommended by the Steering Committee is based upon the Bi-State service option. The Start-up Service would include the following:

- Service would operate bi-directionally, Monday through Friday on a 30 minute peak hour schedule (at least 14 one-way trips).
- Service would be between New Haven and Springfield.
- A minimum of 18 miles of extended double track sections will be added to improve reliability and provide 30 minute headways meeting critical times in New Haven, Hartford and Springfield;
- Service would supplement existing Amtrak service on the corridor. Adjustments to Amtrak's schedule would be attempted when possible in conjunction with operating agreements with Amtrak.
- Along with the existing nine passenger stations being served along this corridor, three additional stations would be added at North Haven, Newington and Enfield.
- The existing Windsor Locks station would be enhanced to provide facilities to accommodate a waiting area and transfers between the train and the shuttle bus to Bradley Airport.
- Local bus service will be modified to provide appropriate service to the stations;
- All stations would have high level platforms and grade-separated pedestrian facilities, considered to be necessary from an operational standpoint.

4.1 Stations

The Start-up Service described includes three additional new stations and improvements to the existing station areas. The station locations for this scenario, which include those new stations not in use today (are *italicized* below), are shown in Figure 4-1.

- New Haven Union Station
- State Street Station



Recommended Action Stations

New Haven - Hartford - Springfield
Commuter Rail Feasibility Study

Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS

Legend

- Rail Study Corridor
- Highways
- Major Roads
- Recommended Action Stations

N W E S

0 5 10 Miles

Figure 4-1

- *North Haven / Hamden Station (at Route 40 connector)*
- Wallingford Station
- Meriden Station
- Berlin Station
- *Newington Station (adjacent to New Britain Busway station)*
- Hartford Union Station
- Windsor Station
- Windsor Locks Station
- *Enfield Station (at Bigelow Commons in Thompsonville)*
- Springfield Union Station

All stations would include high-level platforms, pedestrian amenities with grade separated crossings, bicycle storage and racks, and any additional parking required to accommodate projected ridership. Plan-level drawings of each start-up station are shown in Figure 4-2 through Figure 4-12.

4.2 Schedule

Rail Traffic Controller (RTC) simulation software was used to evaluate a Recommended Action schedule. Under ideal operating conditions, the upgraded railroad would easily provide a high degree of service reliability. This alternative calls for a minimum of 18 miles of added double track to accommodate passing points for the proposed passenger service schedule. If emergency or operating conditions should require closing one of the tracks, trains during the peak periods could experience delays up to 10 to 15 minutes due to single track operation. Delays would be less during off-peak periods when trains operate at greater headways. These operations would require adjustment of freight operations on the line to occur outside the peak periods.

Table 4-1 shows the illustrative weekday schedules for the Recommended Action. This schedule includes 8 round-trips per day, with an attempt to meet the following times:

- Morning work start times in New Haven from the north
- Morning work start times in Hartford from the north and south
- Morning work start times in Springfield from the south
- Morning connections to Metro North and Shore Line East service in New Haven from the north
- Morning connections from Metro North and Shore Line East service in New Haven from the south/west/east
- Afternoon work end times in New Haven heading north
- Afternoon work end times in Hartford heading north and south
- Afternoon work end times in Springfield heading south
- Afternoon connections from Metro North and Shore Line East service in New Haven from the south/west/east
- Afternoon connections to Metro North service in New Haven from the north

Table 4-1
Illustrative Schedules

Southbound

	AM								PM							
Station	CDOT #1	Amtrak #141	CDOT #3	CDOT #5	Amtrak #495	CDOT #7	Amtrak #471	Amtrak #493	Amtrak #55	Amtrak #437	CDOT #9	Amtrak #475	CDOT #11	CDOT #13	CDOT #15	Amtrak #477
Springfield	5:20	5:50	6:20	6:50	7:20	7:50	8:20	10:40	12:55	2:10	3:30	4:00	4:30	5:00	5:35	6:05
Enfield	5:32	6:03	6:32	7:02	7:33	8:02	8:33	10:53		2:22	3:42	4:12	4:42	5:16	5:48	6:18
Windsor Locks	5:43	6:14	6:43	7:13	7:43	8:15	8:44	11:04		2:33	3:53	4:23	4:53	5:27	5:58	6:29
Windsor	5:49	6:20	6:49	7:19	7:49	8:21	8:50	11:10		2:38	3:58	4:29	4:59	5:33	6:04	6:35
Hartford	5:58	6:29	6:58	7:28	7:59	8:30	8:59	11:19	1:31	2:48	4:08	4:38	5:08	5:42	6:13	6:45
Newington	6:06	6:38	7:06	7:36	8:07	8:38	9:08	11:28		2:55	4:15	4:45	5:16	5:50	6:21	6:53
Berlin	6:13	6:45	7:13	7:43	8:15	8:45	9:17	11:35	1:46	3:02	4:22	4:52	5:23	5:57	6:28	7:00
Meriden	6:23	6:55	7:23	7:53	8:24	8:55	9:27	11:45	1:58	3:11	4:31	5:01	5:32	6:07	6:38	7:11
Wallingford	6:31	7:03	7:31	8:01	8:33	9:03	9:35	11:54		3:19	4:39	5:09	5:40	6:15	6:46	7:20
North Haven	6:38	7:11	7:38	8:08	8:40	9:10	9:43	12:01		3:26	4:46	5:16	5:48	6:23	6:53	7:27
State Street	6:45	7:18	7:46	8:14	8:48	9:17	9:50	12:09		3:34	4:54	5:24	5:55	6:30	7:00	7:35
New Haven	6:49	7:22	7:49	8:18	8:51	9:21	9:54	12:12	2:20	3:39	5:02	5:27	5:58	6:34	7:04	7:39

Northbound

	AM						PM									
Station	CDOT #2	CDOT #4	CDOT #6	CDOT #8	Amtrak #490	Amtrak #470	Amtrak #56	Amtrak #474	CDOT #10	Amtrak #486	CDOT #12	Amtrak #476	CDOT #14	CDOT #16	Amtrak #494	Amtrak #148
New Haven	5:50	6:20	6:50	7:50	9:00	10:15	12:55	2:15	3:30	4:00	4:30	5:00	5:30	6:10	7:25	8:30
State Street	5:53	6:23	6:53	7:53	9:03	10:18		2:18	3:33	4:03	4:33	5:03	5:33	6:13	7:28	8:33
North Haven	6:00	6:30	7:04	8:01	9:11	10:25		2:25	3:41	4:11	4:41	5:10	5:40	6:21	7:36	8:41
Wallingford	6:07	6:39	7:12	8:09	9:19	10:33		2:32	3:48	4:18	4:49	5:18	5:48	6:28	7:43	8:48
Meriden	6:16	6:47	7:21	8:17	9:27	10:41	1:20	2:41	3:56	4:27	4:57	5:27	5:57	6:36	7:51	8:57
Berlin	6:26	6:57	7:31	8:27	9:37	10:51	1:32	2:51	4:06	4:37	5:07	5:37	6:07	6:46	8:01	9:08
Newington	6:32	7:04	7:37	8:34	9:44	10:58		2:58	4:14	4:45	5:14	5:43	6:13	6:53	8:09	9:15
Hartford	6:40	7:11	7:45	8:42	9:52	11:06	1:47	3:05	4:21	4:53	5:22	5:51	6:22	7:00	8:17	9:23
Windsor	6:48	7:20	7:54	8:50	10:01	11:15		3:15	4:31	5:03	5:31	5:59	6:35	7:09	8:26	9:33
Windsor Locks	6:55	7:26	8:00	8:57	10:07	11:21		3:20	4:37	5:09	5:37	6:06	6:41	7:15	8:32	9:39
Enfield	7:05	7:37	8:17	9:07	10:18	11:32		3:31	4:47	5:20	5:48	6:16	6:52	7:25	8:42	9:50
Springfield	7:18	7:50	8:30	9:21	10:31	11:50	2:22	3:44	5:01	5:33	6:06	6:29	7:05	7:39	8:56	10:03

Notes: Commuter schedules are illustrative, based on RTC simulation of train operations. Amtrak schedules are March 2004 schedules, with assumed additional stops. Source: Amtrak, Wilbur Smith Associates

The schedule presented in Table 4-1 demonstrates one potential plan for commuter rail stopping at each station along the line. During further development and refinement of this plan, consideration can be given to including express service directly from the New Haven Line to Hartford and Springfield. The average travel time from New Haven to Springfield, including all stops is 1 hour 30 minutes. If an express train were to operate with stops only in New Haven, Hartford and Springfield (eliminating intermediate stops), the average travel time would be reduced by approximately 15 minutes. However, with the limited stops, corresponding ridership may also be substantially reduced along the line. Further analysis would have to be conducted for such service.

4.3 Ridership Levels

The New Haven to Springfield commuter rail service has the ability to attract the following four different types of potential users:

1. Commuters accessing employment hubs in New Haven, Hartford and Springfield;
2. Intercity rail ridership to points off the corridor, specifically connections to the Amtrak service in New Haven and Springfield;
3. Users that would have access to Bradley International Airport (BDL); and
4. Off-peak non-commuter and weekend users.

In the Maximum Build Scenario, a different approach to developing ridership forecasts was developed for each of the four different types of riders. The primary basis for calculating ridership on the line was the ConnDOT model, which is primarily a commuter model using population and employment to calculate expected trips. In addition, the Maximum Build Scenario included substantial off-peak service (business and recreational trips as well as airport service) and replaced the existing Amtrak trains (intercity trips), therefore additional techniques for developing ridership beyond the ConnDOT model were developed. This ridership is presented in the alternatives report.

The Recommended Action includes primarily peak hour service, plus existing Amtrak service mid-day and on weekends. Therefore, the ridership projection includes primarily commuter ridership, described in further detail below. In addition to the commuter ridership, a factor of 10% was added for non-commuters. Substantial off-peak ridership and airport ridership would not be realized without substantial off-peak and weekend service on the line.

4.3.1 Commuter Ridership

The ConnDOT model is a statewide model encompassing the roadway and transit networks in the entire state of Connecticut. Using the ConnDOT year 2025 no-build model, the nine Connecticut stations from North Haven north were added to the model with service headways of 30 minutes in the peak hours. Because the adjoining states, Massachusetts, New York and Rhode Island are treated as externals to the model, an off-model calculation of trips from Springfield was added to the model results for the

Springfield station. This off-model calculation was based on recently available Census 2000 Journey to Work town to town data, grown to reflect year 2025 population and employment. Expected rail capture rates were applied to the data to determine the number of trips from the Springfield station to the rest of the study area.

The results of the ConnDOT model and the out-of-state ridership evaluation indicate the year 2025 projected daily commuter ridership for the Recommended Action is 2,208 as compared to 1,606 for the Minimum Build Scenario and 3,440 for the Maximum Build Scenario. This projected ridership is higher than the Bi-State Alternatives due to the additional stations.

4.3.2 Total Weekday Ridership

Using the adjusted commuter ridership from the ConnDOT model, a factor of 10% was added to account for non-commuter ridership on the line. The breakdown of total weekday ridership is shown in Table 4-2. The resulting Recommended Action weekday ridership by station is shown in Table 4-3, along with the boardings (ons) and alightings (offs) for the AM peak commuter trips. It is estimated that this new service scenario would generate 2,428 new weekday trips on the corridor without the existing Amtrak ridership, estimated at 616 trips (not including the Vermonter).

Table 4-2
Components of Total Weekday Ridership

Commuters	2,208
Off-peak (non-commuter)	220
Total New Trips	**2,428**
Amtrak (not including Vermonter)	616
Total Trips	**3,044**

The ridership projections presented in Table 4-2 and financial estimates developed for this Start-up implementation plan are based upon a rigorous evaluation process and a customized application of ConnDOT's Statewide Travel Model. However, in response to a concern by some stakeholders that these ridership projections may be conservative, additional analysis was conducted to identify a potential high range of ridership for the service. The resulting high range in ridership is 5,000 daily trips. This higher range is anecdotal and so would be viewed as an optimistic figure. Although there is a range in projected capture, the anticipated NHHS ridership and cost analysis in this plan is based upon the evaluation process derived from application of the ConnDOT Statewide Travel Model. It should be noted that this recommended service is to initiate commuter rail along this corridor and that the opportunity remains to enhance the initial service (with additional scheduled trains and stations) as the demand warrants and funding allows.

Table 4-3
Recommended Action Weekday Ridership by Station

	AM Peak Commuter Station Ons	AM Peak Commuter Station Offs	Total Weekday Station Ons
New Haven Union / Metro North / Shore Line East	8	218	249
New Haven State Street	82	139	243
North Haven	159	35	213
Wallingford	160	73	256
Meriden	151	36	206
Berlin	83	40	135
Newington	22	44	73
Hartford	90	378	515
Windsor	75	48	135
Windsor Locks	61	19	88
Enfield	84	49	146
Springfield	129	25	169
Total	1,104	1,104	2,428

Source: Wilbur Smith Associates, Revised ConnDOT Model

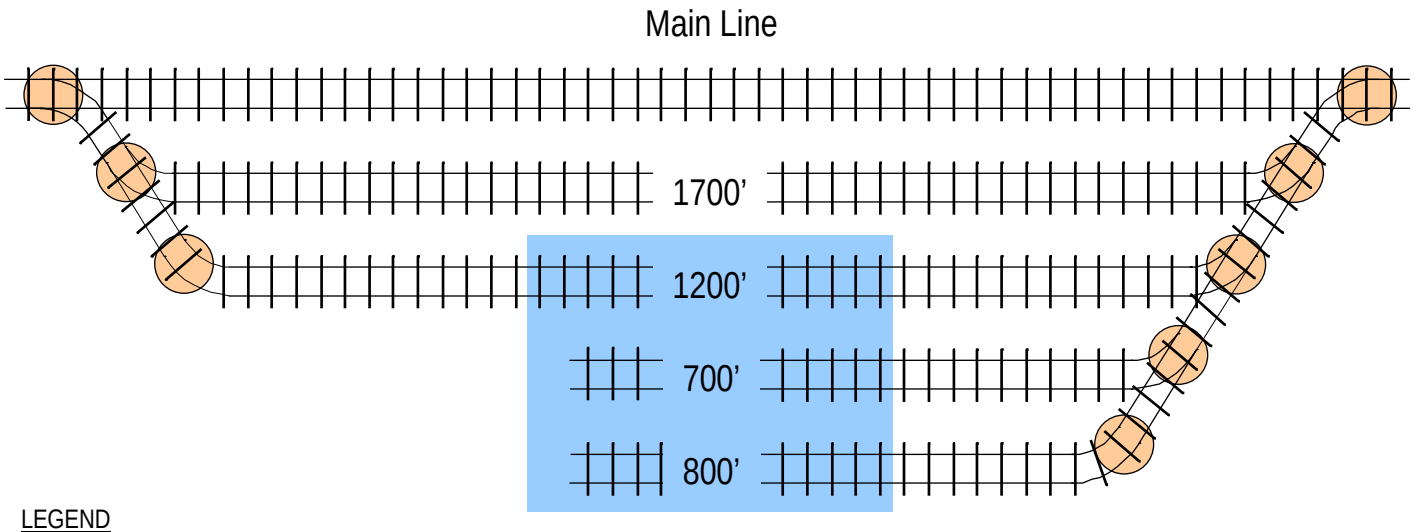
4.4 Maintenance Facility

The Recommended Action requires a new maintenance facility in the New Haven area to service the train sets. Discussions with Connecticut Department of Transportation and Amtrak officials maintaining the Shore Line East equipment in New Haven pointed to the need for a new facility, as the existing Shore Line East facility shared with Metro North cannot handle several more train sets as currently configured. A schematic of the facility is shown in Figure 4-13.

4.4.1 Maintenance Facility Configuration

Conceptually, the facility would include the following:

- A 1,700-foot siding off of the main line track where the rail service equipment would be stored overnight. This includes two switches off the main line. The facility itself would have three tracks: a 1,200-foot run through track linking with the siding and two stub-end tracks, totaling 1,500 track feet. This track arrangement would permit three train sets to be maintained without one blocking the other, and would also provide room for fleet expansion. Facility track feet would total 4,400 feet.



LEGEND

250’ x 500’ insulated pre-fab building

Switch

Notes:

- 1700’ siding off rail line
- 1200’ run through track
- 700’ stub track for work / storage
- 800’ stub track for work / storage

MAINTENANCE FACILITY SCHEMATIC FOR RECOMMENDED ACTION

ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

FIGURE 4-13

- The facility would include a 250-foot by 500-foot insulated prefabricated metal shop building with a cast in-place concrete floor, work bench/shop area, small office area and utility / restroom area.
- The area around the building would be paved, including a paved access road to the facility tracks. The areas on each side of and between the rails would also be paved to facilitate all weather vehicular access to the rail equipment.
- The site improvements around the facility – including the building and surrounding yard area, access roads, and rail equipment tracks – would be illuminated.
- The maintenance facility would be furnished with the appropriate maintenance tools and necessary supplies and equipment for routine servicing and cleaning of the rail equipment including four 100-ton screw jacks, crane or hoist, and welding, grinding, bending and machining equipment and fueling facility. The facility would have its own electrical generator in case of a local power failure.
- The maintenance facility would be furnished with a 4x4 pickup for maintaining the parking areas and maintenance access areas.

4.4.2 Maintenance Facility Location

The first consideration that was given to providing a maintenance facility was to consider existing facilities for both Metro North Railroad and Shore Line East service. Amtrak maintains trains for Shore Line East in a facility near New Haven's Union Station that is shared with Metro North (which uses that facility for car rebuilding). ConnDOT has indicated that Metro North's main railroad equipment maintenance facility for railroad equipment in New Haven is obsolete and undersized for the increasing scope and magnitude of its passenger railroad operations. Furthermore, according to Amtrak's head of Shore Line East maintenance operations, there is not enough room to accommodate the additional train sets that would be needed for a NH-H-S service. Metro North's activities are already constrained at this facility, and Amtrak's use of the facility is for three shifts, 24 hours a day. Even if this site had additional capacity for a NH-H-S rail maintenance facility, it would likely be incompatible with the proposed service's needs as the Metro North facility currently is used for maintaining electric equipment, and the NH-H-S train sets would be diesel sets. There is the future potential for Shore Line East service to be electric trains in the future (with diesel train sets transferred to the NH-H-S operation).

In ConnDOT's June, 2002 *Fleet Configuration Analysis* study for Metro North's New Haven Line, it was determined that a newly-available four-acre parcel adjacent to the New Haven yard at Union Station was the most appropriate location for a collection of new or enlarged Metro North maintenance facilities; alternate sites in East Bridgeport and Stamford for Metro North were also evaluated and did not contain adequate space.

The Amtrak-owned Cedar Hill yard (described below) on the New Haven/Hamden/North Haven border was also considered for Metro North in that study, but it not meet Metro North's needs well for several reasons. First, Cedar Hill is two miles off of the end of Metro North service, which would increase operating costs. Also, for Metro North trains to access the yard, trains must cross a restricted single-track segment over an old bridge. Potential environmental cleanup costs were also cited. In addition, the Cedar Hill Yard is not served by overhead electrical catenary as is the Metro North line, and therefore, electrification would need to be extended to this site or else Metro North trains would need to be pulled into and out of the site.

All the sites considered for an NH-H-S maintenance facility were in the vicinity of New Haven for several reasons. First, this location offers the most flexibility to share trains with the SLE service if needed. Secondly, at the end of the line, the New Haven vicinity would minimize offline travel before or after maintenance activities. Finally, a site at the Springfield end was not considered desirable as ConnDOT has indicated that control of the maintenance operations of this facility should remain under their jurisdiction in Connecticut.

For the NH-H-S facility needs, an additional four-track area in the New Haven Union Station yard was considered, but Metro North uses that area for storage and has plans for a truck and wheel shop.

A field review was made of areas that could accommodate a maintenance facility south of Milepost 7 (Springfield Line bridge over Quinnipiac River in North Haven) with a preference for locations closer to New Haven. The evaluation considered the space needs for a maintenance facility. Three sites were identified, all of which had similar shortcomings concerning the cost of potential environmental remediation and distance from the New Haven Station requiring additional operating costs to transport vehicles to the maintenance facility. The following are the sites that were considered to have adequate room for a maintenance facility, shown in order of preference:

Amtrak Cedar Hill Yard

Heading north out of New Haven's Union Station, the Springfield line crosses the Mill River (milepost 1.48) and Mill River interlocking and then opens into a large area historically known as the Cedar Hill Yard. Cedar Hill was historically a major switching point in New England, comprising what is now Amtrak's operations on the New Haven – Hamden border, as well as what is now CSX's Cedar Hill Yard on its Middletown line, located across the Quinnipiac River, several miles north of New Haven (stretching as far north as Universal Drive and I-91 Exit 9 in North Haven). The Northeast Corridor line heading east towards Old Saybrook also diverges from these other two lines in this area.

The Amtrak portion of the Cedar Hill Yard runs between about Milepost 2.1 and Milepost 3.1. The rail yard appears to have a number of open areas that store lumber or

other bulk materials and could be reconfigured in some fashion to accommodate the maintenance facility.

A large petroleum storage tank farm is located on the north end of the yard, and just to the east of this area is an area away from the rest of the yard that follows a set of tracks (which joins back with the main Springfield Line further north). This is a substantial storage area for storing rail and ties. This area could likely accommodate a maintenance facility as well if the bulk materials could be relocated or more efficiently stored.

A previous study by ConnDOT evaluated the potential for siting a maintenance facility in the area of the Cedar Hill Yard. This study did not look at the CSX facility, only the existing Amtrak facility. Amtrak has indicated a willingness to sell this yard to ConnDOT under the condition that ConnDOT would take on the liability associated with contamination at the site (i.e., Amtrak is absolved on liability). Cleanup costs were estimated at $7 million.

CSX Cedar Hill Yard

In addition to continuing northeast to Middletown, the CSX line also merges back into Amtrak's Springfield Line further north and therefore might serve as an alternative location for a maintenance facility if the Amtrak Springfield Line does not prove feasible. The CSX line diverges from the Springfield Line at the southern end of the Amtrak Cedar Hill Yard. There are piles of building supplies in this area between the Amtrak and CSX tracks, where Anastasio Trucking trans-loads materials from CSX. The Providence and Worcester Railroad also operates along these tracks.

At the north end, the CSX Cedar Hill Yard includes a bulk transfer facility, accessed in several locations off of Universal Drive in North Haven (Exit 9 off of I-91). South of the bulk transfer area is an expansive open stretch of straight track within low-lying land (probably mostly wetland) associated with the Quinnipiac River, visible in the distance from Interstate 91 between Exits 8 and 9. Aerial maps imply that this area historically had many more tracks than it does today, and much of it appears to have been disturbed, and likely filled to raise its elevation. Another issue of concern is that the New Haven landfill (at I-91 Exit 8) abuts this yard.

In general, the CSX Cedar Hill Yard in the bulk transfer area and/or the open areas to the south would appear to offer a substantial amount of room to accommodate a facility. Assuming the yard could be purchased by ConnDOT for NH-H-S services or the existing CSX use of the yard could be accommodated in conjunction with a new commuter rail maintenance facility, it is likely that the maintenance facility could be constructed within the existing "footprint" of filled and disturbed areas without affecting wetlands. It should be noted that similar contamination issues to the Amtrak yard could likely be present here, in part because of the rail operations, and also because the landfill.

Former Dow Chemical/Upjohn Site

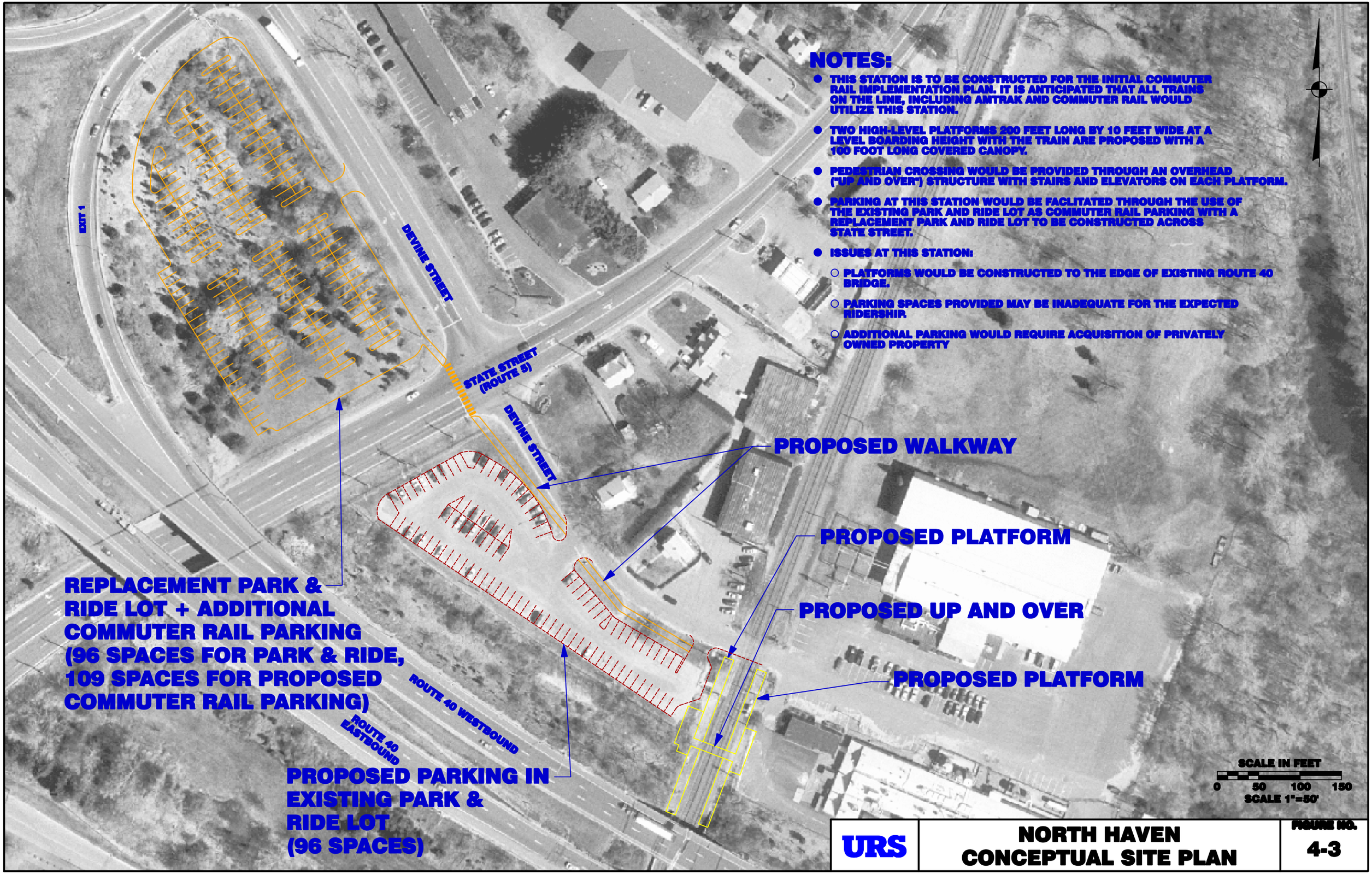
A sizable vacant parcel in North Haven, immediately south of Route 40, roughly between Mileposts 6.0 and 6.3 is a vacant site at 41 Stiles Lane that is immediately east of the Springfield Line. The site is signed with notices indicating likely contamination. According to the EPA's Envirofacts Warehouse – Facility Registry System website, it is a Toxics Release Inventory listing site and hazardous waste handler that has gone under several names in the past, including Dow Chemical Company North Haven Laboratories, Upjohn Fine Chemical Division, and Pharmacia. While no further research was performed into the level of contamination at this site, it is clear that this property is likely under remediation or a candidate for remediation.

4.5 Full-build Improvements

This chapter has described the elements necessary for a start-up service for the New Haven to Springfield Commuter Rail service. In addition to these elements, a number of improvements are envisioned for future service on the line. These include:

- Double-track the remaining 20.6 miles of single track sections to improve reliability and allow service at least as frequent as every 15 minutes;
- Construct second high-level platforms and grade-separated pedestrian facilities at Wallingford, Berlin and Windsor Locks Stations, necessary with additional double-track segments;
- Construct an additional station in the Wharton Brook area on the former Pratt and Whitney property as development takes place;
- Provide new commuter rail parking in the new Meriden parking structure to be constructed with downtown development plans in Meriden.

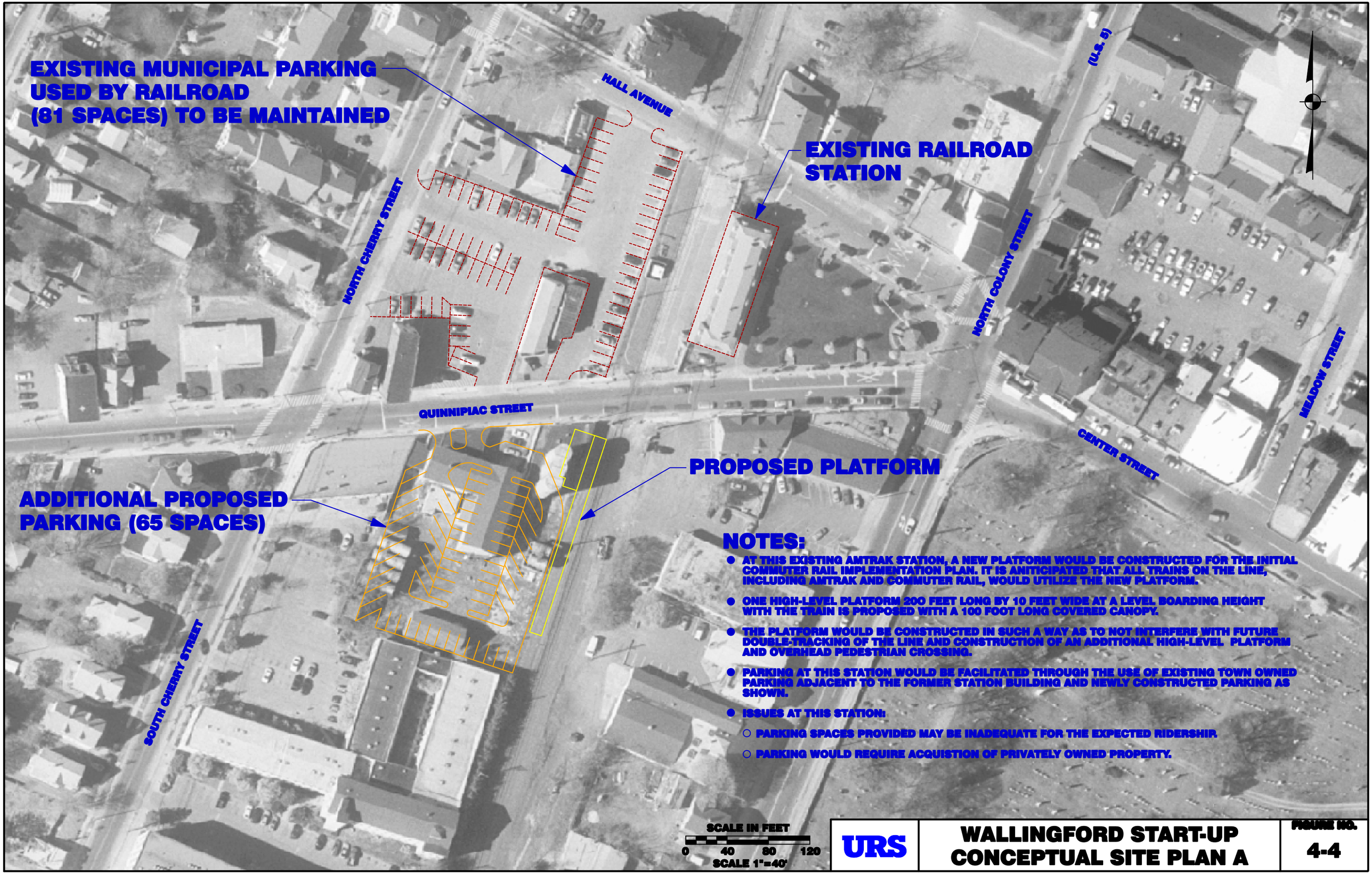
Plan-level drawings of the full-build stations that differ from start-up service are shown in Figure 4-14 through Figure 4-19. Renderings of each full-build station are shown in Figure 4-20 through Figure 4-29.



URS

NORTH HAVEN CONCEPTUAL SITE PLAN

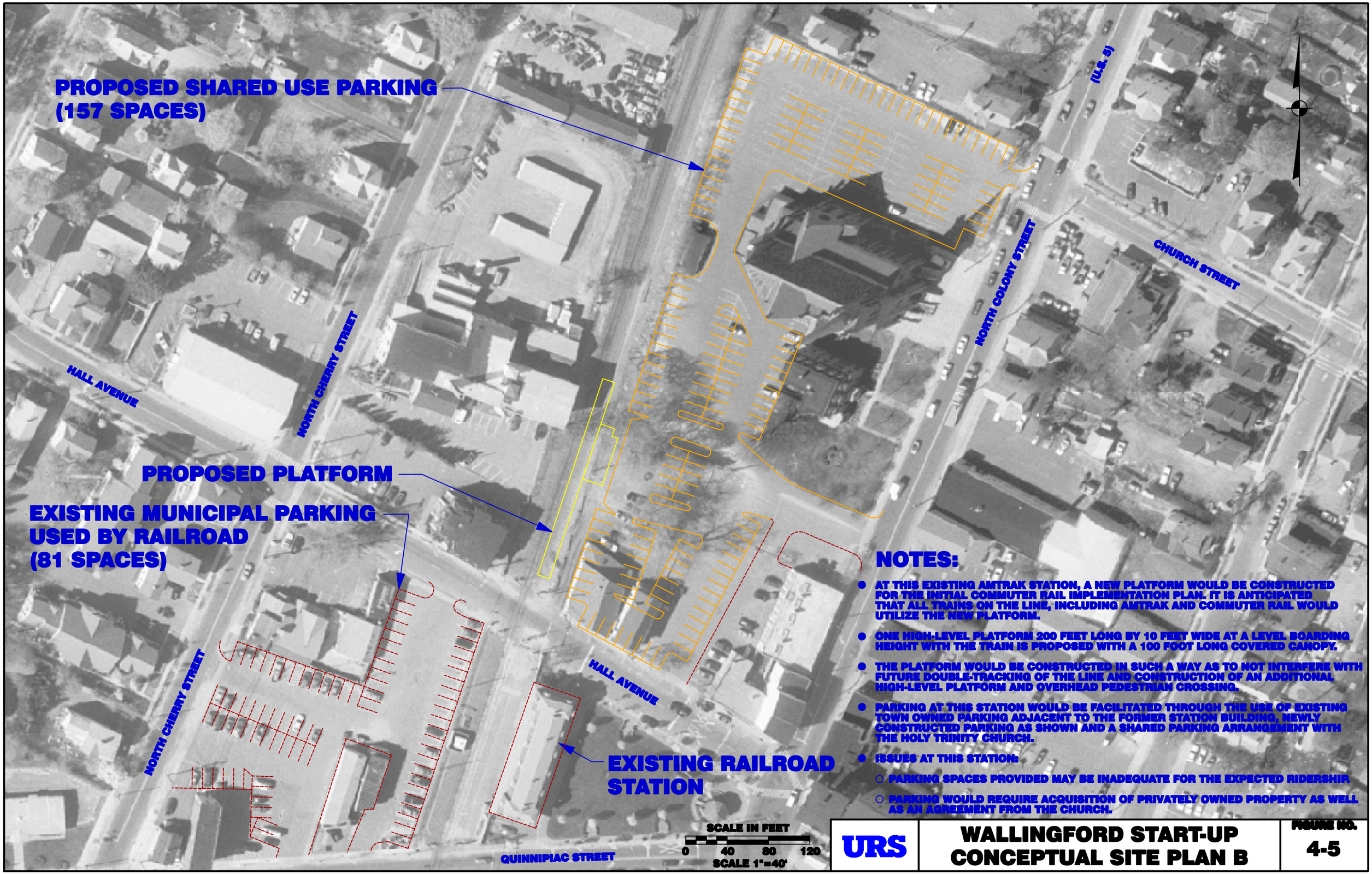
FIGURE NO. 4-3



URS

WALLINGFORD START-UP CONCEPTUAL SITE PLAN A

FIGURE NO. 4-4



NOTES:

- AT THIS EXISTING AMTRAK STATION, A NEW PLATFORM WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORM.
- ONE HIGH-LEVEL PLATFORM 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN IS PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- THE PLATFORM WOULD BE CONSTRUCTED IN SUCH A WAY AS TO NOT INTERFERE WITH FUTURE DOUBLE-TRACKING OF THE LINE AND CONSTRUCTION OF AN ADDITIONAL HIGH-LEVEL PLATFORM AND OVERHEAD PEDESTRIAN CROSSING.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE USE OF EXISTING TOWN OWNED PARKING ADJACENT TO THE FORMER STATION BUILDING, NEWLY CONSTRUCTED PARKING AS SHOWN AND A SHARED PARKING ARRANGEMENT WITH THE HOLY TRINITY CHURCH.
- ISSUES AT THIS STATION:
  - PARKING SPACES PROVIDED MAY BE INADEQUATE FOR THE EXPECTED RIDERSHIP
  - PARKING WOULD REQUIRE ACQUISITION OF PRIVATELY OWNED PROPERTY AS WELL AS AN AGREEMENT FROM THE CHURCH.

URS	WALLINGFORD START-UP CONCEPTUAL SITE PLAN B	FIGURE NO. 4-5

NOTES:

- AT THIS EXISTING AMTRAK STATION, NEW PLATFORMS WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORMS.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE PROVIDED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS ON EACH PLATFORM.
- PARKING AT THIS STATION WOULD BE TEMPORARY PENDING THE FUTURE DEVELOPMENT OF THE CITY OWNED SITE ON WHICH IT SHOWN. PERMANENT PARKING WOULD BE IN THE FORM OF A SHARED PARKING DECK AS PART OF THE MERIDEN CITY CENTER INITIATIVE PLAN.
- THE EXISTING AMTRAK STATION WOULD BE REPLACED WITH A FUTURE MULTI-MODAL CENTER AT THE FORMER POST OFFICE LOCATION ONCE FUNDING FOR THE MULTI-MODAL CENTER IS SECURED.

URS

MERIDEN
CONCEPTUAL SITE PLAN

FIGURE NO.
4-6

NOTES:

- AT THIS EXISTING AMTRAK STATION, A NEW PLATFORM WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORM.
- ONE HIGH-LEVEL PLATFORM 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN IS PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- THE PLATFORM WOULD BE CONSTRUCTED IN SUCH A WAY AS TO NOT INTERFERE WITH FUTURE DOUBLE-TRACKING OF THE LINE AND CONSTRUCTION OF AN ADDITIONAL HIGH-LEVEL PLATFORM AND OVERHEAD PEDESTRIAN CROSSING.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE USE OF EXISTING PARKING ADJACENT TO THE STATION BUILDING AND NEWLY CONSTRUCTED PARKING AS SHOWN.
- ISSUES AT THIS STATION:
  - PARKING WOULD REQUIRE ACQUISITION OF PRIVATELY OWNED PROPERTY.

EXISTING RAILROAD PARKING (49 SPACES) TO BE MAINTAINED

EXISTING RAILROAD STATION

PROPOSED PLATFORM

PROPOSED PARKING (6 SPACES)

PROPOSED PARKING (140 SPACES)

FARMINGTON AVENUE

MAIN STREET

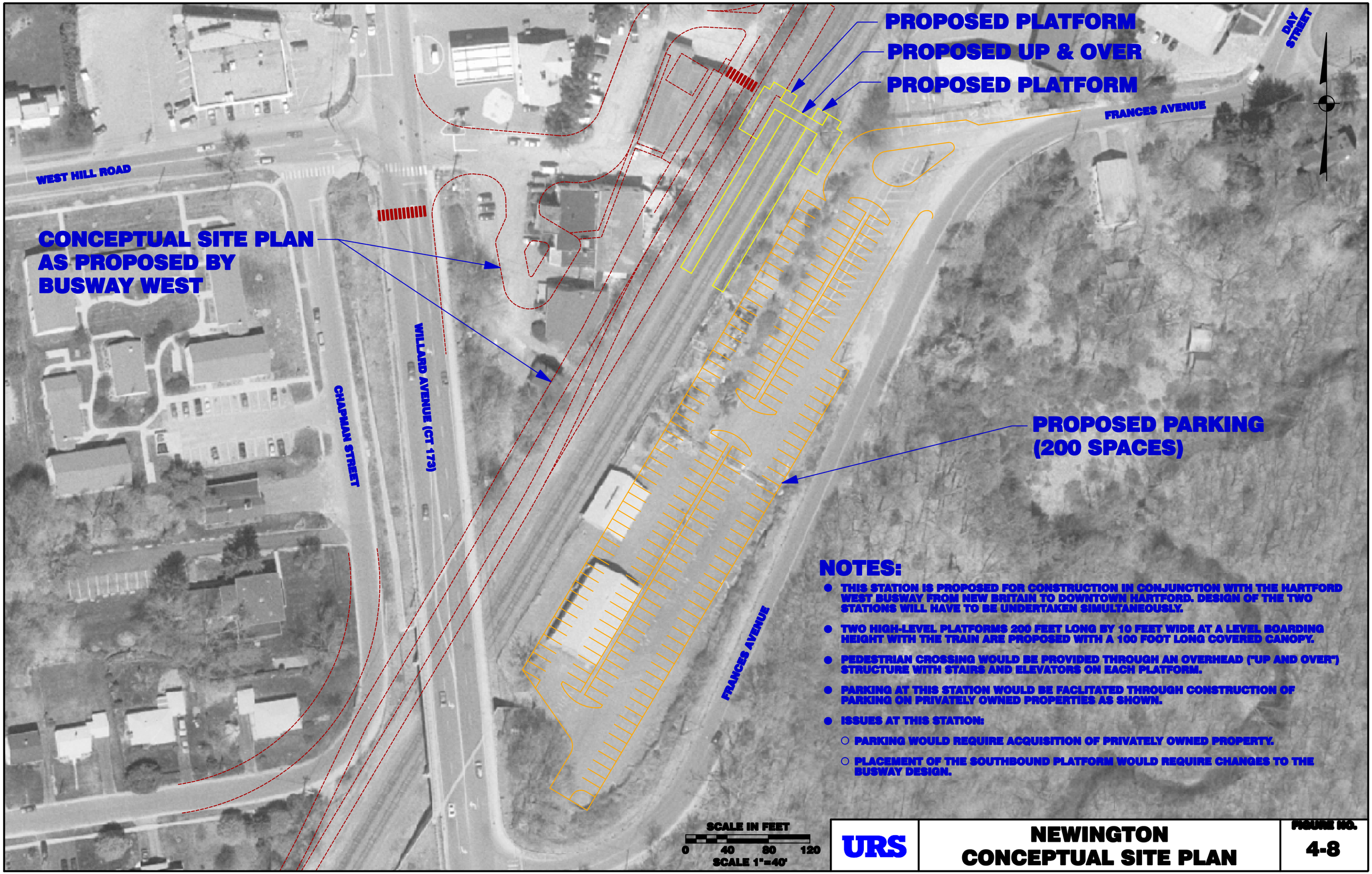
(CT 372)

SCALE IN FEET
0 40 80 120
SCALE 1"=40'

URS

BERLIN START-UP CONCEPTUAL SITE PLAN

FIGURE NO. 4-7



URS

NEWINGTON CONCEPTUAL SITE PLAN

FIGURE NO.
4-8

NOTES:

- AT THIS EXISTNIG AMTRAK STATION, THE EXISTING LOW-LEVEL PLATFORM WOULD BE MODIFIED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. ONE CENTER ISLAND HIGH-LEVEL PLATFORM 200 FEET LONG IS PROPOSED ON THE NORTHERN PORTION OF THE EXISITNG PLATFORM TO ENABLE LEVEL BOARDING WITH THE TRAIN.
- STATION ACCESS WOULD REMAIN AS CURRENTLY CONFIGURED AND NO NEW PARKING WOULD BE PROVIDED.
- THE EXISTING WALKWAY ALONG THE RAIL LINE BETWEEN UNION STATION AND THE LEGISLATIVE OFFICE BUILDING WOULD BE ENHANCED WITH LIGHTING, LANSCAPING AND COVERING FROM THE ELEMENTS.

PROPOSED RAISED PLATFORM OVER EXISTING PLATFORM

EXISTING UNION STATION

EXISTING PLATFORM

EXISTING TRANSPORATION CENTER PARKING (195 SPACES)

PROPOSED COVERED WALKWAY

CHURCH STREET
ASYLUM AVENUE
FARMINGTON AVENUE
FLOWER STREET
BROAD STREET
I-84 WESTBOUND
I-84 EASTBOUND
EXIT 48
SPRUCE STREET
UNION PLACE
HIGH STREET
ALLYN STREET
ANN STREET
FORD STREET
PEARL STREET
JEWELL STREET
TRINITY STREET
BUSHNELL PARK
STATE ARMORY
LEGISLATIVE OFFICE BUILDING PARKING GARAGE
CAPITOL BUILDING

SCALE IN FEET
0 100 200 300
SCALE 1"=100'

URS	HARTFORD CONCEPTUAL SITE PLAN	FIGURE NO. 4-9

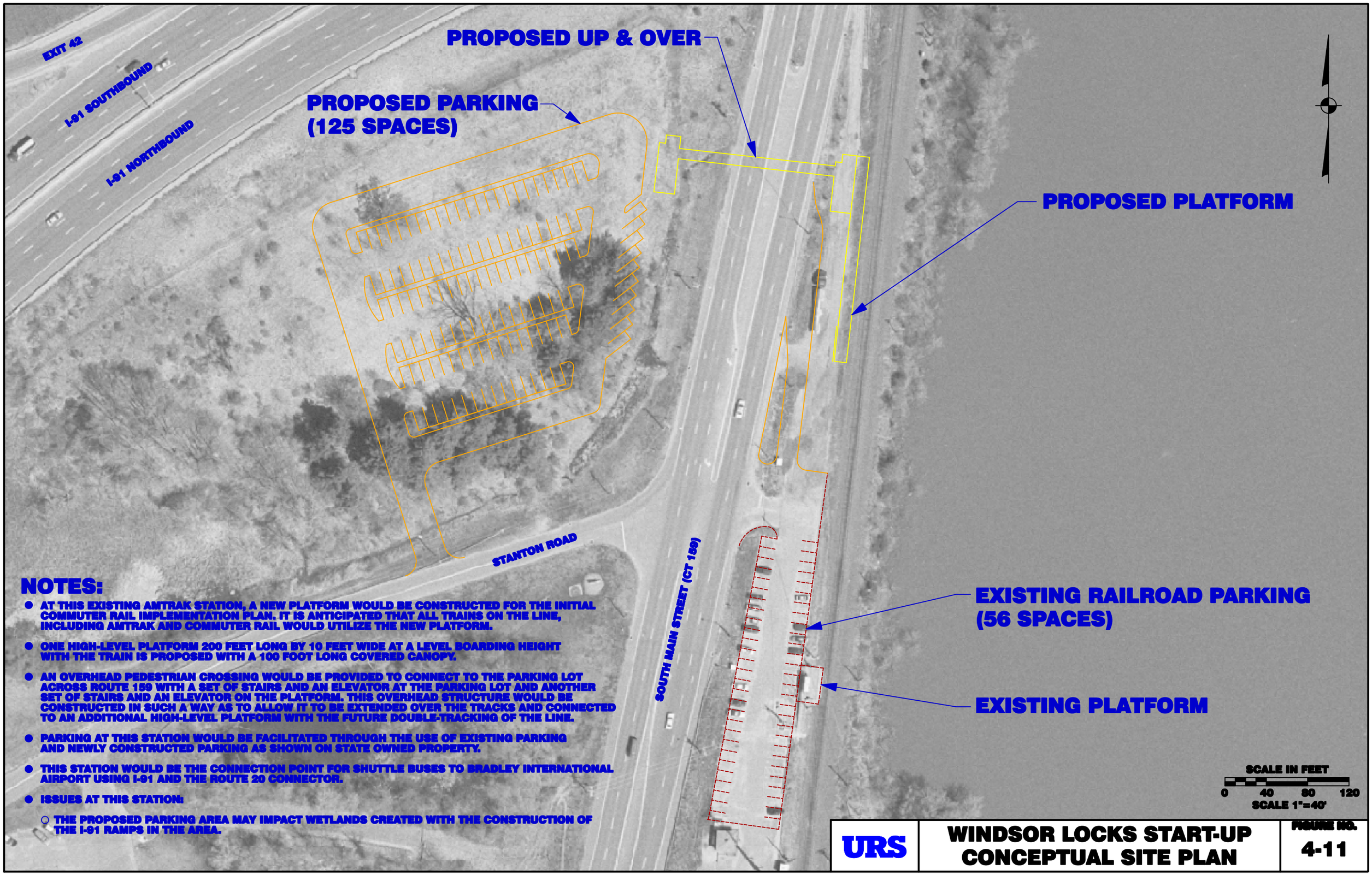
NOTES:

- AT THIS EXISTING AMTRAK STATION, NEW PLATFORMS WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORMS.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE PROVIDED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS ON EACH PLATFORM.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE USE OF EXISTING TOWN OWNED PARKING BEHIND TOWN HALL AND NEWLY CONSTRUCTED PARKING AS SHOWN ON TOWN OWNED PROPERTY.

URS

WINDSOR
CONCEPTUAL SITE PLAN

FIGURE NO. 4-10



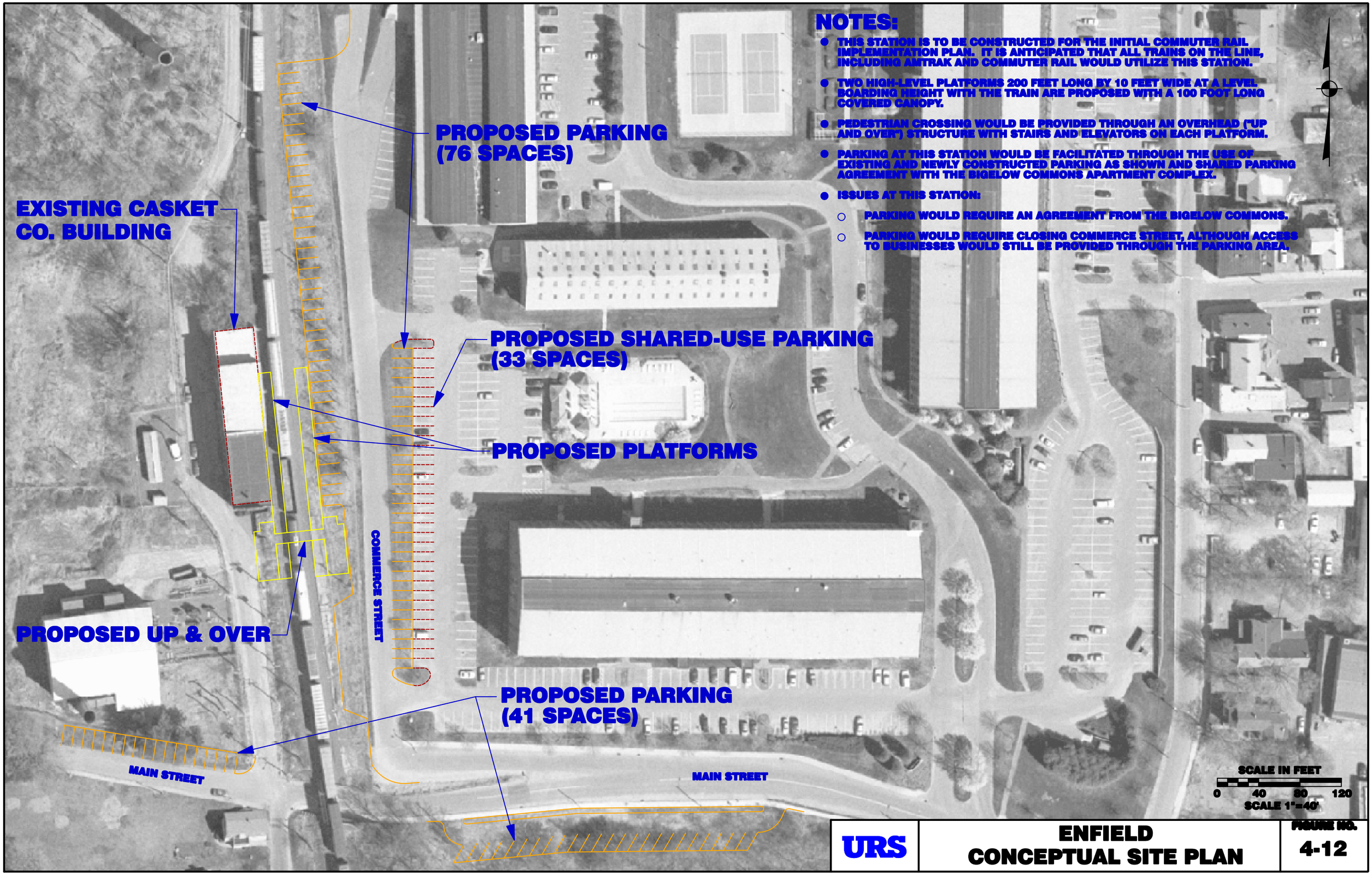
NOTES:

- AT THIS EXISTING AMTRAK STATION, A NEW PLATFORM WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORM.
- ONE HIGH-LEVEL PLATFORM 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN IS PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- AN OVERHEAD PEDESTRIAN CROSSING WOULD BE PROVIDED TO CONNECT TO THE PARKING LOT ACROSS ROUTE 159 WITH A SET OF STAIRS AND AN ELEVATOR AT THE PARKING LOT AND ANOTHER SET OF STAIRS AND AN ELEVATOR ON THE PLATFORM. THIS OVERHEAD STRUCTURE WOULD BE CONSTRUCTED IN SUCH A WAY AS TO ALLOW IT TO BE EXTENDED OVER THE TRACKS AND CONNECTED TO AN ADDITIONAL HIGH-LEVEL PLATFORM WITH THE FUTURE DOUBLE-TRACKING OF THE LINE.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE USE OF EXISTING PARKING AND NEWLY CONSTRUCTED PARKING AS SHOWN ON STATE OWNED PROPERTY.
- THIS STATION WOULD BE THE CONNECTION POINT FOR SHUTTLE BUSES TO BRADLEY INTERNATIONAL AIRPORT USING I-91 AND THE ROUTE 20 CONNECTOR.
- ISSUES AT THIS STATION:
  - THE PROPOSED PARKING AREA MAY IMPACT WETLANDS CREATED WITH THE CONSTRUCTION OF THE I-91 RAMPS IN THE AREA.

URS

WINDSOR LOCKS START-UP CONCEPTUAL SITE PLAN

FIGURE NO. 4-11



NOTES:

- THIS STATION IS TO BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THIS STATION.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE PROVIDED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS ON EACH PLATFORM.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE USE OF EXISTING AND NEWLY CONSTRUCTED PARKING AS SHOWN AND SHARED PARKING AGREEMENT WITH THE BIGELOW COMMONS APARTMENT COMPLEX.
- ISSUES AT THIS STATION:
  - PARKING WOULD REQUIRE AN AGREEMENT FROM THE BIGELOW COMMONS.
  - PARKING WOULD REQUIRE CLOSING COMMERCE STREET, ALTHOUGH ACCESS TO BUSINESSES WOULD STILL BE PROVIDED THROUGH THE PARKING AREA.

URS	ENFIELD CONCEPTUAL SITE PLAN	FIGURE NO. 4-12

NOTES:

- ALTHOUGH NOT INCLUDED IN THE INITIAL IMPLEMENTATION PLAN, THIS STATION IS PROPOSED FOR CONSTRUCTION IN CONJUNCTION WITH NEW DEVELOPMENT ON THE FORMER PRATT AND WHITNEY SITE.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE FACILITATED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS ON EACH PLATFORM.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE CONSTRUCTION OF A NEW PARKING LOT.
- POTENTIAL ISSUES AT THIS STATION:
  - SIGHT LINES AND QUEING OF VEHICLES MAY BE A PROBLEM BETWEEN THE PARKING LOT DRIVEWAY AND THE WASHINGTON AVENUE INTERSECTION.

PROPOSED UP & OVER

PROPOSED PLATFORM

PROPOSED PLATFORM

PRATT & WHITNEY ACCESS ROAD

PROPOSED PARKING
(112 SPACES)

WASHINGTON AVENUE

(U.S. 5)

SCALE IN FEET
0 40 80 120
SCALE 1"=40'

URS

WHARTON BROOK FULL-BUILD CONCEPTUAL SITE PLAN

FIGURE NO.
4-14

EXISTING MUNICIPAL PARKING
USED BY RAILROAD
(81 SPACES) TO BE MAINTAINED

HALL AVENUE

EXISTING RAILROAD
STATION

NORTH CHERRY STREET

NORTH COLONY STREET

(U.S. 5)

MEADOW STREET

CENTER STREET

PROPOSED UP & OVER

QUINNIPIAC STREET

ADDITIONAL PROPOSED
PARKING (65 SPACES)

SOUTH CHERRY STREET

PROPOSED PLATFORMS

NOTES:

- AT THIS EXISTING AMTRAK STATION, NEW PLATFORMS WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANITICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL, WOULD UTILIZE THE NEW PLATFORMS.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE PROVIDED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS ON EACH PLATFORM.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE USE OF EXISTING TOWN OWNED PARKING ADJACENT TO THE FORMER STATION BUILDING AND NEWLY CONSTRUCTED PARKING AS SHOWN.
- ISSUES AT THIS STATION:
  - PARKING SPACES PROVIDED MAY BE INADEQUATE FOR THE EXPECTED RIDERSHIP.
  - PARKING WOULD REQUIRE ACQUISTION OF PRIVATELY OWNED PROPERTY.

SCALE IN FEET
0 40 80 120
SCALE 1"=40'

URS

WALLINGFORD FULL-BUILD CONCEPTUAL SITE PLAN A

FIGURE NO.
4-15

PROPOSED SHARED USE PARKING
(157 SPACES)

PROPOSED UP & OVER

PROPOSED PLATFORM

PROPOSED PLATFORM

EXISTING MUNICIPAL PARKING
USED BY RAILROAD
(81 SPACES)

EXISTING RAILROAD
STATION

HALL AVENUE

NORTH CHERRY STREET

NORTH COLONY STREET

CHURCH STREET

(U.S. 5)

QUINNIPIAC STREET

SCALE IN FEET
0 40 80 120
SCALE 1"=40'

NOTES:

- AT THIS EXISTING AMTRAK STATION, NEW PLATFORMS WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORMS.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE PROVIDED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS ON EACH PLATFORM.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE USE OF EXISTING TOWN OWNED PARKING ADJACENT TO THE FORMER STATION BUILDING, NEWLY CONSTRUCTED PARKING AS SHOWN AND A SHARED PARKING ARRANGEMENT WITH THE HOLY TRINITY CHURCH.
- ISSUES AT THIS STATION:
  - PARKING SPACES PROVIDED MAY BE INADEQUATE FOR THE EXPECTED RIDERSHIP
  - PARKING WOULD REQUIRE ACQUISITION OF PRIVATELY OWNED PROPERTY AS WELL AS AN AGREEMENT FROM THE CHURCH.

URS	WALLINGFORD FULL-BUILD CONCEPTUAL SITE PLAN B	FIGURE NO. 4-16

NOTES:

- AT THIS EXISTING AMTRAK STATION, NEW PLATFORMS WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORMS.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE PROVIDED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS ON EACH PLATFORM.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH USE OF EXISTING PARKING ADJACENT TO THE STATION BUILDING AND NEWLY CONSTRUCTED PARKING AS SHOWN.
- THE STATION BUILDING AT THIS SITE IS RANKED AS FIRST ON A REGIONAL LIST OF TRANSPORATION ENHANCEMENT PROJECTS CURRENTLY SEEKING FUNDING.
- ISSUES AT THIS STATION:
  - PARKING WOULD REQUIRE ACQUISITION OF PRIVATELY OWNED PROPERTY.

EXISTING RAILROAD PARKING (49 SPACES) TO BE MAINTAINED

PROPOSED PLATFORM

EXISTING RAILROAD STATION

PROPOSED UP & OVER

PROPOSED PLATFORM

PROPOSED PARKING (6 SPACES)

PROPOSED PARKING (140 SPACES)

FARMINGTON AVENUE

MAIN STREET

(CT 372)

SCALE IN FEET
0 40 80 120
SCALE 1"=40'

URS

BERLIN FULL-BUILD CONCEPTUAL SITE PLAN A

FIGURE NO. 4-17

NOTES:

- AT THIS EXISTING AMTRAK STATION, NEW PLATFORMS WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORMS.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE PROVIDED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS AT EACH PLATFORM.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH USE OF EXISTING PARKING ADJACENT TO THE STATION BUILDING AND NEWLY CONSTRUCTED PARKING AS SHOWN.
- THE STATION BUILDING AT THIS SITE IS RANKED AS FIRST ON REGIONAL LIST OF TRANSPORATION ENHANCEMENT PROJECTS CURRENTLY SEEKING FUNDING.
- ISSUES AT THIS STATION:
  - PARKING WOULD REQUIRE ACQUISITION OF RAILROAD OWNED PROPERTY.
  - PARKING WOULD REQUIRE APPROVAL FOR A NEW GRADE CROSSING.

PROPOSED PARKING (168 SPACES)

PROPOSED UP & OVER

PROPOSED PLATFORM

EXISTING RAILROAD PARKING (68 SPACES)

PROPOSED GRADE CROSSING

EXISTING RAILROAD STATION

HARDING STREET

NEW BRITAIN AVENUE

FARMINGTON AVENUE

(CT 372)

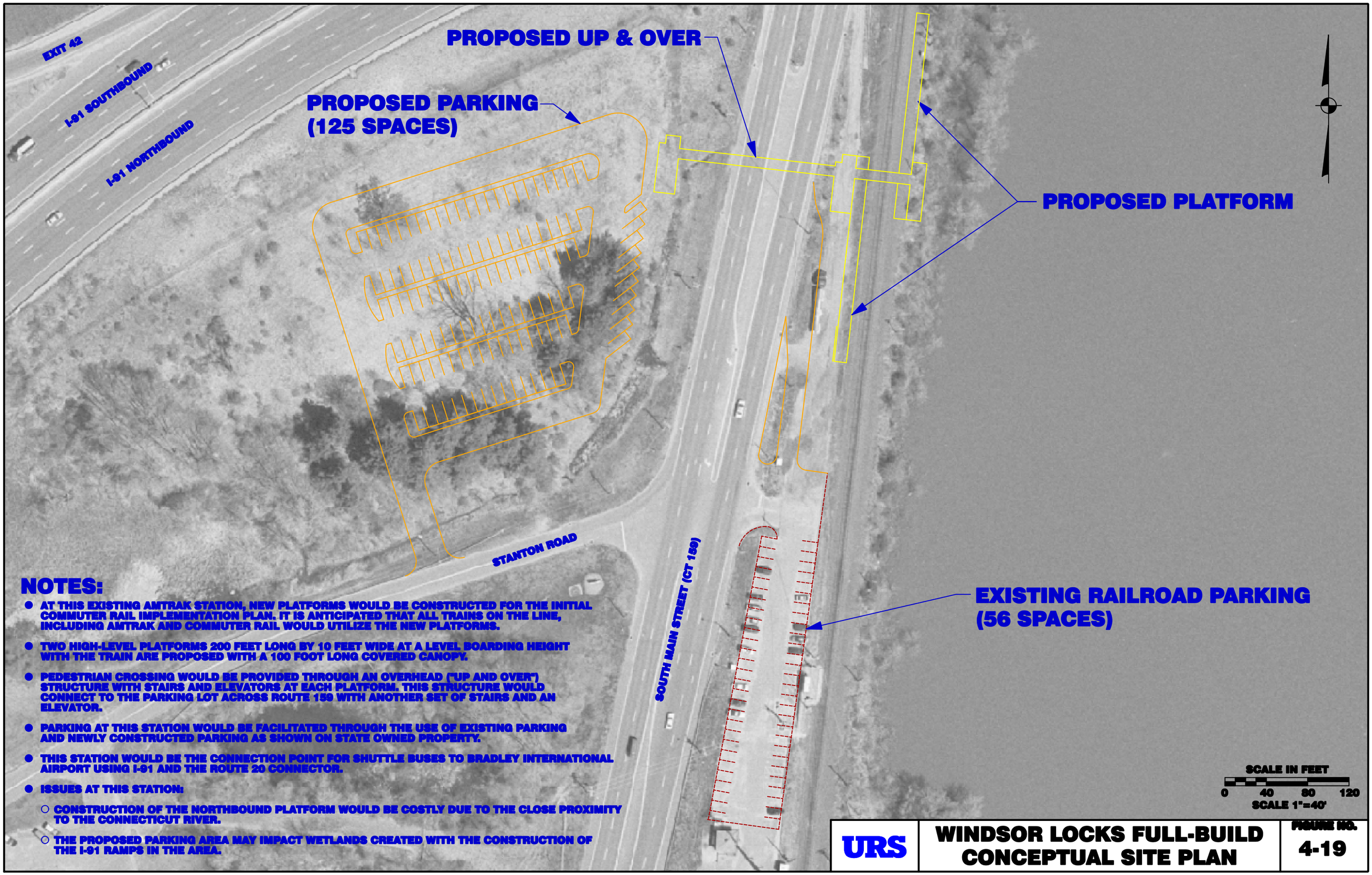
MAIN STREET

SCALE IN FEET
0 60 120 180
SCALE 1"=60'

URS

BERLIN FULL-BUILD CONCEPTUAL SITE PLAN B

FIGURE NO. 4-18



NOTES:

- AT THIS EXISTING AMTRAK STATION, NEW PLATFORMS WOULD BE CONSTRUCTED FOR THE INITIAL COMMUTER RAIL IMPLEMENTATION PLAN. IT IS ANTICIPATED THAT ALL TRAINS ON THE LINE, INCLUDING AMTRAK AND COMMUTER RAIL WOULD UTILIZE THE NEW PLATFORMS.
- TWO HIGH-LEVEL PLATFORMS 200 FEET LONG BY 10 FEET WIDE AT A LEVEL BOARDING HEIGHT WITH THE TRAIN ARE PROPOSED WITH A 100 FOOT LONG COVERED CANOPY.
- PEDESTRIAN CROSSING WOULD BE PROVIDED THROUGH AN OVERHEAD ("UP AND OVER") STRUCTURE WITH STAIRS AND ELEVATORS AT EACH PLATFORM. THIS STRUCTURE WOULD CONNECT TO THE PARKING LOT ACROSS ROUTE 159 WITH ANOTHER SET OF STAIRS AND AN ELEVATOR.
- PARKING AT THIS STATION WOULD BE FACILITATED THROUGH THE USE OF EXISTING PARKING AND NEWLY CONSTRUCTED PARKING AS SHOWN ON STATE OWNED PROPERTY.
- THIS STATION WOULD BE THE CONNECTION POINT FOR SHUTTLE BUSES TO BRADLEY INTERNATIONAL AIRPORT USING I-91 AND THE ROUTE 20 CONNECTOR.
- ISSUES AT THIS STATION:
  - CONSTRUCTION OF THE NORTHBOUND PLATFORM WOULD BE COSTLY DUE TO THE CLOSE PROXIMITY TO THE CONNECTICUT RIVER.
  - THE PROPOSED PARKING AREA MAY IMPACT WETLANDS CREATED WITH THE CONSTRUCTION OF THE I-91 RAMPS IN THE AREA.

URS

WINDSOR LOCKS FULL-BUILD CONCEPTUAL SITE PLAN

FIGURE NO.
4-19

STATE STREET-NEW HAVEN STATION
EXPANSION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-20

NORTH HAVEN STATION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-21

FUTURE WALLINGFORD STATION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-22

MERIDEN STATION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-23

FUTURE BERLIN STATION CONCEPT

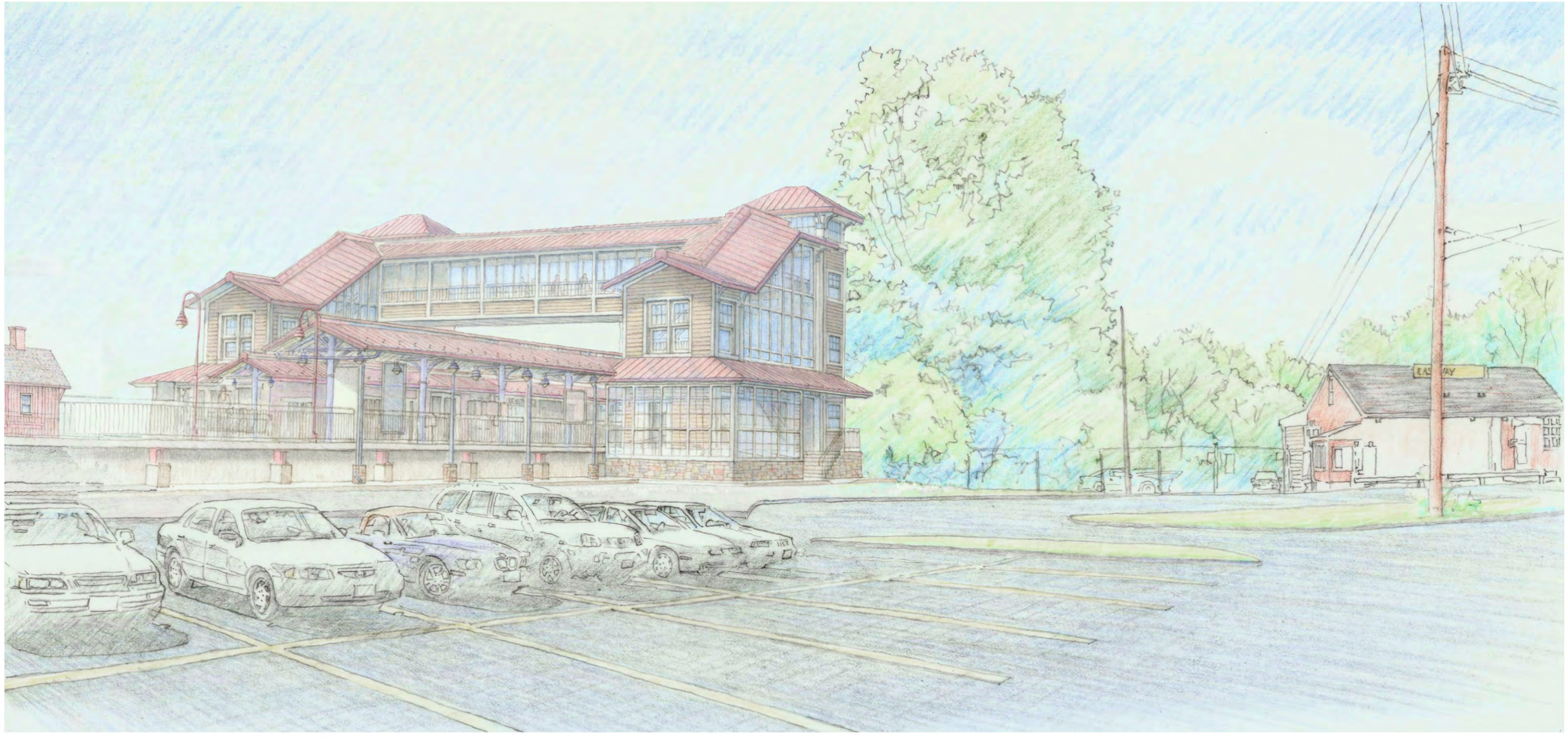
NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-24



NEWINGTON STATION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-25

HARTFORD STATION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-26

WINDSOR STATION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-27

FUTURE WINDSOR LOCKS STATION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-28

ENFIELD STATION CONCEPT

NEW HAVEN - HARTFORD - SPRINGFIELD
COMMUTER RAIL IMPLEMENTATION STUDY

CONNECTICUT DEPARTMENT OF TRANSPORTATION

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

URS

FIGURE NO.
4-29

Chapter 5
System Integration Plan

An integral part of the commuter rail service would be the integration with other freight service on the line, passenger rail service both on the line and connecting, and connecting bus services.

5.1 Freight Integration

While the Springfield Line is an important passenger corridor and can become more so with provision of frequent commuter service during peak travel times, freight service remains an important consideration. The freight service is provided by short line carriers, operating over the line under contractual agreements with Amtrak, which owns the route. The simulations of passenger and freight service confirmed that freight service would need to be operated at times other than the prime commuter hours. Building a commuter and intercity service pattern with frequent trains in each direction make it impractical to run slower freight trains during the period from about 5:30 AM to 9:00 AM, and again from about 3:00 PM to 7:00 PM. Freight service often requires the trains to sit on the main line while switching cars into and out of industrial tracks, and unless the entire line is rebuilt as double track, too many conflicts will occur. However, there are opportunities to move freight over the line during the mid-day hours, particularly for through service between Springfield and New Haven or Springfield and Berlin that does not require switching en-route. After 7:00 PM, the railroad will only see occasional passenger train moves that can be operated together with freight service. Some shortline switching operations that now take place during the mid-day hours will need to be shifted to later time slots. This, of course, is a matter of negotiation between Amtrak and the short line freight carriers, and will need to be reviewed with industrial shippers along the line.

The track additions outlined for the implementation of the initial commuter service are those needed for dependable passenger operation during the busy morning and evening peak travel periods. If it is impossible to shift the local freight movements to a late evening time frame, additional trackage will be needed to accommodate those freight moves along with the planned passenger service.

5.2 Connecting Bus Services

Bus connections would be provided to and from New Haven – Hartford – Springfield rail service at all of the stations included in the Recommended Action. Bus connections would be provided by modifications to existing routes, new routes that will be implemented as part of the New Britain – Hartford Busway, and one new route. The following sections provide an overview of all of these connecting bus services. For routes where alignment, span of service, or frequency changes would be made, those changes are also described.[3]

5.2.1 State Street and New Haven Union Stations

In New Haven, all existing bus services are focused on downtown (see Figure 5-1). Most existing routes—all but five—also serve either Union or State Street stations. With New Haven – Hartford – Springfield rail, changes would be made to the three of the five routes to provide additional connections (see Figure 5-2). Frequency changes would also be made to three other routes to make connections more convenient. With these changes, six routes would provide connections at Union Station and eight routes would provide connections at State Street Station:

State Street Station

- C North Haven
- D Grand Avenue & D Dixwell Avenue
- F East Haven & F West Chapel Street
- G Shelton Avenue/East Chapel Street
- Q State Street/Edgewood Avenue
- Z Goffe Street/Sargent Drive
- Commuter Connection: Downtown NH (AM)
- Commuter Connection: Sargent Drive (AM)

Union Station

- B Whalley Avenue & B Congress Street
- J Whitney Avenue & J Kimberly Avenue
- M Washington Avenue/State Street
- Commuter Connection: Downtown NH (PM)
- Commuter Connection: Sargent Drive (PM)
- Coliseum Parking Shuttle

B Whalley Avenue & B Congress Avenue - Route B's four southern variations (B4, B5, B6, and B7) would be re-routed via Union Station. Since all southern variation trips are through-routed with northern variation trips (B1, B2, and B3), this change would provide connections to Union Station from both the north and the south.

[3] Unless otherwise noted, spans of service and service frequencies would remain as at present.

Figure 5-1
CTTransit New Haven Service

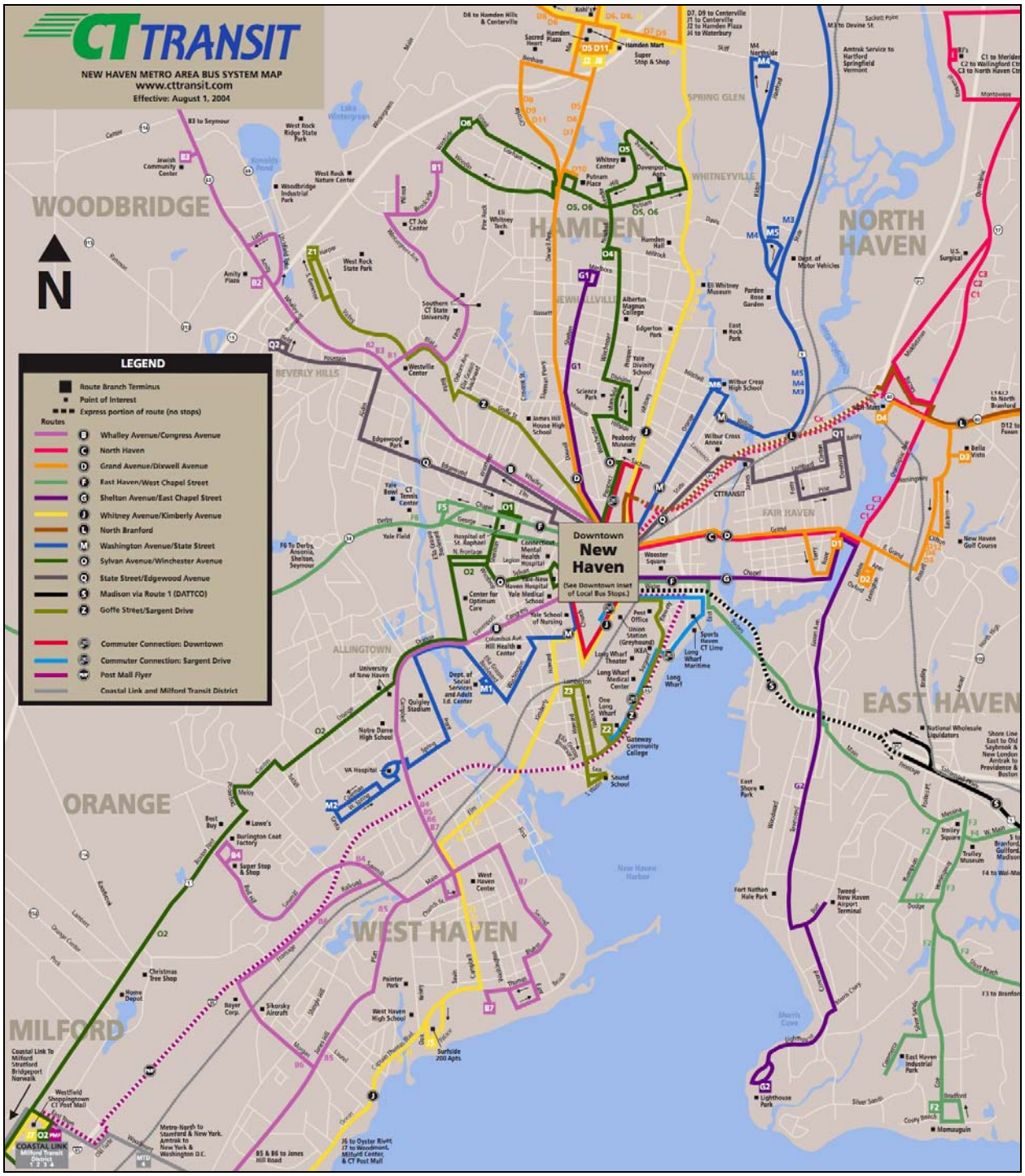
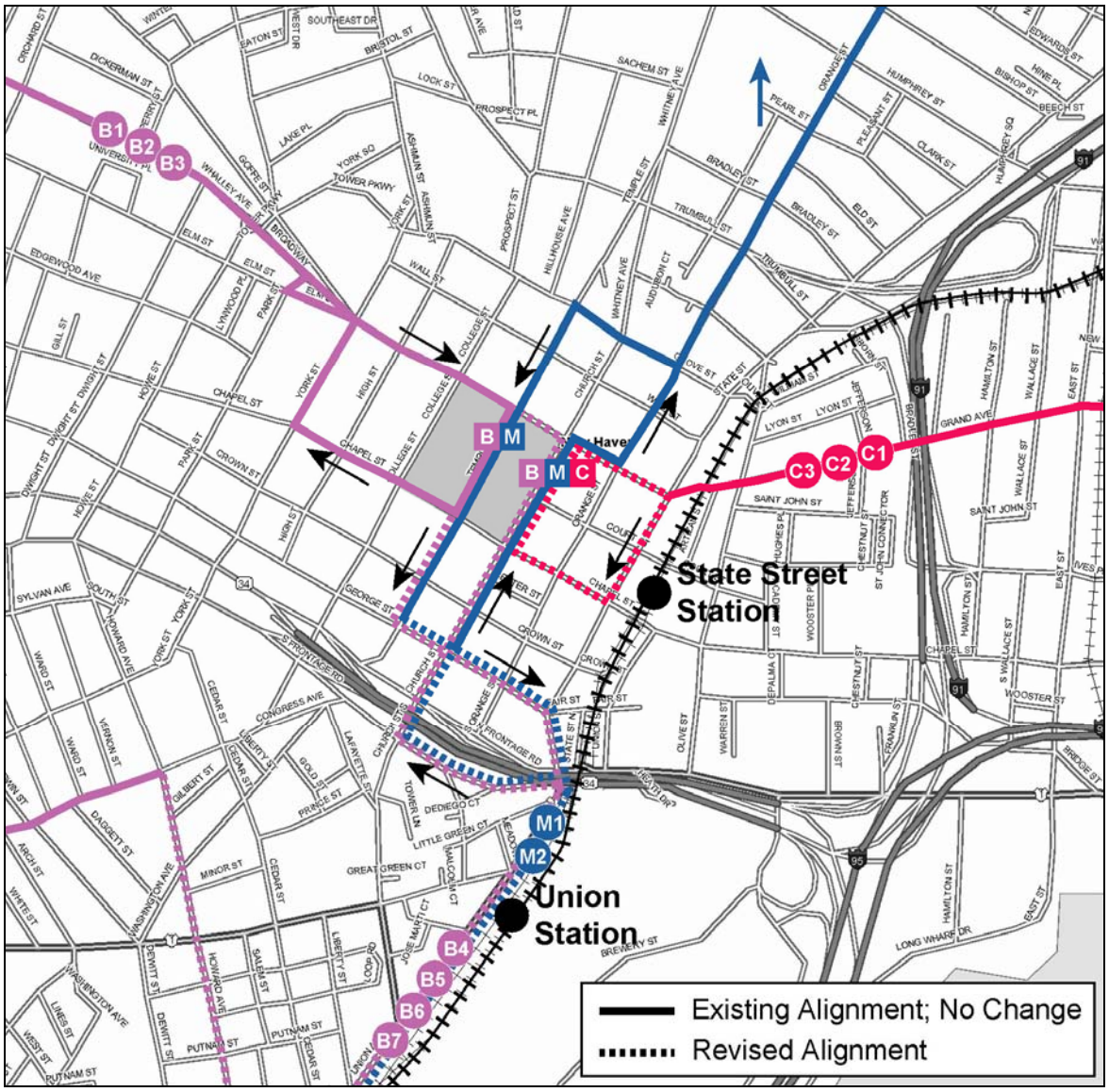


Figure 5-2
CTTransit New Haven Alignment Changes



Note: Only routes with revised alignments are shown.

C North Haven - **CT**TRANSIT-New Haven's Route C, which operates between Meriden and New Haven, would parallel the rail line in a number of areas but would be maintained in order to continue service to local stops between rail stations. However, a number of changes would be made Route C to simplify route operations, and to provide connections at Wallingford, North Haven and State Street stations:

- All C1 service would operate between the Kohl's Terminus in Meriden and downtown New Haven. At Wallingford Station, to provide more convenient connections, the route would be revised slightly to operate into the station.

- All C1x service would operate between the Kohl's Terminus in Meriden and downtown New Haven.
- All C2x service would operate between Route 5 and Cedar Lane and downtown New Haven as a short-turn of C1x.
- All C3 service would operate as C3x between North Haven Station and downtown New Haven.

D Grand Avenue/Dixwell Avenue - Route D, which operates between East Haven and Hamden via downtown New Haven and Station Street Station, would continue to operate along its current alignment.

F East Haven/West Chapel Street - Route F, which operates between East Haven and Orange via downtown New Haven and State Street Station, would continue to operate along its current alignment.

G Shelton Avenue/East Chapel Street - Route G, which operates between East Haven and downtown New Haven via State Street Station, would continue to operate along its current alignment.

J Whitney Avenue/Kimberly Avenue - Route J, which operates between Hamden and New Haven, would continue to operate along its current alignment via Union Station.

M Washington Avenue/State Street - The M1 and M2 Washington Avenue variations of Route M, which operates between Orange and Hamden via downtown New Haven, would be re-routed via Union Station. Combined with the continued through-routing of these Washington Avenue variations with Street variations (M3, M4, M5, and M6), nearly all service would operate via Union Station.

Q State Street/Edgewood Avenue - Route Q State Street/Edgewood Avenue, which operates within New Haven via State Street Station, would continue to operate along its existing alignment.

Z Goffe Street/Sargent Drive - The Z1 variation of Route Z, which operates within New Haven, would be extended from State and Chapel Streets to State Street Station.

Commuter Connection: Downtown New Haven - The Commuter Connection Downtown New Haven route, which operates between the Union and State Street Stations and downtown New Haven, would continue to operate along its existing alignment.

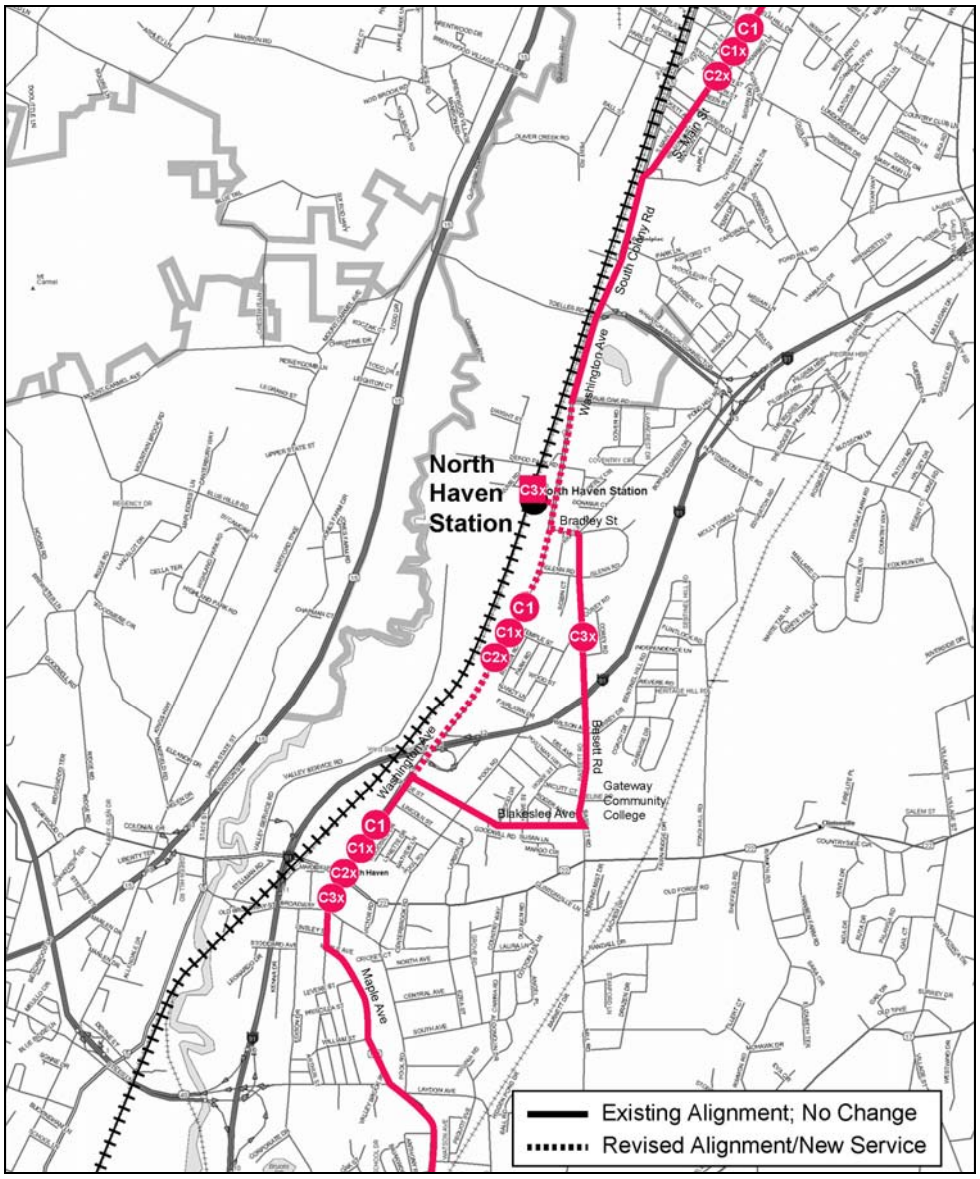
Commuter Connection: Sargent Drive - The Commuter Connection Sargent Drive route, which provides service between Union and State Street Stations and Gateway Community College, Long Wharf Maritime, and the Sport Haven, would continue to operate along its existing alignment.

Temple Street Garage Parking Shuttle - The Temple Street Garage Parking Shuttle, which is a shuttle between the Temple Street Parking Garage and Union Station for Union Station park and ride commuters, would continue to operate along its existing alignment.

5.2.2 North Haven Station

North Haven Station would be served by one route: **CT**TRANSIT's C North Haven. Changes to this route would be as described above in the New Haven Stations section. Service in the vicinity of North Haven station would be as shown in Figure 5-3.

Figure 5-3
Connecting Bus Service at North Haven Station

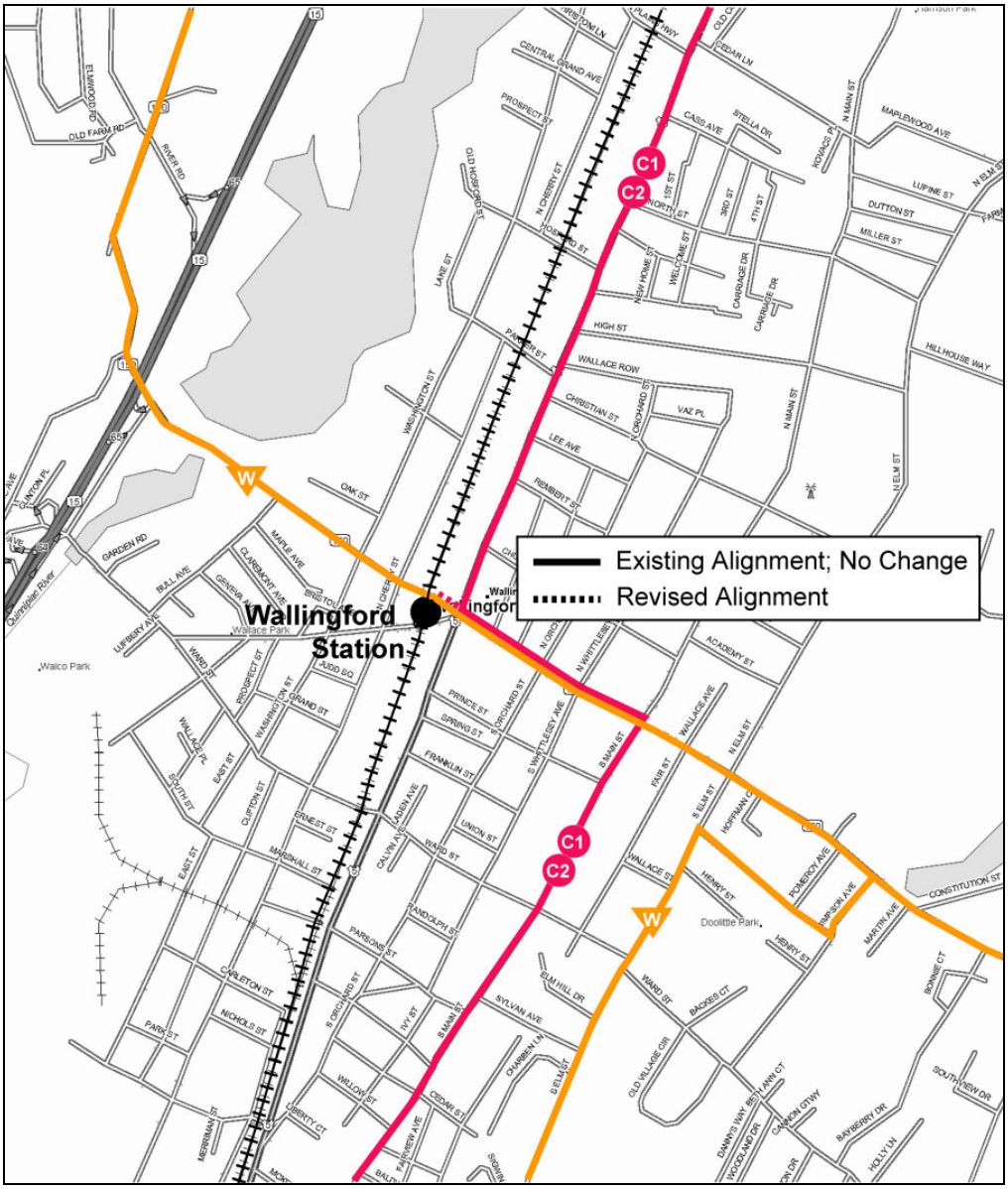


5.2.3 Wallingford Station

Wallingford Station would be served by two routes (see Figure 5-4):

- **CT**TRANSIT-New Haven's Route C North Haven
- **CT**TRANSIT-Wallingford's Wallingford route

Figure 5-4
Connecting Bus Service at Wallingford Station



C North Haven - All Route C trips, which operate between Meriden and New Haven, would be routed via State Street Station. Additional changes, as described in the New

Haven Stations section, would also be made to simplify route operations, and to provide local connections at Wallingford and North Haven stations.

W Wallingford Local - **CT**TRANSIT-Wallingford's Wallingford Local route, which operates between Burke Heights and the Route 5 K-Mart shopping center via Wallingford Station, would continue to operate along its current alignment. With New Haven – Hartford – Springfield commuter rail, to provide peak period connections in both directions, the span of service would be extended to approximately 6:30 am to 6:30 pm. Service would continue to operate every 60 minutes.

5.2.4 Meriden Station

Meriden Station acts as the hub for **CT**TRANSIT-Meriden's three routes (see Figure 5-5):

- Route A Yale Acres
- B Kohl's – South Meriden
- C East Main Street – West Main Street

All routes would continue to operate without any alignment changes and would continue to serve Meriden Station. However, service would be extended to 6:00 or 6:30 pm to allow rail commuters to make pm peak connections. Service frequencies on Route C would also be improved.

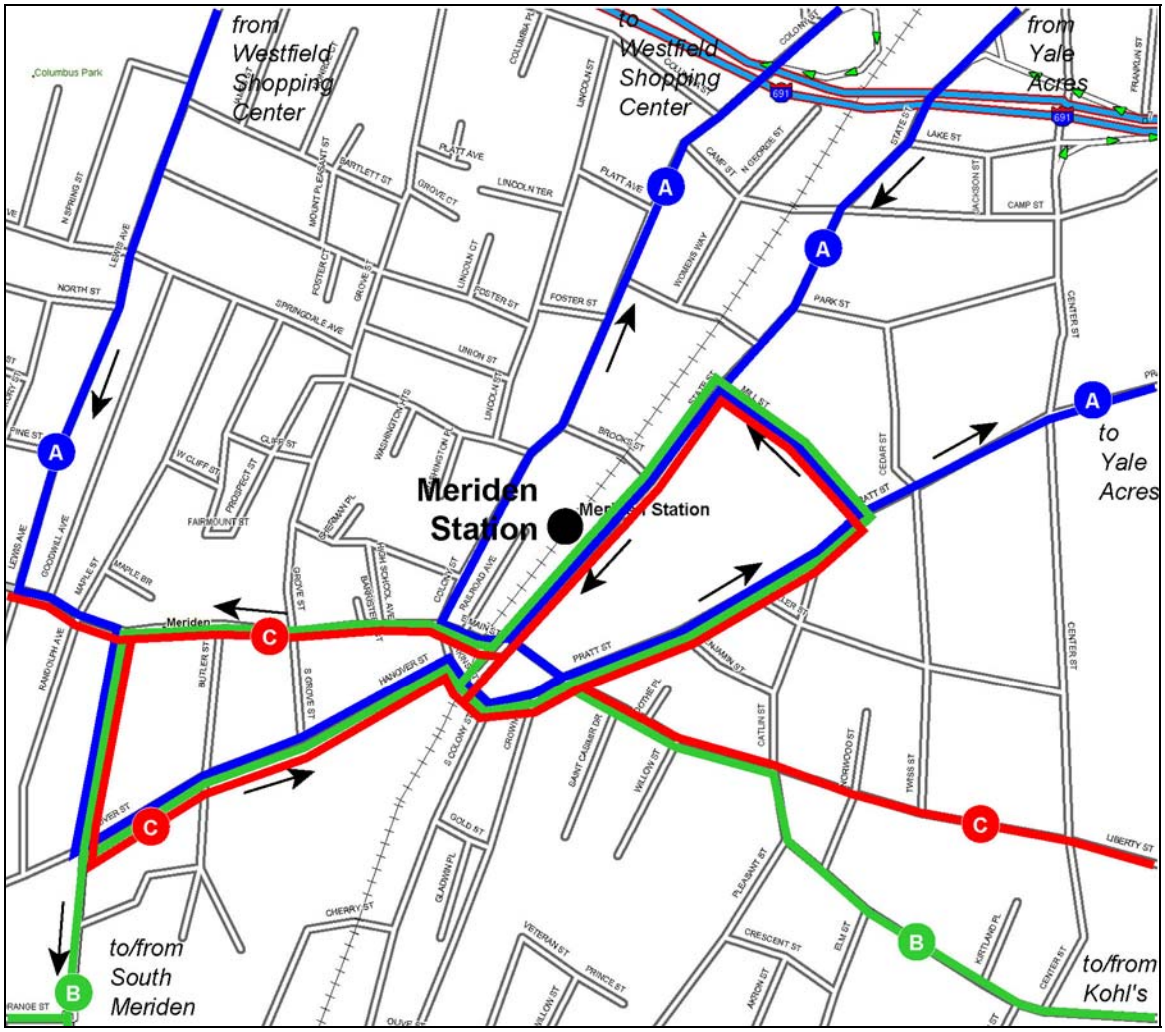
A Yale Acres - Route A, which operates as a loop serving areas north of downtown Meriden including Yale Acres, Meriden Square, Westfield Shopping Town, and the Midstate Medical Center, would continue to operate along its existing alignment. Service currently operates every 60 minutes from 6:30 am to 4:30 pm. Current frequencies would be maintained, but to provide pm peak connections for commuters, service in the evening would be extended to add 5:30 pm and 6:30 pm departures.

B Kohl's – South Meriden - Route B serves areas in southern Meriden Veteran's Memorial Medical Center (VMMC) West Campus as well as Kohl's Plaza. Connections can be made with **CT**TRANSIT's Route C North Haven at Kohl's Plaza. Service would continue to operate along this existing alignment. Service currently operates every 60 minutes from 6:30 am to 5:30 pm. Current frequencies would be maintained, but to provide pm peak connections for commuters, service in the evening would be extended to add a 6:30 pm departure.

C East Main Street – West Main Street - Route C operates along East and West Main Streets including stops at VMMC's East Campus and Centennial Plaza. There are two distinct segments to this route: one that operates along East Main Street, and another that operates along West Main Street. Service to East Main Street operates departs from Meriden Station every 45 to 75 minutes between 6:30 am and 5:30 pm. With New Haven – Hartford – Springfield rail, to provide pm peak connections for commuters, and more consistent headways, service would be reconfigured to operate every 60 minutes between 6:30 am and 6:30 pm. Service to West Main Street currently operates departs from

Meriden Station every 60 to 90 minutes between 8:00 am and 5:00 pm. With New Haven – Hartford – Springfield rail, to provide pm peak connections and more consistent headways, service would be reconfigured to operate every 60 minutes between 7:00 am and 6:00 pm.

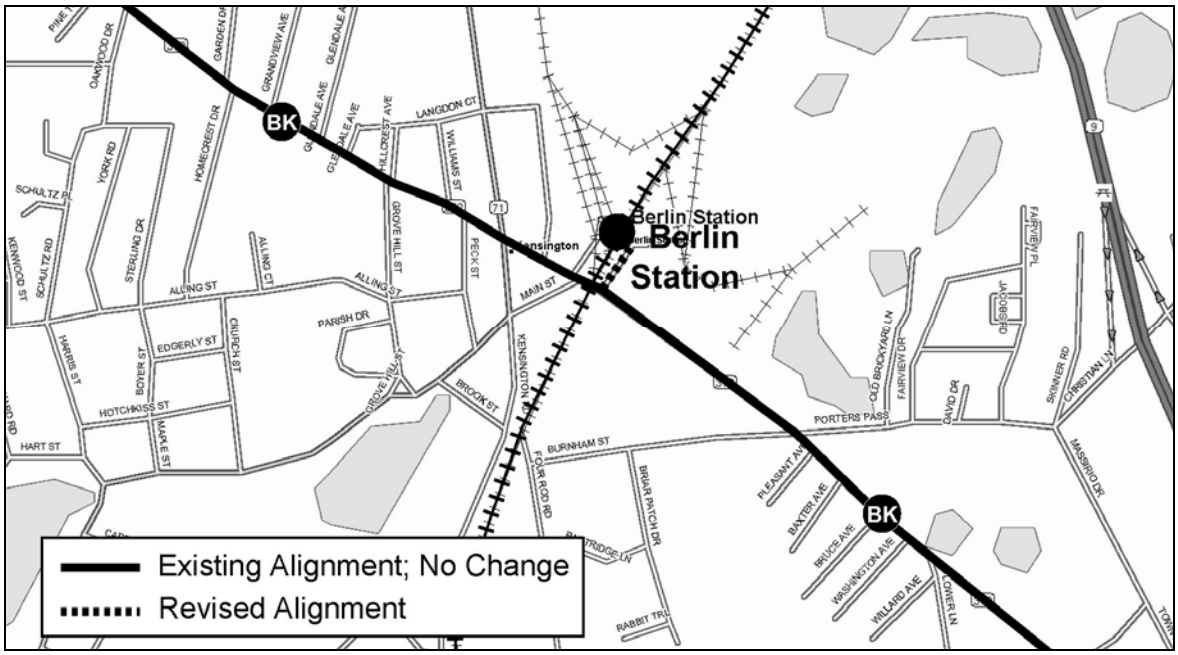
Figure 5-5
Meriden Transit District Meriden Station Service



5.2.5 Berlin Station

Berlin Station would be served by one route: **CT**TRANSIT-New Britain's BK Berlin/Kensington route. Alignment, span of service, and frequencies changes would be made to provide these connections (see Figure 5-6).

Figure 5-6
CTTransit – New Britain Berlin Station Service



NBT BK Berlin Kensington/Berlin Turnpike - **CT**TRANSIT-New Britain's Route BK currently operates along Farmington Avenue straight past Depot Road near the proposed site for Berlin Station. With the New Britain – Hartford Busway, Route BK will be extended to Hartford via the busway. It will also be modified to eliminate the unproductive Basset/Ellis, Harris, and Worthington Ridge Loops in order to provide direct service between Webster Square Plaza, Kensington, Willowbrook Park and New Britain. The weekday service span will be extended to 5 am to 9 pm, and service frequencies improved to every 30 minutes during peak periods and every 60 minutes during off-peak periods.

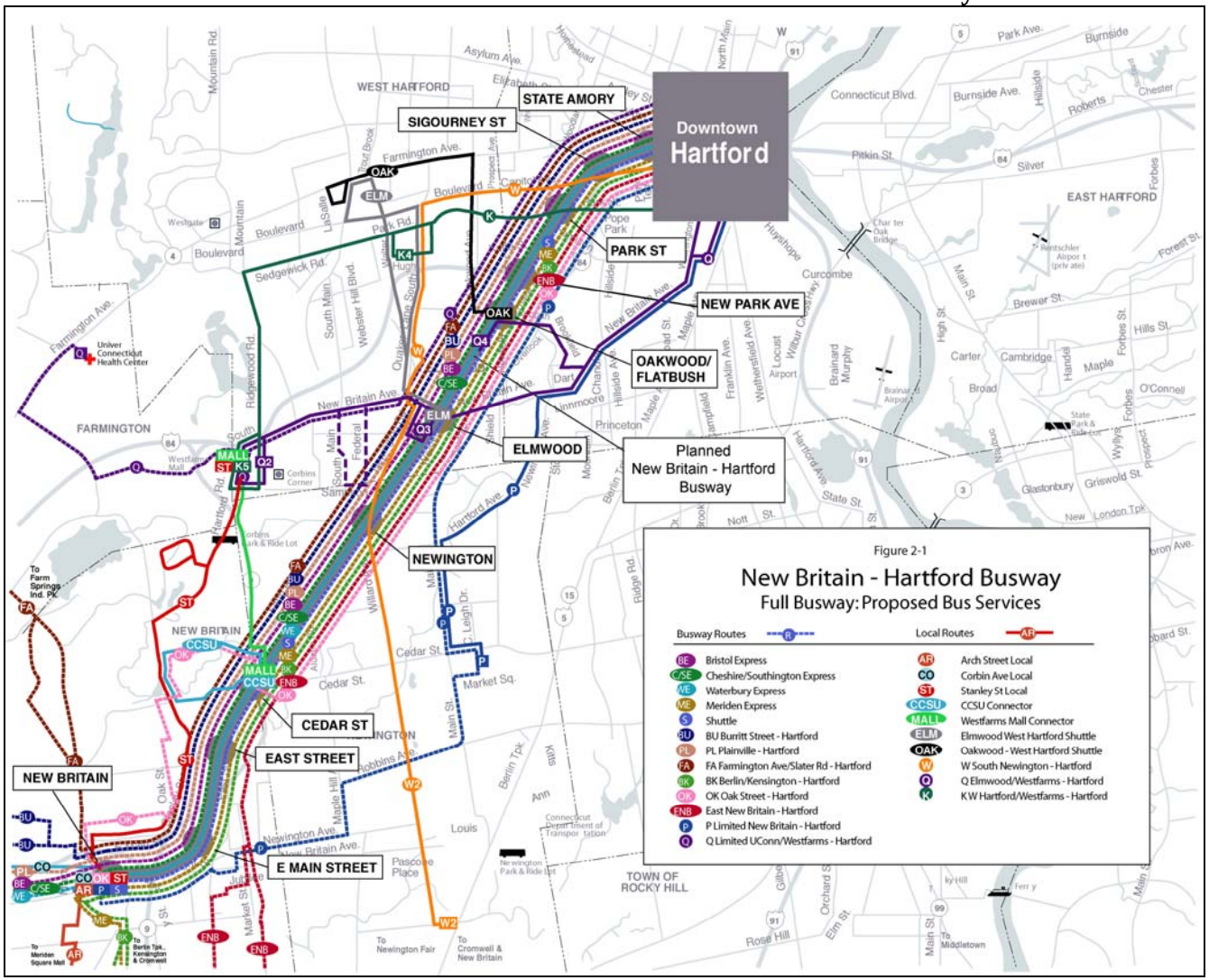
With the development Hew Haven – Hartford – Springfield rail service, and the development of Berlin Station, the route would also be modified to deviate off of Farmington Avenue along Depot Road to and from Berlin Station.

5.2.6 Newington Station

Newington Station would be served by **CT**TRANSIT's W Capitol Avenue route, as well as by all services operating on the New Britain – Hartford Busway (see Figure 5-7):

- W2 Capitol Avenue/Veteran's Hospital
- New Britain – Hartford Busway Shuttle
- BK Berlin/Kensington Local
- BU Burritt Street Local

Figure 5-7
Services associated with the New Britain – Hartford Busway



- ENB East New Britain Local
- FA Farmington Avenue
- OK Oak Street
- PL Plainville Local

W Capitol Avenue - With the New Britain – Hartford Busway, the W2 Veteran's Hospital variation of Route W, which will operate between Willard Avenue in Newington and Union Station via Newington Station. This change will extend local bus service into South Newington to serve apartment complexes on Willard Avenue, retail on the turnpike and employment on Louis Street. The part time variations to Fenn Road and Newington Center will also be eliminated. On weekdays, service will operate from 5 am to 11 pm, every 30 minutes during peak periods and every 60 minutes during the rest of the day.

New Britain – Hartford Busway Shuttle - The New Britain – Hartford Busway Shuttle will operate entirely within the New Britain – Hartford Busway, and will stop at all busway stations. Weekday service will operate from 5 am to 11 pm, with 15 minutes peak period headways and 30 minutes off-peak headways.

BK Berlin/Kensington Local - With the New Britain – Hartford Busway, **CT**TRANSIT-New Britain's BK route will be simplified based on the findings and advice of the Statewide Bus System Study. The unproductive Basset/Ellis, Harris, and Worthington Ridge Loops will be eliminated to provide direct service between Webster Square Plaza, Kensington, Willowbrook Park, and New Britain. After the morning peak the route will be extended to include the 30 minute Wal-Mart, Home Depot, Lowes, Ames, Toys R Us loop. Service will also be extended to Hartford via the busway, with Route BK stopping at all busway stations. Weekday service will operate from 5 am to 9pm, every 30 minutes during peak periods, and every 60 minutes during the rest of the day.

BU Burritt Street Local - With the New Britain – Hartford Busway, **CT**TRANSIT-New Britain's B Burritt Street route will be extended from downtown New Britain along the busway to Hartford's Union Station. In New Britain, Route BU's alignment will be the same as for the current NBT Route B. This route will stop at all busway stations. Weekday service will operate from 5 am to 9 pm, with 30 minute headways throughout the day.

ENB East New Britain Local - Route ENB East New Britain Local will be a new busway route designed to transport workers to jobs along John Downey Drive and to carry commuters from the East Street/Buena Vista corridor to jobs along the busway. The route will enter the busway at East Street Station, and then make all stops between there and Union Station. Weekday service will operate from 5 am to 9 pm, with 30 minute headways throughout the day.

FA Farmington Ave Local - With the New Britain – Hartford Busway, **CT**TRANSIT-New Britain's F Farmington Avenue route will be extended from downtown New Britain along the busway to Hartford's Union Station. This route will stop at all busway stations. In New Britain, Route FA's alignment will be the same as for the current NBT Route F. Weekday service will operate from 5 am to 9 pm, with 30 minute headways throughout the day.

OK Oak Street Local - With the New Britain – Hartford Busway, **CT**TRANSIT-New Britain's O Oak Street route will be modified and extended from downtown New Britain along the busway to Hartford's Union Station. In addition, local service will re-routed away from Westfarms Mall to the busway at Cedar Street Station in order to provide access from northeast New Britain and to downtown New Britain via local streets. The unproductive Eddy Glover loop of the existing Oak Street service will also be eliminated. This route will stop at all busway stations except East Street. Weekday service will operate from 5 am to 9 pm, with 30 minute headways throughout the day.

PL Plainville Local - With the New Britain – Hartford Busway, **CT**TRANSIT-New Britain's PL Plainville route will be modified and extended from downtown New Britain along the busway to Hartford's Union Station. Alignment changes on the local portion of the route will be to simplify the route based on recommendation in the Statewide Bus Study. This route will stop at all busway stations. Weekday service will operate from 5 am to 9 pm, with 30 minute headways throughout the day.

5.2.7 Hartford Union Station

Union Station would be Hartford's major hub for New Haven – Hartford – Springfield rail service. At this location, bus service would be designed to provide connections to the ten highest ridership local routes, to other routes that already operate to, from, or via Union Station, and to planned New Britain – Hartford Busway routes:

CTTRANSIT-Hartford routes:

- A Asylum Ave/Hillside Ave
- B Silver Lane
- E Farmington Ave
- F Ashley St/Broad St
- K North Main St/Park St
- Q Vine Street/New Britain Ave
- T Franklin Ave/Blue Hills Ave
- U Wethersfield Ave/Albany Ave
- YM Burnside Ave/Manchester
- Z Tolland Turnpike
- S Granby Street/Garden Street

New Britain – Hartford Busway Services:

- BE Bristol Express
- CSE Cheshire/Southington Express
- WE Waterbury Express
- ME Meriden Express
- New Britain – Hartford Busway Shuttle
- BK Berlin/Kensington
- BU Burritt Street

- ENB East New Britain Local
- FA Farmington Avenue
- OK Oak Street
- P New Britain Limited
- PL Plainville Local
- Q UConn Limited

Of **CT**TRANSIT-Hartford's top ten ridership routes, three currently operate via Union Station. For the other seven, the Hartford terminal would be shifted to Union Station to provide connections to and from New Haven – Hartford – Springfield rail. In addition, CTTransit-Hartford's S route also provides service to the station. The necessary route changes are described below and shown in Figure 5-8.

A Asylum Ave/Hillside Ave - Route A, which operates between West Hartford and Wethersfield via downtown Hartford and Union Station, would continue to operate along its existing alignment.

B Silver Lane - Route B Silver Lane provides service between Manchester and Hartford. To provide connections at Union Station, Route B's Hartford terminal at Market Street would be relocated to Union Square.

E Farmington Ave - Route E Farmington Ave, which operates between Farmington and downtown Hartford via Union Station, would continue to operate along its existing alignment.

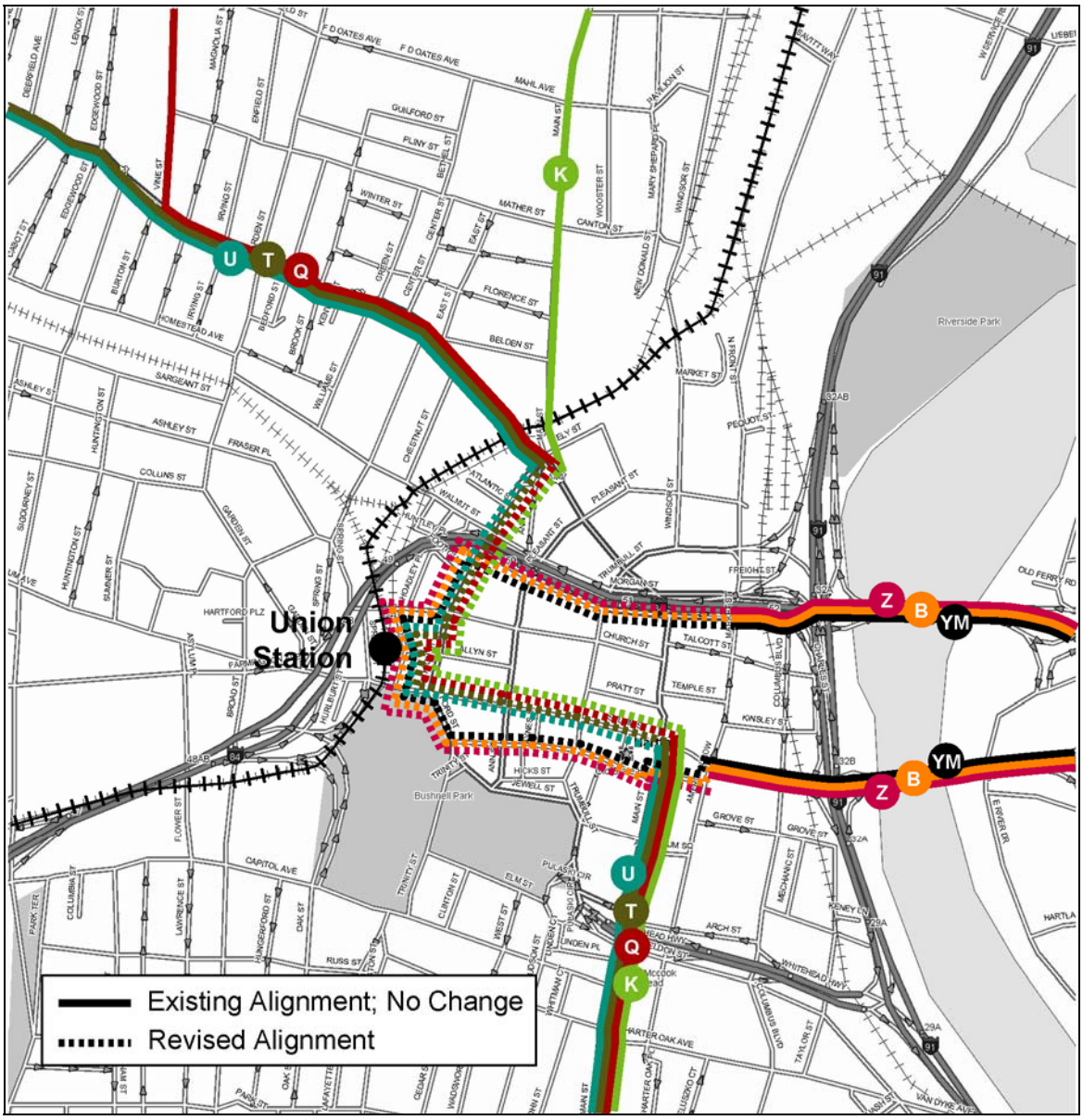
F Ashley Street/Broad Street - Route F, which operates between Hartford and Wethersfield via Union Station and downtown Hartford, would continue to operate along its current alignment.

K North Main St/Park St - Route K, which provides service between Farmington, West Hartford, Elmwood, Hartford, and Windsor, is one of **CT**TRANSIT-Hartford's highest ridership routes (carrying approximately 4,500 passengers per weekday). To provide connections to Union Station, Route K's inner terminal would be moved from Main Street to Union Station

Q Vine Street/New Britain Avenue/Westfarms Flyer - Route Q provides service between Westfarms Mall, West Hartford, downtown Hartford, and the Blue Hills area of Hartford. To provide connections to Union Station, Route K's inner terminal would be moved from Main Street to Union Station.

T Franklin Avenue/Blue Hills Avenue - Route T Franklin Avenue/Blue Hills Avenue operates between Bloomfield and Rocky Hill or Newington via downtown Hartford. As with Routes K and Q, to provide connections to Union Station, Route K's inner terminal would be moved from Main Street to Union Station.

Figure 5-8
CTTransit – Hartford Alignment Changes



Note: Only routes with revised alignments are shown.

U Wethersfield Ave/Albany Ave - Route U operates between Wethersfield and Bloomfield via downtown Hartford. In the same manner as with Routes K, Q, and T, direct connections could be provided to and from Union Station by relocating Route U's downtown Hartford terminal from Main Street to Union Station:

YM Burnside Ave/Manchester - Route YM operates between Manchester with downtown Hartford via East Hartford. Service currently terminates on Market Street in downtown

Hartford. To provide connections to New Haven – Hartford – Springfield rail, Route YM would be extended to Union Station.

Z Tolland Turnpike - Route Z provides service between Rockville and downtown Hartford via Manchester and East Hartford, including stops at Buckland Hill Mall. All service currently terminates on Market Street in downtown Hartford. To provide connections to Union Station, Route Z would be extended to Union Station in a similar manner as Route B Silver Lane and YM Burnside Avenue/Manchester.

S Granby Street/Garden Street - Route S Granby Street/Garden Street has two variations, both of which operate north of downtown: S1 Granby Street – Seabury, and S2 Garden Street –Charlotte Street. S1 Granby Street – Seabury operates via Union Station, but S2 does not. Most peak period, peak direction S1 trips are interlined with S2 Garden Street trips, which provide connections to Union Station on those interlined trips. Most off-peak S2 trips are not interlined, meaning that direct connections to Union Station would not be possible on those trips.

All New Britain – Hartford Busway routes would operate to and from Hartford's Union Station. These routes will be as follows (see also Figure 5-7):

Express Routes
- BE Bristol Express
- CSE Cheshire/Southington Express
- ME Meriden Express
- WE Waterbury Express

CTTRANSIT-Hartford Routes
- P New Britain/Newington Limited
- Q New Britain Avenue Limited
- W2 Capitol Avenue/Veteran's Hospital

CTTRANSIT-New Britain Routes
- New Britain – Hartford Busway Shuttle
- BK Berlin/Kensington Local
- BU Burritt Street Local
- ENB East New Britain Local
- FA Farmington Avenue
- OK Oak Street
- PL Plainville Local

Descriptions of the CTTransit – New Britain routes were described previously in the Newington Station section. Descriptions of other New Britain – Hartford Busway routes are as follows:

BE Bristol Express - The Route 43 Bristol Commuter Express will be redesignated as BE Bristol Express[4] and rerouted to operate via the busway, and will operate the entire length of the busway. The route will stop in New Britain for trips destined for New Britain and to provide connections to other routes, and then operate express between New Britain and Aetna Station. Weekday service will be provided from 5:00 am to 11:00 pm, with 15 minute peak period headways and 30 minute off-peak headways.

CSE Cheshire/Southington Express - The Route 41 Cheshire/Southington Express will redesignated as CSE Cheshire/Southington Express and rerouted to operate via the busway, and will operate the entire length of the busway. As with the BE Bristol Express, the route will stop in New Britain, and then operate express between New Britain and Aetna Station. Weekday service will be provided from 5:00 am to 11:00 pm with service every 30 minutes during peak periods and every 60 minutes during off-peak periods.

WE Waterbury Express - The WE Waterbury Express will be a new route designed to serve travel between Waterbury, New Britain, and Hartford. The Waterbury Express will make stops in downtown Waterbury, a park-n-ride lot east of Waterbury, New Britain and downtown Hartford. As with all New Britain – Hartford Busway express routes, Route WE will operate express from New Britain Station to Aetna Station.

ME Meriden Express - The ME Meriden Express will replace the existing Meriden route that operates via I-91 to Hartford with a more westerly routing using the Chamberlin Highway (Route 71) to New Britain. The new route will provide express service from downtown Meriden and Kensington to New Britain and Hartford. Weekday service will be provided from 5:00 am to 11:00 pm with service every 30 minutes during peak periods and every 60 minutes during off-peak periods.

P New Britain/Newington Limited - Route P New Britain/Newington Limited will be a new variation of the existing Route P service that will provide express service to Hartford from Newington. Weekday service will be provided from 5:00 am to 11:00 pm, with 30 peak period headways and 60 minute off-peak headways.

Q New Britain Avenue Limited - A new variation of the existing Route Q service, the Route Q express, will provide local service between UConn Medical Center, Westfarms Mall and Elmwood along the existing Route Q alignment, and then use the busway to travel to downtown Hartford. Weekday service will be provided from 5:00 am to 11:00 pm, with 30 minute peak period headways and 60 minute off-peak headways.

W Capitol Avenue - As described in the "Other CTTRANSIT Routes" section above, the W2 Veteran's Hospital variation of Route W, which currently terminates at the Veteran's Hospital, will be extended to the southern end of Willard Avenue in Newington, and the part time variations to Fenn Road and Newington Center will be eliminated. On weekdays, service will

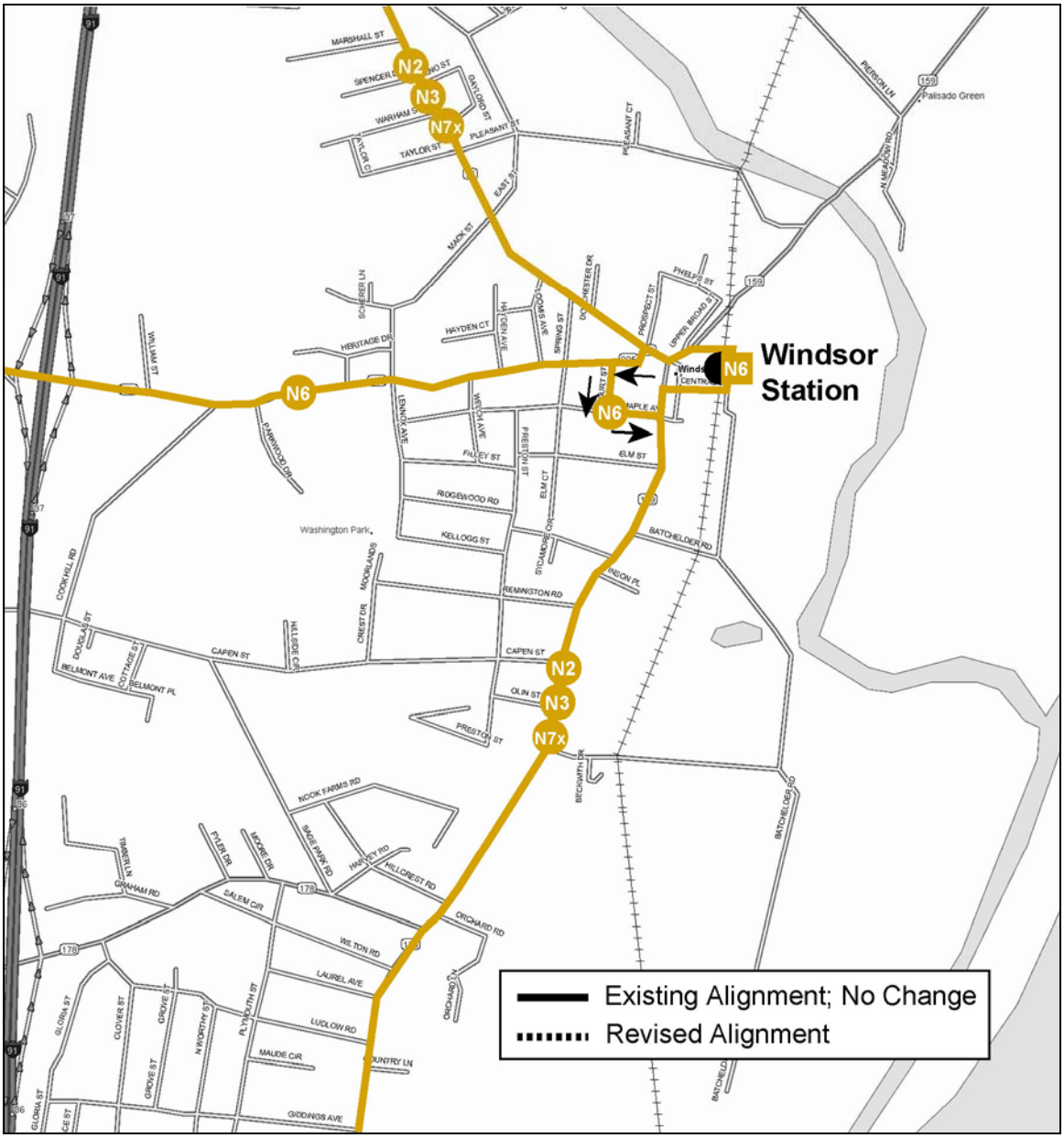
[4] The route nomenclatures used in this section are those used in the New Britain – Harford Busway EIS.

operate from 5 am to 11 pm, every 30 minutes during peak periods and every 60 minutes during the rest of the day.

5.2.8 Windsor Station

Windsor Station would be served by one route: **CT**TRANSIT's N Campfield Avenue/Windsor (see Figure 5-9). Service on this route would be expanded to provide better service to the Day Hill Road area, and the number of variations would be reduced.

Figure 5-9
CTTransit Routes serving Windsor Station



N Campfield Avenue/Windsor - **CT**TRANSIT's Route N Campfield/Windsor operates between Bradley International Airport, Bloomfield, Windsor, and Hartford. Major stops include the Windsor Railroad Station, Poquonock Park and Ride, Griffin Office Park and Bradley International Airport. There are eight variations, three of which (N2, N4, and N6) operate via the site of the proposed Meadows Station:

With New Haven – Hartford – Springfield rail service, Route N service would be simplified to provide more consistent service and to shift some Bradley service to Windsor Locks Station. These changes would be as follows:

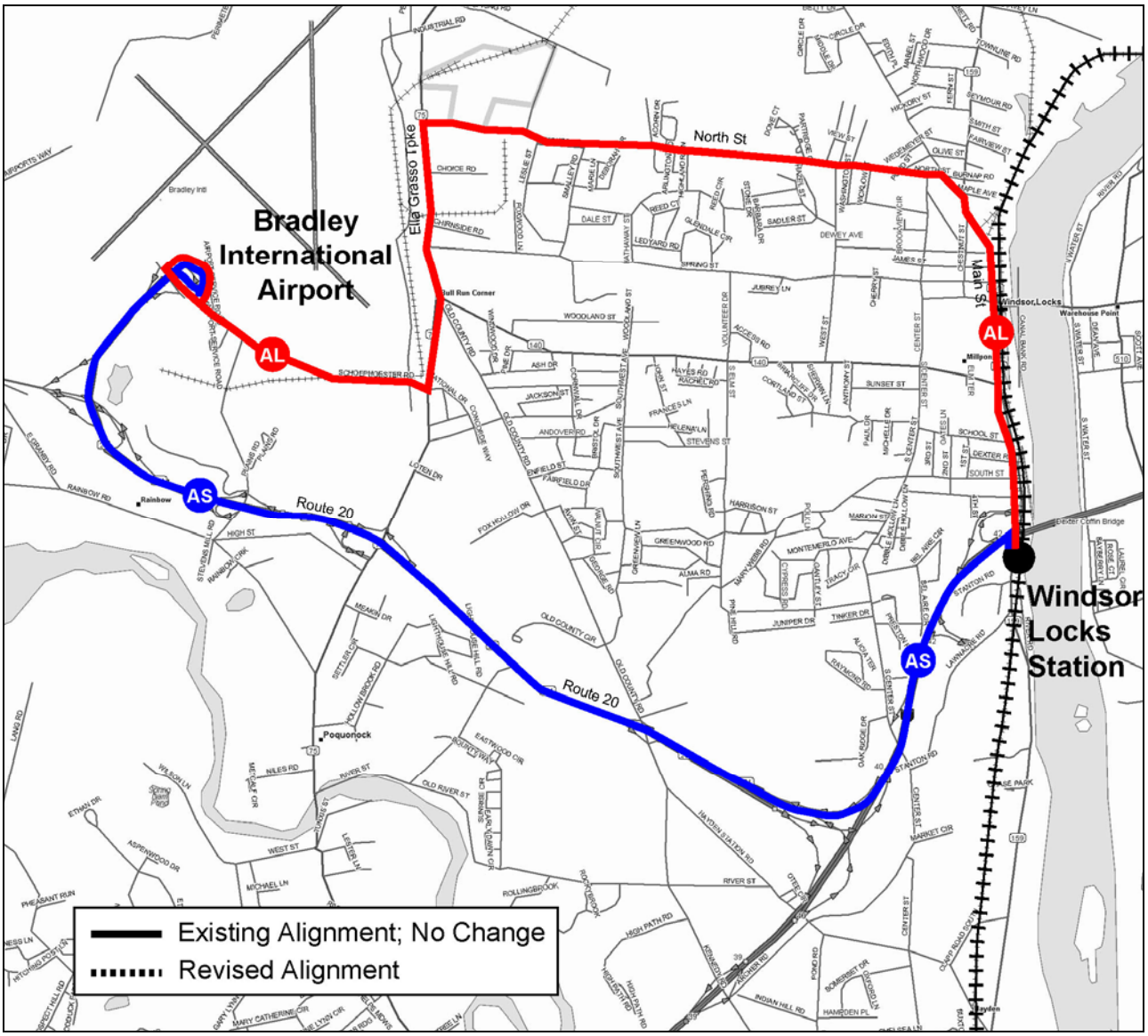
- N2 Windsor RR Station's span of service would be expanded to operate from 5:30 am to 7:00 pm, every 30 minutes during peak periods and every 60 minutes during the mid-day.
- N3 Bradley International Airport via Poquonock service would be expanded. Weekday service would operate from 6:00 am to 6:00 pm, every 60 minutes during peak periods and every 120 minutes during the mid-day. The alignment of N3 would remain unchanged.
- N4 Portman would be eliminated (replaced by expanded N2 Windsor service).
- N5 Bradley International Airport via Kennedy Road would be eliminated and replaced by the new AL Bradley - Windsor Locks route (as described above in the Windsor Locks Station section).
- N6 Matianuck Avenue service would continue to operate as at present, with one am peak inbound trip and one pm peak outbound trip.
- N7 Day Hill Road service would operate as N7x service.
- N7x service would be expanded. Weekday service would operate from 5:30 am to 7:00 pm, every 30 minutes during peak periods and every 60 minutes during the mid-day. Service would be coordinated with N2 Windsor RR Station to provide 15 minute peak headways and 30 minute off-peak headways between downtown Hartford and Windsor Station. The alignment of N7x would remain unchanged.

5.2.9 Windsor Locks Station

Windsor Locks is currently served by two **CT**TRANSIT Commuter Express routes: Route 5 Enfield Express, and Route 13 Windsor Locks Express. Both of these routes would be replaced by New Haven – Springfield – Hartford rail service. However, two new routes would be implemented: one that would connect Windsor Locks Station with Bradley International Airport, and another that would connect the station with the Windsor Locks Industrial area (see Figure 5-10).

5 Enfield – Somers & 13 Windsor Locks Express - **CT**TRANSIT's Route 5 Enfield Express and 13 Windsor Locks Commuter Express routes provide express service between Enfield, Windsor, and downtown Hartford via I-91. Route 13 also provides local service on some trips in the Windsor industrial area northeast of Bradley International Airport.

Figure 5-10
Bus Routes serving Windsor Locks Station



These routes would largely parallel New Haven – Hartford – Springfield rail service, and to avoid duplication of service, would be eliminated. The local service provided by some Route 13 trips would be replaced by new AL Bradley Airport Local service described below.

AS Bradley Airport Shuttle - With New Haven – Hartford – Springfield rail service, a new AS Bradley – Windsor Locks Station Limited route would be implemented to provide connections between Windsor Locks Station and Bradley International Airport. As shown in Figure 5-10, service would operate via South Main Street, I-91, Route 20, and then loop through the

terminals. Service would operate non-stop between Windsor Locks and Bradley, with a one way travel time of 10 minutes.

Schedules would also be coordinated with rail arrival and departures. For the maximum build alternative, weekday service would operate for the full span of rail service, every 15 minutes during peak periods and every 60 minutes during off-peak periods.

AL Bradley Airport Local - To replace Route 13 Windsor Locks local service, and to provide local connections between Windsor Locks Station and Bradley Airport, a new local route would be established. This route would operate from Windsor Locks Station north on Rt 159 (South Main and Main Street), then bear left on Suffield Street to left on North Street to left on Ella Grasso Turnpike (Route 75) to right on Schoephoester Road to airport terminals. Service would operate on weekdays from 5:00 am to 7:00 pm, every 30 minutes during peak periods and every 60 minutes during off-peak periods.

5.2.10 Enfield Station

The town of Enfield is currently served by two routes: **CT**TRANSIT's Route 5 Enfield Express to Hartford, and PVTA's Route 16 Longmeadow/Enfield service to Springfield. **CT**TRANSIT's Route 5 service would be replaced by New Haven – Springfield – Hartford rail service, and PVTA Route 16 service in Enfield would be replaced by a new local route that would feed the rail station (see Figure 5-11).

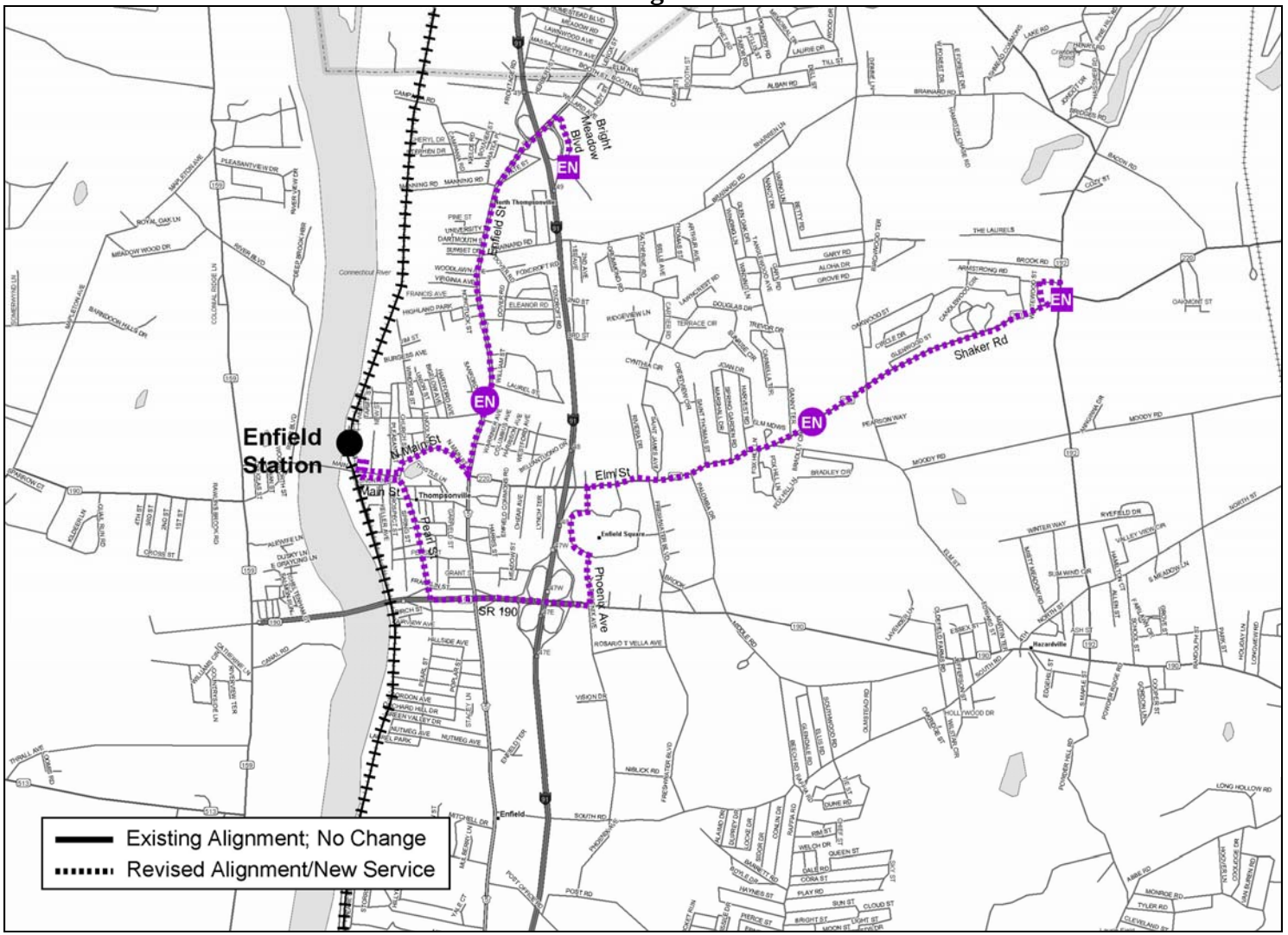
5 Enfield Express - **CT**TRANSIT's Route 5 Enfield Express route, which provides express service between Enfield, Windsor, and downtown Hartford via I-91, would parallel New Haven – Hartford – Springfield rail service. To avoid duplication of service, Route 5 would be eliminated.

16 Longmeadow/Enfield - PVTA's Route 16 Longmeadow/Enfield operates between Enfield and Springfield, MA via Longmeadow, MA. With New Haven – Hartford – Springfield rail service, Route 16 service in Enfield would be discontinued, with the rail line providing service to Springfield. With this change, the route would terminate on US 5 at the state line.

The local service now provided by Route 16 within Enfield would instead be provided by a new local route (Route EN Enfield Local, described below). This route would also provide connections with the rail line.

EN Enfield Local - Route EN Enfield Local would be a new local route that would replace PVTA Route 16 local service in Enfield. This route would provide feeder service to the rail line and to improve upon the service now provided by PVTA. Service would operate every 60 minutes from 6:00 am to 7:00 pm.

Figure 5-11
Bus Routes serving Enfield Station



5.2.11 Springfield Union Station

Currently, all PVTA routes that serve downtown Springfield operate to, from, or through the Springfield Bus Terminal, which is located on Main Street at the intersection of Liberty Street (see Figure 5-12). With the implementation of New Haven – Hartford – Springfield rail, and the redevelopment of Union Station, these 21 routes would be relocated to Union Station, which is about one block away:

- G1 Chicopee Center-Fairfield Mall/Summer-Allen
- G2 Carew-East Springfield/Belmont-Dwight Rd
- G3 Springfield Plaza via Liberty/King-Westford
- B4 Plainfield/Walnut St-Springfield College
- B5 Dickinson-Tiffany-Jewish Home
- B6 Ludlow via Bay
- B7 State-Boston Road-Eastfield Mall
- G8 Orange-Plumtree
- R9/15 St James Avenue/Worthington Street
- R10 Westfield State via Main St & West Springfield
- P11 Holyoke Community College Express
- B12 Stonybrook Express
- B13 Maple Street/East Longmeadow
- B14 Feeding Hills
- R16 Longmeadow/Enfield/Basketball Hall of Fame
- B17 Eastfield Mall via Parker-Wilbraham Road
- P20 Holyoke via Holyoke Mall-Riverside
- P21 Holyoke via Chicopee
- 26 Downtown Trolley
- R27 Wilbraham/Eastfield Mall/Sixteen Acres

Service to and from Union Station would be via Lyman Street, where there would be direct connections to the rail platforms (see Figure 5-13). For the purposes of this study, it is assumed that, at least for buses, Lyman Street's current one-way operation (northbound only) would be converted to two-way operation.

G1 Chicopee Center-Fairfield Mall/Summer-Allen- Route G1 Chicopee Center-Fairfield Mall/Summer-Allen operates between Chicopee and the Springfield/East Longmeadow line via Main Street and the Springfield Bus Terminal in downtown Springfield. With New Haven – Hartford – Springfield rail, Route G1's alignment and operating strategy would remain unchanged, except that the Springfield terminal would be relocated to Union Station.

G2 Carew-East Springfield/Belmont-Dwight Road- Route G2 Carew-East Springfield/Belmont-Dwight Road operates between East Springfield and East Longmeadow via Main Street and the Springfield Bus Terminal in downtown Springfield. With New Haven – Hartford – Springfield rail, Route G2's alignment and operating strategy would remain unchanged, except that a short deviation would be added in and out of Union Station along Lyman Street.

Figure 5-12
Existing PVTA Bus Service in Downtown Springfield

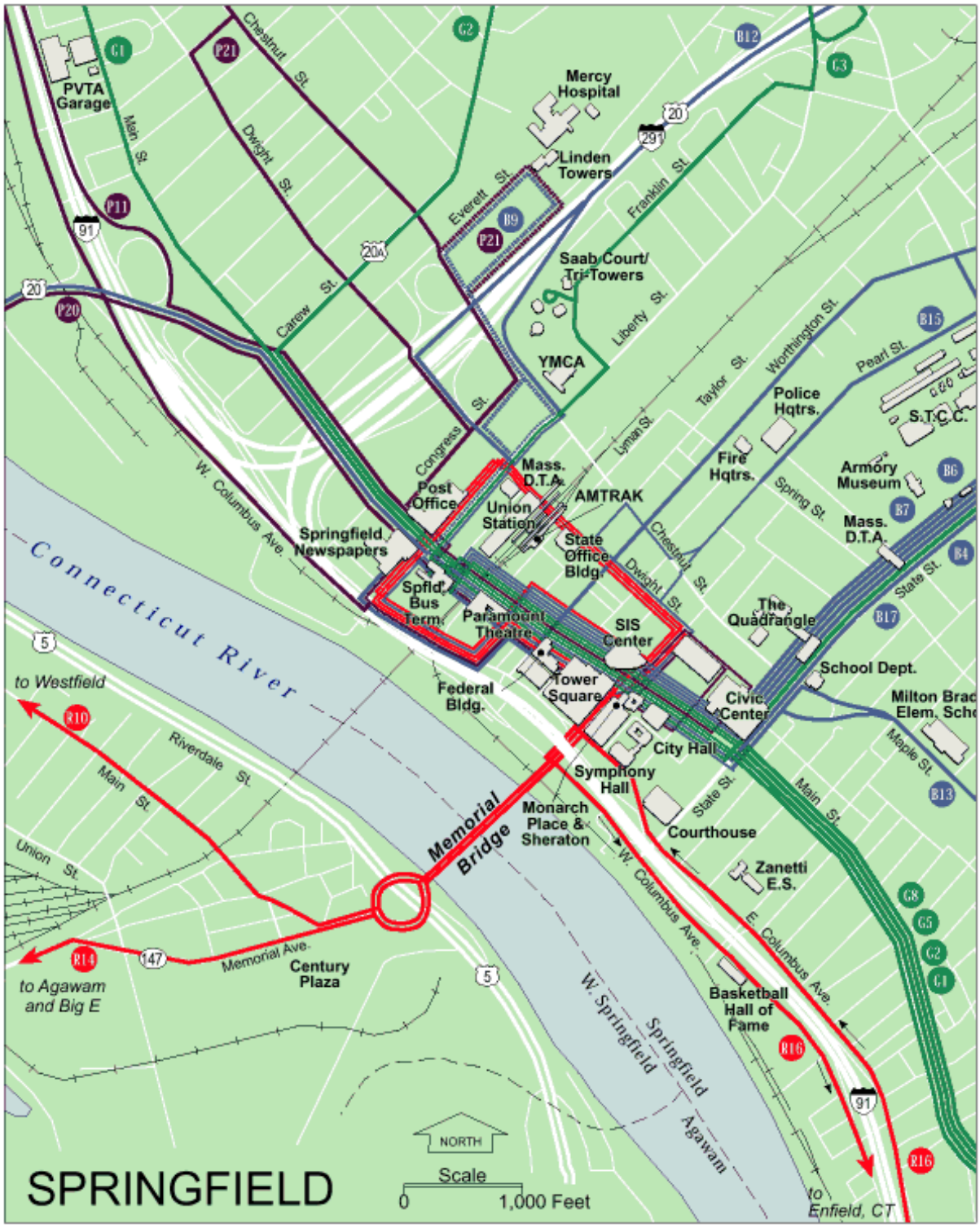
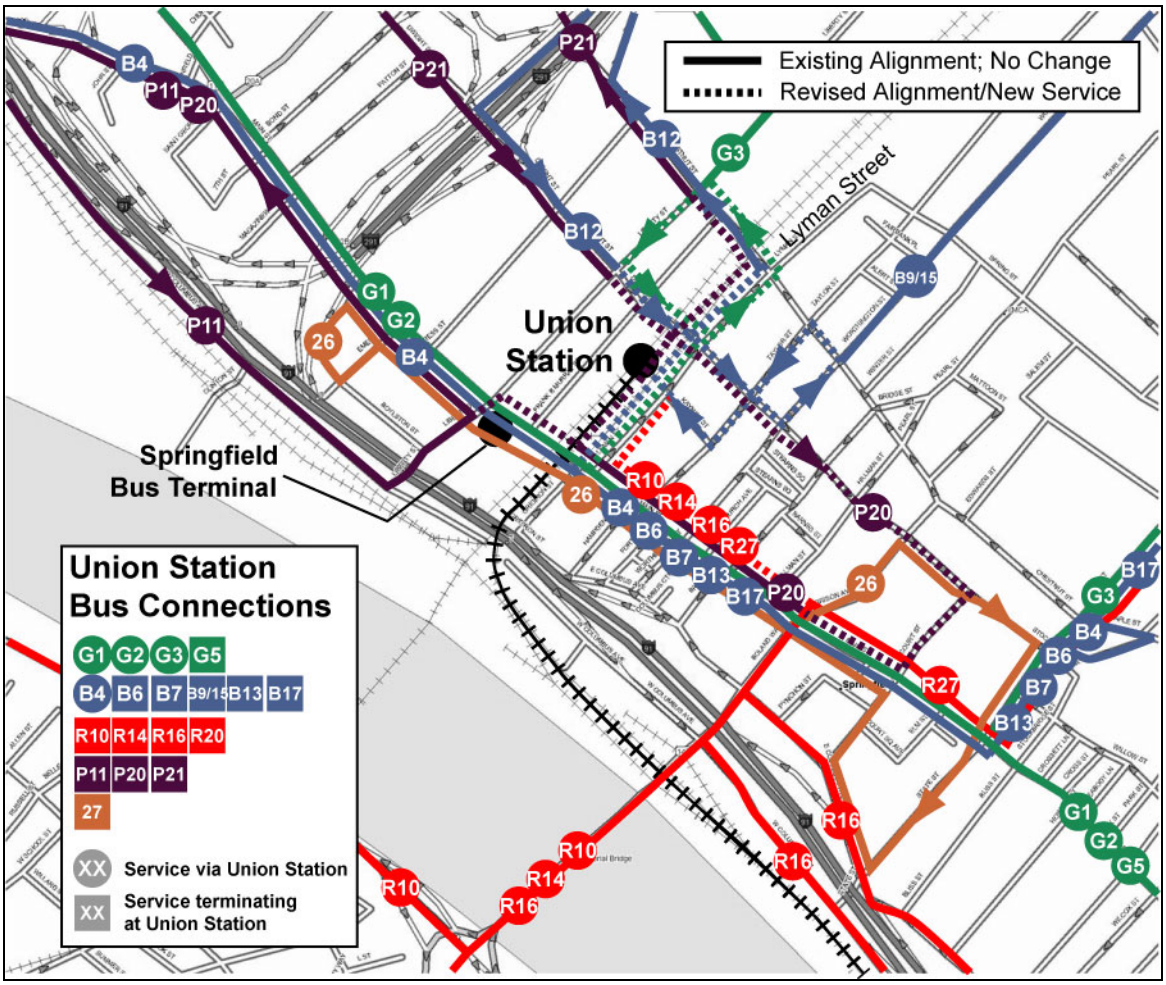


Figure 5-13
PVTA Bus Connections at Union Station



G3 Springfield Plaza via Liberty/King-Westford - Route G3 Springfield Plaza via Liberty/King-Westford operates between Springfield Plaza near the Springfield/Chicopee line and Westford Circle in East Springfield. With New Haven – Hartford – Springfield rail, the downtown Springfield alignment of the route would be re-routed via Union Station.

B4 Plainfield/Walnut Street-Springfield College - Route B4 Plainfield/Walnut Street-Springfield College operates between the Chicopee/Springfield line at Plainfield Street and Springfield College in East Springfield. With New Haven – Hartford – Springfield rail, Route B4's alignment and operating strategy would remain unchanged, except that a short deviation would be added in and out of Union Station along Lyman Street.

G5 Dickinson-Tiffany-Jewish Home - Route G Dickinson-Tiffany-Jewish Home operates between South Springfield and Longmeadow and the Springfield Bus Terminal in downtown Springfield. With New Haven – Hartford – Springfield service, Route G5's inner terminal would be relocated to Union Station.

B6 Ludlow via Bay - Route B6 Ludlow via Bay operates between Ludlow and the Springfield Bus Terminal. With New Haven – Hartford – Springfield rail, the basic operation of the route would remain unchanged, except that the inner terminal would be relocated from the Springfield Bus Terminal to Union Station.

B7 State-Boston Road-Eastfield Mall - Route B7 State-Boston Road-Eastfield Mall operates between the Eastfield Mall and the Springfield Bus Terminal largely along Boston Road, State Street, and Main Street. Service would operate in essentially the same manner as it now does, but the inner terminal would be relocated to Union Station.

G8 Orange-Plumtree - Route G8 Orange-Plumtree operates between East Springfield and the Springfield Bus Terminal via Plumtree Road and Orange Street. With New Haven – Hartford – Springfield rail, Route G8's inner terminal would be relocated to Union Station in the same manner as Routes B6 and B7.

B9/15 Saint James Avenue/Worthington Street - Route B9/15 Saint James Avenue/Worthington Street operates with three major variations, all of which operate to and from the Springfield Bus Terminal: (1) Oak Grove, (2) Cadwell Drive, and (3) East and Royalton Streets. With New Haven – Hartford – Springfield rail, Route B9/15 would continue to operate with the same variations, but with its inner terminal relocated to Union Station.

R10 Westfield State College via Main Street West Springfield - Route R10 Westfield State College via Main Street West Springfield operates between Westfield State College and the Springfield Bus Terminal. With New Haven – Hartford – Springfield rail, the basic operation of the route would remain unchanged, but the inner terminal of the route would be shifted to Union Station.

P11 Holyoke Community College Express - Route P11 Holyoke Community College Express provides express service between Holyoke Community College and the Springfield Bus Terminal. With New Haven – Hartford – Springfield rail service, the inner terminal of the route would be shifted to Union Station.

B12 Stonybrook Express - Route B12 Stonybrook Express provides express service between the Hampden County Correctional Facility at Stonybrook and the Springfield Bus Terminal. With New Haven – Hartford – Springfield rail, the inner terminal would be shifted to Union Station.

B13 Maple Street/Longmeadow - Route B13 Maple Street/Longmeadow operates between East Longmeadow and the Springfield Bus Terminal. With New Haven – Hartford – Springfield rail, the route's inner terminal would be relocated from the Springfield Bus Terminal to Union Station.

B14 Feeding Hills/Springfield - Most Route B14 Feeding Hills/Springfield service operates between Feeding Hills and the Springfield Bus Terminal. With New Haven – Hartford –

Springfield service, Route B14's inner terminal would be moved to Union Station. Otherwise, the route would continue to operate as at present.

R16 Longmeadow/Enfield - PVTA's Route R16 Longmeadow/Enfield currently operates between Enfield, CT and Springfield, MA via Longmeadow, MA. As described in the Enfield Station section, Route 16 service would be terminated at the Massachusetts/Connecticut state line. At the downtown Springfield end, the terminal would be shifted from the Springfield Bus Terminal to Union Station. Weekday service frequencies would be improved to every 60 minutes during peak period and every 120 minutes during off-peak periods.

B17 Eastfield Mall via Parker-Wilbraham Road - Route B17 operates between the Eastfield Mall in East Springfield and downtown Springfield. With New Haven – Hartford – Springfield rail service, Route B17 would continue to operate essentially as it now does, but the inner terminal would be shifted from the Springfield Bus Terminal to Union Station.

P20 Holyoke via Holyoke Mall-Riverdale - Route P20 operates between Holyoke Center and the Springfield Bus Terminal via the Holyoke Mall. Early morning trips also serve Providence Hospital and Interstate Drive Industrial Park. With New Haven – Hartford – Springfield rail, Route P20's inner terminal would be moved to Union Station (with the downtown loop via Civic Center maintained).

P21 Holyoke/Springfield via Chicopee - Route P21 Holyoke/Springfield via Chicopee operates between Holyoke Center and the Springfield Bus Terminal via Chicopee Center. With New Haven – Hartford – Springfield rail, the basic operation of the route would remain unchanged, but the Springfield terminal would be moved to Union Station.

26 Trolley Loop Service - Route 26 is a rubber-tired trolley loop that operates through downtown Springfield, and provides connections to a remote parking lot. The alignment of this route would remain unchanged, with passengers making connections to and from New Haven – Hartford – Springfield rail via a stop on Main Street at Frank B Murray Street.

Route 26 Trolley Loop service currently operates every 15 minutes from 7:00 am to 9:45 am and from 3:00 am to 6:00 pm. With New Haven – Hartford – Springfield rail service, the pm span of service would be extended to 7:00 to provide later connections. Service would continue to operate every 15 minutes.

R27 Wilbraham/Eastfield Mall/Sixteen Acres - Route R27 Wilbraham/Eastfield Mall/Sixteen Acres is a peak period only route with service between the Eastfield Mall and either the Sixteen Acres Center in East Springfield or downtown Springfield. With New Haven – Hartford – Springfield service, all trips would operate to and from downtown Springfield, and the Springfield terminal would be moved from the Springfield Bus Terminal to Union Station.

Service levels would also be improved. Service would operate every 60 minutes during peak periods, and every 120 minutes during off-peak periods.

5.3 Transit Integration

New Haven - Springfield commuter rail is planned to connect with bus services provided by seven public transit operators (including different **CT**TRANSIT divisions), and with three other rail services. This can be accomplished by coordinating schedules, implementing joint fares, using rail stations as hubs for local bus services, and by combining marketing and information efforts. This section describes potential actions in these areas.

5.3.1 Schedule Coordination

One of the most fundamental ways to facilitate transit trips is to make connections as convenient as possible. The connecting bus services that were developed as part of this project, and described in the "Connecting Bus Services" chapter, were designed to facilitate bus-rail transfers. Nearly all of those services were defined to operate at 10, 15, 30, or 60 minute headways, which would allow schedules to be well coordinated New Haven – Hartford – Springfield rail service operating at 30 minute headways. As a practical matter, most of the changes that would be required to provide convenient connections would be very straight-forward. On routes with frequent service (10 minutes of less), no special scheduling efforts would be required. On routes with less frequent service, many of the changes would consist simply of shifting existing schedules forward or back by a small amount. In nearly all cases, coordinated transfers could be provided between most or all peak direction trips.

There would be connections with other transit services at all New Haven - Hartford - Springfield stations (see Table 5-1). Actions that would be taken to provide connections to a wide range of locations, and to make them as convenient as possible would be as summarized in Table 5-2 and described in the following sections.

New Haven Union and State Street Stations - At State Street and New Haven Union Stations, bus connections would be to and from New Haven - Hartford - Springfield rail, as well as with Metro-North and Shore Line East rail service. As described in the Connecting Bus Services chapter, bus connections to all of these services could be improved, and additional routes would be routed via State Street and Union Stations. However, given the frequency of the rail services at those stations, bus services would not be scheduled for connections with particular services.

North Haven Station - North Haven Station would be served by one route, which would be **CT**TRANSIT-New Haven's Route C North Haven. The changes for this route that are described in the Newington Station section would also provide convenient connections with nearly all peak period NH-H-S trains at North Haven Station.

Table 5-1
Connecting Transit Services

Union Station	CTTransit -New Haven Greater New Haven Transit District Shore Line East Metro North Amtrak Acela Express and Regional routes
State Street Station	CTTransit -New Haven Greater New Haven Transit District Shore Line East Metro North
North Haven Station	CTTransit -New Haven
Wallingford Station	CTTransit -Wallingford CTTransit -New Haven
Meriden Station	CTTransit -Meriden
Berlin Station	CTTransit -New Britain
Newington Station	CTTransit-Hartford CTTransit -New Britain
Hartford Union Station	CTTransit-Hartford
Windsor Station	CTTransit-Hartford
Windsor Locks Station	CTTransit-Hartford
Enfield Station	CTTransit-Hartford
Springfield Station	Pioneer Valley Transit Authority Amtrak Vermonter, Lake Shore Limited and Regional routes

Wallingford Station - There would be connections to two routes at Wallingford Station: **CT**TRANSIT-Wallingford's Wallingford Route, and **CT**TRANSIT-New Haven's Route C North Haven. The Wallingford route currently operates every 60 minutes during the mid-day. To provide connections with NH-H-S service, the Wallingford route would be realigned to serve the rail station, service extended to the am and pm peaks, and the schedule would be shifted forward or back to provide coordinated connections with every other peak period train.

For Route C North Haven, more extensive changes would be required. The operating strategy for this route is currently very complicated, and as the route now operates, it would only be possible to provide very limited connections. However, with a restructuring of Route C as described in the Connecting Bus Services chapter, it would be possible to provide connections with nearly all rail trips.

Table 5-2
Changes to Provide Coordinated Bus Connections

		Peak Headways (mins)			
Station/Connecting Bus Route	AM Peak	PM Peak	Clockface?	Possible Coordination	Changes Required/Comments
New Haven Union Station					
B Whalley/Congress Ave	10-15	11-15	No	Most trains	None, service already frequent enough to provide short transfer times
J Whitney Ave/Kimberly Ave	4-30	2-30	No	Selected trains	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
M Washington Ave/State St	15-30	20-31	No	TBD	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
O Sylvan Ave/Winchester Ave	10-20	10-20	No	Most trains	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
Z Goffe Street/Sargent Drive	15-20	12-20	No	Most trains	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
Commuter Connection	15	15	Yes	All trains	Increase frequency and reschedule for improved connections to all rail services
Coliseum Parking Shuttle	7.5	7.5	Yes	All trains	Increase frequency and reschedule for improved connections to all rail services
State Street Station					
C North Haven	15	15	Yes	TBD	Set schedule for coordination at North Haven and Wallingford Stations (see above)
D Grand Avenue & D Dixwell Avenue	10	10	Yes	All trains	None, service already frequent enough to provide short transfer times
F East Haven & F West Chapel Street	10-15	10-15	No	Most trains	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
G Shelton Avenue/East Chapel Street	30-42	20-35	No	Selected trains	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
Q State Street/Edgewood Avenue	15-20	14-21	No	Most trains	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
Z Goffe Street/Sargent Drive	15-20	12-20	No	Most trains	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
Commuter Connection	15	15	Yes	All trains	None, special scheduling for NH-H-S rail not warranted due to connections with variety of services
North Haven Station					
C North Haven	15	15	Yes	Most trains	Restructure and reschedule route
Wallingford Station					
NET Wallingford	60	60	Yes	Every peak direction train	Extend service through PM peak, shift bus schedule forward or back to match rail
C North Haven	15	15	Yes	Most trains	Restructure and reschedule route
Meriden Station					
A Yale Acres	60	60	Yes	Every peak direction train	Extend service through PM peak, shift bus schedule forward or back to match rail
B Kohl's - South Meriden	60	60	Yes	Every peak direction train	Extend service through PM peak, shift bus schedule forward or back to match rail
C East Main Street - West Main Street	60	60	Yes	Every peak direction train	Extend service through PM peak, reschedule bus service
Berlin Station					
BK Berlin/Kensington Local	30	30	Yes	TBD	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
Newington Station					
W Capitol Avenue	Limited service		No	Limited	Shift schedule forward or back to provide limited connections
New Britain - Hartford Busway Shuttle	15	15	Yes	TBD	Set schedule for connection at Hartford Union Station (see above)
BK Berlin/Kensington Local	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
BU Burritt Street Local	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
FA Farmington Avenue	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
OK Oak Street	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
PL Plainville Local	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
ENB East New Britain Local	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
Hartford Union Station					
Existing Services					
A Asylum Ave/Hillside Ave	7-20	10-20	No	Most trains	Shift bus schedules forward or back to match rail
B Silver Lane	30	30	Yes	Every train	Extend route to Union Station, shift bus schedules forward or back to match rail
E Farmington Ave	2-10	5-10	No	Every train	None, service already frequent enough to provide short transfer times
F Ashley St	15	15	Yes	Every train	Shift bus schedules forward or back to match rail
K North Main St/Park St	10	10	Yes	Every train	Extend route to Union Station, but no special scheduling required because service is frequent

		Peak Headways (mins)			
Station/Connecting Bus Route	AM Peak	PM Peak	Clockface?	Possible Coordination	Changes Required/Comments
Hartford Union Station (cont.)					
N Campfield Ave/Windsor	15	15	Yes	TBD	Restructure and reschedule route for connections at Windsor Station (see above)
Q Vine Street/New Britain Avenue	10	10	Southb	Every train	Extend route to Union Station, reschedule for clockface headways in both directions
T Franklin Avenue/Blue Hills Avenue	5-15	3-15	No	Every train	Extend route to Union Station, reschedule for clockface headways
U Wethersfield Ave/Albany Ave	15	10-20	No	Every train	Extend route to Union Station, reschedule for clockface headways
W Capitol Avenue	*Limited service*		No	TBD	Schedule for coordination at Newington Station (see below)
YM Burnside Ave	13-22	15	Yes	Every train	Extend route to Union Station, reschedule AM peak service for clockface headways
Z Tolland Tpk/ Rockville/Buckland Hills	15	10-20	Outb	Every train	Extend route to Union Station, reschedule PM peak service for clockface headways
Planned New Britain - Hartford Busway Services					
New Britain - Hartford Busway Shuttle	15	15	Yes	Every train	Set new shuttle schedule based on rail schedules
BK Berlin/Kensington Local	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
BU Burritt Street Local	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
FA Farmington Avenue	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
OK Oak Street	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
PL Plainville Local	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
ENB East New Britain Local	30	30	Yes	Limited	Busway services to be coordinated with shuttle route and each other rather than NH-H-S rail service
Windsor Station					
N Campfield Ave/Windsor	15	15	Yes	Every peak direction train	Restructure and reschedule route
Windsor Locks Station					
AS Bradley Shuttle	15	15	Yes	Every train	New route to be implemented for rail service; schedule bus route around train schedule
AL Bradley Local	30	30	Yes	Every peak direction train	New route to be implemented for rail service; schedule bus route around train schedule
Enfield Station					
EN Enfield Local	60	60	Yes	Every train	New route to be implemented for rail service; schedule bus route around train schedule
Springfield Union Station					
G1 Chicopee Center-Fairfield Mall/Summ	15	20	Yes	All peak direction trains	Shift bus schedule forward or back to match rail, increase pm peak service from 20 to 15 min
G2 Carew - E Springfield/Belmont-DwRd	15	20	Yes	All peak direction trains	Shift bus schedule forward or back to match rail, increase pm peak service from 20 to 15 min
G3 Springfield Plaza Liberty/King-Westf	15	20	Yes	All peak direction trains	Shift bus schedule forward or back to match rail, increase pm peak service from 20 to 15 min
B4 Plainfield/Walnut St.-Springfield Coll	20	20	Yes	Every other peak direction train	Shift bus schedule forward or back to match rail
G5 Dickinson-Tiffany-Jewish Home	60	60	Yes	Every peak direction train	Shift bus schedule forward or back to match rail
B6 Ludlow via Bay	20	20	Yes	Every 3rd peak direction bus trip	Shift bus schedule forward or back to match rail
B7 State-Boston Rd.-Eastfield Mall	15	15	Yes	Every peak direction train	Shift bus schedule forward or back to match rail
G8 Orange-Plumtree/Springfield	60	60	Yes	Every other peak direction train	Shift bus schedule forward or back to match rail
B9/15 St. James Avenue/Worthington St.	10-45	60	Yes	Every other peak direction train	Shift bus schedule forward or back to match rail
R10 Westfield State College W Springfie	30	30	Yes	Every peak direction train	Shift bus schedule forward or back to match rail
P11 Holyoke Community College Express	60	60	Yes	Every other peak direction train	Shift bus schedule forward or back to match rail
B12 Stonybrook Express	No service	120	Yes	Every other peak direction train	Shift bus schedule forward or back to match rail
B13 Maple Street/East Longmeadow	30	20-40	Partially	2 train trips	Shift bus schedule forward or back to match rail
R14 Feeding Hills/Springfield	60	60	Yes	Every other peak direction train	Shift bus schedule forward or back to match rail
R16 Longmeadow/Enfield	70-150	90	No	Limited	Shift bus schedule forward or back to match rail
B17 Eastfield Mall Parker-Wilbraham Rd	30	30	Yes	Every peak direction train	Shift bus schedule forward or back to match rail
P20 Holyoke/Springfield via Holyoke Mal	30	15-30	Yes	Most peak direction trains	Shift bus schedule forward or back to match rail
P21 Holyoke/Springfield via Chicopee	30	30	Yes	Every peak direction train	Shift bus schedule forward or back to match rail
26 Downtown Trolley	15	15	Yes	Every peak direction train	Shift bus schedule forward or back to match rail
R27 Wilbraham/Eastfield Mall/Sixteen A	2 trips	2 trips	No	Limited	Shift bus schedule forward or back to match rail

Meriden Station - **CT**TRANSIT-Meriden's three routes (A Yale Acres, B Kohl's – South Meriden, and C East Main Street – West Main Street) all operate to and from Meriden Station. With NH-H-S rail, service would be extended to the end of the pm peak. Routes A and B currently operate every 60 minutes throughout the day, while Route C operates at irregular headways. To provide connections with every other peak direction train, Route C would be rescheduled to operate every 60 minutes, and all three routes would be scheduled to arrive and depart from Meriden Station to meet every other peak period train.

Berlin Station - Berlin Station would be served by one route that would provide only limited service: Route W2 Veteran's Hospital. It would be possible to provide limited connections between this route and NH-H-S rail by shifting Route W's schedule forward or back.

Newington Station - Connections at Newington Station would be with the same New Britain – Hartford Busway routes as at Hartford Union Station section. With New Britain – Hartford shuttle service scheduled to coordinate with rail at Union Station, and other routes scheduled to provide even interval service on the busway, no specific schedule coordination actions would be taken at Newington. However, service on the busway with be very frequent (as frequent as every 2 minutes), and with this frequent service, connections to all other busway stations will be very convenient.

Hartford Union Station - Bus connections between NH-H-S rail at Hartford Union Station would be with routes that currently operate via the station, high ridership routes that would be extended to Union Station, and new routes that would be implemented with the New Britain – Hartford Busway. For the existing routes, coordinated connections could be provided with nearly all trains by shifting existing schedules forward or back, or by revising schedules to implement clockface operations.

For connections to and from New Britain – Hartford Busway services, the major New Britain – Hartford Shuttle route, which would operate every 15 minutes during peak periods, could be scheduled to provide connections with all trains. However, most other New Britain – Hartford Busway routes would be scheduled to provide service at even intervals on the busway, and thus could not be specifically coordinated with NH-H-S rail service.

Windsor Station - Windsor Station would be served by one route, N Campfield Avenue/Windsor. As described in the Connecting Bus Services chapter, the operating strategy for this route is very complicated, and as this route now operates, it would only be possible to provide very limited connections. However, if Route N were restructured as described in the Connecting Bus Services chapter, it would be possible to provide connections between Route N and all rail trips.

Windsor Locks Station - Windsor Locks Station would be served by two routes, both of which would provide connections between the station and Bradley Airport: AS Bradley

Airport Shuttle, and AL Bradley Airport Local. The AS shuttle route would meet all trains in both directions, and the AL local route would meet all peak direction trains.

Enfield - Enfield would be served by one route, EN Enfield, which would be specifically designed to provide connections between Enfield and NH-H-S rail, and which would operate every 60 minutes. Depending upon the rail schedules that are ultimately set, it may be possible to provide peak direction bus connections for all trains. At a minimum, it will be possible to provide coordinated connections in the peak direction for every other train.

Springfield - The New Haven – Hartford – Springfield rail study assumes that PVTA's downtown Springfield terminal would be relocated from the Peter Pan bus terminal to Union Station (about one block to the northeast). With this relocation, direct connections would be possible between NH-H-S rail service and all of PVTA's downtown Springfield routes.

Most PVTA service operates at clockface headways, and most peak direction bus trips could be coordinated with peak direction train trips simply by shifting existing schedules forward or back. On routes with 15 or 30 minute headways during both peak periods (5 of 20 routes), coordinated connections could be provided for every peak direction train. On routes with 20 or 60 minute headways (10 of 20 routes), coordinated connections could be provided with every other peak direction train. On other routes, the shifting of bus schedules forward or back could provide coordinated connections with selected train trips.

5.3.2 Fare Coordination

Trips involving New Haven - Springfield commuter rail service and one or more connecting services will involve two or more transit operators. Ideally, regular riders would be able to use a single fare media on corridor rail service, and on all connecting transit services. These would include:

- New Haven – Hartford – Springfield commuter rail
- Amtrak service between New Haven and Springfield
- PVTA bus service
- **CT**TRANSIT bus service (Hartford, New Britain, Meriden, Wallingford, and New Haven divisions
- Greater New Haven Transit District Trolley
- Metro-North commuter rail
- Shore Line East commuter rail

While the number of different operators that would be involved would be large, there are already a number of joint fare arrangements in place. These include:

- **Shore** Line **East/Metro-North UniRail**: The UniRail pass is a combined Shore Line East and Metro-North monthly pass. It provides unlimited travel on Shore Line East and Metro-North New Haven Line service, and provides a $44 to $48 discount from the price of individually purchased Shore Line East and Metro-North monthly passes.

- **Metro-North/Connecting Bus UniTicket:** the UniTicket is a monthly pass available to Metro-North monthly pass holders that is valid on connecting bus service, including CTTRANSIT service in Connecticut. For trips to and from Milford and New Haven, a UniTicket with bus connections at one end is priced at $24. With bus connections at both ends, the cost is $41.

- **Shore Line East/Commuter Connection Monthly Plus**: The Monthly Plus pass provides unlimited travel on Shore Line East and **CT**TRANSIT Commuter Connection bus service in New Haven. This pass is priced at the cost of a Shore Line East monthly pass plus $8, which is a $32 discount from the price of regular Shore Line East and **CT**TRANSIT passes.

- **CTTRANSIT: CT**TRANSIT provides free transfers between all of its services, including those operated by different divisions, as well with some private services that are subsidized by the state (DATTCO's S-Route in South Central Connecticut). **CT**TRANSIT 31-Day passes are also valid on all services operated by all **CT**TRANSIT divisions, and on the same private services with which there are free transfers.

While none of these joint fare arrangements cover all service, they could provide the foundation for a NH-H-S corridor joint pass. One approach that would include all corridor services would be to (see also Table 5-3):

1. Expand the UniRail pass program to include new New Haven - Hartford - Springfield rail service. The existing pass price structure, which is based on origin and destination stations, could be easily expanded to New Haven - Hartford - Springfield service. This would produce a pass that would cover New Haven - Hartford – Springfield rail, Shore Line East, and Metro-North's New Haven Line.

2. Negotiate an agreement with Amtrak to allow monthly pass or UniRail pass holders to use Amtrak services in the New Haven - Hartford - Springfield corridor. Amtrak has recently begun entering joint fare agreements with local transit operators, and now has agreements in place in Southern California and Virginia. In the Los Angeles area, Metrolink monthly pass holders can now use their passes on Amtrak trains within the limits of their pass. In San Diego, the North San Diego County Transit District recently implemented a similar joint fare arrangement on a six month trial basis. In Virginia, Virginia Railway Express

pass holders can ride Amtrak trains for $1.[5] An agreement with Amtrak to allow use of UniRail tickets on their trains would produce a pass that was valid on all rail services within the corridor, and on all connecting services.

3. Expand the UniTicket option to UniRail passes. This would produce a pass that would be valid on all rail services and all connecting bus services.

The existing joint fare arrangements would also provide a framework for pass handling procedures, and for cost and revenue sharing. As long as New Haven - Springfield commuter rail service used the same fare collection practices as Shore Line East service, the same fare media could be used as on that service. Fare handling for the UniTicket option on connecting bus services would be the same as at present, where the pass is simply used as a flash pass. The financial agreements that have been developed for the UniRail and UniTicket programs would provide a framework from which to expand these programs within Connecticut and to Massachusetts services (New Haven - Hartford - Springfield rail and PVTA bus service).

Table 5-3
Potential Joint Monthly Pass Types

Pass Type	Valid On:
NH-H-S Monthly Pass	New Haven – Hartford-Springfield Rail
Above plus Amtrak Agreement	New Haven – Hartford-Springfield Rail Amtrak
Above plus UniRail	New Haven – Hartford-Springfield Rail Amtrak Shore Line East Metro North Railroad
Above plus UniTicket	New Haven – Hartford-Springfield Rail Amtrak Shore Line East Metro North Railroad PVTA Connecting Bus CTTransit Connecting Bus (all divisions)

5.3.3 Common Stations

As described in the Connecting Bus Services chapter, many local bus services would be reconfigured to operate to, from, or via rail stations. These changes would help integrate local and regional transit services, both public and private:

[5] Until June 28, 2004, VRE pass holders could ride Amtrak at no additional cost. The $1 charge was implemented as part of a fare increase.

State Street and New Haven Union Stations - In a similar manner to Hartford's Union Station, New Haven's two rail stations are already served by Amtrak, **CT**TRANSIT, and private carrier bus services (Union Station). They are also served by Metro-North commuter rail to New York City and Shore Line East service from New London. As at Hartford's Union Station, the implementation of New Haven - Hartford - Springfield rail service and associated connecting bus changes would strengthen the connections that could be made at these locations.

Meriden Station - Meriden Station acts as the hub for **CT**TRANSIT-Meriden services. With the implementation of New Haven - Hartford - Springfield service, those bus services would be improved, and the combination of New Haven - Hartford - Springfield service and local bus services would greatly improve commuting options and regional travel options.

Hartford Union Station - Hartford's Union Station is already a major transportation hub that is currently served by Amtrak, **CT**TRANSIT, and private carrier bus services. Union Station will also be the downtown terminal for the planned New Britain – Hartford Busway, and with New Haven - Hartford - Springfield service, additional **CT**TRANSIT routes would be operated to and from Hartford's Union Station.

Springfield Union Station - With the redevelopment of Union Station, which is now underway, the implementation of New Haven - Hartford - Springfield rail service and the relocation of PVTA's hub to Union Station, Union Station will be the focal point of most Springfield area public transit. Although not examined as part of this study, there would also be opportunities to shift private carrier bus services from the Springfield bus terminal to Union Station.

5.3.4 Joint Marketing / Information

Riders of New Haven - Hartford - Springfield rail and connecting services will need to become familiar with services provided by multiple transit operators. For this to be accomplished, the provision of effective service information will be especially important. Service information should be provided via a number of different outlets and in a variety of formats.

The organization responsible for New Haven - Hartford - Springfield service should be the primary provider of information, and should develop maps, schedules, and a website. The New Haven - Hartford - Springfield rail operator should also provide information on connecting services. In turn, operators of connecting services should also provide information on New Haven - Hartford – Springfield rail. At a minimum, this should include phone numbers and web links for additional information. For trips that involve multiple connections, web-based itinerary planning systems can also facilitate travel. These systems ask the user a number of questions about their trip, including their origin

and destination, the time they want to travel, and other preferences. They then respond with specific directions for the trip, including information on all transit legs and scheduled times.

5.4 Connector Bus Operating Costs

This section estimates increases in operating costs and vehicle requirements for connecting bus services associated with the Recommended Action for New Haven – Hartford – Springfield commuter rail service. It also describes the methodologies used to develop the estimates.

Operating costs for connecting bus services would require an additional expenditure of approximately $3.8 million per year, and bus vehicle requirements would increase by 12, at a capital cost of $3.6 million (see Table 5-4). Approximately half of the operating cost increases would be in the Hartford area, with much of that increase attributable to the implementation of two new routes to connect the New Haven-Hartford-Springfield rail service with Bradley Airport. Relative to existing costs, operating cost increases would also be large in Wallingford and Meriden, where spans of service would be lengthened to provide peak period connections. Operating cost increases in the Springfield area would be very small, as the relocation of the Springfield bus terminal to Union Station would result in only negligible increase in vehicle miles and no increases in vehicle hours.

Table 5-4
Projected Annual Operating Costs and Vehicle Requirements

	Increase in Operating Costs	Increase in Vehicle Requirements
CTTRANSIT-New Haven	$1,158,001	6
CTTRANSIT-Wallingford	$230,912	0
CTTRANSIT-Meriden	$624,448	0
CTTRANSIT-New Britain	$1,077	0
CTTRANSIT-Hartford	$1,736,323	6
CTTRANSIT Total	$3,750,761	12
Pioneer Valley Transit Authority	$6,101	0
Total	$3,756,863	12

Note: $2002, per year

Increases in peak vehicle requirements would be split between the Hartford and New Haven areas, where each would require 6 additional buses. In the Hartford area, a total of 15 additional vehicles would be required to provide new and or expanded service to provide connections. However, this increase would be partially offset by a savings of 9 vehicles due to the elimination of Route 9/15, which would be replaced by the proposed rail service. With this savings, the net increase in the Hartford area would be 6 buses.

In the New Haven area, 6 additional vehicles would be required, largely due to the provision of more frequent peak period service on two routes (C North Haven and Commuter Connection). Vehicle requirements in other areas (for CTTRANSIT-Wallingford, CTTRANSIT-Meriden, CTTRANSIT-New Britain, and PVTA) would remain the same as at present.

5.4.1 Operating Costs

In total, in FY 2002 dollars, the bus service changes that would be made to provide convenient connections to New Haven-Hartford-Springfield rail would increase costs by $3.8 million. Virtually all of this increase would be borne by CTTRANSIT; operating cost increases to PVTA would be negligible (see Table 5-5). By transit operator, operating cost increases would be as described in the following sections.

Table 5-5
Operating Cost Increases by Operator

	Increase in Operating Costs
CTTRANSIT-New Haven	$1,158,001
CTTRANSIT-Wallingford	$230,912
CTTRANSIT-Meriden	$624,448
CTTRANSIT-New Britain	$1,077
CTTRANSIT-Hartford	$1,736,323
CTTRANSIT Total	$3,750,761
Pioneer Valley Transit Authority	$6,101
Total	$3,756,863

Note: $2002, per year

CTTRANSIT-New Haven

In the New Haven area, **CT**TRANSIT-New Haven operating cost increases would be largely attributable to changes on three routes (see Table 5-6):

- The additional time required to re-route Route B Whalley/Congress via Union Station.
- A doubling of peak period service levels on Route C North Haven to provide connections with every train.
- A quadrupling of peak period service levels on the Commuter Connection route in order to provide connections with every train.

Table 5-6
CTTRANSIT-Hartford Operating Cost Increases by Route

	Increase in Operating Costs
CTTRANSIT-NEW HAVEN	
B Whalley/Congress Ave	$562,093
C North Haven	$361,468
M Washington Ave/State St	$13,987
Z Goffe Street/Sargent Drive	$25,482
Commuter Connection	$194,971
CTTRANSIT-New Haven Total	$1,158,001

Note: $2002, per year

CTTRANSIT-Wallingford and CTTRANSIT-Meriden

In Wallingford and Meriden, the operating cost increases are entirely attributable to extending spans of service to provide peak period connections (see Table 5-7). In Wallingford, service would begin earlier and end later, while in Meriden, service would be extended in the afternoon to 6:30 pm.

Table 5-7
CTTRANSIT-Wallingford and -Meriden Operating Cost Increases by Route

	Increase in Operating Costs
CTTRANSIT-WALLINGFORD	
NET Wallingford	$230,912
CTTRANSIT-MERIDEN	
A Yale Acres	$217,928
B Kohl's - South Meriden	$201,164
C East Main Street - West Main Street	$205,355
CTTRANSIT-Meriden Total	$624,448

Note: $2002, per year

CTTRANSIT-New Britain

In New Britain, operating cost increases would be negligible, and attributable to the short additional distance that buses would travel in and out of Berlin Station (see Table 5-8).

Table 5-8
CTTRANSIT-New Britain Operating Cost Increases by Route

	Increase in Operating Costs
CTTRANSIT-NEW BRITAIN	
BK Berlin Kensington	$1,077

Note: $2002, per year

CTTRANSIT-Hartford

In the Hartford area, **CT**TRANSIT-Hartford operating cost increases, summarized in Table 5-9, would be largely attributable to the following changes:

Table 5-9
CTTRANSIT-Hartford Operating Cost Increases by Route

	Increase in Operating Costs
CTTRANSIT-HARTFORD	
AL Bradley Airport Local	$303,391
AS Bradley Airport Shuttle	$530,189
B Silver Lane	$86,506
EN Enfield Local	$306,185
K North Main St/Park St	$190,086
N Campfield Ave/Windsor	$530,527
Q Vine Street/New Britain Avenue/Westfarms Flyer	$133,852
T Franklin Avenue/Blue Hills Avenue	$188,712
U Wethersfield Ave/Albany Ave	$93,271
W Weston Street	$68,660
YM Burnside Ave	$66,010
Z Tolland Tpk/ Rockville/Buckland Hills	$99,839
5/13 Enfield-Somers/Windsor Locks Express	-$860,907
CTTRANSIT-Hartford Total	$1,736,323

Note: $2002, per year

- The implementation of two new routes (AL Bradley Airport Local and AS Bradley Airport Shuttle) to provide connections between Windsor Locks Station and Bradley Airport.
- The implementation of a new EN Enfield Local route to provide connections between Enfield Station and Enfield (and which would also replace PVTA's Enfield service[6]).
- Increases in Route N7x Day Hill Road Limited service to provide connections between Windsor Station and the Day Hill Road area.

In addition, in the Hartford area, rail service would replace current Route 5/13 Enfield/Windsor Locks express service. The savings attributable to the elimination of this route (nearly $900,000 per year) would offset much of the cost of the additional services described above.

Pioneer Valley Transit Authority

Changes to PVTA's actual operating costs would be negligible, as the shift of the Springfield hub from the Springfield Bus Terminal to Union Station would not significantly impact service miles or service hours (see Table 5-10). However, while PVTA operating costs would remain relatively unchanged, PVTA would lose a $70,000 a year payment from the town of Enfield for the operation of the Enfield portion of PVTA Route 16 that would be replaced by **CT**TRANSIT-Hartford service. Including this amount, the net impact on PVTA would be approximately $75,000 per year.

[6] Note that the Town of Enfield currently pay PVTA $70,000 per year for the PVTA's Route 16 service in Enfield. These estimates attribute the cost of the new service to CTTRANSIT-Hartford, rather than to the town.

Table 5-10
Pioneer Valley Transit Authority Operating Cost Increases by Route

	Increase in Operating Costs
PVTA	
G1 Chicopee Center-Fairfield Mall/Summer-Allen	$1,926
G2 Carew - East Springfield/Belmont-Dwight Road	$2,001
G3 Springfield Plaza via Liberty/King-Westford	$0
B4 Plainfield/Walnut St.-Springfield College	$1,316
G5 Dickinson-Tiffany-Jewish Home	$782
B6 Ludlow via Bay	$765
B7 State-Boston Rd.-Eastfield Mall	$1,181
G8 Orange-Plumtree/Springfield	$248
B9/15 St. James Avenue/Worthington St.	$389
R10 Westfield State College via W. Springfield	$584
P11 Holyoke Community College Express	$305
B12 Stonybrook Express	$32
B13 Maple Street/East Longmeadow	$43
R14 Feeding Hills/Springfield	$300
R16 Longmeadow/Enfield	-$5,017
B17 Eastfield Mall via Parker-Wilbraham Rd	$41
P20 Holyoke/Springfield via Holyoke Mall	$940
P21 Holyoke/Springfield via Chicopee	$264
R27 Wilbraham/Eastfield Mall/Sixteen Acres	$3
PVTA Total	$6,101

Note: $2002, per year

5.4.2 Vehicle Requirements

Vehicle requirements would increase by 12 vehicles: 6 each for CTTRANSIT-New Haven and CTTRANSIT-Hartford (as summarized in Table 5-11). Vehicle requirements for other operators would not be impacted. The estimated cost for the purchase of these 12 vehicles is $300,000 each for a total of $3.6 million.

These vehicle requirement increases are attributable to the service changes described above. In New Haven, the additional vehicles would be required on Route B Whalley/Congress, Route C North Haven, and the Commuter Connection. In Hartford, additional vehicles would be required on most of the routes that would provide connections, offset by vehicle savings due to the elimination of Route 5/13 Enfield/Windsor Locks Express.

Table 5-11
Vehicle Requirement Increases by Operator

	Increase in Vehicle Requirements
CTTRANSIT-New Haven	6
CTTRANSIT-Wallingford	0
CTTRANSIT-Meriden	0
CTTRANSIT-New Britain	0
CTTRANSIT-Hartford	6
CTTRANSIT Total	12
Pioneer Valley Transit Authority	0
Total	12
Cost per vehicle	$300,000
Total cost for vehicles	$3,600,000

5.4.3 Operating Cost Methodology

Operating costs estimates for connecting bus services were developed based on the cost structures of each individual operator as reported in FTA's National Transit Database. These estimates include all costs (including non-vehicle maintenance and administration), and are in 2002 dollars. Using this data, cost models were developed that allocate direct bus operating costs of the basis of vehicle service hours and vehicle service miles, and indirect costs as factors (see Table 5-12).

- Vehicle operations costs were allocated on the basis of vehicle service hours (since most of these costs are driven by labor, which is based on the number of hours worked).
- Vehicle maintenance costs were allocated on the basis of vehicle service miles (since most of these costs are mileage driven.
- Non-vehicle maintenance costs, which are for facility maintenance (for example, admin buildings, fare collection equipment, bus stops, etc.), were allocated as a percent of vehicle operations and vehicle maintenance costs.

For the changes that are considered for this project, an incremental approach was used that presumes that there would be increases in non-vehicle maintenance, but that the relatively small magnitude of the changes would not increase administrative costs. On this basis, the cost formulas for new services include direct costs for vehicle operations on a vehicle service hour basis, vehicle maintenance on a vehicle service mile basis, and non-vehicle maintenance as a percent of operations and vehicle maintenance costs:

*CTTRANSIT-New Haven: ((\$44.88 * VSH) + (\$1.40* VSM))) * 1.048*

CTTRANSIT-Wallingford: *((\$41.48 * VSH) + (\$0.84* VSM))) * 1.021*

CTTRANSIT-Meriden: *((\$41.48 * VSH) + (\$0.84* VSM))) * 1.021*

CTTRANSIT-New Britain: *((\$25.59 * VSH) + (\$0.49* VSM))) * 1.025*

CTTRANSIT-Hartford: *((\$45.52 * VSH) + (\$1.34* VSM))) * 1.045*

PVTA (Springfield): *((\$32.16 * VSH) + (\$0.62* VSM))) * 1.031*

Table 5-12
Operating Cost Allocation

	Vehicle Ops	Vehicle Maint	Non-Vehicle Maint	General Admin	Total
CTTRANSIT-NEW HAVEN					
FY 2002 Actuals	\$12,445	\$4,597	\$818	\$2,990	\$20,977
Vehicle Service Hours (VSH)					277.3
Vehicle Service Miles (VSM)					3,282
Cost per VSH	\$44.88				\$75.65
Cost per VSM		\$1.40			
Non-Veh-Maint & GA Factors			4.8%	17.5%	22.3%
CTTRANSIT-WALLINGFORD & MERIDEN					
FY 2002 Actuals	\$3,024	\$749	\$80	\$1,007	\$4,895
Vehicle Service Hours (VSH)					73.0
Vehicle Service Miles (VSM)					890.2
Cost per VSH	\$41.42				\$67.05
Cost per VSM		\$0.84			
Non-Veh-Maint & GA Factors			2.1%	26.7%	28.8%
CTTRANSIT-NEW BRITAIN					
FY 2002 Actuals	\$151	\$48	\$5	\$43	\$250
Vehicle Service Hours (VSH)					5.9
Vehicle Service Miles (VSM)					97.5
Cost per VSH	\$25.59				\$42.37
Cost per VSM		\$0.49			
Non-Veh-Maint & GA Factors			2.5%	21.6%	24.1%
CTTRANSIT-HARTFORD					
FY 2002 Actuals	\$21,859	\$8,572	\$1,370	\$5,165	\$36,966
Vehicle Service Hours (VSH)					480.2
Vehicle Service Miles (VSM)					6,374.2
Cost per VSH	\$45.52				\$76.98
Cost per VSM		\$1.34			
Non-Veh-Maint & GA Factors			4.5%	17.0%	21.5%
PIONEER VALLEY TRANSIT AUTHORITY					
FY 2002 Actuals	\$12,380	\$3,101	\$475	\$3,487	\$19,636
Vehicle Service Hours (VSH)					384.9
Vehicle Service Miles (VSM)					4,984.0
Cost per VSH	\$32.16				\$51.02
Cost per VSM		\$0.62			
Non-Veh-Maint & GA Factors			3.1%	22.5%	25.6%

Chapter 6
Operating Plan Costs and Performance Measures

Using the service plan outlined in Chapter 4, the following chapter describes the operating plan, including capital costs, operating costs, fares and revenues. The estimated capital cost for the start-up service, described in more detail in Section 6.1 is $296.3 million. The estimated operating cost for the start-up rail service, described in more detail in Section 6.2, is $10,079,000. The estimated revenue for the start-up rail service, described in more detail in Section 6.4, is $1,117,600. The annual deficit from the operation of the start-up rail service would be $8,960,400.

6.1 Capital Costs

Capital costs for the Recommended Action consist of five rail–related components: train set equipment (locomotives and cars), a maintenance facility for the equipment, parking and station costs, cost to double track portions of the line, and bridge costs.

6.1.1 Train Set Equipment

For New Haven-Hartford-Springfield service, there are two types of anticipated train set equipment. One would consist of conventional commuter rail equipment, i.e. a locomotive and three passenger cars. The other would consist of a set of three self-propelled rail cars (Diesel Multiple Units, or DMUs). The specific equipment required is discussed in this section, along with estimated costs using conventional equipment. Specifics of potential equipment, including both conventional equipment and DMU are discussed in Chapter 8.

The amount of equipment necessary for service on the line differs under two possible scenarios. In the first scenario, Amtrak and ConnDOT would maintain separate equipment pools. In the second, there would be a single combined equipment pool used for all trains. The Amtrak Vermonter (train 55 and 56) and the through train to and from Washington (train 141 and 148) are not included in these equipment turns, since they use equipment from a different pool. With separate pools, ConnDOT would need a minimum of 6 sets plus 2 spare sets, and Amtrak would need 3 sets plus a spare set, for a total of 11

equipment sets. With a combined pool, 8 sets plus two spares, or a total of 10 sets, would be required. The equipment turns with separate Amtrak and ConnDOT services would be as shown in Table 6-1.

Table 6-1
Train Set Equipment Needs

Scenario 1	Scenario 2
ConnDOT SPG-1-8-13-NHV SPG-3-10-15-NHV SPG-5-12-SPG NHV-2-7-14-SPG NHV-4-9-16-SPG NHV-6-11-NHV = 6 sets total for ConnDOT **Amtrak** SPG-495-470-437-476-SPG SPG-471-474-475-494-SPG NHV-490-493-486-477-NHV = 3 sets total for Amtrak shuttles	**Combined** SPG-1-8-9-14-SPG SPG-3-490-475-16-SPG SPG-5-470-11-494-SPG SPG-495-474-13-NHV SPG-7-10-15-NHV NHV-2-471-486-477-NHV NHV-4-493-12-SPG NHV-6-437-476-SPG = 8 sets total for common pool
9 sets equipment	8 sets of equipment
3 spare sets (2 ConnDOT, 1 Amtrak)	2 spare sets for total service
12 sets of equipment	10 sets of equipment

Under the combined plan, Amtrak or CDOT could own all the equipment, with the non-owner paying a "usage fee" as an operating cost in lieu of ownership. It would also work if each entity owned some of the equipment, with usage charges being worked out as a contractual matter between the parties. In California's Surfliner corridor, for example, Amtrak owns some cars and Caltrans owns others. They are operated interchangeably in a single unified service in which Amtrak supports 40% of the net cost and Caltrans supports 60%. A common equipment pool would enable any equipment to be used on any schedule and would be more flexible from an operating standpoint, in addition to requiring less equipment in total.

For this analysis, it is assumed that ConnDOT would require a minimum of 6 train sets, plus two spare locomotives, trailer coaches and cab coaches. Costs for the train sets required, assuming conventional commuter rail equipment, i.e. a locomotive and three passenger cars are used in this analysis. Specifics of potential equipment sources are discussed in Chapter 8.

Locomotives **-** An appropriate locomotive type for the New Haven-Hartford-Springfield service would be a diesel electric locomotive used in commuter rail service today. One locomotive can typically haul five or six commuter cars, but in the Recommended Action, it would only haul three. The estimated costs of a locomotive come in a range of

about $2.8 million for a basic "no frills" passenger locomotive[7] to about $4.5 million for a high-end AC power locomotive[8]. Delivery costs would be a negligible percentage of the purchase price.

Cars - Assuming the traditional train sets, the New Haven-Hartford-Springfield service would use two car types: a cab car and a trailer car or coach. The cab car has an engineer's compartment, which the coach does not. Cab cars are used in a "push pull" configuration. With a cab car on the opposite end of the train from the locomotive, the train set can be operated in either direction, obviating the need to reposition the locomotive from front to back. An average cost of $1.37 million is assumed for a coach car and $1.87 million is assumed for a cab car.[9] Delivery costs would be a negligible percentage of the purchase price.

Table 6-2 below presents the two rolling stock options and their likely costs. A cost for two spare sets is included.

Table 6-2
Minimum Rolling Stock Summary

Type	Number	Spares	Total Units	Unit Cost	Total Cost
Locomotives	6	2	8	$4,500,000	$36,000,000
Coaches	12	2	14	$1,370,000	$19,180,000
Cab cars	6	2	8	$1,870,000	$14,960,000
Total					**$70,140,000**

Source: Wilbur Smith Associates per sources described in text

6.1.2 Maintenance Facility / Storage

The cost for the maintenance facility described in Chapter 4 would be approximately $13 million, inclusive of engineering and construction, but not including land acquisition or environmental clean-up. Land requirements would be in the range of 12 acres, estimated at about $8 million, including an allowance of $4 million for property purchase and $4 million for environmental clean-up that may be required due to the necessary location along the rail right-of-way. Purchase of a site would require assumption of environmental issues on the site, the extent of which would be addressed further in the Environmental Assessment phase of this project, once a specific site is identified. Therefore the total cost would be approximately $21 million, including only an allowance for environmental costs. The costs for a maintenance facility are broken down in Table 6-3.

[7] Per conversation with Preston Cook of Engine Systems Inc. (ESI), distributor for EMD.
[8] Per conversation with Peter Richter of the Connecticut Department of Transportation.
[9] Per Connecticut Department of Transportation study entitled *New Haven Line Fleet Configuration Analysis*, Task 5: Lifecycle Cost Analysis, page 102.

Table 6-3
Maintenance Facility Costs

Item	Quantity	Cost per unit	Cost
Building (complete) [1]	125,000 sq ft	$25 / sq ft	$3,125,000
Excavation	52,000 cub yd	$10 / cub yd	$520,000
Pavement	6200 tons	$50 / ton	$310,000
Fencing	1636 ft	$20 / ft	$33,000
Subballast	9534 sq yd	$10 / sq yd	$96,000
Trackwork	4400 ft	$150 / ft	$660,000
Switches	8	$215,000 each	$1,720,000
Shop Machinery			$250,000
Generator			$8,000
Subtotal			**$6,722,000**
Electrical (20%)			$1,345,000
Minor Items / Contingency (30%)			$2,017,000
Subtotal			**$10,084,000**
Engineering (15%)			$1,311,000
Construction (15%)			$1,311,000
Fueling Facility			$50,000
Washing Facility			$100,000
Property Maintenance Equipment			$40,000
Land Acquisition with Cleanup Allowance	12 acres	$650,000 / acre	$7,800,000
TOTAL			**$20,696,000**

Notes:
Building is pre-fabricated structure with a typical footing design, has basic finished interior, wide enough for three tracks, utilities supplied by local comp. Pavement is standard asphalt mix, access rd is 300 ft long and 24 ft wide. Area inside fence and outside of building is asphalt, fencing is chain link. Trackwork price includes rail, ties, ballast and other track materials. Switches are power operated. Land Acquisition based average unit price for ROW acquisition, including an allowance for environmental clean-up likely associated with a site. Assume site soils are suitable for building and track construction. Property Maintenance Equipment will be leased or subcontracted.

6.1.3 Station Costs

For the Recommended Action, the stations are envisioned to be slightly less substantial the then Maximum Build Scenario, but would still have covered platforms in both directions, bridge walkways over the tracks, and parking as required by ridership. The following costs include these items broken down into categories for each existing and new station. Plan-level drawings of each of the stations are presented in Chapter 4. The total station area costs, including parking and stations are shown in Table 6-4. The total start-up service station cost is anticipated to be $81 million.

Parking and Site Work Costs – Parking costs include surface parking or parking garage construction with applicable site work. Costs were estimated based on advisement from ConnDOT at $5,000 per parking space for surface parking and $15,000 per space for parking garage construction, based on previous experience with similar projects. No additional parking is anticipated at this time for New Haven Union Station, New Haven State Street Station or Hartford Union Station.

For Hartford Union Station, $2,000,000 has been included for construction of a covered walkway from Union Station to the back entrance of the Legislative Office Building Parking Garage with related lighting and landscaping.

Springfield Union Station costs were provided by the Pioneer Valley Planning Commission to account for improvement not currently planned with the renovations taking place at the station. They include an estimated 130 parking spaces dedicated to commuter rail to be provided in one of the planned Union Station garages at an estimated cost of $18,500 per space.

Platform and Amenities Costs – Costs include 200 foot by 10 foot platforms, 100 foot by 10 foot canopies, elevators, stair towers and pedestrian bridges as shown on site plans. The estimated cost for each platform is $1,375,000. The estimated cost for the elevators, stair towers and pedestrian bridge is $2,750,000.

North Haven, Meriden, Newington, Windsor and Enfield Stations include costs for two platforms, two canopies, elevators, stair towers and pedestrian bridges. Wallingford, Berlin and Windsor Locks Stations will only require single track for the start-up service proposed for the Recommended Action, therefore costs include only one 200 foot by 10 foot platform and one 100 foot by 10 foot canopy. No station costs were included for New Haven Union Station.

The use of the State Street station requires Springfield line trains to use different tracks into the New Haven station than current operations allow. An allowance of $4,000,000 for platform improvements is estimated based on the contractor bids for the current Shore Line East station construction. This study did not include a detailed analysis of track occupancy and train movements at New Haven.

Table 6-4
Station Area Costs

	New Parking Spaces	Surface Parking and Site Work	Parking Garage and Site Work	Platform and Amenities	Survey, Design, Construction Services [1]	Right-of-way Acquisitions	Estimated Total Site Development Costs [2]
New Haven State Street	--	--	--	$4,000,000	$1,040,000	--	$5,040,000
North Haven	205	$1,025,000	--	$5,500,000	$1,700,000	--	$8,225,000
Wallingford [3]	200	$1,000,000	--	$1,375,000	$620,000	$840,000	$3,835,000
Meriden	200	$1,000,000	--	$5,500,000	$1,690,000	$846,000	$9,036,000
Berlin (Alternative A)	147	$735,000	--	$1,375,000	$550,000	$390,000	$3,050,000
Newington	200	$1,000,000	--	$5,500,000	$1,690,000	$675,000	$8,865,000
Hartford	--	$2,000,000 [4]	--	$2,000,000	$1,040,000	--	$5,040,000
Windsor	266	--	$3,990,000	$5,500,000	$2,470,000	$417,000	$12,377,000
Windsor Locks	125	$625,000	--	$4,250,000	$1,270,000	--	$6,145,000
Enfield (Alternative B)	117	$585,000	--	$5,500,000	$1,590,000	$453,000	$8,128,000
Springfield [5]	130	--	$2,405,000	$6,500,000	$2,320,000	--	$11,225,000
Start-up Service Totals [6]	1,590	$7,970,000	$6,395,000	$47,000,000	$15,980,000	$3,621,000	**$80,966,000**
Wharton Brook Station	112	$560,000	--	$5,500,000	$1,580,000	$720,000	$8,360,000
Wallingford Second Platform and Ped Crossing	--	--	--	$4,125,000	$1,080,000	--	$5,205,000
Meriden Parking Garage	200	--	$3,000,000	--	$780,000	--	$3,780,000
Berlin Second Platform and Pedestrian Crossing	--	--	--	$4,125,000	$1,080,000	--	$5,205,000
Windsor Locks Second Platform and Ped Crossing	--	--	--	$2,750,000	$720,000	--	$3,470,000
Additional Full-build Items Totals [6]	312	$560,000	$3,000,000	$16,500,000	$5,240,000	$720,000	**$26,020,000**
Total [6]	1,902	$8,530,000	$9,395,000	$63,500,000	$21,220,000	$4,341,000	**$106,986,000**

Notes: [1] Reflect survey (3%), design (10%), construction staking (1%), and construction admin (12%) of parking and station costs. [2] Does not include costs for public involvement, site plan approvals; hazardous materials studies or remediation; environmental studies or mitigation; geotechnical studies, regulatory permitting, project financing, property appraisals, relocations, program administration costs, or other costs not explicitly included. [3] Costs based on an ideal number of parking spaces constructed and not on site plans shown. [4] Cost for walkway. [5] Costs obtained from PVPC. [6] All costs are in 2004 dollars.

For Hartford Union Station, a cost of $2,000,000 has been included for conversion of one section of the existing platform to a high level platform with canopy and other related station area improvements.

Springfield Union Station costs were provided by the Pioneer Valley Planning Commission to account for improvement not currently planned with the renovations taking place at the station. Springfield station related costs are expected to be $6,500,000 for four elevators, four stair towers, related tunnel work, platforms, canopies, station related signage and station related lighting.

Right-of-way Acquisitions Costs - Costs for right-of-way acquisitions are estimated based on concept-level determinations of property acquisition needs. A unit cost of $300,000 per acre has been used based on information provided by ConnDOT and a limited internet-based review of commercial property values. Parcel limits estimated based on a review of aerial photography.

Full-build Station Costs – In addition to the start-up service Recommended Action costs, Table 6-4 lists additional costs that would be incurred with the future double-tracking of the entire Springfield line, as outlined in Chapter 4 for a full-build. An additional station at Wharton Brook, anticipated with the development of the Pratt and Whitney property in North Haven is estimated at $8.36 million. Second platforms and overhead pedestrian crossings that would be required in Wallingford, Berlin and Windsor Locks with the addition of double track are estimated at $5.2 million for Wallingford and Berlin and $3.47 million for Windsor Locks, where the elevators and stairways are already in place with the overhead pedestrian crossing from the parking area. In addition, a cost has been included for the future provision of 200 parking spaces in a parking garage envisioned in Meriden with future development. The additional station costs for the full-build are $26 million.

6.1.4 Double Track Extension and Related Signal System Costs

For the Start-up Service, the Springfield Line would essentially remain a single-track railroad with a bi-directional signaling / train control system and multiple controlled passing sidings similar to the existing configuration. However, five existing double track sections would require a minimum of approximately 18-miles of track extensions to provide additional double track on the Springfield Line to accommodate the increase in train movements without impacting planned service trip times.

The Bi-State Alternative called for approximately 15.4 miles of extended track. With the addition of three new stations in the alternative, additional double track would permit more flexibility in scheduling and operations. The Recommended Action further improves service flexibility by adding approximately 2.6 more miles of new track for a total of a minimum of 18 miles and ten new #20 track turnouts (switches) that will connect the ends of the new double track sections to the single track.

The recommended Start-up Service would require (at a minimum) the following major track changes (see Figure 6-1):

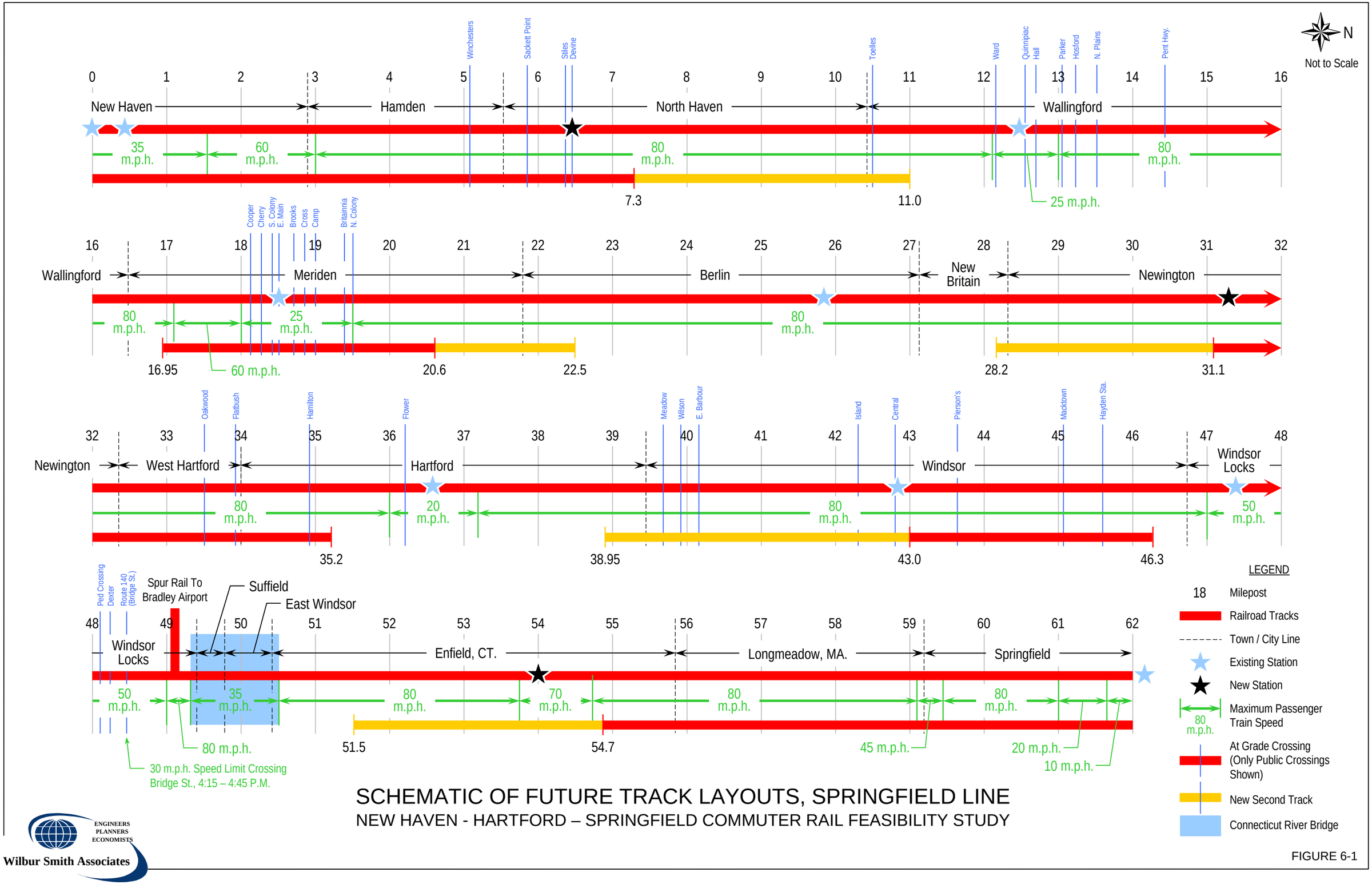
- Extend existing double track from MP 7.3 (Cedar) to MP 11.0 (south of Wallingford) with a new interlocking at MP 11.0. This requires double track across the Quinnipiac River and differs from the Bi-State 1 Alternative.
- Extend existing double track from MP 20.6 (Quarry) through the industrial track to MP 22.5 with a new interlocking at MP 22.5.
- Extend existing double track from MP 28.2 to 31.1 (New), and from MP 33.4 (Wood) to MP 35.2 (Parkville) with a new interlockings at MP 28.2. Some track through Hartford may be redesignated as a running track instead of a passing track, however this issue requires further study and coordination with Amtrak operations staff.
- Extend existing double track from MP 38.9 (Fry) to MP 43.0 (Windsor) with a new interlocking at MP 38.9 (Fry).
- Extend existing double track from MP 51.5 (east side of Connecticut River) to MP 54.7 (Field) with a new interlocking at MP 51.5.

Each double track extension will require modifications to the existing and/or new signal system "interlockings" to control the new #20 track switch connection from the new (extended) end of double track to the existing single track. For conceptual planning purposes, it was assumed that existing interlockings and switches will be retained. Therefore, the signal system costs include additional all electric switch machines, track circuits, interlocking signals and other signal system equipment required to accommodate the double track extensions.

Each new interlocking will require tie-in to Amtrak's Centralized Electrification and Traffic Control (CETC) facility in South Station, Boston which houses Amtrak's Train Dispatchers for remote supervision of the Springfield Line. Appropriate interlocking signals, track circuits and other signal equipment will be required to allow bi-directional train movements on either track. Each interlocking will also be equipped with a "Local Control Panel" to allow for onsite control of signals and track switches for routine testing, a failure within the CETC control center or connecting communications equipment, or as a contingency to respond to any unforeseen operational problem affecting normal train movements. Amtrak forces will make CETC software database changes to facilitate the track and signal changes in the Recommended Action. The costs for additional code system equipment and CETC database work are included in the various conceptual cost estimates below.

The track and signal system related costs for the Start-up Service Recommended Action were conceptually estimated to include the following major work items and assumptions:

- A minimum of 18 miles of new track at approximately $800,000 per mile or approximately $150 per track foot installed ($14,400,000). Rail would be minimum 132-lb. (or currently available 136-lb) with double shoulder tie plates secured to main line ties with standard cut spikes. The new track would be fully anchored in accordance with the Amtrak MW-1000 track standards manual. Grading and drainage remains in place along the line.



SCHEMATIC OF FUTURE TRACK LAYOUTS, SPRINGFIELD LINE

NEW HAVEN - HARTFORD – SPRINGFIELD COMMUTER RAIL FEASIBILITY STUDY

ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

FIGURE 6-1

- 10 new #20 track turnouts or "switches" of the same weight and rail section as the new track; 2 new switches (one at each end) are required for each additional double-track section; estimated cost $150,000 for each #20 turnout (track material and installation); assumed no movable point frogs; standard AREMA #20 pattern turnout on wood ties. ($1,500,000)
- 5 new Interlocking control points at $1.5 million each. ($7,500,000); additional track circuits, code system equipment, Signals, "cut-section" signal locations and other required signal equipment for the new track is included; Adequate roadway maintenance access to the new Interlockings should be confirmed during Preliminary Engineering.
- Modifications to the 5 existing interlockings to accommodate double track extensions are estimated to cost approximately $750,000 each. ($3,750,000)
- Grade crossing signal modifications (6 @ $100,000 each) to accommodate double track changes (Toelles, Meadow, Wilson, East Barber, Island, Central St); other miscellaneous grade crossing work - $150,000; (total $750,000). It is also assumed Oakwood Ave, Flatbush Ave and Hamilton St crossings are in existing double track section. Several existing signal instrument houses may require relocation – TBD during Preliminary Engineering.
- AC Power Distribution modifications to accommodate new interlockings, new signal cut-sections, and other locations where signal power distribution changes are required- $1,000,000.

These costs are summarized in Table 6-5. The total conceptual engineering track and signal system costs are therefore estimated at approximately $33.235 million for the Start-Up Service Recommended Action.

Table 6-5
Start-up Service Double Track Extension and Signal System Costs

Item	Quantity	Cost per Unit	Cost
New Track	18 miles	$800,000 / mile	$14,400,000
Switches	10	$150,000 each	$1,500,000
New Interlocking Control Points	5	$1,500,000 each	$7,500,000
Modified Interlocking Control Points	5	$750,000 each	$3,750,000
Grade Crossing Signal Modifications	6	$100,000 each plus misc.	$750,000
AC Power Modifications			$1,000,000
Subtotal			$28,900,000
Design, Inspection, Testing, and Cut-over		15%	$4,335,000
Start-up Service Total			**$33,235,000**

In addition to the 18 miles of track and signal system costs for the Recommended Action, the "Full Build" double-tracking of the entire Springfield line will require another 20.5 miles of track, plus signal system, power distribution, and grade-crossing changes.

The conceptual cost for 20.5 miles of new track is approximately $800,000 per mile or approximately $150 per track foot installed ($16,000,000) including the following major work items and assumptions:

- Extend the Recommended Action double track approximately 5.9 miles from MP 11.0 (south of Wallingford) to the double track section at MP 16.95 (Meriden).
- Extend the Recommended Action double track approximately 5.7 miles from MP 22.5 to the double track section at MP 28.2.
- Extend Recommended Action double track approximately 3.7 miles from MP 35.2 to the double track section at MP 38.9 (Fry).
- Extend Recommended Action double track approximately 5.2 miles from MP 46.3 to the double track section at MP 51.5 (east side of Connecticut River).

The track and signal system related costs for the Full-Build were conceptually estimated to include the following major work items and assumptions:

- 20.5 miles of new track at approximately $800,000 per mile or approximately $150 per track foot installed ($16,400,000). Rail would be minimum 132-lb. (or currently available 136-lb) with double shoulder tie plates secured to main line ties with standard cut spikes. The new track would be fully anchored in accordance with the Amtrak MW-1000 track standards manual. Grading and drainage remains in place along the line.
- 8 new #20 track turnouts or "switches" of the same weight and rail section as the new track; 2 new switches (one at each end) are required for each double-track section; estimated cost $150,000 for each #20 turnout (track material and installation); assumed no movable point frogs; standard AREMA #20 pattern turnout on wood ties. (Total $1,200,000)
- Modifications to the 8 existing interlockings to accommodate double track extensions are estimated to cost approximately $750,000 each. ($6,000,000); Additional track circuits, code system equipment, signals, "cut-section" signal locations and other required equipment in new track included; Adequate roadway maintenance access to the new interlockings should be confirmed during Preliminary Engineering.
- Grade crossing signal modifications (11 @ $100,000 each) to accommodate double track changes (Ward, Quinnipiac, Hall, Parker, Hosford, N. Plains, Pent Hwy, Flower, Ped Crossing, Dexter, Bridge St); other miscellaneous grade crossing work - $275,000; (total $1,375,000). Several existing signal instrument houses may require relocation to be determined during Preliminary Engineering.
- AC Power Distribution modifications to accommodate existing Interlocking, new signal cut-sections, and other locations where signal power distribution changes are required- $1,250,000.

These costs are summarized in Table 6-6. The total conceptual engineering track and signal system costs are therefore estimated at approximately $30.235 million in addition to the Start-up Service costs for an estimated total of $63.394 million for the Full-build with double tracking of the entire line.

Table 6-6
Full-build Double Track Extension and Signal System Costs

Item	Quantity	Cost per Unit	Cost
New Track	20.5 miles	$800,000 / mile	$16,400,000
Switches	8	$150,000 each	$1,200,000
Modified Existing Interlocking Control Points	8	$750,000 each	$6,000,000
Grade Crossing Signal Modifications	11	$100,000 each plus misc.	$1,375,000
AC Power Modifications			$1,250,000
Subtotal			$26,225,000
Design, Inspection, Testing, and Cut-over		15%	$3,934,000
Additional Full-build Items Total			**$30,159,000**
Full-build Total			**$63,394,000**

It is of note that for maximum flexibility, additional switches configured as a "double-crossover" should be installed at various locations throughout the Springfield Line to facilitate continuous train movements from either track to either track without requiring some train movements to stop and back through a crossover before proceeding. For both the Recommended Action and Full Build scenarios, this conceptual estimate does not include any costs for double crossovers as the final locations and configuration (facing point / trailing point) of crossovers, interlocking limits, and other important operating characteristics should be undertaken as part of Preliminary Engineering and Design.

Actual locations of signals and switches (including universal crossovers) must meet the safety and operational requirements of a detailed Signal Block Design and be validated during Preliminary Engineering through revised operations modeling.

6.1.5 Bridge Costs

Bridge costs were evaluated in the Alternatives Report as part of the maximum build scenario. For a start-up service, it is assumed that bridge rehabilitation costs would be encountered only where a new second main track is to be constructed, and that all other bridge costs would be considered maintenance costs to renew the existing infrastructure, owned and maintained by Amtrak. Therefore, of the bridge costs presented in the Maximum Build section of the Alternatives Report, only the short-term costs apply and only for bridges listed in Table 6-7. On this basis, the bridge costs assumed for the initial commuter service is $505,000. The bridge costs assumed for the double-tracking of the entire line are listed as well.

Table 6-7
Bridge Costs

AMTRAK Bridge No.	Description	Short Term Rehabilitation / Replacement Cost
30.99 (Newington)	74 ft Encased I-Beam over Newington River	$86,000
35.15 (Hartford)	79 ft Through Girder over Park Ave.	$176,000
42.65 (Windsor)	29 ft Deck Girder over Batchelder Rd.	$123,000
53.98 (Thompsonville)	35 ft Encased I-Beam over Main St.	$36,000
	Subtotal	$421,000
	Design and Construction Services (20%)	84,000
	Start-up Service Total	**$505,000**
15.26 (Yalesville)	58 ft Conc. Box Beam over Falls Brook	$31,000
16.78 (Meriden)	28 ft I-Beam over Gypsy Lane	$2,599,000
25.52 (Berlin)	170 ft Stone Arch over Mill River	$44,000
25.76 (Berlin)	35 ft Through Girder over Farmington Ave.	$1,150,000
26.39 (Berlin)	56 ft Stone Arch over Willow Brook	$84,000
35.41 (Hartford)	50 ft Conc/Stone Arch over Park River	$107,000
35.51 (Hartford)	103 ft Through Girder over Capitol Ave.	$288,000
36.38 (Hartford)	85 ft Through Girder over Roadway B	$29,000
36.53 (Hartford)	77 ft Through Girder over Asylum St.	$182,000
36.55 (Hartford)	637 ft Deck Girder over Station Viaduct	$762,000
36.66 (Hartford)	36 ft Deck Girder over Church Street	$1,029,000
37.35 (Hartford)	93 ft Conc. Arch and Encased I-Beam over Windsor St.	$188,000
49.73 (Windsor Locks)	1541ft Through Truss & Deck Girder over Connecticut Riv	$1,844,000
	Subtotal	$8,337,000
	Design and Construction Service (20%)	1,668,000
	Additional Full-build Items Total	**$10,005,000**
	Full-build Total	**$10,510,000**

Source: URS Corporation

6.1.6 Airport Connection

In the recommended action, the airport connection will initially be handled via a shuttle bus from Windsor Locks station. Therefore, no capital construction costs are necessary, aside from those shown at Windsor Locks station. It is anticipated that a minor cost will be incurred for the purchase of an additional airport shuttle bus, including in the bus cost estimates in Chapter 5.

6.1.7 Total Start-up Service Recommended Action Capital Costs

A summary of total capital costs for the Start-up commuter rail service appears in Table 6-8. The cost estimate includes necessary train sets, spares, the maintenance facility, parking and station costs, double track costs, and bridge rehabilitation or replacement costs. Design, construction service (including Amtrak flagmen) and inspection costs have been applied to each individual estimate. The estimate also includes right-of-way and environmental cost allowances that may be associated with station and maintenance facility construction; however these costs will require refinement in the next phase of implementation. Therefore, to be conservative, a contingency of 40% has been used to reflect unforeseen costs, per Federal Transit Administration guidelines at this phase of implementation. The estimated total capital cost for the Start-up commuter rail service is $291.3 million.

Table 6-8
Commuter Rail Start-up Service Recommended Action Capital Costs

Element		**Cost**
Train Equipment		$70,140,000
Maintenance facility		20,696,000
Stations		80,966,000
Double Track		33,235,000
Bridges		505,000
Amtrak Flagmen		2,500,000
Subtotal		**$208,042,000**
Contingency	40%	$83,217,000
Total		**$291,259,000**

Source: Wilbur Smith Associates, URS Corporation, Washington Group International

6.1.8 Total Full-build Capital Costs

In addition to the capital costs for the Start-up Service Recommended Action, the long term recommendation is to complete double-tracking the entire Springfield corridor. The additional costs associated with the double-tracking are presented in each of the sections above and a summary of these costs appear in Table 6-9. The cost estimate includes additional parking and station costs, double track costs, and bridge rehabilitation or replacement costs. Design, construction service (including Amtrak flagmen) and inspection costs have been applied to each individual estimate. A contingency of 40% has been used to reflect unforeseen costs, per Federal Transit Administration guidelines at this phase of implementation. The estimated total additional capital costs for the future Full-build are $96 million.

Table 6-9
Additional Full-build Capital Costs

Element		Cost
Stations		$26,020,000
Double Track		$30,159,000
Bridges		$10,005,000
Amtrak Flagmen		$2,500,000
Subtotal		**$68,684,000**
Contingency	40%	$27,474,000
Total		**$96,158,000**

6.2 Commuter Rail Operating Costs

This analysis calculates annual operating costs by multiplying the Springfield Line service's projected annual train miles for its Start-up Service times a representative cost per train mile.

6.2.1 Train Miles

A train mile measures the distance a train travels. That is, a train set traveling one mile equals one train mile. The Recommended Action schedule would have 8 round trips per day or 16 one-way trips each weekday. A run between New Haven and Springfield is 62 miles; using 8 round trips or 16 one way trips would generate 992 revenue train miles per weekday. Fifty-two weeks at 5 days per week totals to 260 days of operation, less some holidays on which New Haven-Hartford-Springfield service would not run. (Note that Shore Line East and most commuter rail systems in the US have approximately 254 operating weekdays per year). Annual train miles are thus calculated: 992 train miles multiplied by 254 days produces 251,968 annual train miles, exclusive of any shop moves or deadheading for maintenance purposes.

6.2.2 Cost per Train Mile

In order to refine the operating cost estimate for the new commuter rail service, the study team looked at the experience of commuter rail operators nationally with a focus on Shore Line East (SLE). For various reasons, SLE appears to offer a model which most closely resembles how the New Haven-Hartford-Springfield service would operate. These are:

- SLE uses Amtrak for train and engine crews. While not a certainty, Amtrak appears the most likely candidate to operate the service. This is because Amtrak owns the Springfield Line, and it has expressed a desire to operate the service.
- SLE operates over Amtrak's Northeast Corridor between New London and New Haven. The new service would operate over Amtrak infrastructure as well.

- Amtrak maintains SLE rolling stock in New Haven. Amtrak could expand its maintenance pool there to provide resources for the new service, albeit at a separate facility.

All things being equal, Shore Line East per train-mile operating costs should hold true for the New Haven-Hartford-Springfield service. Similar to SLE, Amtrak owns the right-of-way along this corridor. Therefore, a track usage fee must be negotiated between the operator and Amtrak and the cost can vary with each agreement renewal. For this analysis, it is assumed that the current per train mile track usage fee charged by Amtrak for SLE service would be applied to the New Haven to Springfield corridor.

SLE operating costs, revenue train miles, and operating costs per train mile for three recent years appear below in Table 6-10.

Table 6-10
Shore Line East Operating Costs per Train Mile

Year	Operating Cost	Train Miles	Cost/ Train Mile
1999	$5,702,061	160,160	$35.60
2000	$6,081,910	132,117	$46.03
2001	$7,486,284	197,314	$37.94

Source: ConnDOT

A unit cost estimate of $40 per train mile has been applied, based upon Shore Line East commuter rail experience. Accordingly, an annual operating cost for the recommended Start-up service would be derived as follows: 251,968 annual train miles at $40 per train mile totals to $10,079,000. In addition, the operating costs for the bus services in the study area would increase by $3,757,000 to account for additional connecting bus service.

6.3 Fare Policy and Collection Method

The fare policy and collection method for Shore Line East are assumed for the New Haven-Hartford-Springfield service. There are four ticket and pass categories. These are in descending price order: One-Way, Ten-Trip, Monthly, and Monthly Plus. Monthly Plus allows transfers to bus transit. These categories offer discounts off the One-Way fare for riders who purchase multiple ride tickets or passes. For example, the One-Way fare between Old Saybrook and New Haven is $5.75, while the Ten-Trip ticket provides for a $5.20 per-trip fare for the same trip. A similar fare structure is assumed for the new Springfield Line service. SLE offers the Uni-Rail pass, which allows for travel on both SLE and Metro-North. Conceivably, the Springfield Line service could offer this pass as well.

SLE riders can purchase tickets and passes in various ways. One-Way tickets are sold on board trains. They are available at the New London, Old Saybrook, and New Haven ticket windows. They are valid for 90 days. Ten-Trip tickets and Monthly and Monthly Plus passes can be purchased at the staffed station ticket windows, through the mail, and by phone (1-800-All-Ride in Connecticut). Ten-Trip tickets are valid for 90 days. Monthly and Monthly Plus passes are valid for the calendar month shown and may be used for unlimited travel between stations specified. The bus portion of the Monthly Plus pass is honored for travel on all CTTRANSIT bus routes including Commuter Connection buses in New Haven. The Springfield Line service tickets would be obtain in the same ways - on board trains, at ticket windows, through the mail, and over the phone.

SLE conductors check all tickets on board trains, as would conductors on the Springfield Line service.

6.4 Commuter Rail Revenue

To calculate fare box revenue for the Recommended Action, a similar fare structure was developed to that being put in place for 2005 on Shore Line East. Table 6-11 shows the suggested One-Way fare matrix for service on the line using the formula $2.419 + $.146 per mile greater than 10 miles, rounded to the nearest quarter dollar. Monthly fares, shown in Table 6-12, are 50% of the One-Way fares and the per trip cost is based on 42 trips per month. It was assumed that commuter ridership would be using a Monthly pass and non-commuter would pay a One-Way fare.

Based on the fare structure and weekday ridership presented, revenue for the State-up commuter rail service would be $4,400 per day. Using 254 days of weekday service per year, the annual revenue would be $1,117,600.

The ridership projections developed for this implementation plan are based upon a rigorous evaluation process and a customized application of ConnDOT's Statewide Travel Model. However, some stakeholders have suggested that these ridership projections may be conservative. To obtain an indication of a possible upper projection for this implementation plan, the Department performed a further review of the 2000 Census Journey to Work data for towns being served by the Shore Line East (SLE) commuter rail service. The SLE service is a peak-period commuter rail service, which has been operating since 1990 along Amtrak's northeast corridor, between New Haven and Old Saybrook, with through service to Stamford and connections with New Haven Line (New Haven - New York Grand Central Terminal) commuter rail service.

This review indicated that the SLE service capture rate of the potential commuter market is approximately 5 percent, which is more than double the projection from the Statewide Travel Model application for the New Haven-Hartford-Springfield (NHHS) rail service plan. While the two systems are not directly comparable, the higher captured rate experienced by SLE could be considered the higher end of a range for the NHHS plan.

Table 6-11
Recommended Action One-Way Fare Matrix

Station Pair	New Haven	State Street	North Haven	Wallingford	Meriden	Berlin	Newington	Hartford	Windsor	Windsor Locks	Enfield	Springfield
New Haven	-											
State Street	$2.25	-										
North Haven	$2.25	$2.25	-									
Wallingford	$2.75	$2.50	$2.25	-								
Meriden	$3.50	$3.50	$2.50	$2.25	-							
Berlin	$4.50	$4.50	$3.50	$2.75	$2.25	-						
Newington	$5.25	$5.25	$4.25	$3.50	$2.75	$2.25	-					
Hartford	$6.00	$6.00	$5.00	$4.25	$3.50	$2.25	$2.25	-				
Windsor	$6.75	$6.75	$6.00	$5.00	$4.25	$3.25	$2.50	$2.25	-			
Windsor Locks	$7.50	$7.25	$6.50	$5.75	$4.75	$3.75	$3.00	$2.25	$2.25	-		
Enfield	$8.25	$8.25	$7.50	$6.75	$5.75	$4.75	$4.00	$3.25	$2.50	$2.25	-	
Springfield	$9.50	$9.50	$8.50	$7.75	$7.00	$6.00	$5.00	$4.50	$3.50	$3.00	$2.25	-

Source: Wilbur Smith Associates, based on ConnDOT formula for SLE
Note: Fare calculated at $2.293 + $.138 per mile greater than 10 miles, then rounded to nearest quarter dollar.

Table 6-12
Recommended Action Approximate Monthly Fare Matrix

Station Pair	New Haven	State Street	North Haven	Wallingford	Meriden	Berlin	Newington	Hartford	Windsor	Windsor Locks	Enfield	Springfield
New Haven	-											
State Street	$51	-										
North Haven	$51	$51	-									
Wallingford	$58	$57	$51	-								
Meriden	$77	$75	$57	$51	-							
Berlin	$100	$98	$80	$62	$51	-						
Newington	$117	$115	$97	$78	$60	$51	-					
Hartford	$132	$131	$112	$94	$75	$52	$51	-				
Windsor	$152	$150	$132	$114	$95	$72	$55	$51	-			
Windsor Locks	$164	$163	$144	$126	$108	$85	$68	$52	$51	-		
Enfield	$186	$184	$166	$147	$129	$106	$89	$74	$54	$51	-	
Springfield	$210	$209	$190	$172	$154	$131	$114	$98	$78	$66	$51	-

Source: Wilbur Smith Associates, based on ConnDOT formula for SLE
Note: Fare calculated at 50% of one-way fare times 42 trips, then rounded to nearest dollar.

The resulting high range in ridership is 5,000 daily trips. This higher range is anecdotal and so would be viewed as an optimistic figure. Although there is a range in projected capture, the anticipated NHHS ridership and cost analysis in this plan is based upon the evaluation process derived from application of the ConnDOT Statewide Travel Model. It should be noted that this recommended service is to initiate commuter rail along this corridor and that the opportunity remains to enhance the initial service (with additional scheduled trains and stations) as the demand warrants

Ridership and Revenue Variables

This analysis of initial implementation alternatives has treated the added commuter rail service separately for the purposes of projecting ridership and resulting revenue. However, the service is envisioned as co-existing with Amtrak's current service on the Springfield line. Ideally, the Amtrak schedules during the peak hours could be adjusted to make the same station stops as the commuter trains, and subject to seating availability, the Amtrak trains could serve commuter needs. Similarly, the commuter schedules provide added opportunities for connections at New Haven with Amtrak intercity trains as well as connecting travel via Metro North and Shore Line East.

Metrolink, the commuter rail service in the Los Angeles area, shares routes both north and south from Los Angeles with Amtrak's Surfliner route, a state-supported corridor service with up to 12 round trips per day on some days. Metrolink and Amtrak initiated a "Rail 2 Rail" program, which allows Metrolink monthly pass holders to ride Amtrak's Surfliner trains. The fares on Amtrak are typically higher than Metrolink, and the Amtrak trains serve fewer stations. A funding transfer agreement between Metrolink and Amtrak reimburses Amtrak for a portion of the "loss" incurred because of the lower commuter fares. The program has been extremely successful, producing annual ridership gains on both services because of the greater number of trip opportunities.

A cooperative effort between a ConnDOT service and Amtrak service on the Springfield line would likely have similar results. Amtrak's mid-day trains could be used for one direction of a round trip outside the peak hours, inducing more travel than would be expected if the systems were operated independently. No attempt is made here to project the ridership levels that such a synergy would produce, or to project the resulting revenue increases. At such time as commuter service is initiated, it would be appropriate to test the concept by accepting commuters on selected Amtrak trains, and expanding the program if it proves beneficial to both agencies.

6.5 Cost Summary

A summary of the performance revenue calculations is shown in Table 6-13. Given the Start-up Service Recommended Action is projected to cost $10,078,000 to operate using conventional rolling stock with revenues at $1,117,600, the annual operating deficit would be at $8,960,000 annually. This is in addition to the capital costs of $291.3

million. Using a total of 4,215,384 passenger miles estimated by the ConnDOT model, the revenue per passenger mile was calculated to be $0.26, the fare box recovery was calculated to be 11.0% and the productivity (passenger miles per vehicle miles) was calculated to be 16.73. Productivity, a calculation of passenger miles per vehicle miles, is often used to determine the efficiency of the service.

Table 6-13
Ridership, Costs, Revenue and Performance Measures

Total Weekday Trips	2,428
Annual Passenger Miles	4,215,384
Annual Revenue	$ 1,117,600
Annual Rail Operating Cost	$ 10,079,000
Annual Rail Operating Deficit	$ 8,960,400
Revenue per Passenger Mile	$0.26
Fare box Recovery	11.0%
Productivity (Passenger Miles per Vehicle Miles)	16.73

Connecting bus capital ($3.6 million) and annual operating costs ($3.8 million) would be in addition to the commuter rail capital and annual operating costs. Applying the 2004 CTTransit farebox recovery rates, the annual operating deficit for the connecting bus service, as a component of the commuter rail impelemntaiton plan would be approximately $2.75 million.

Chapter 7
Environmental Resource Review

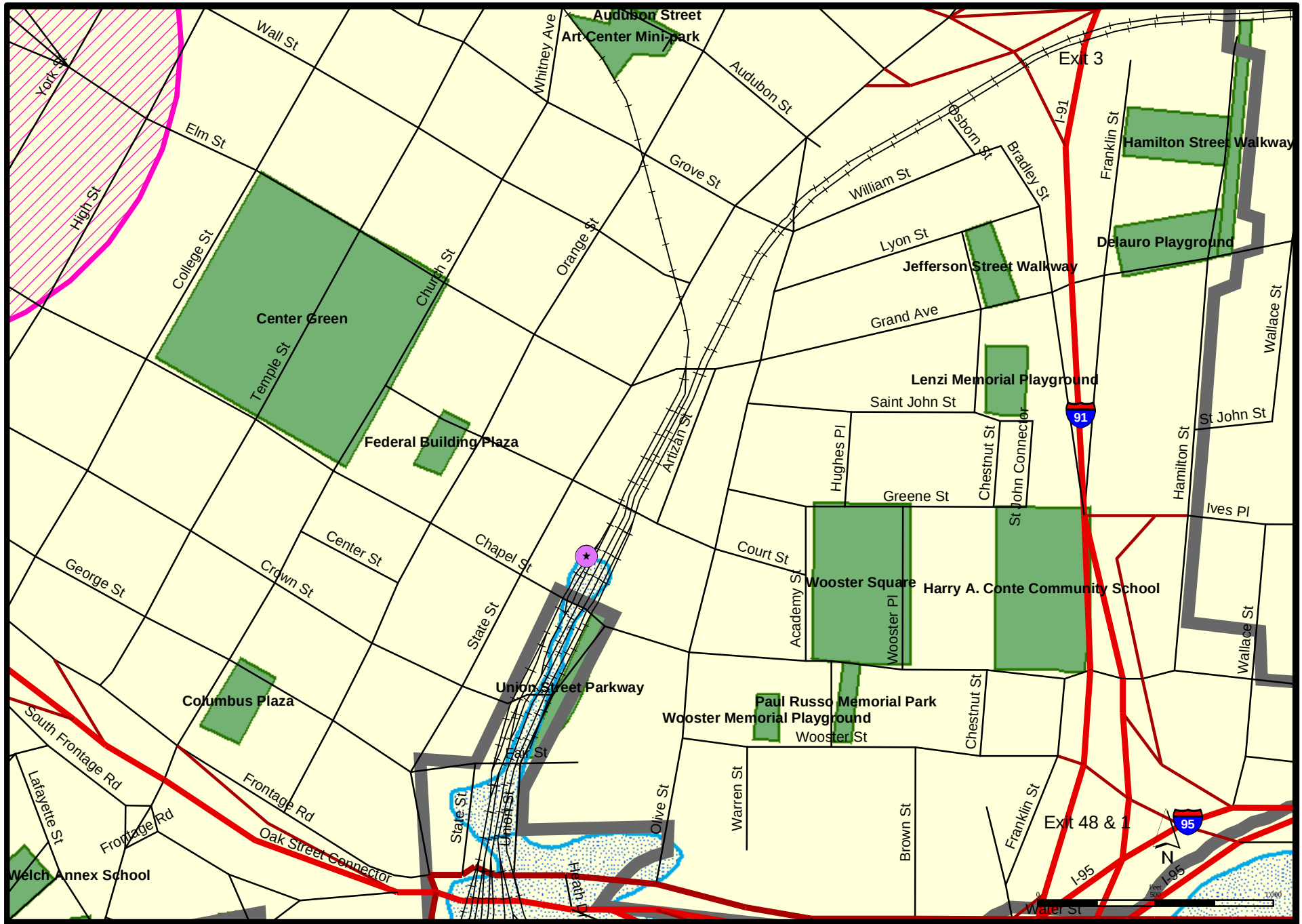
This chapter is a preliminary review of the potential environmental issues associated with the construction of the passenger stations and track for the start-up and full-build service.

7.1 Start-up Service Station Resource Review

7.1.1 New Haven State Street Station

The proposed New Haven State Street Station (Figure 7-1), located northeast of the Chapel Street / State Street intersection, lies within an existing urbanized and previously disturbed area. The only natural resource potentially affected by station development, based on the secondary source review, is the 100-year floodplain. The floodplain approaches the station site from the south along the railroad tracks, possibly extending as far as the location of the proposed elevator/stair. The proposed platform, which extends north of the elevator/stair, appears to be distinctly outside the floodplain limits. During subsequent project phases, accurate mapping of the floodplain boundary will be necessary to determine whether any proposed construction falls within it. Potential impacts on floodplains will need to be addressed during the NEPA/CEPA process. In the event that construction activities will take place within or will affect the floodplain, a Floodplain Management Certification will be needed from the Connecticut Department of Environmental Protection (CTDEP). The certification essentially requires that any construction within floodplains be planned so as not to decrease flood storage capacity and so as to place the floor of any proposed structures (e.g. station) at or above the base flood elevation (BFE). In addition, stormwater management will need to consider potential impacts to floodplains.

The site is located within the coastal boundary and is therefore subject to the Connecticut Coastal Management Act (CCMA). During the NEPA/CEPA process and subsequent permitting phases, the station will need to be shown consistent with the activities and use policies established by the CCMA. No other natural resources are in close proximity to the station. The Farmington Heritage Canal, approximately 250 feet away at its nearest point, is not expected to be affected.


Audubon Street
Art Center Mini-park
Wall St
Whitney Ave
Audubon St
York St
Elm St
Grove St
High St
College St
Church St
Orange St
Center Green
Temple St
Federal Building Plaza
Exit 3
I-91
Osborn St
Bradley St
William St
Franklin St
Hamilton Street Walkway
Lyon St
Jefferson Street Walkway
Delauro Playground
Grand Ave
Wallace St
Lenzi Memorial Playground
Saint John St
91
Hughes Pl
Chestnut St
St John Connector
Hamilton St
St John St
Artizan St
Greene St
Ives Pl
Court St
Center St
Chapel St
George St
Crown St
State St
Academy St
Wooster Square
Wooster Pl
Harry A. Conte Community School
Union Street Parkway
Columbus Plaza
Paul Russo Memorial Park
Wooster Memorial Playground
Wooster St
Chestnut St
South Frontage Rd
Lafayette St
Frontage Rd
Oak Street Connector
Welch Annex School
Olive St
Warren St
Brown St
Franklin St
Exit 48 & 1
95
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Additional Statewide Important Farmland Soils
Parks/Open Space
Coastal Boundary
Station
New Haven, Hartford, Springfield Commuter Rail
Natural Resources Review
FINAL REPORT
NEW HAVEN STATE STREET STATION
Figure 7-1

At the proposed New Haven State Street site, an additional platform and connecting stair will be built to the west of and parallel to the existing Amtrak platforms. There are no historic resources located in close proximity to the proposed station additions, therefore it is anticipated that there will be no physical or visual impact to historic resources in or around this station.

7.1.2 North Haven Station

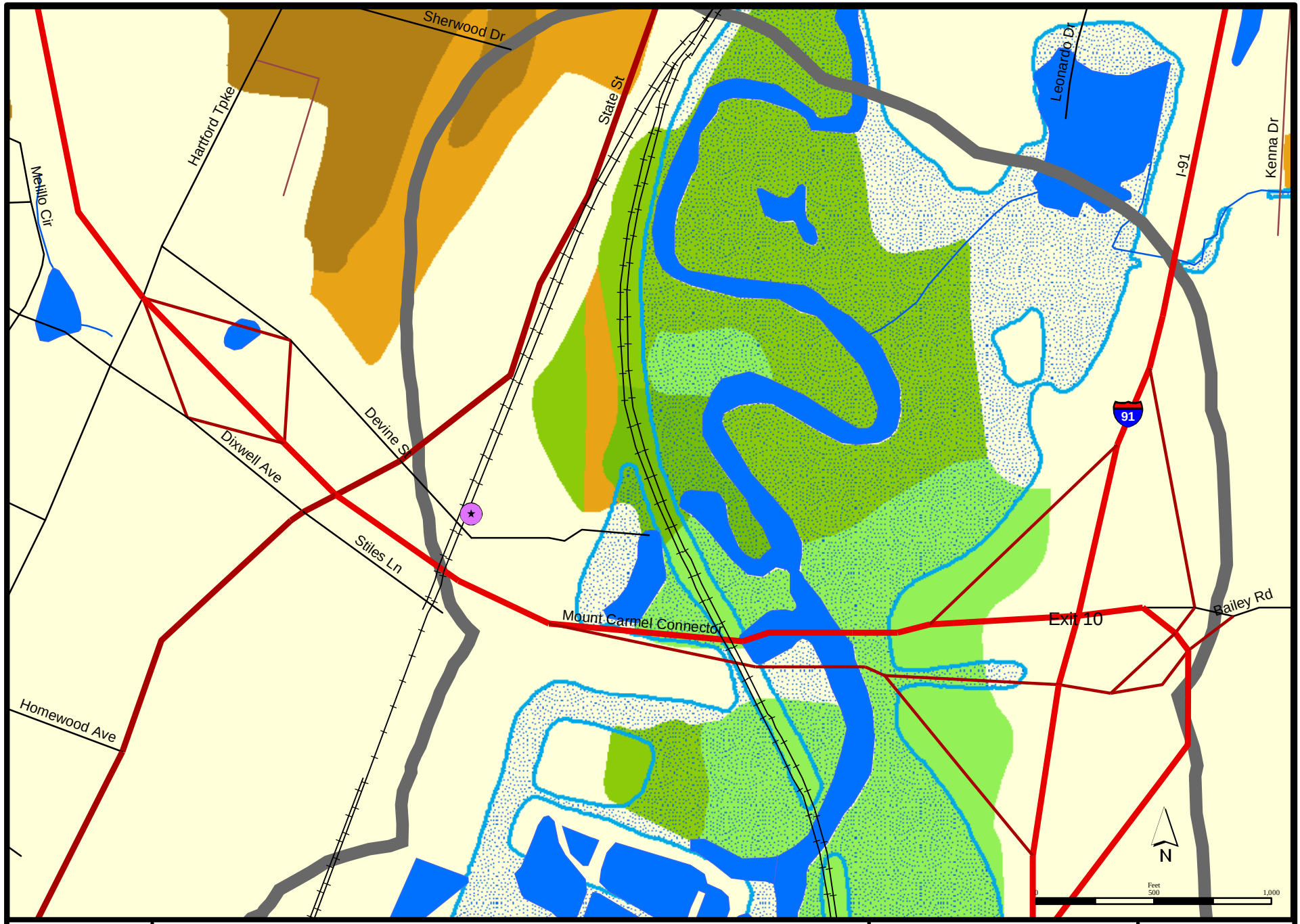
The proposed North Haven Station (Figure 7-2) is over 300 feet from mapped wetlands and contains no other natural resources, according to the secondary source review. It is therefore unlikely to adversely affect natural resources. The site, however, is located within the coastal boundary and is therefore subject to the CCMA. During the NEPA/CEPA process and subsequent permitting phases, the station will need to be shown consistent with the activities and use policies established by the CCMA.

The conceptual plan for this site includes a new station, platforms and a crossover to be constructed south of the existing Amtrak station. The immediate area does not contain any historically significant resources, therefore it is anticipated that no historic resources will be physically or visually impacted by the plan.

7.1.3 Wallingford Station

According to the secondary source mapping, there are no natural resources in the vicinity of the Wallingford Station (Figure 7-3) and, therefore, no potential impacts from either Site Plan A or Site Plan B. The Railroad Green Park, located east of the existing railroad station, would not be affected by either Site Plan A or Site Plan B.

At this site, the historic Wallingford Railroad Station, built in 1871 and listed on the National Register of Historic Places (National Register), is currently used by Amtrak as a passenger terminal. The plans at this station retain the existing station building and call for the construction of platforms and additional at-grade parking, both to be located either north or south of the existing station. The parking will mostly make use of already existing lots, but on both plans, structures will be replaced by parking. As the project advances to the NEPA/CEPA phase, it will be necessary to ensure that these structures are not potentially eligible for inclusion on the National Register. If they are, additional coordination with the State Historic Preservation Office (SHPO), a Section 4(f) Evaluation, Section 106 documentation, and various mitigation activities may be necessary. Given the current design plans and previous field visits, there are no impacts to known historic resources anticipated at this site.



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Coastal Boundary
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NORTH HAVEN / HAMDEN STATION

Figure 7-2

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Natural Resources Review
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WALLINGFORD STATION

Figure 7-3

7.1.4 Meriden Station

At the Meriden Station (Figure 7-4), a portion of the proposed parking lot falls within the extensive 100-year floodplain between State and Pratt Streets, and portions of the proposed elevator/stair ("up & over") east of the railroad tracks, as well as the existing train station, may also be located within the floodplain. During subsequent project phases, accurate mapping of the floodplain boundary will be necessary to determine how much proposed construction falls within it. Potential impacts on floodplains will need to be addressed during the NEPA/CEPA process and a Floodplain Management Certification will be needed from the CTDEP prior to construction of any elements in the floodplain. The certification essentially requires that any construction (or reconstruction) within floodplains be planned so as not to decrease flood storage capacity and so as to place the floor of any proposed structures at or above the base flood elevation (BFE). In addition, stormwater management will need to consider potential impacts to floodplains.

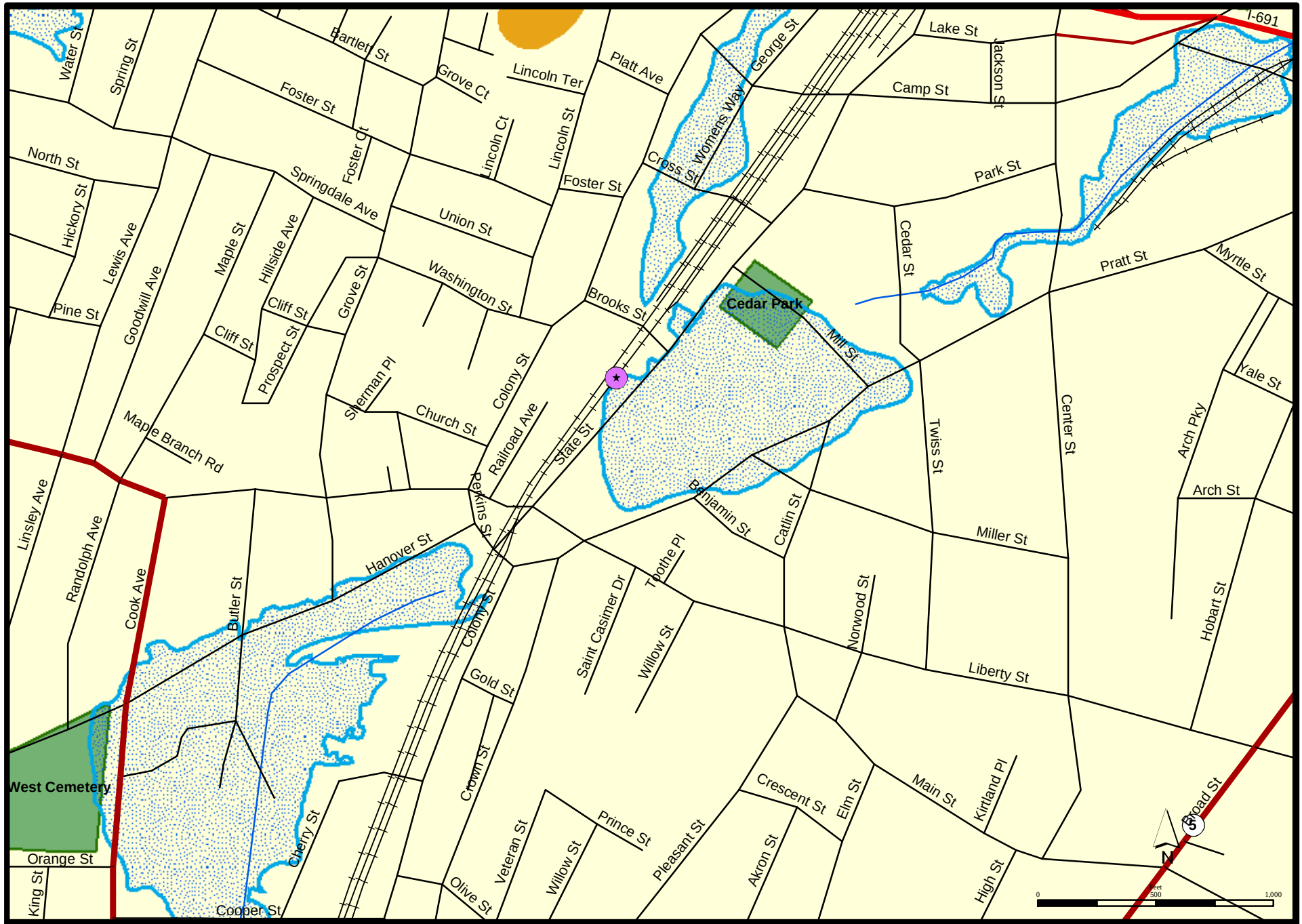
No other natural resources are in the vicinity of the station, according to the secondary source mapping.

At the Meriden site, the conceptual plan incorporates the existing station, which is not a historic property. Additional platforms and a crossover are planned northwest of the station, which is located in a heavily developed commercial area at the southwest corner of the intersection of State and Brook Streets. It is anticipated that no historic resources will be impacted by this proposed design.

7.1.5 Berlin Station

The only natural resource in close proximity to the Berlin Station (Figure 7-5) is farmland soils, which are located west of the railroad tracks and north of the existing station. The proposed platforms under Site Plan A are in areas previously disturbed by rail construction and not mapped as farmlands. This option would therefore not affect farmland soils. However, the Full-build Site Plan B proposes new platforms north of the existing station on both sides of the tracks and a new parking lot northwest of the station, in an area mapped as farmlands of additional statewide importance and prime farmland. Per state and federal farmland protection policy acts, potential impacts to farmlands will need to be addressed during the NEPA/CEPA process. Proposed project activities on farmlands may require review by the Natural Resources Conservation Service (NRCS).

All site plans for this station retain the existing Berlin Railroad Station, a structure that was built in 1900 and is eligible for inclusion on the National Register of Historic Places. None of the station plans are likely to have any impact on historic resources, but given the historic nature of the existing station, it is recommended that the SHPO have an opportunity to comment on the design plans as the project advances through the NEPA/CEPA phase, to ensure compliance with Section 106 (36 CFR 800) Regulations of the Advisory Council on Historic Preservation and Section 4(f) of the Department of Transportation Act.



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MERIDEN STATION

Figure 7-4

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BERLIN STATION

Figure 7-5

7.1.6 Newington Station

This station (Figure 7-6) would be a joint station with the Hartford West Busway and conceptually located as proposed by that project, on the northwest side of the railroad tracks, with access from the intersection of Route 173 / West Hill Road. The secondary source mapping showed no natural resources in that vicinity that could be impacted by the station as proposed. A commuter rail parking lot is proposed on the opposite side of the tracks, in the footprint of an existing parking lot and building between Frances Avenue and the tracks. Based on the mapping, it appears that the parking lot is outside (west of) the 100-year floodplain of Piper Brook, but accurate mapping of the floodplain boundary will be necessary to determine whether any direct project impacts will occur. Such impacts will need to be addressed during the NEPA/CEPA process and subsequent environmental permitting. Floodplain Management Certification will be required if activities will occur in or affect the floodplain. In addition, potential impacts on Piper Brook and its associated wetlands will need to be carefully considered, particularly in regard to stormwater runoff, given their proximity to the proposed development and the potential need for a retention pond for parking lot runoff.

The proposed plan for this station was developed in conjunction with the Hartford West Busway project. While no historic properties will be impacted by the commuter rail portion of the plan, it is anticipated that one historic property located at 160 Willard Avenue will be impacted by the associated Busway project. Therefore, it is recommended that the SHPO review site plans of this station during the NEPA/CEPA process to ensure clarity on potential impacts.

7.1.7 Hartford Station

There are no natural resources in the vicinity of the Hartford Station (Figure 7-7), so the minor proposed modifications at this station will not directly affect natural resources. A covered walkway connecting the station with the Legislative Office Building is proposed parallel to the tracks along the edge of Bushnell Park, which would increase impervious surface but enhance access to the park.

At this site, the existing Union Station, which is listed on the National Register of Historic Places, will be utilized. The existing platforms are also incorporated into the plan. A raised platform will be added to the northern end of the existing platforms to provide commuter rail access. It is anticipated that the addition of this platform will not have a visual impact on the existing station, yet given the historic nature of the station, it is recommended that the SHPO have an opportunity to review the station plans to ensure compliance with Section 106 (36 CFR 800) Regulations of the Advisory Council on Historic Preservation and Section 4(f) of the Department of Transportation Act. If the SHPO determines that Union Station will be adversely impacted, Section 106 documentation and a separate Section 4(f) review may be required. To mitigate any adverse effects it may then be necessary to develop a Programmatic Agreement (PA) or a

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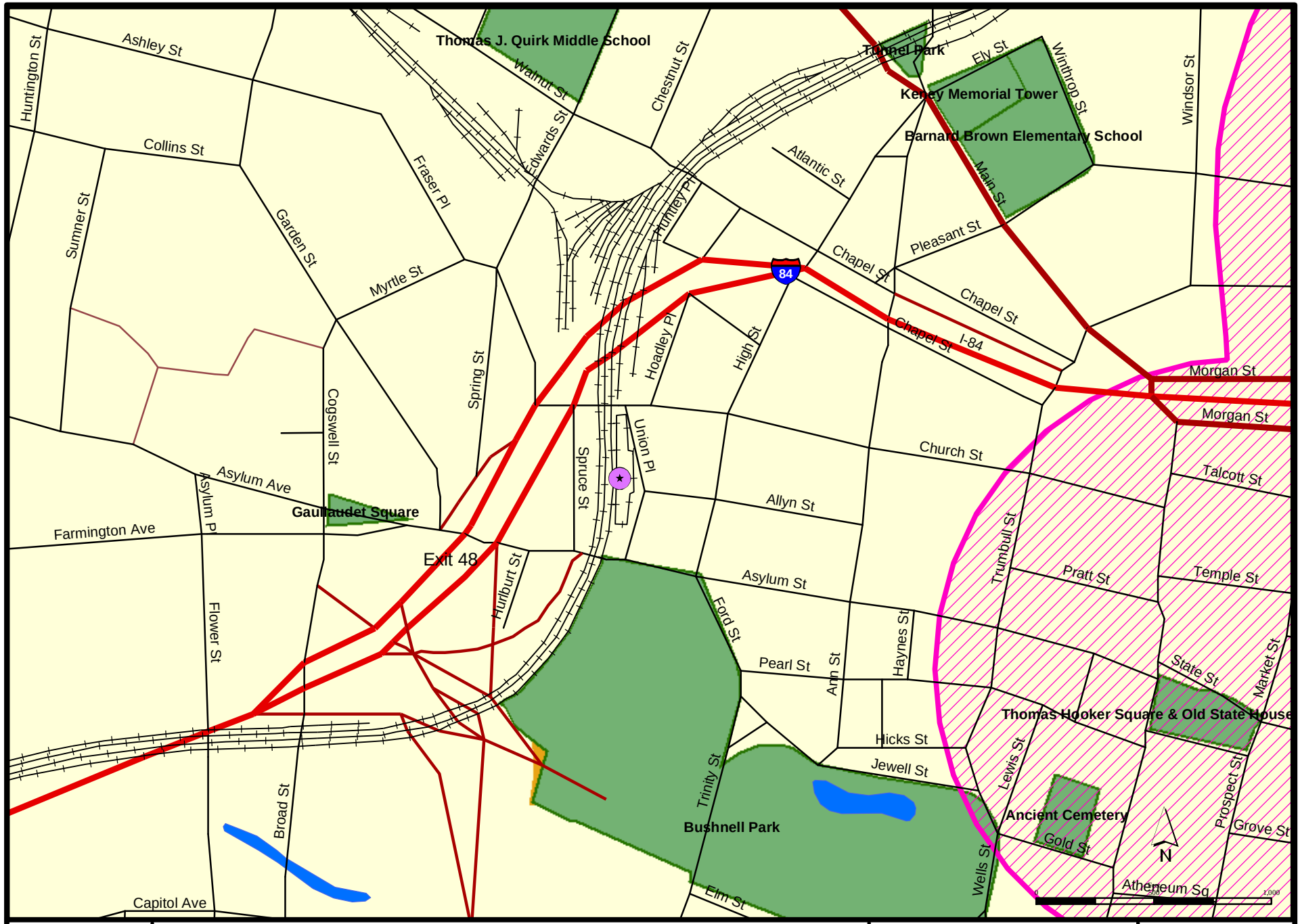
NEWINGTON STATION

Figure 7-6



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Natural Resources Review
FINAL REPORT

HARTFORD UNION STATION

Figure 7-7

Memorandum of Agreement (MOA), stipulating appropriate mitigation measures. No additional historic resources will be impacted as a result of this proposed plan.

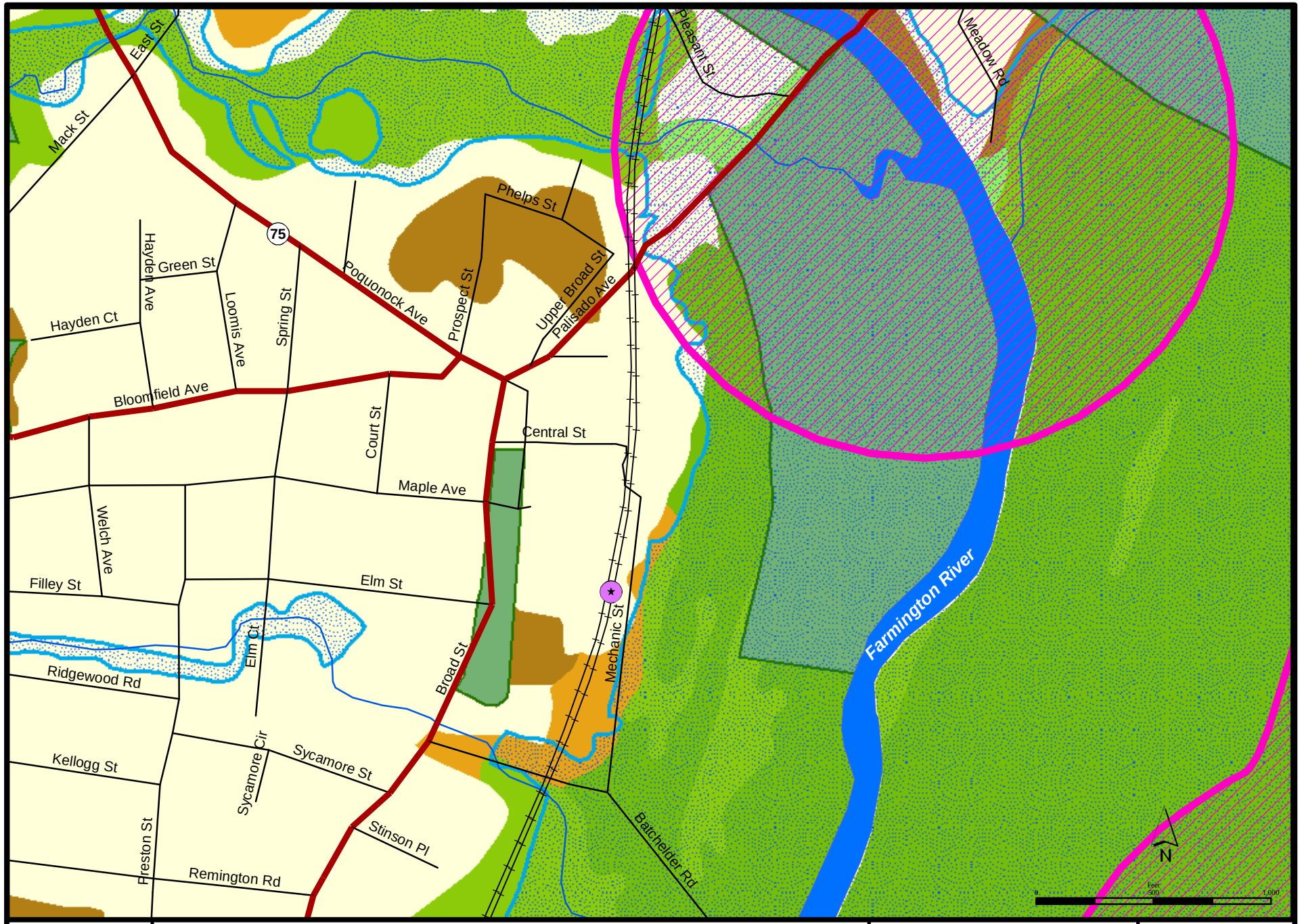
7.1.8 Windsor Station

The proposed Windsor Station (Figure 7-8) would involve new platforms, "up & overs", and a proposed parking structure between Mechanic Street and the rail line, approximately halfway between Batchelder Road and Central Street. Based on secondary source mapping, it appears that the site is surrounded and may partially encroach upon 100-year floodplains (Farmington River) and farmlands of additional statewide importance. In addition, wetlands associated with the Farmington River floodplain are shown within 100 feet. Although most of the proposed station development footprint is currently developed, a small portion in the vicinity of the dog pound appears to be vacant/undeveloped. During subsequent project phases, accurate mapping of the floodplain and farmland soils boundaries will be necessary to determine whether any proposed construction directly impacts these resources. Potential impacts on these resources will need to be addressed during the NEPA/CEPA process. In addition, potential impacts on the wetlands associated with the Farmington River will need to be carefully considered, particularly in regard to stormwater runoff, given their proximity. In the event that construction activities will take place within or will affect the floodplain, a Floodplain Management Certification will be needed from the CTDEP. Proposed project activities on farmlands may require review by the Natural Resources Conservation Service (NRCS).

The conceptual plan for this station calls for the existing station to be maintained and for new platforms and parking to be constructed on state and town-owned land. No above ground historic resources will be impacted by this plan, but the proximity of the proposed parking structure to the Connecticut River indicates that the station will need to be reviewed by the SHPO to ensure that no resources will be impacted. The NEPA/CEPA process will provide this opportunity. Given the proximity of the site to the Connecticut River, it is recommended that the site be investigated by the State Archeologist as an archeologically sensitive area prior to any ground disturbance according to Section 106 Regulations of the Advisory Council on Historic Preservation. If the SHPO determines that a historic resource that is listed or considered eligible for inclusion in the National Register will be adversely impacted, Section 106 documentation and a separate Section 4(f) review may be required. To mitigate any adverse effects it may then be necessary to develop a Programmatic Agreement (PA) or a Memorandum of Agreement (MOA), stipulating appropriate mitigation measures.

7.1.9 Windsor Locks Station

The proposed site for the Windsor Locks Station (Figure 7-9), on the northwestern corner of the Main Street / Stanton Road intersection, lies partially within the 100-year floodplain of the Connecticut River, as indicated by the secondary source mapping. There is no regulated floodway at this location. Floodplain boundaries will need to be accurately mapped and impacts on floodplains will need to be studied further in the



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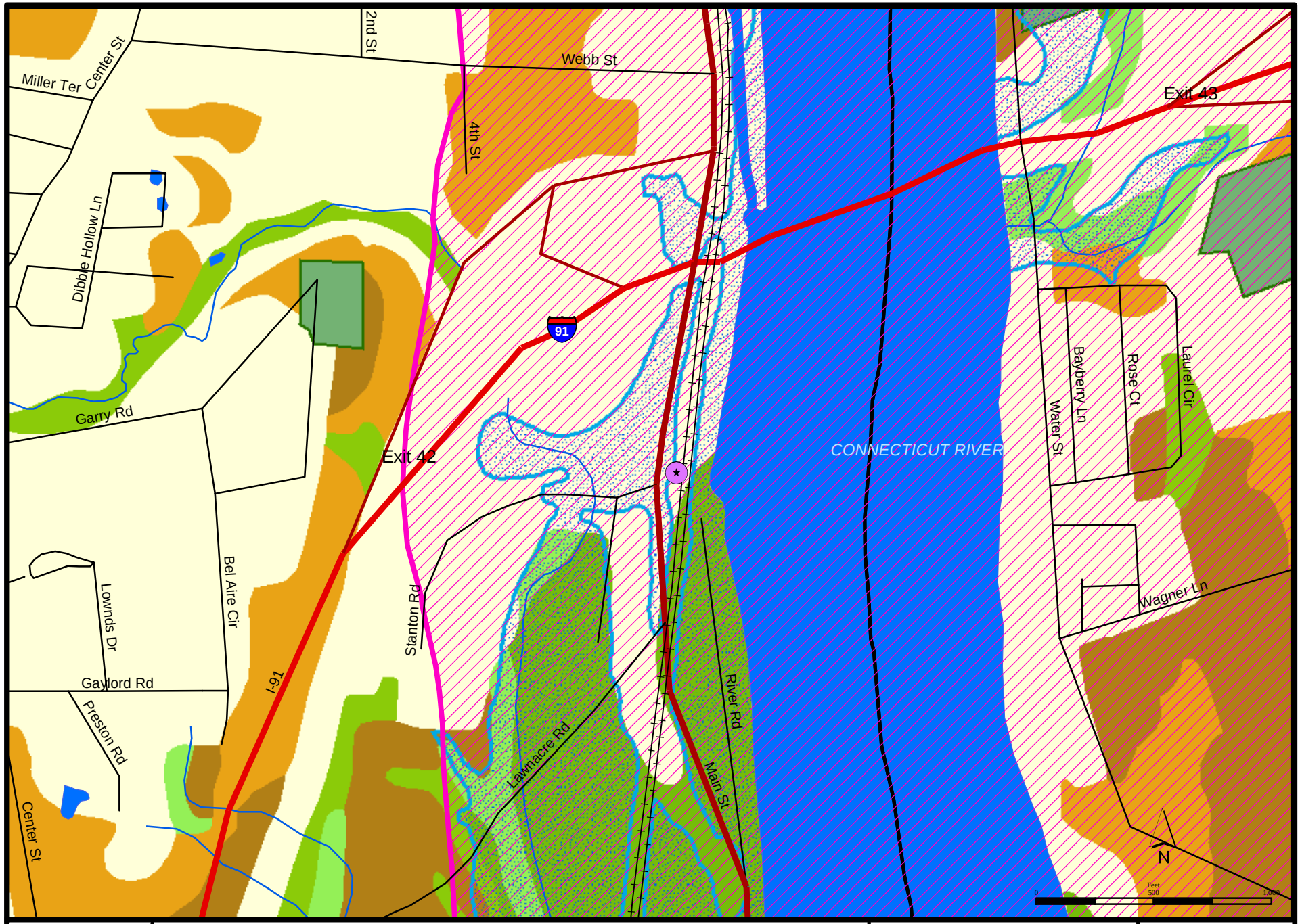
WINDSOR STATION

Figure 7-8



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Natural Resources Review
FINAL REPORT

WINDSOR LOCKS STATION

Figure 7-9

NEPA/CEPA process. If construction will occur in or affect the floodplain, a Floodplain Management Certification will be needed from CTDEP prior to construction. The certification essentially requires that construction within floodplain areas is planned so as not to decrease flood storage capacity and so that station elements are positioned at or above the base flood elevation (BFE). Additionally, stormwater management will need to be carefully evaluated and designed to avoid impacts on floodplains and/or wetlands.

Although mapping did not show wetland soils, field observations revealed wetlands on the proposed station site. The wetlands are associated with the channelized flow of runoff southerly along Main Street, then westerly along Stanton Road, such that the channel/wetlands essentially frame the proposed parking area. Vegetation along the approximately 20-foot-wide channel consists of dense common reed (*Phragmites australis*) bordered by mixed shrubs. Approximately 150 feet west of the intersection, along Stanton Road, the runoff is channelized through a pipe, and approximately 200 feet west of the pipe, the wetland expands into a broad field of *Phragmites*. There are also wetlands mapped along the Connecticut River on the east side of the tracks in the vicinity of the station site.

Wetlands will need to be delineated per state and federal definitions and portrayed on the proposed site plan. Further evaluation of wetland impacts will be necessary during the NEPA/CEPA process and if impacts to jurisdictional wetlands cannot be avoided, construction of the station would require an Inland Wetlands and Watercourses permit from the CTDEP and possibly a U.S. Army Corps of Engineers (ACOE) permit. Impacts that cannot be avoided would need to be minimized and then mitigated at a minimum ratio of 1:1, and CTDEP and/or the ACOE might require other mitigation measures as part of the NEPA/CEPA and/or permitting processes.

The site falls within the NDDB record that encompasses a broad corridor along the Connecticut River, so coordination with CTDEP regarding the status and/or presence of any threatened, endangered, and/or special concern species would be necessary during the NEPA/CEPA and/or environmental permitting process, to further evaluate potential impacts to such species.

Although not shown on the secondary source mapping, the CTDEP's Stream Channel Encroachment Lines list indicates that encroachment lines exist along the entire stretch of the Connecticut River within Windsor Locks. Efforts should be made to avoid impacts within stream channel encroachment lines. If impacts cannot be avoided, a Stream Channel Encroachment permit from CTDEP would be required.

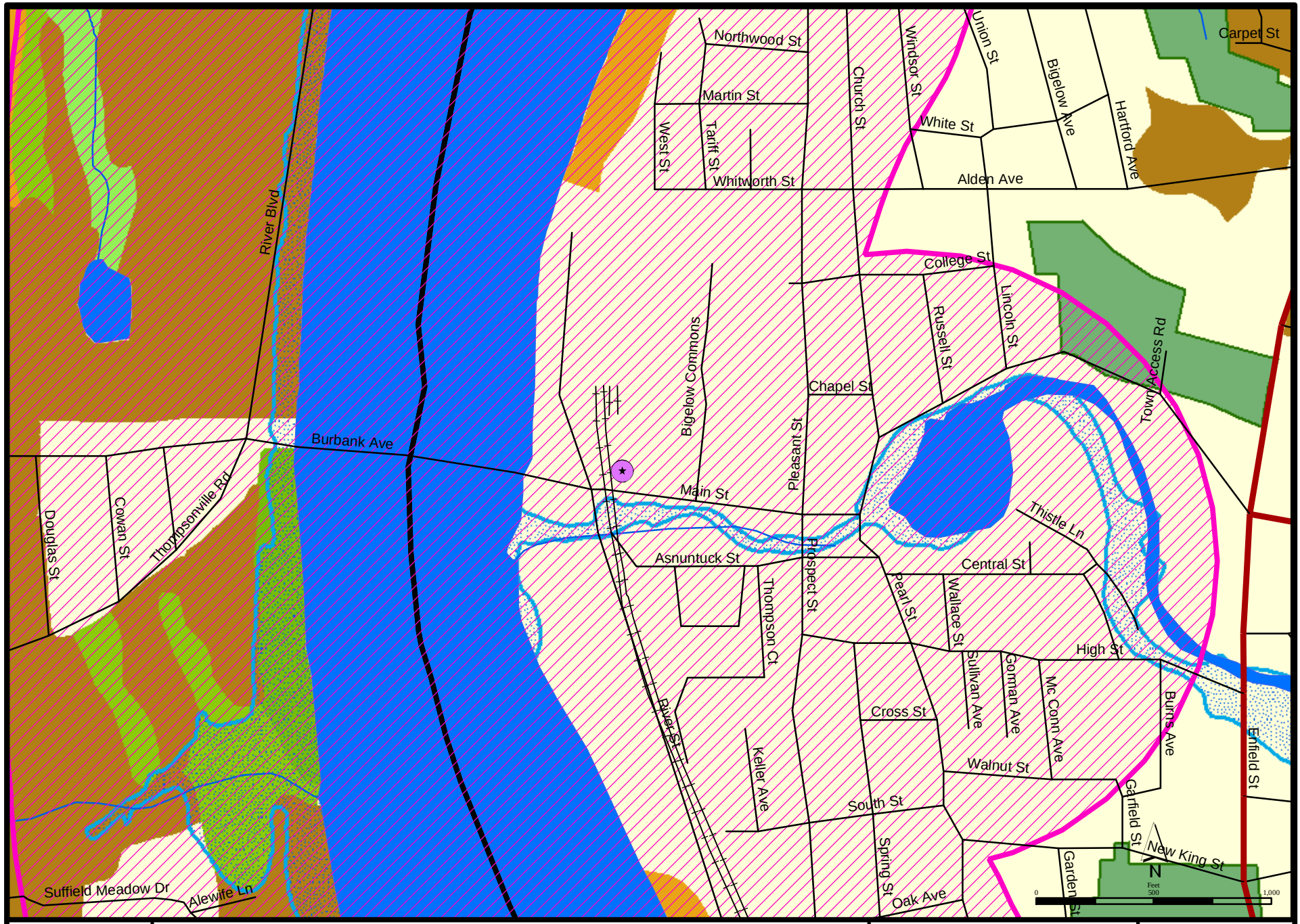
The plan for this station incorporates the existing Amtrak station and calls for the construction of a new platform and paved entry improvements to the west of the tracks. An historic rail station to the north in Windsor Locks is not now included and will not be impacted by this project. The area immediately west of the proposed station includes Broad Street Green Historic District, which runs roughly along Broad Street from Batchelder Road to Union Street. However, given the presence of the existing rail line and station, the proposed station plan is not likely to have a significant impact on any of

the properties included in the District. Given the close proximity of the site to the District and the historic nature of Windsor Town Center, the finalized station plans will need to be reviewed by the SHPO to ensure that they are consistent with Section 106 (36 CFR 800) of the Advisory Council on Historic Preservation and subsequently Section 4(f) of the Department of Transportation Act. The NEPA/CEPA process will provide this opportunity. If the SHPO determines that a historic resource that is listed or considered eligible for inclusion in the National Register will be adversely impacted, Section 106 documentation and a separate Section 4(f) review may then be required. To mitigate any adverse effects it may then be necessary to develop a Programmatic Agreement (PA) or a Memorandum of Agreement (MOA), stipulating appropriate mitigation measures.

7.1.10 Enfield Station

The Enfield Station (Figure 7-10), located north of Main Street between North River and Commerce Streets, falls within a broad NDDB record along the Connecticut River and possibly within the zone of an additional NDDB record. Coordination with the CTDEP regarding the status and/or presence of threatened, endangered, and/or special concern species or their habitat would be necessary during the NEPA/CEPA and/or environmental permitting process to further evaluate potential impacts to such species.

Conceptual Site Plan B proposes new parking along the disturbed rail right-of-way in combination with shared-use parking on existing parking lots. In the plan, platforms will abut the eastern wall of the Connecticut Casket Company building, a historic structure that may be eligible for inclusion on the National Register of Historic Places. The Casket Company building will be maintained as part of both station plans and as a result, it is anticipated that neither of the plans will have any significant impact on above-ground historic resources. The station will need to be reviewed by the SHPO to ensure that no resources will be impacted. Given the proximity of the site to the Connecticut River, it is recommended that the site be investigated by the State Archeologist as an archeologically sensitive area prior to any ground disturbance. The NEPA/CEPA process will provide for these further reviews. If the SHPO determines that a historic resource that is listed or considered eligible for inclusion in the National Register will be adversely impacted, Section 106 documentation and a separate Section 4(f) review may be required. To mitigate any adverse effects it may then be necessary to develop a Programmatic Agreement (PA) or a Memorandum of Agreement (MOA), stipulating appropriate mitigation measures.



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ENFIELD STATION

Figure 7-10

7.2 Full-build Service Station Resource Review

7.2.1 Wharton Brook Station

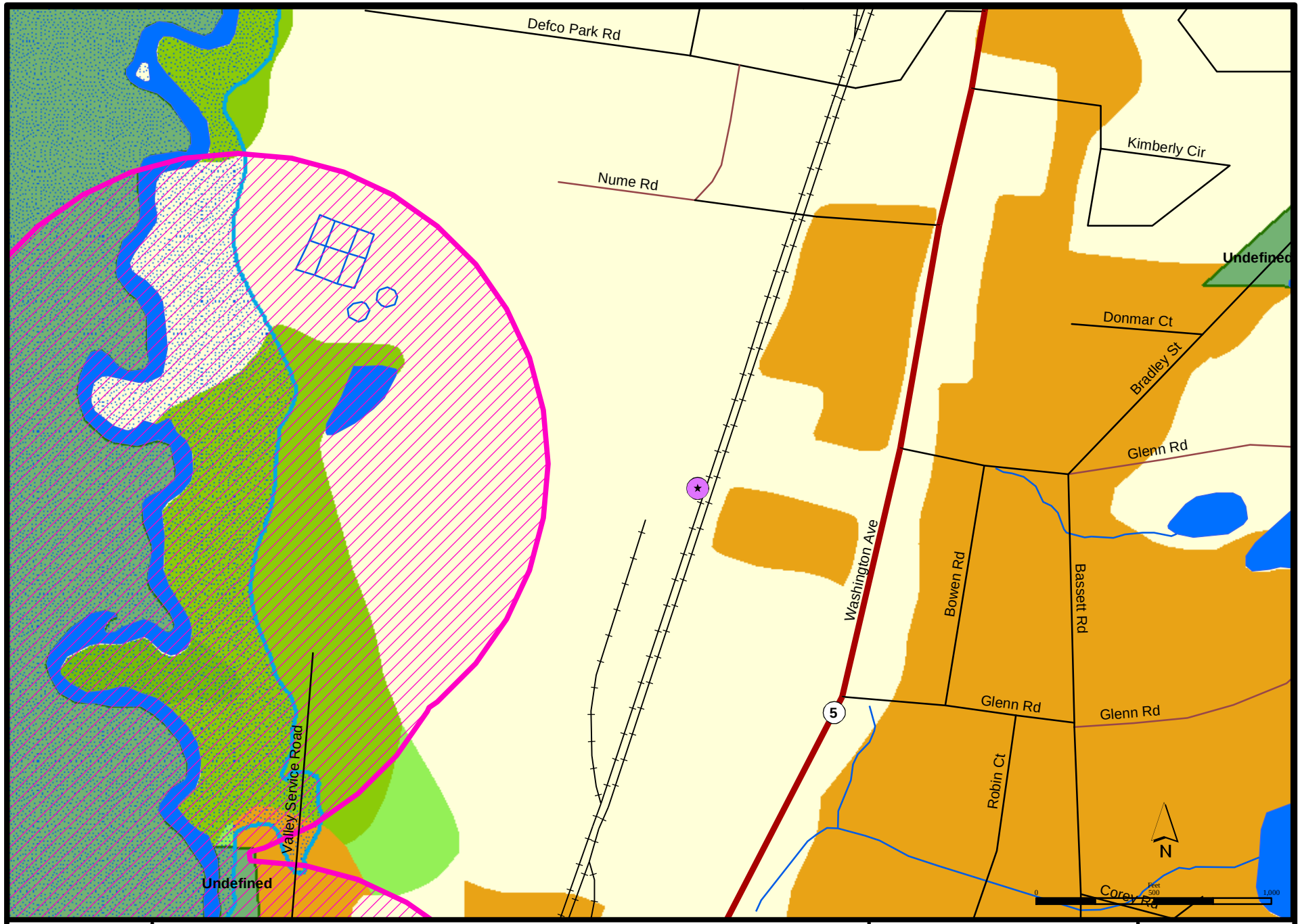
The Wharton Brook Station (Figure 7-11) would be accessible from the Pratt & Whitney access road, which intersects with Washington Avenue (Route 5) north of Temple Street and south of Glenn Road. Based on the secondary source mapping, the only natural resource potentially affected by the proposed Wharton Brook Station is one or more Natural Diversity Data Base (NDDB) records. The proposed platforms and parking lot fall within the potential impact area of threatened, endangered, or special-concern species or their habitats. While it is unlikely that the station site has significant ecological value, since it is located within a highly disturbed setting, coordination with the CTDEP will be necessary during the NEPA/CEPA process to further evaluate potential impacts to sensitive species from this station.

The conceptual plan for the Wharton Brook Station includes the construction of new platforms and a parking lot in an open space that would be accessible from the Pratt & Whitney access road located north of Temple Street and south of Glenn Road. The surrounding area does not contain any historically significant resources, therefore it is anticipated that no historic resources will be physically or visually impacted by the plan.

7.3 Double Tracking

A minimum of 18 miles of track will be added to create double track configurations in order to accommodate both freight rail and commuter rail traffic for the start-up service. The additional tracks will occur in five different locations with segment lengths of approximately two to four miles each. The remaining single track segments will be double-tracked for the full-build. The double track locations are described in Chapter 6.

The double tracking will occur within existing rail rights-of-way and in locations that were previously double tracked. As such, they are on ground that was formerly filled and prepared as rail bed. At the one water crossing (of the Quinnipiac River) in North Haven, a double track trestle is already in place and requires no reconstruction. A review of resource mapping shows that the proposed double track areas contain no wetlands, significant vegetation, threatened or endangered species habitat, unique geology, farmland soils, or other special resources. Engineering surveys have found no remnant rail signals, boxes, or culverts in the double track locations, so the potential for historic rail features is extremely low and the disturbed ROW condition indicates low archaeological sensitivity as well. Because the extra track segments would be directly adjacent to existing operating rail lines, they would be consistent with existing land uses. Given these considerations, the addition of the double track sections would not be expected to result in any significant adverse environmental impacts.



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Natural Resources Review
FINAL REPORT

WHARTON BROOK STATION

Figure 7-11

Chapter 8
Financing Needs and Next Steps

In Chapter 6, the capital and operating costs for the implementation of both the Start-up Service Recommended Action and a future Full-build on the New Haven to Springfield Line were identified. A major component of implementing the service is the identification of sources for these capital and operating costs. In this chapter, the financing needs and potential sources are discussed, as well as other necessary next steps to implementation.

8.1 Implementation Next Steps

The purpose of this study is to develop an implementation plan for commuter rail service between New Haven, Connecticut and Springfield, Massachusetts. The next steps needed to pursue the recommended Start-up Service implementation plan would include:

1. **Develop a funding plan** – The funding and financing of the service are the most controversial issues remaining before implementation given the current Connecticut and federal fiscal situation. Section 8.2 presents the timeline required for future funding. Section 8.4 gives further information about federal funding options available.

2. **Complete the environmental process outlined in the Connecticut (CEPA) and National Environmental Policy Act (NEPA)** – This process must be undertaken by the State of Connecticut with Federal Transit Administration (FTA) guidance before service can begin. This is a key to obtaining any federal funding for the project as well. Further details about the environmental documentation likely required are available in Section 8.3 of this report.

3. **Complete preliminary design** – This report gives conceptual station plans and double track section locations necessary for the development of cost estimates for future funding. The next stage in implementation of service will require refinements of these plans to the preliminary design level (10% design), including exact locations for station platforms, station parking, new

track and maintenance facilities. This is typically done in conjunction with the environmental process.

4. **Make necessary refinements to the operating plan** – Based upon the results of the preliminary design and environmental process, refinements should be made to the overall operating plan outlined in this document.

5. **Execute operating agreements** – As the State of Connecticut does not currently own the track over which the service would operate, preliminary operating agreements with Amtrak, other commuter rail operators (as needed), freight operators, and transit operators should be executed early in the process to ensure buy-in for the service before capital funds are expended.

6. **Complete final design and property acquisition** – The final design of stations, double track sections, bridges and the maintenance facility should be undertaken simultaneously with the necessary acquisition of property for these facilities (anticipated to be required only for station parking and the maintenance facility).

7. **Procure rolling stock** – The decision as to the type of rolling stock that best fits this service will be a key aspect of the implementation. Section 8.6 of this report gives guidelines on the positive and negative aspects of self-propelled rail car trains compared to traditional locomotive-hauled push-pull coach trains. The procurement of rolling stock for the service requires substantial turn-around time due to the fact that rail equipment is made to order.

8. **Hire an operator** – Although Amtrak currently owns the line between New Haven and Springfield, there are a number of possible operators for the future service. Section 8.5 discusses potential operators for the service in greater detail.

9. **Construct new facilities** – This involves the construction of station areas (including parking and platforms), new track segments (including track, interlockings, signals and bridges), and maintenance facilities.

10. **System testing** – As a final step to opening the system, final debugging modifications and improvements are made prior to start-up. This includes checks of the rolling stock, stations, track and signal improvements, and all other elements of the project to ensure all components are working correctly prior to commencement of revenue service.

8.2 Funding Requirements and Timeline

For the Start-up Service Recommended Action, the timeline associated with the next steps listed above is shown in Table 8-1 and a breakdown of the capital cost requirements by timeline component is shown in Table 8-2.

Table 8-1
Start-up Service Recommended Action Timeline

Activity/Year	2005	2006	2007	2008	2009	2010	2011
Legislative Funding & Authorization							
Environmental Assessment							
Preliminary Design							
Operating Agreements							
Final Design							
Property Acquisition							
Equipment Procurement							
Advertise & Award Operator Contract							
Advertise & Award Construction Bids							
Construction							
System Testing							
	2005	2006	2007	2008	2009	2010	2011

Table 8-2
Start-up Service Recommended Action Capital Costs by Time Component

Element	Design and Construction Inspection	Property Acquisition	Equipment Procurement	Construction
Train Equipment	--	--	$70,140,000	--
Maintenance facility	$2,622,000	$7,800,000	--	$10,274,000
Station Areas	$15,980,000	$3,621,000	--	$61,365,000
Double Track	$4,335,000	--	--	$28,900,000
Bridges	$84,000	--	--	$421,000
New Connecting Buses	--	--	3,600,000	--
Amtrak Flagmen	--	--	--	2,500,000
Subtotal	$23,021,000	$11,421,000	$73,740,000	$103,460,000
Contingency (40%)	$9,209,000	$4,568,000	$29,496,000	$41,384,000
Total	$32,230,000	$15,989,000	$103,236,000	$144,844,000
Time funding required	Winter 2007	Winter 2007	Winter 2007	Fall 2008

8.2.1 State Division of Funding

One major issue associated with the New Haven, Hartford, Springfield Commuter Rail service is the allocation of capital and operating costs between the two states which benefit from the service. The Connecticut-Massachusetts state line occurs at MP 55.8 of the 62-mile corridor. Therefore, 10% of the line is within Massachusetts. Some of the capital costs for the project are attributed to one state or the other, while others are used over the entire line. All of the line in Massachusetts is currently double-tracked, meaning all new double-track will be constructed in Connecticut. Station area costs are attributed to the specific station at which they occur, meaning Springfield Station costs can be attributed to Massachusetts. New connecting buses would be required only in Connecticut. Other costs, such as train equipment and maintenance facilities can be divided based on 10% of the track length. An outline of the possible division of capital costs is shown in Table 8-3.

Table 8-3
Start-up Service Recommended Action Capital Costs by State

Element		Connecticut	Massachusetts
Train Equipment		$63,126,000	$7,014,000
Maintenance facility		$18,626,000	$2,070,000
Stations		$69,741,000	$11,225,000
Double Track		$33,235,000	--
Bridges		$505,000	--
New Connecting Buses		$3,600,000	--
Amtrak Flagmen		$2,500,000	--
Subtotal		**$191,333,000**	**$20,309,000**
Contingency	40%	$76,533,000	$8,124,000
Total		**$267,866,000**	**$28,433,000**

The division of operating costs could be handled similarly to the train equipment and maintenance facility costs outlined above, resulting in a 90% / 10% split of operating costs between Connecticut and Massachusetts. Alternatives for the division of operating costs include basing the formula on the morning boardings or passenger miles. This issue would be the subject of negotiations between the two states as the project continues into the next phase.

8.3 NEPA Documentation

Based on the environmental impact evaluations prepared for this feasibility study, there are relatively few adverse environmental impacts from the project and they are minor impacts. This outcome has largely resulted from locating the proposed commuter rail within an existing rail corridor and avoiding significant resources in the placement of stations. There are broad transportation benefits of the project, the project has substantial public support, and the project is not expected to be highly controversial. As the project

goes forward, the Federal Transit Administration (FTA), as a potential funding source, will evaluate the project for impacts which might be potentially significant and then decide what type of environmental document is appropriate to comply with NEPA. While there are procedural as well as technical considerations for FTA, the magnitude of impacts identified through this study indicate that extensive and/or detailed impact studies at the level of an Environmental Impact Statement (EIS) would not be necessary for this project and that an Environmental Assessment (EA) would adequately address the project's potential minor impacts.

8.4 Funding Plan

It is very useful to understand the difference between "funding and "financing." Funding is the primary stream of revenue used to offset cost or to support various leveraging options. Finance is the means by which the primary revenue streams are manipulated to make funds available when needed or to reduce the costs of borrowing. By way of illustration, in the case of bonds issued against revenues from a tax dedicated to transit use, the revenue stream from the tax pledged as security for the bonds would be the "funding." The bond proceeds, which concentrate the long-term tax revenues into several years to meet construction expense, would be the "financing." This section will examine the potential funding sources for the start-up service.

The largest source of funding for any commuter rail/regional rail transit improvement would be the FTA Section 5309 New Starts program. While certainly not impossible, securing significant federal capital support could be very difficult. The competition for New Starts funding is intense with the political support for a project often being more important than its technical merit. Connecticut is already pursuing New Starts funding for the New Britain to Hartford Busway.

As part of the New Starts process, FTA utilizes the Summit program on the travel demand forecasting model being used for ridership projections to determine user benefits attributed to the project. With previous projects, the format of the ConnDOT model made running the Summit program inaccurate. Therefore, substantial revisions to the ConnDOT model would be required in order to run the program. Alternatively, the three regional travel demand forecasting models, those of the Capital Region Council of Governments, the South Central Regional Council of Governments, and the Pioneer Valley Planning Commission, could be used in combination, creating either one larger corridor model or obtaining results from all three by town and combining the results. In any case, this continued effort at travel demand forecasting would be costly and would not guarantee New Starts funds.

Potential funding sources can come from both the public and private sectors and from federal, state and local sources. This section describes several of the federal sources available.

8.4.1 Primary Federal Funding Options

The Transportation Equity Act for the 21st Century (TEA-21) authorized federal transportation funding levels over a six-year period beginning in federal fiscal year 1998. Funds included both formula and grant funding to be used at the discretion of States and Metropolitan Planning Organizations (MPO).

Beyond earmarked funds, there are formula funds for highways, transit, and "flexible funds" which can be spent on a variety of transportation-related projects, including public roads and sidewalks, transit capital projects, and transportation enhancements, which encompass a broad range of environmentally related activities. Much of this funding is anticipated by State and local transportation departments and is likely to be committed to other projects.

Since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, the US Department of Transportation has permitted States wide discretion in assigning portions of "conventional" highway funds to the flexible funding pool, thus widening the funds potentially available for transit projects. Legislation currently pending in Congress would continue these provisions of ISTEA and TEA-21. The following paragraphs describe the current federal funding programs available for transit projects. It should be noted that TEA-21 is up for reauthorization, and the list of eligible federal funding sources may change.

- ***Section 5307 Urbanized Area Formula Program*** – Formerly known as the Section 9 program, the urbanized area formula program provides funding to all areas with populations of over 50,000 to be used for locally determined capital projects and transportation-related planning. The amount made available to the Urbanized Area Formula Program (49 U.S.C. 5307) by the FY 2004 DOT Appropriations Act was $3.4 billion.

  The Metropolitan Planning Organization (MPO) in each area annually approves a program of projects that plans for the distribution of Section 5307 funds for various capital projects. Funds are not necessarily distributed to transit agencies on the basis of their service data and the amount of funds brought to the area by that service data. Each grantee must submit a grant application for those projects included in the Program of Projects. Regional rail capital costs are eligible for these funds. Section 5307 funds used for operating assistance is now restricted to urbanized areas of under 200,000 people.

- ***Section 5309 New Start Program*** – The term "New Start" is used to mean a project that involves building a new fixed guideway system, or extending an existing fixed guideway. The new start can be a vintage streetcar, light rail line, heavy rail rapid transit, commuter rail, people-mover, or busway. Also, new start projects can involve the development of transit corridors and markets to support the eventual construction of fixed guideway systems, including the construction of park-and-ride lots and the purchase of land to protect future rights-of-way. The amount made available for New Starts projects in the FY 2004 DOT Appropriations Act was $1.3

billion. Projects can receive up to 80 percent of eligible project costs from the FTA. However, current guidance and practice limits this funding to about 50 percent federal share.

In order to receive new start funds, projects should be authorized by TEA-21 or any subsequent authorizing act. Annual appropriations legislation then allocates available funding in specific amounts to specific projects. In order to receive new start funds, projects must first be rated by the FTA in accordance with criteria for ranking and evaluating new start projects. Such recommendations are included in the Annual Report on New Starts submitted to Congress in the spring of each year along with the President's budget request. FTA manages new start projects in four recognized phases: 1) Systems Planning 2) Preliminary Engineering 3) Final Design 4) Construction. FTA has extensive guidance regarding the requirements of each phase.

Projects of less than $50 million for total construction may qualify for a ***Small Starts*** funding within the New Starts program. Projects must be cost effective, per the New Starts criteria, but are freed from much of the onerous New Starts evaluation process. With reauthorization of TEA-21, the limit may rise to $75 million for total construction[10].

- ***Section 5311 Non-Urbanized Area Formula Program*** – The Non-urbanized Area Formula Program provides capital, operating and administrative assistance for public transportation in areas under 50,000 in population. Each State must spend no less than 15 percent of its FY 2004 Non-Urbanized Area Formula apportionment for the development and support of intercity bus transportation, unless the Governor certifies to the U.S. Secretary of Transportation that the intercity bus service needs of the State are being adequately met. The FY 2004 apportionment was $238 million.

8.4.2 Flexible Federal Highway Funding

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) created opportunities for certain categories of funds to be transferred between highway and transit projects according to State, regional / local discretion and priorities. This flexibility was enhanced further through TEA-21. Highway funds transferred to transit have been used to fund a variety of improvements such as construction and rehabilitation of rail stations, maintenance facility renovations, rolling stock procurements, and development of multi-modal transportation centers. Since 1991, nearly $5 billion in flexible funds have been transferred. Over the life of TEA-21, over $100 billion of highway funds could potentially have been used to finance qualifying transit projects.

FHWA funds designated for use in transit capital projects must be derived from the metropolitan and statewide planning and programming process, and must be included in

[10] The Bush Administration has proposed legislation that would allow the Small Starts projects to be increase to $75 million, but a "streamlined" FTA evaluation process would be put in place to determine which Small Start projects should be financed.

an approved Statewide Transportation Improvement Program (STIP) before the funds can be transferred. The State DOT requests, by letter, the transfer of highway funds for a transit project to the FHWA Division Office. The letter should specify the project, amount to be transferred, apportionment year, State, federal aid apportionment category (i.e. Surface Transportation Program (STP), Congestion Mitigation and Air Quality (CMAQ), or congressional earmark), and a description of the project as contained in the STIP.

Transferred funds are treated as FTA formula funds, but are assigned a distinct identifying code for tracking purposes. The funds may be used for any capital purpose eligible under the FTA formula program to which they are transferred and in the case of CMAQ for certain operating costs. FTA and FHWA have issued guidance on project eligibility under the CMAQ program in a Notice at 65 FR 9040 et seq. (February 23, 2000). In accordance with 23 U.S.C. 104(k), all FTA requirements are applicable to transferred funds except local share – FHWA local share requirements apply. Transferred funds should be combined with regular FTA funds in a single annual grant application.

Other FHWA programs are flexible as well. Under certain circumstances, National Highway System (NHS) funds may be used to fund transit improvements in NHS corridors. Interstate Substitute Funds continue to be eligible for transit use.

- ***Surface Transportation Program (STP)*** – STP is the largest Federal Highway Administration (FHWA) flexible funding program. Funds may be used for all projects eligible for funding under current FTA programs, excluding Sections 5307 and 5311 operating assistance. A portion of STP funds available to each State is sub-allocated to urbanized areas that are programmed at the regional level. States use the balance of STP funds on a statewide level. Each State must use 10 percent of their STP funds for transportation enhancements such as bike and pedestrian facilities, scenic easements, and historic preservation projects. Certain rail projects are eligible to be funded as enhancements, such as rehabilitation and operation of historic transportation buildings and facilities.
- ***Congestion Mitigation and Air Quality Improvement Program (CMAQ)*** – Funds available through the CMAQ program are used to support transportation projects in air quality non-attainment areas. A CMAQ project must contribute to the national ambient air quality standards by reducing pollutant emissions from transportation sources.

8.4.3 Other Federal Funding Options

- ***Railroad Rehabilitation and Improvement Financing (RRIF) Program*** – The Railroad Rehabilitation and Improvement Financing (RRIF) Program enables the Federal Railroad Administration (FRA) to provide loans and loan guarantees for railroad capital projects, including freight railroads, State and local passenger and commuter railroads, and Amtrak. RRIF authorizes $3.5 billion, on a revolving basis, in direct federal loans and /or loan guarantees. Loans can have a term of 25 years with an interest rate that is essentially the cost of money to the federal government. RRIF loans are for railroad purposes only, but can be used for almost

any rail purpose. There are no specific dollar thresholds. RRIF loans must be accompanied by a "credit risk premium", i.e. a premium payment that insures the Government against default. Pursuant to TEA 21, Congress can appropriate funds to cover this credit risk premium, or the applicant or a private or governmental partner may provide such funds.

As Congress has not appropriated funds to cover the credit risk premium, it is up to each applicant to provide or obtain such funds. Obviously, the size of the premiums will be critical to the workability of the program. The Secretary of Transportation, in consultation with the Congressional Budget Office and the White House Office of Management and Budget (OMB), will determine the amount required for the premium. Many factors will be taken into consideration including credit worthiness of the applicant, collateral offered, or experience of other borrowers. It is expected that a credit risk of about 5 percent will be required.

- ***Section 130 Grade Crossing Program*** – TEA 21 requires each State to use 10 percent of the funds apportioned each year under the Surface Transportation Program (STP) to be used for carrying out rail-highway crossing and hazard elimination activities. Under the Section 130 grade crossing program, each State is required to identify crossing needs within the State and establish and implement a schedule of projects to meet those needs. This is the primary source of funding for crossing improvements. The 10 percent set aside represents the minimum amount of federal funding available for highway safety. Other federal highway programs may also be used for grade crossing projects, including additional amounts of STP funds. Private grade crossings currently are not eligible for Section 130 funds. Although the Section 130 program is set at a 90 percent federal share, States have the discretion to waive the non-federal match for most Section 130 projects. Because motorists are the primary beneficiaries of grade crossing projects, federal regulations prohibit States from requiring a railroad contribution toward the cost of Section 130 projects. However, railroads often will make voluntary contributions.

- ***Job Access and Reverse Commute Grants*** – A new federal funding source was created to increase access to jobs for low-income workers. This program is authorized to receive up to $150 million per year in FY 1999-2003, with 20 percent of the grant going to urbanized areas with less than one million people. The FY 2004 apportionment was $104 million. Up to $10 million per year can go to reverse commute projects, defined as transportation to suburban job opportunities. Funds from non-DOT Federal programs can be used to pay for the local match, which is 50 percent. The program offers discretionary grants for transportation to qualified low-income individuals. Funds can be provided for capital, operating and maintenance expenses, for promoting transit use by workers with non-traditional work hours, for promoting the use of transit vouchers by appropriate agencies, and for promoting the use of employer-provided transportation and transit pass benefits.

- ***TIFIA Financing*** – The Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA). The program established a new federal credit program called TIFIA under which the U.S. Department of Transportation may provide three forms of credit assistance secured (direct) loans, loan guarantees, and standby lines of

credit – for surface transportation projects of national or regional significance. Transit projects are eligible. A project's eligible costs, as defined under 23 U.S.C 181, must be reasonably anticipated to total at least $100 million, or alternatively, equal 50 percent or more of the state's federal-aid highway apportionments for the most recently completed fiscal year, whichever is less.

- ***DMU Demonstration Grant*** – In 2004, the FRA began an advanced-technology DMU demonstration project with the Florida DOT for revenue service between Miami and West Palm Beach as part of the Next Generation High-Speed Rail Technology program. The first DMU is already in service, with additional cars currently being manufactured by Colorado Railcar to begin service in 2005. The purpose of the demonstration was to determine the current availability of DMUs which comply with FRA safety requirements for operation on track shared with freight and conventional passenger trains and the suitability of this equipment for regularly scheduled revenue service in the United States. Although this particular demonstration project is underway, the federal government may re-solicit interest in demonstrating this technology from time to time.

8.5 Operator Comparison

In order to understand better the advantages and disadvantages of hiring various entities for the operation and equipment maintenance of the new commuter rail service, the consultant team contacted five public agencies that sponsor commuter rail services. These agencies employ operators as varied as (1) Amtrak, (2) private rail operating companies like Herzog Transit Services and Connex which specialize in providing commuter rail operating and maintenance services, and (3) Metro North.

The contacted agencies using Amtrak are Southern California Regional Rail Authority (SCRRA), sponsor of the Metrolink commuter service in the Los Angeles area; North County Transit District (NCTD), sponsor of The Coaster commuter rail service in the San Diego area; and the Peninsula Corridor Joint Powers Board (PCJPB), sponsor of the Caltrain commuter rail service in the San Francisco Bay Area.

The contacted agency using Herzog is the San Joaquin Regional Rail Commission (SJRRC), sponsor of the Altamont Commuter Express (ACE) commuter service between Stockton and San Jose, California.

The Connecticut Department of Transportation (ConnDOT) Bureau of Public Transport was contacted for insight on Metro North which provides the commuter service on ConnDOT's New Haven Line. SCRRA also offered comments on Connex, which will begin providing commuter rail services for Metrolink in 2005, replacing Amtrak as the operator.

All the agencies were asked for their insights on the advantages and disadvantages of using their respective operators. The comments are summarized in Table 8-4. Generally

speaking, Amtrak and Metro North offer the advantages of leveraging their sizable pool of labor for train operations and maintenance. Amtrak costs specifically tend to be lower, as commuter rail staffers are incremental to intercity staff and do not trigger any major expansion of overhead expenses.

Table 8-4
Operator Comparison

Operator	Advantages	Disadvantages
Amtrak	- National experience in commuter rail operations - Deep reserve of labor for operations and maintenance - Trained to Class 1 railroad standards - Incremental costing - Established Labor Relations Department dealing regularly with rail unions - Economies of scale in purchasing train parts and supplies	- Inefficient work rules - Inflexibility on liability insurance - Fate tied to the annual Congressional budget process - Centralization puts commuter rail operations at risk: if Amtrak does not get the federal and state dollars it needs for intercity services, it may cut back on offering services for regional commuter operations as a way to pare costs
Private Contract Operator, e.g. Herzog and Connex	- "Tailored" operation - Flexibility in labor deployment: workers tend to be cross trained	- Potentially higher cost than Amtrak
Metro North	- Deep reserve of labor, more than Amtrak in Connecticut - Trained to Class 1 railroad standards - Established Labor Relations Department - Economies of scale in purchasing	- Inefficient work rules - Higher costs than Amtrak

In contrast, private operators can more easily "tailor" or customize their operations to the circumstances of the commuter rail operation. Whereas with Amtrak, commuter rail operations for one agency may largely mirror how Amtrak works elsewhere. Furthermore, private operators are not as tied to strict work rules as are Amtrak and Metro North, as workers may not be represented by the traditional rail unions At ACE, Herzog employees are represented by the Carpenters Union, the largest labor union in California. Under their contract, Herzog workers can be cross trained to fulfill various

roles, as needed. For example, a clerk on ACE can serve as a conductor today. Amtrak and Metro North workers cannot do the same. The potential for providing tailored operations and workforce flexibility can mitigate potential higher costs versus Amtrak.

Table 8-4 compares Amtrak, private companies, and Metro North as potential operators of a "stand alone" commuter rail service, with its own equipment and maintenance facilities. However, if the service were to be fully integrated with existing Amtrak services on the New Haven-Hartford-Springfield line (sharing the same work forces and type of rolling stock), there is a clear advantage of employing Amtrak as the operator. This is that Amtrak as the operator would be disposed to seeking ways to better utilize crews and equipment than if it were not the operator. The bottom line for the commuter rail sponsor would be consequently lower capital and operating costs for an integrated service versus a stand alone service operated by Amtrak or anyone else.

8.6 Rolling Stock Procurement

The procurement of rolling stock for the corridor is a process that requires a significant amount of lead time and as such, should begin as soon as funding is identified. This section outlines potential equipment for the start-up service.

The analysis is limited to the six consists making a total of 16 daily local ConnDOT trips. As discussed in previous sections, combining Amtrak and ConnDOT equipment would provide some efficiencies. The forecast seating requirement is 180 seats per train, based on analysis of the projected ridership numbers presented in earlier chapters of the report. Two basic classes of rolling stock can be considered for operation of the proposed service.

1. Locomotive-Hauled Push-Pull Coach Train
2. Self-Powered Rail Car Train (SPRC) also referred to as Diesel Multiple Unit (DMU)

This section describes these two basic classes of passenger rolling stock in terms of operational and economic characteristics for the proposed 62-mile commuter rail service.

8.6.1 Locomotive-Hauled Push-Pull Coach Service

Locomotive-hauled diesel push-pull operations characterize most of the commuter railroads in North America. In this configuration, a diesel electric locomotive is employed to provide propulsion, lighting and HVAC power for the train. The diesel engine drives an electric generator that supplies power to electric motors on the locomotive's drive-wheels. A separate diesel engine and generator typically provides electric power to heat, cool and light the passenger coaches. The typical minimum length for a push-pull train is a locomotive and three coaches. Trains with two cars are occasionally deployed, but are not favored. It is assumed that a two-car train could be deployed for New Haven to Springfield commuter rail service. The typical diesel locomotive is 60 to 70 feet long and weighs 125 tons. The maximum practical train length for a single passenger locomotive is typically 8 or 9 cars.

The locomotive hauls the train in pull configuration. When the consist reaches the end of its trip and turns to head back toward its origin, the engineman shifts the locomotive into push mode and changes his seating position from the locomotive to a work station at the far end of the last car in the consist. This work station provides a throttle, brakes, and other controls that allow him to operate the locomotive and the train in the push configuration.

The passenger coaches are unpowered trailers. Coaches can be either single-level or bi-level. Regardless of height, the typical coach is 85 feet long. A single-level car generally weighs about 50 tons. A bi-level weighs approximately 60 tons. The Massachusetts Bay Transportation Authority (MBTA) in Boston and the Long Island Railroad (LIRR) in New York operate a mix of single-level and bi-level equipment. Metro-North and ConnDOT only operate single coaches at this time. The Water Street Bridge would restrict the use of bi-level cars on the New Haven to Springfield corridor.

For shorter commuter type trips each single-level coach typically seats 95 to 125 passengers. Higher seating capacities are achieved by narrowing the center aisle of the car and providing five seats in every row - two seats on one side of the aisle and three on seats on the other (3-2 seating). Structurally, the typical single-level coach rests on a center sill above the wheels sets ("trucks") at either end of the car. Passenger entry and egress from the car requires either a high-level platform designed to match the height of the car floor or uses short three step stairways (called "traps") located at each corner of the car.

Very few single-level coaches are currently being built for North American commuter railroads. Most railroads are migrating to bi-level coaches to lower capital and operating expenditures and to maximize the number of passengers that can be carried on very popular trains. Three manufacturers have been producing most of bi-level coaches used on this continent. Bombardier builds a large high capacity unit that is favored by western and southern railways. Kawasaki builds a more compact unit that fits with the tighter vertical clearance profiles typical of established eastern commuter railways. Nippon Sharyo has built "gallery cars" for Chicago and San Francisco. However, this discussion focuses on the Bombardier and Kawasaki cars. Rolling stock that is compatible with high-level platforms is the only type being considered for this service.

Bi-level coaches are generally employed to provide more passenger capacity at a maintenance and operating cost equivalent to a single-level coach. With 3-2 seating, capacities exceeding 180 passengers can be achieved. The typical bi-level coach has a depressed seating level below the center sill (between the "trucks") and a second higher level above. Stairs provide access to the higher level, therefore bi-level cars increase dwell time and impact fare collection.

Crewing for a push-pull train requires an engineman and generally at least one conductor to check fares, supervise boarding and alighting, and ensure order on the train. For on-board fare collection, one conductor is typically deployed for every two coaches in the

train. For a high density of short passenger trips, a higher level of train manning might be required to support on-board fare collection.

The push-pull configuration offers several advantages and disadvantages for the proposed New Haven-Hartford-Springfield regional rail service.

What are the advantages of Locomotive-hauled services?

- **Known Proven Technology –** Locomotive and coach technology is readily available in North America and used extensively at large properties including Amtrak, Metro-North in New York, the MBTA in Boston, LIRR in New York and Metra in Chicago. The technology is also well known by the entire US railroad industry, given the numerous years in use. The rail technology is proven off-the-shelf hardware and the local railroad workforce and management community is familiar with push-pull coach technology.
- **Capital and Operating Cost for Longer Trains –** Capital cost per seat declines as the train length increases, making locomotive-hauled services ideal for higher ridership services. The capital cost per seat is reduced with the addition of each coach as a large proportion of the consist cost is due to the locomotive. In an SPRC consist, the capital cost per unit does not vary with the length of the consist when each additional unit is powered.
- **Availability of Used Equipment -** Remanufactured locomotives and used coaches can be employed to reduce capital outlay for equipment. ConnDOT is the nation's most recent buyer of used single-level coaches, having acquired 33 used Mafera coaches from Virginia Railway Express (VRE)[11]. Chicago's Metra has just retired a large fleet of bi-level gallery cars some of which are being recycled into service by commuter railroads in Virginia and Maryland. Chicago's Metra and Amtrak are the two North American passenger railroads that have most recently retired locomotives. It is understood that most of these units have found their way onto the used market with the primary buyers being leasing firms that are providing them to short line freight operators.
- **ADA Accessibility –** A single-level locomotive-hauled consist on a service with high-level platforms is fully accessible for the disabled population with level boarding.

What are the disadvantages of Locomotive-hauled services?

- **Minimum Consist Size –** The typical minimum length for a push-pull train is a locomotive and three coaches. Trains with two cars are occasionally deployed, but are not favored. A service with smaller ridership would suffer from an excess of equipment.

[11] VRE is pressed for passenger capacity, storage space and maintenance capacity. Consequently VRE is replacing its single-level coaches with used bi-levels from Chicago.

- **Fuel Efficiency –** Fuel consumption for a push-pull operation is in the range of 0.25 to 0.5 miles per gallon. By contrast, a Self-Powered Rail Car / Diesel Multiple Unit consumes fuel in the range of 1.5 to 3.4 miles per gallon.
- **Noise, Vibration and Power –** The typical diesel locomotive is 60 to 70 feet long and weighs 125 tons and runs a 3000 HP engine. The 3000 HP 125 ton locomotive creates noise and vibration that may pose a problem for neighbors. The locomotive also generates more power than required to move the short consist required for subject service.
- **Internal Combustion Engine and Fossil Fuel** – The fumes and fuel associated with locomotive operations are not considered compatible with passenger operations and stations in long tunnels. A significant fraction of the urban transit systems in North America and the world penetrate the core of the central city in tunnels. The proposed New Haven to Springfield service has no tunnel elements.

8.6.2 Self-Powered Rail Car / Diesel Multiple Units

A Self-Powered Rail Car (SPRC) is a passenger rail car with a self-contained, on-board source of motive power, making reliance on a locomotive or electric power distribution system unnecessary. Historically nearly all SPRCs have used on-board diesel engines for propulsion power and have been capable of operation as a single train with multiple cars. SPRCs have commonly been called Diesel Multiple Units, or DMUs. While motive power may be a diesel internal combustion engine or an alternative self-contained, on-board source, all SPRCs in common use rely on diesel propulsion.

SPRCs are often used in Europe in circumstances where service is operated with short (generally less than four cars) trains and the infrastructure for electric traction is not available. In the last two decades, European transit officials have been very actively exploring the flexibility offered by an SPRC to operate in a mix of operating environments.

In the 1950's, SPRCs were growing in popularity in North America for conventional railway service until market, technological, and regulatory forces undermined the viability of low-density passenger services. With recent increased interest in urban rail passenger transport, SPRCs have been reintroduced in North America over the last 10 years in Texas, New Jersey, and Ontario. New systems are in advanced states of development in Florida, North Carolina, California, and Oregon. In 2003, Amtrak negotiated to purchase a fleet of SPRCs for several of its low-density routes. Amtrak did not consummate the purchase when the capital cost of the units barely exceeded its rigid capital funding and budget limits. Amtrak remains interested in using SPRCs for services such as its Springfield Line local service in the future.

Worldwide, SPRCs are designed for use in a wide variety of operating environments ranging from main line intercity railways to street running trolley car type service. Different vehicle designs are employed depending upon service requirements. TCRP

Report 52 "Joint Operation of Light Rail Transit or Diesel Multiple Unit Vehicles With Railroads" describes SPRC vehicles in three categories:

- Category 1 – FRA Compliant Cars
- Category 2 – Non-FRA Compliant Cars – generally too lightly built for FRA crashworthiness standards.
- Category 3 – Diesel Light Rail Vehicle – generally shorter, lighter, articulated cars for street running trolley operations

For the New Haven, Hartford, Springfield service, SPRCs that comply with FRA crash-worthiness standards for operation on track shared with freight and conventional passenger trains will be required.

FRA Compliant SPRCs / DMUs

FRA compliant SPRCs are relatively heavy cars primarily designed for safe and unrestricted use on the nation's conventional railroad network sharing track with other trains including freight, commuter rail and Amtrak operations. They comply with all regulations stipulated by Federal Railroad Administration (FRA) for operation on the US conventional railroad network. Examples of the use of this equipment include:

- Trinity Railway Express linking Fort Worth with Dallas uses a fleet of 13 rebuilt vintage Budd RDC's originally constructed in the 1950's.
- South Florida RTA's Tri Rail service linking Miami, Fort Lauderdale and West Palm Beach has ordered two new DMU's from Colorado Railcar.
- The Colorado Railcar offering is the first Category 1 SPRC built in more than 40 years. North Carolina's Triangle Transit Authority has ordered 28 cars for its Raleigh-Durham service opening in 2008.

What are the advantages of SPRCs / DMUs?

- **Capital and Operating Cost for Short Trains** – Passenger rail rolling stock planning and selection studies generally agree that SPRCs offer superior overall economics to locomotive-hauled equipment when the typical train length falls below four cars. For short trains, the SPRCs offer savings in fuel consumption and vehicle acquisition. As train lengths increase, the lower costs to acquire and maintain additional seating capacity with unpowered coaches more than compensate for the relatively high costs of acquiring, operating, and maintaining a locomotive[12].

  Colorado Railcar has discovered that its single-level SPRC powered by two 600 hp diesel engines produces sufficient tractive effort to haul one or two unpowered coaches for some service applications. The economic and operating implications of using a mix of SPRC's and coaches in the same train are theoretically very attractive but not well documented and likely to vary considerably between

[12] While some railways use SPRC's in services designed for one-person train operation, the savings noted here focus on vehicle acquisition, vehicle maintenance and propulsion energy costs and do not consider the reduced transportation staff possible with one-person train operation

service applications. The option of using SPRCs as "power cars" to pull short coach consists should be seriously studied in any rail corridor where SPRC's alone appear potentially attractive. A demonstration project of this configuration is currently underway at Tri-Rail in Florida.

In summary, it is less expensive to purchase and maintain SPRC's with the lower capacity required for proposed New Haven-Hartford-Springfield operation.

- **Noise and Vibration** – Compared with locomotive-hauled equipment, the heaviest SPRCs are less than half the weight and horsepower of the typical passenger locomotive, leading to lower noise and vibration impacts.

- **Fuel Efficiency** – A single SPRC consumes fuel in the range of 1.5 to 3.4 miles per gallon[13]. A conventional passenger locomotive consumes fuel in the range of 0.25 to 0.5 miles per gallon. For a single car operation, the fuel savings with a SPRC are impressive and often compelling. (However, the fuel savings available from SPRC operations erode with increased train length since the fuel consumption increases linearly with SPRC train length. Locomotive fuel consumption does not increase linearly as coaches are added to its train.)

- **Acceleration** – Owing to more favorable weight-to-horsepower ratios and greater tractive efficiency of more powered wheels on the train, SPRCs generally offer better acceleration than locomotive-hauled coach trains.

- **Reduced Infrastructure Requirements** – Compared with locomotives, the infrastructure to maintain SPRCs is more modest. Lifts and hoists to manipulate 125-ton units are not required. Huge diesel engines of 3,000 to 6,000 HP are replaced with lighter engines seldom exceeding 600 HP. Therefore, it is easier to maintain the SPRC without elaborate shop facilities.

- **Flexibility** – SPRCs offer the flexibility to demonstrate, initiate and operate passenger rail services in circumstances where the use of alternative rolling stock technologies would be daunting. Factors contributing to the flexibility of the SPRC include the ability to use existing tracks, ability to operate short trains more economically than push-pull diesel operations, and reduced noise and vibration compared with diesel locomotive operations. The SPRC can operate in short trains of one to three cars anywhere a diesel train runs without the noise, vibration, cost or fuel consumption of a locomotive-hauled train.

- **Regulatory Compliance and Tolerance** – The Category 1 SPRC being considered for this service is compatible with FRA regulations for general use on North America's conventional railroad network.

[13] KKO and Assocates, Industry Survey of DMU Manufacturers interested in US Market. October 1996.

What are the disadvantages of SPRCs / DMUs?

- **Capital and Operating Costs for Long Trains** – As discussed above, when the train lengths routinely exceed three cars, the economic advantages of SPRCs over locomotive-hauled equipment quickly erode due a combination of costs for rolling stock acquisition, maintenance and fuel. The purchase price of an unpowered commuter coach is generally less than half the cost of a SPRC unit. Maintenance for a commuter coach is also less work than for an SPRC. Most commuter and regional rail lines in North America operate with average peak train lengths well in excess of three cars.

- **Internal Combustion Engine and Fossil Fuel –** The fumes and fuel associated with SPRC operations are not considered compatible with passenger operations and stations in long tunnels. A significant fraction of the urban transit systems in North America and the world penetrate the core of the central city in tunnels. The proposed service has no tunnel elements.

- **Rolling Stock Supply and Availability –** With the mid-20th century demise of North American intercity passenger railroading, the supply industry stopped producing SPRCs compatible with the US conventional railway environment. The Budd RDC, last produced in the 1950's, was the last commercially viable SPRC specifically manufactured to operate on the North American conventional railway network.[14] Budd's successor to the RDC, the SPV 2000, was introduced in the 1970's to replace aging RDCs used on lightly used lines in Connecticut and New York. The "Seldom Propelled Vehicle" proved unreliable and expensive to operate.

  The failure of the SPV 2000 forced some of the last SPRC operations to shift to less economic locomotive-hauled services because no other manufacturer was willing to consider building units for the limited US market. In the late 1970's, Boston gave up trying to operate its large but aged RDC fleet as self-powered units but towed the old cars behind locomotives for another 10 years until replacement coaches could be purchased. In the early 1980's, Philadelphia's last SPRC services were discontinued due to the confluence of a poor fiscal climate and an aging RDC fleet that could not economically be replaced.

  From the 1970's until the turn of this century, no manufacturer offered a Category 1 SPRC at an attractive price. Consequently, North America transit planners interested in SPRC's for North American applications had no choice but to consider how to use European Category 2 vehicles. The new Category 1 offering by Colorado Railcar has been purchased for use on Florida's Tri-Rail service. United Transit Systems (a consortium of Tokyo-based Sojitz Corp. and Seoul-

[14] The archetypical US SPRC is the Budd RDC. Hundreds of Budd cars were built in the 1950's for operation on rail passenger branch lines and some main line services. The New Haven and Boston and Maine railroads owned more Budd RDC cars than any other railways in the world.

based Rotem Co.) is building 28 Category 1 SPRCs for North Carolina. A planned transit operation in Oregon will soon be awarding a contract for its Category 1 SPRCs. The North Carolina cars are expected to be fully compliant with all FRA regulations with 2x2 seating for 170 passengers.

In summary, the pool of used or remanufactured vehicles for capital cost savings is very thin.

- **Regulatory Compliance and Tolerance –** Without a ready supply of SPRCs tailored to operate within safety parameters established for North American operations, considerable energy in the urban rail passenger planning community over the last decade has been focused on how to safely use equipment designed for European operation in the North American operating context. The Federal Railroad Administration has deliberated with the public transportation planning community to develop and explore strategies that allow for the safe sharing of track between conventional rail equipment and light passenger rail cars (both electric and diesel). Together, federal regulators and transit officials have been exploring and reconsidering the barriers to safe operation of conventional and light rail cars on the same tracks, with slow but perceptible progress. In the last four years, the FRA has issued waivers to several transit systems allowing their light Category 3 trains to share track with conventional railroad equipment where the service periods of the transit and freight operations do not overlap. The transit services generally operate 16 to 18 hours during the day and evening with freight operations restricted to the overnight hours.

  Regulators and transit officials continue to evaluate strategies that may allow more operational flexibility. An industry working-group meets periodically to review progress toward new options for sharing track. However, the relatively new prospect of suppliers willing to produce economical quantities of Category 1 SPRCs for attractive prices has ameliorated the pressure to find ways to use Category 2 units for some proposed services.

  In summary, regulatory compliance is only available for limited pool of Category 1 SPRCs.

8.6.3 Comparison and Evaluation of Options

Two general equipment options for ConnDOT's use on the New Haven-Hartford-Springfield commuter rail service were identified and evaluated. These were:

- Locomotive-hauled Push-Pull Coach Train
- Self-Powered Rail Car Train

Details on two possible equipment configurations are listed in Table 8-5. For this comparison, the following equipment were assumed. For locomotive-hauled equipment, a conventional locomotive type (F-59 PHI by General Motors Electro Motive Division)

and Comet V cars (from Alstom) are detailed. For SPRCs/DMUs, the Colorado Railcar three-car DMU consist is detailed. Both train set types are compatible with high level platforms and FRA crashworthiness standards for operation on track shared with freight and conventional passenger trains. The seating capacity of each is comparable, and matches the requirements for the NH-H-S service. Both types can be operated in a push-pull mode, obviating the need to turn the train set for a reverse movement.

Table 8-5
Comparison of Locomotive-hauled Train Set and SPRC/DMU Train Set Options

	Locomotive-Hauled Train Set	**SPRC/DMU**
Summary of Typical Equipment Options	Typical New Three-Car Push-Pull Train Set (Single-level)	Colorado Railcar Single-level DMU
Minimum Configuration	One Locomotive, Two Coaches and One Cab Car	One Powered Coach and Two Trailing Coaches
Seating Capacity	327	278
Capital Cost (Millions)	$8.6	$6.8
Horsepower	3,000	1,200
Weight (Tons)	290	224
Length (Feet)	315	255
Tons/Seat	.96	1.24
Typical Annual Fuel Cost for NH-H-S Service[15]	$1,070,864	$342,676
Capital Cost/Seat	$26,330	$24,460
HP/Ton	10	5
High Platform Boarding?	Yes	Yes
Noise and Vibration	High	Medium/Low
Total Fleet Size (Units)	27	21
Minimum capital cost for seven[16] complete train sets (Millions)	$58.9	$47.6

Table 8-6 shows a summary evaluation of the two types of train consists per evaluation criteria deemed important to both riders and operators/maintainers of the equipment. Overall, SPRC/DMU train sets appear to have several advantages over locomotive-hauled rail cars. But it is important to remember that few new SPRCs / DMUs are in

[15] Assuming 992 daily revenue train miles, 254 annual days of operation, $1.70 per gallon for diesel fuel not including tax, 0.4 mpg for locomotives, 1.25 mpg for DMU/Coach pairs. (per statistics prepared by Colorado Railcar Manufacturing, LLC for Dave Carter of New Jersey Transit, 13 April 2004)
[16] Six consists required for service plus one spare.

operation today. Therefore, the quantifiable superiority of SPRCs / DMUs in the areas cited below is pending further operational assessments of this type of rolling stock. To be conservative, this study has developed its operating plan using conventional commuter rail equipment. As the study progresses, SPRCs / DMUs will be looked at again for potential application in the Springfield line commuter rail service.

Table 8-6
Summary Comparison of Locomotive-Hauled Train Sets and SPRC/DMU Technologies

	Locomotive-hauled Train Set	**SPRC / DMU Train Set**
Operating Cost		+ [17]
Capital Cost		+
Minimum Fleet Size		+
Comfort	Even	
Acceleration	Unknown	
Availability	+	
Reliability	High	Unknown
Noise and Vibration		+
Air Quality Impacts		+
Fuel Consumption		+
Maintenance Costs		+
Image		+
Flexibility		+
One-Person-Train-Operation		+

[17] Indicates superiority for proposed New Haven-Hartford-Springfield service.