



## **New Haven Hartford Springfield Commuter Rail Implementation Study**

### **Recommended Action**

The Connecticut Department of Transportation (ConnDOT) is currently conducting a study to develop an implementation plan for commuter rail service between New Haven and Hartford, CT, and Springfield, MA. This document is a summary of the start-up service proposed by the study Steering Committee. The study documentation and proposed recommendation will be presented to the public in November 2004 and comments will be received through December 15, 2004. A final report, which will respond to public comments and include an assessment of equipment type, potential financial resources and implementation schedule, will subsequently be prepared and published in early 2005.

Before a set of implementation alternatives were developed, two scenarios, a "minimum" and "maximum" build, were identified as two extremes in possible service on the line. Using the data from these two initial alternatives, a set of four possible service implementation alternatives were created for initial startup of the service along with a menu of options that could be added to the service either immediately or over time. An alternatives report was produced to document these potential alternatives for initial implementation of commuter rail service and can be found on the study website at [www.nhhsrail.com](http://www.nhhsrail.com).

Upon review of the alternatives presented in the alternatives report, the study team and the Steering Committee have recommended an action for initial commuter rail service on the line. The start-up service recommended by the Steering Committee is based upon the Bi-State service option. This Recommended Action includes:

- 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.
- 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 with no adjustments made in the Amtrak schedule. However fares would be adjusted for commuter use.
- 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.



## 1 Stations

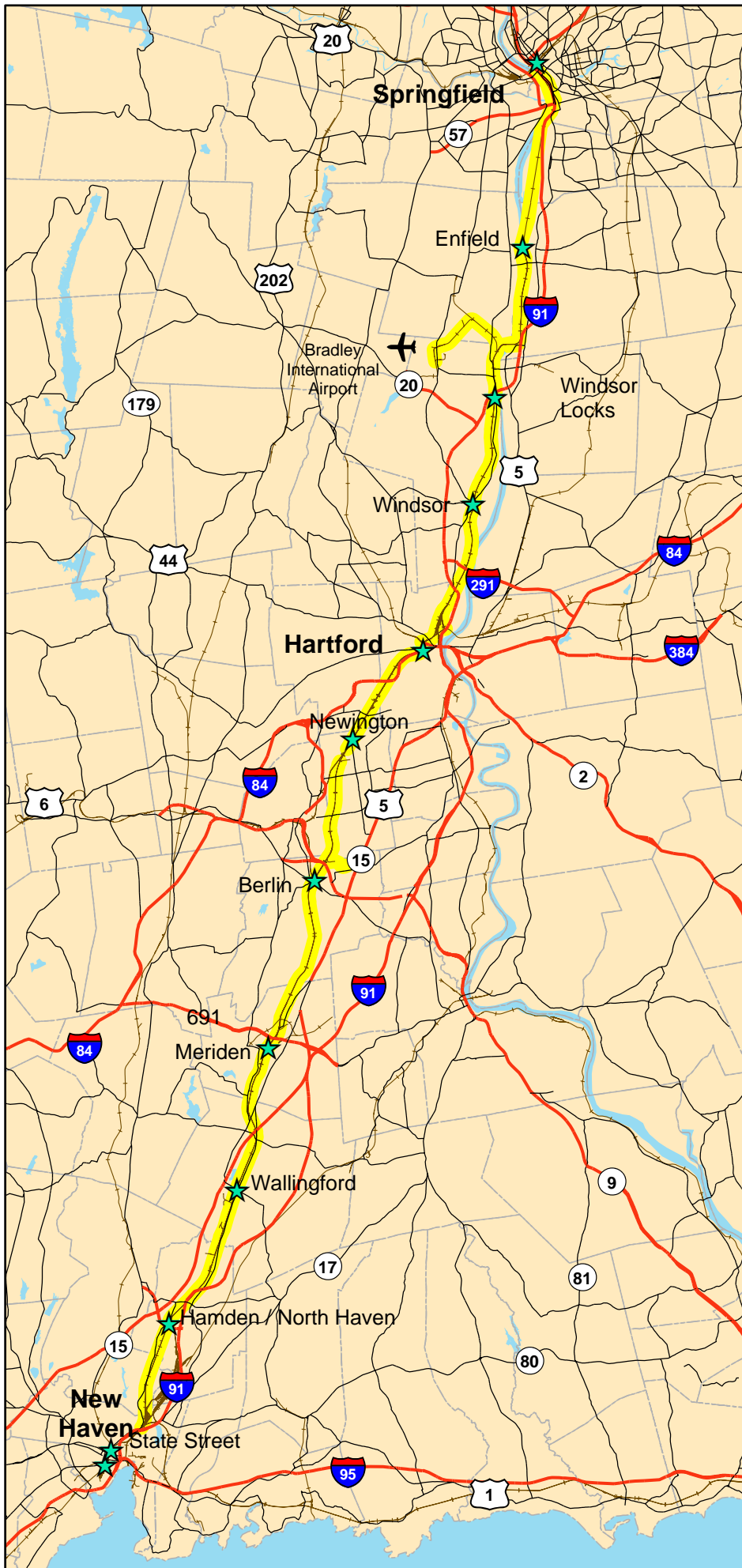
The Recommended Action described includes three additional stations and improvements to the station areas. The stations for this scenario, which include those new stations not in use today (are *italicized* below), are shown in **Error! Reference source not found.**:

- 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

Station improvements 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 station are shown at the end of this document.

## 2 Schedule

Rail Traffic Controller (RTC) simulation software was used to evaluate a Bi-State 1 Alternative 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 1 shows the illustrative weekday schedules for the Bi-State 1 Alternative. This schedule is currently being revised using the additional stations in the Recommended Action and comments received to date. A final schedule for the Recommended Action will appear in the Final Report. This final schedule is anticipated to include 7 round-trips per day with the possibility of 8 round-trips per day.



# Recommended Action Stations

New Haven - Hartford - Springfield  
Commuter Rail Feasibility Study



**Legend**

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

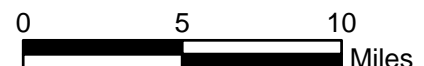


Figure 1

**Table 1**  
**Bi-State 1 Alternative Illustrative Schedules**

**Southbound**

Station	AM									PM					
	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**

Station	AM					PM									
	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



### **3 Ridership Levels for Recommend Action**

The New Haven to Hartford commuter rail service has the ability to attract several different types of riders. The four different types of potential users are:

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.

#### **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. Table 3, found later in the report, shows the AM peak commuter boardings (ons) and alightings (offs) for each station.



### 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 2. The resulting Recommended Action weekday ridership by station is shown in Table 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 2**  
**Components of Total Weekday Ridership**

Commuters	2,208
Off-peak	220
<b>Total New Trips</b>	<b>2,428</b>
Amtrak (not including Vermonter)	616
<b>Total Trips</b>	<b>3,044</b>

**Table 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
<b>Total</b>	<b>1,104</b>	<b>1,104</b>	<b>2,428</b>

Source: Wilbur Smith Associates, Revised ConnDOT Model



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. 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.

## **4 Capital Costs for Recommended Action**

Capital costs for the Recommended Action consist of five 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. These cost components are being refined in the last phase of the study, however a preliminary estimate is shown below for each component.

### **4.1 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 service would require 6 train sets, plus a spare locomotive, trailer coach and cab coach. The specific equipment required is discussed in this section, along with estimated costs.

#### ***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<sup>1</sup> to about \$4.5 million for a high-end AC power locomotive<sup>2</sup>. Delivery costs would be a negligible percentage of the purchase price.

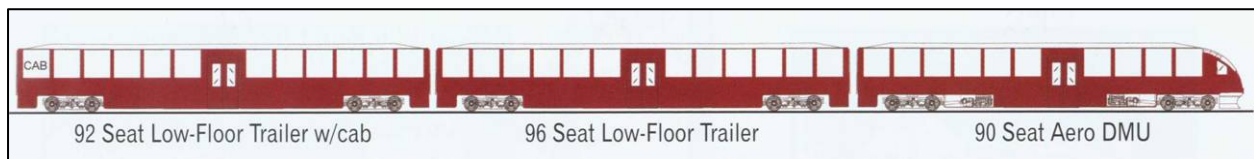
### ***Cars***

The cars would need to board and alight riders at stations that currently have either low or high platforms. 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. A cab car typically has 109 seats. A coach car typically has 111 seats with a restroom. An average cost of \$1.37 million is assumed for both car types.<sup>3</sup> Delivery costs would be a negligible percentage of the purchase price.

### ***Diesel Multiple Units***

An alternative rolling stock assumption is the use of new DMU technology. DMUs may be more cost effective on lines with lighter passenger densities than are traditional locomotive-hauled equipment. Colorado Rail Car, whose DMU is seen at right, is the only manufacturer of DMUs that are compliant with safety requirements of the Federal Railroad Administration (FRA) for operation on track shared with freight and conventional passenger rail equipment. The Amtrak Springfield line is such an environment. Accordingly, a DMU operating on the line would have to be an “FRA compliant” DMU.

Each train set would consist of one motorized unit, a trailing coach, and a cab-coach. This combination would allow the set to operate in a push-pull mode, obviating the need to turn the set for the return trip. Each train set costs \$6.8 million, FOB plant (Fort Lupton, Colorado).<sup>4</sup> Delivery costs would be a negligible percentage of the purchase price. A schematic of the three-car train set appears below.



<sup>1</sup> Per conversation with Preston Cook of Engine Systems Inc. (ESI), distributor for EMD.

<sup>2</sup> Per conversation with Peter Richter of the Connecticut Department of Transportation.

<sup>3</sup> Per Connecticut Department of Transportation study entitled *New Haven Line Fleet Configuration Analysis*, Task 5: Lifecycle Cost Analysis, page 102.

<sup>4</sup> Per conversation with Christina Raider, Colorado Railcar.





### ***Rolling Stock Summary***

Table 4 below presents the two rolling stock options and their likely costs. Spares are included. As conventional and DMU equipment comparisons are refined for the final report, cost estimates for the equipment will be refined as well.

**Table 4**  
**Rolling Stock Summary**

<b>Type</b>	<b>Number</b>	<b>Spares</b>	<b>Total Units</b>	<b>Unit Cost in \$ millions</b>	<b>Total Cost in \$ millions</b>
<b>Conventional</b>					<b>58.90</b>
<i>Locomotives</i>	<i>6</i>	<i>1</i>	<i>7</i>	<i>4.50</i>	<i>31.50</i>
<i>Coaches</i>	<i>12</i>	<i>1</i>	<i>13</i>	<i>1.37</i>	<i>17.81</i>
<i>Cab cars</i>	<i>6</i>	<i>1</i>	<i>7</i>	<i>1.37</i>	<i>9.59</i>
<b>DMUs</b>	<b>6</b>	<b>1</b>	<b>7</b>	<b>6.8</b>	<b>47.60</b>

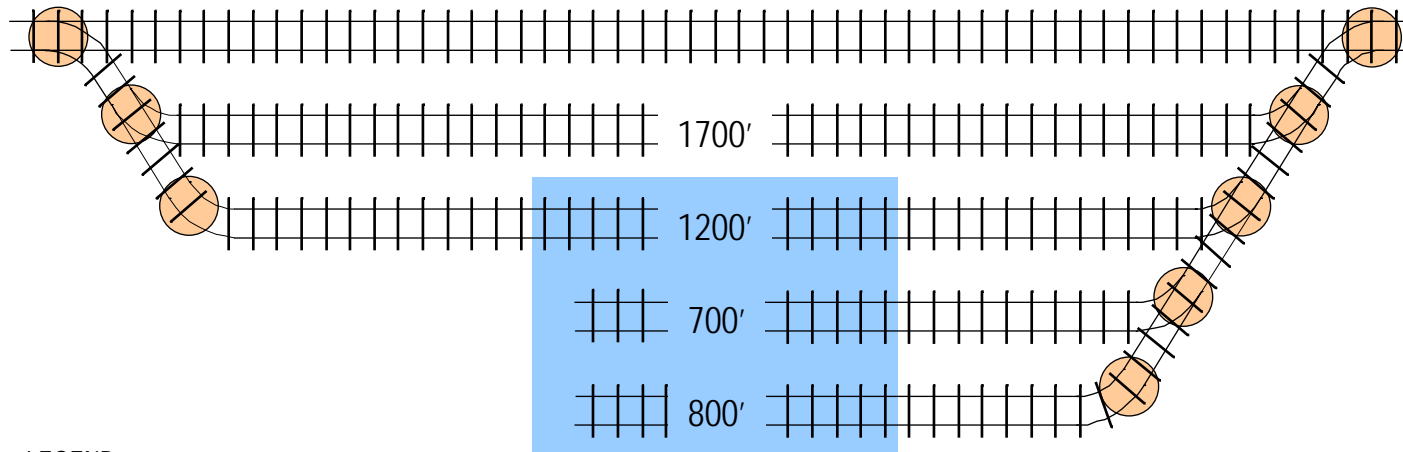
Source: Wilbur Smith Associates per sources described in text

### **4.2 Maintenance Facility / Storage**


The Recommended Action assumes 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. One potential location for this new facility would be at Cedar Hill Yard, located north along the line from downtown New Haven. Two general areas have been investigated. One is on or near the Amtrak portion of the yard, and the other is on or near the CSXT portion of the yard. A schematic of the facility is shown in Figure 2. Conceptually, the facility could 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.
- 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.

Main Line



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 2



- 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.

The cost for such a facility would be approximately \$12 million, inclusive of engineering, construction and contingencies, but not including land acquisition or environmental clean-up. Land requirements would be in the range of 15 to 22 acres, estimated at about \$4 million, exclusive of 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. Therefore the total cost would be approximately \$16 million, exclusive of environmental costs.

### **4.3 Station Costs**

For the Recommended Action, the stations are envisioned to be slightly less substantial than the 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 Figures 2 – X. Cost estimates for the stations are being refined based on these drawings for the final report. No station costs were included for New Haven Station. A cost for conversion to high level platforms was included for Hartford and Springfield stations.

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).



### ***Surface Parking***

For a parking lot with 90 degree angle parking, 4-inch bituminous paving, 6-inch granular base, 10-inch subbase, 2-foot excavation, painted lines on pavement, partial drainage system, and continuous curbing, the estimated cost is \$5,000 per space. The estimated right-of-way cost for parking is \$200,000 per acre with 100 spaces per acre or \$2,000 per space. Therefore, surface parking is estimated at \$7,000 per space.

### ***Parking Lot Lighting***

For fixtures, metal poles and bases, the estimated cost is \$2,500 each.

### ***Parking Structure***

For a stand alone multistory garage, with 90/45/60 degree angled parking, with precast, prestressed double T's structure, fire stairs and elevators, ramps and floors, the estimated cost is \$15,000 per space.

The total parking costs, including surface parking and lighting or parking structure, vary by station and are presented in Table . The number of spaces required is based on ridership numbers presented previously.

### ***Station Platforms and Canopy***

Based on Shore Line East station construction bids in Branford, Guilford and Clinton, the platforms and canopy cost are estimated to be \$2.5 million for two 200 foot long by 10 foot wide platforms and two 100 foot long by 10 foot canopies.

### ***Station Elevator, Stair Tower and Pedestrian Bridge***

Based on Shore Line East station construction bids in Guilford, the elevator, stair tower and pedestrian bridge costs are estimated to be \$2.5 million for two elevator, two stair towers and a connecting pedestrian bridge.

The total station costs, including platforms, canopy, elevators, stair towers and pedestrian bridge total \$5,000,000 per station.

The total station area costs, including parking and stations are shown in Table 5. Although cost estimates for the stations are being refined based on the plan-level drawings for the final report, the total station cost is anticipated to remain approximately \$70 million.



**Table 5**  
**Station Area Costs**

<b>Site</b>	<b>Cost</b>
New Haven State St	\$4,000,000
Hartford	\$2,500,000
Springfield	\$2,500,000
North Haven, Wallingford, Meriden, Berlin, Newington, Windsor, Windsor Locks, Enfield	\$6,000,000 - \$9,500,000 per station
<b>Total</b>	<b>70,000,000</b>

Source: URS Corporation, revised by ConnDOT design

#### **4.4 Double Track Costs**

For the Recommended Action, the Springfield Line would remain a single-track railroad with a bi-directional signaling / train control system and multiple controlled passing sidings. However, to provide sufficient double trackage for dependable operation, several extensions of the current double track would be needed. The Bi-State Alternative called for approximately 15.4 miles of extended track. With the addition of three new stations in the alternative, longer extensions of double track would permit more flexibility in scheduling and operations. Therefore, the Recommended Action calls for a minimum of 18 miles of additional track and five new sets of universal or “double” crossovers for maximum operational flexibility. Track extensions required include:

- Extend double track from MP 7.3 (Cedar) to MP 11.5 (south of Wallingford). This requires double track across the Quinnipac River and differs from Bi-State 1.
- Extend double track from MP 20.6 (Quarry) through the industrial track to MP 22.5. This differs from Bi-State 1.
- Extend double track from MP 28.2 to 31.1 (New), and from MP 33.4 (Wood) to MP 35.1.
- Extend double track from MP 38.9 (Fry) to MP 43.0 (Windsor).
- Extend double track from MP 51.5 (east side of Connecticut River) to MP 54.7 (Field).

The Recommended Action would involve 18 miles of new track at \$800,000 per mile, plus 5 new control points at \$1.5 million each. Control point costs include related signal system improvements. The total estimated track costs are therefore \$21.9 million.



#### 4.5 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 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 assumed for the initial commuter service are \$5 million. This estimate is being refined for the final report.

#### 4.6 Airport Connection Costs

For the shuttle bus alternative, no capital construction costs are necessary. It is anticipated that a minor cost may be incurred for the purchase of an additional airport shuttle bus, estimated at less than \$500,000 and therefore included in contingencies.

#### 4.7 Total Capital Costs

A summary of capital costs appears in Table 6. The cost estimate includes necessary train sets, spares, the maintenance facility, parking and station costs, double track costs, and bridge rehabilitation or replacement costs. In addition, a 10% design and inspection fee has been applied. Amtrak flagmen will be required for construction within 25 feet of the rail line, including platforms, overhead structures, and double tracking segments. Many of the right-of-way costs and environmental costs that may be associated with station and maintenance facility construction are not included. However, to be conservative, a contingency of 40% has been used to reflect these unforeseen costs. The total capital cost for the Recommended Action is \$263 million.

**Table 6**  
**Recommended Action Capital Costs**

<b>Element</b>		<b>Cost</b>
Maintenance facility		16,000,000
Stations		70,000,000
Double Track		21,900,000
Bridges		5,000,000
<b>Subtotal</b>		<b>\$112,900,000</b>
Design and Inspection	10%	\$11,290,000
Train Equipment		\$58,900,000
Amtrak Flagmen		\$5,000,000
<b>Subtotal</b>		<b>\$188,090,000</b>
Contingency	40%	75,236,000
<b>Total</b>		<b>\$263,326,000</b>

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



## 5 Operating Costs

This analysis calculates operating costs by multiplying the New Haven-Hartford-Springfield service’s projected annual train miles for its Recommended Action times a representative cost per train mile. These operating costs are being refined for the Final Report.

### 5.1 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 7 or 8 round trips per day or 14 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.

### 5.2 Cost per Train Mile

As with the minimum and maximum build scenarios, the Recommended Action assumes an operating cost for conventional rail equipment of \$40 per train mile, which is similar to what Shore Line East (SLE) experiences today. Accordingly, an annual operating cost for the Recommended Action utilizing conventional rolling stock would be derived as follows: 251,968 annual train miles at \$40 per train mile totals to \$10,078,720.

The resulting annual operating costs are projected in Table 7.

**Table 7**  
**Operating Cost Comparisons**

Service Level	Assuming 4 Southbound AM 4 Southbound PM 4 Northbound AM 4 Northbound PM
Annual Train Miles	251,968
Cost/Train Mile	\$40.00
Annual Operating Cost	\$10,078,720



## 6 Revenue

To calculate farebox revenue for the Recommended Action, a similar fare structure to that used for Shore Line East and Metro North was developed by ConnDOT. Table 9 shows the suggested one-way fare matrix for service on the line using the formula \$2.293 + \$.138 per mile greater than 10 miles, rounded to the nearest quarter dollar. Monthly fares 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 would be \$4710 per day. Using 254 days of weekday service per year, the annual revenue would be \$1,194,000. This equates to a farebox recovery rate of 11.8%. Therefore, given the Recommended Action is projected to cost \$10.078 million to operate using conventional rolling stock with revenues at \$1,194,000, the annual operating deficit would be at \$8.88 million annually and the subsidy per passenger would be \$14.40. This is in addition to the capital costs of \$263 million. A summary of the revenue calculations is shown in Table 8.

**Table 8**  
**Revenue Comparison**

Total Weekday Trips	2,428
Annual Revenue	\$ 1,194,000
Annual Operating Cost	\$ 10,078,000
Fare box Recovery	11.8%

### *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,





**Table 9**  
**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: ConnDOT

Note: Fare calculated at \$2.293 + \$.138 per mile greater than 10 miles, then rounded to nearest quarter dollar.



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.

## 7 Summary

A preliminary estimate of the expectations of the Recommended Action start-up service for the new commuter service is shown in Table 10. More detailed estimates of cost will be prepared for the Final Report.

**Table 10**  
**Recommended Action Preliminary Results**

<b>One-way train trips</b>	7 or 8 NB / 7 or 8 SB (plus 16 Amtrak trains)
<b>New track required</b>	18 miles
<b>Capital cost</b>	\$263 million
<b>Annual Operating cost</b>	\$10 million
<b>Annual Revenue</b>	\$1.2 million
<b>Annual Operating Deficit</b>	\$8.8 million
<b>Projected Ridership (total new daily trips)</b>	2,428
<b>Per Passenger Subsidy</b>	\$14.40
<b>Farebox Recovery</b>	11.8 %



As mentioned in the ridership section of this write-up, a review of the SLE service capture rate indicated that approximately 5 percent of the potential commuter market is captured by that service. The resulting high range in ridership (5,000) would affect the values reported in Table 10 regarding Annual Revenue (\$2.4 million), Annual Operating Deficit (\$7.6 million), Per Passenger Subsidy (\$6), and Farebox Recovery (24%). 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.