

# CENTRAL CONNECTICUT RAIL STUDY



## SUMMARY OF FINDINGS



**CONNECTICUT DEPARTMENT OF TRANSPORTATION**  
**STATE PROJECT NUMBER: 171-366**

**MAY 2016**

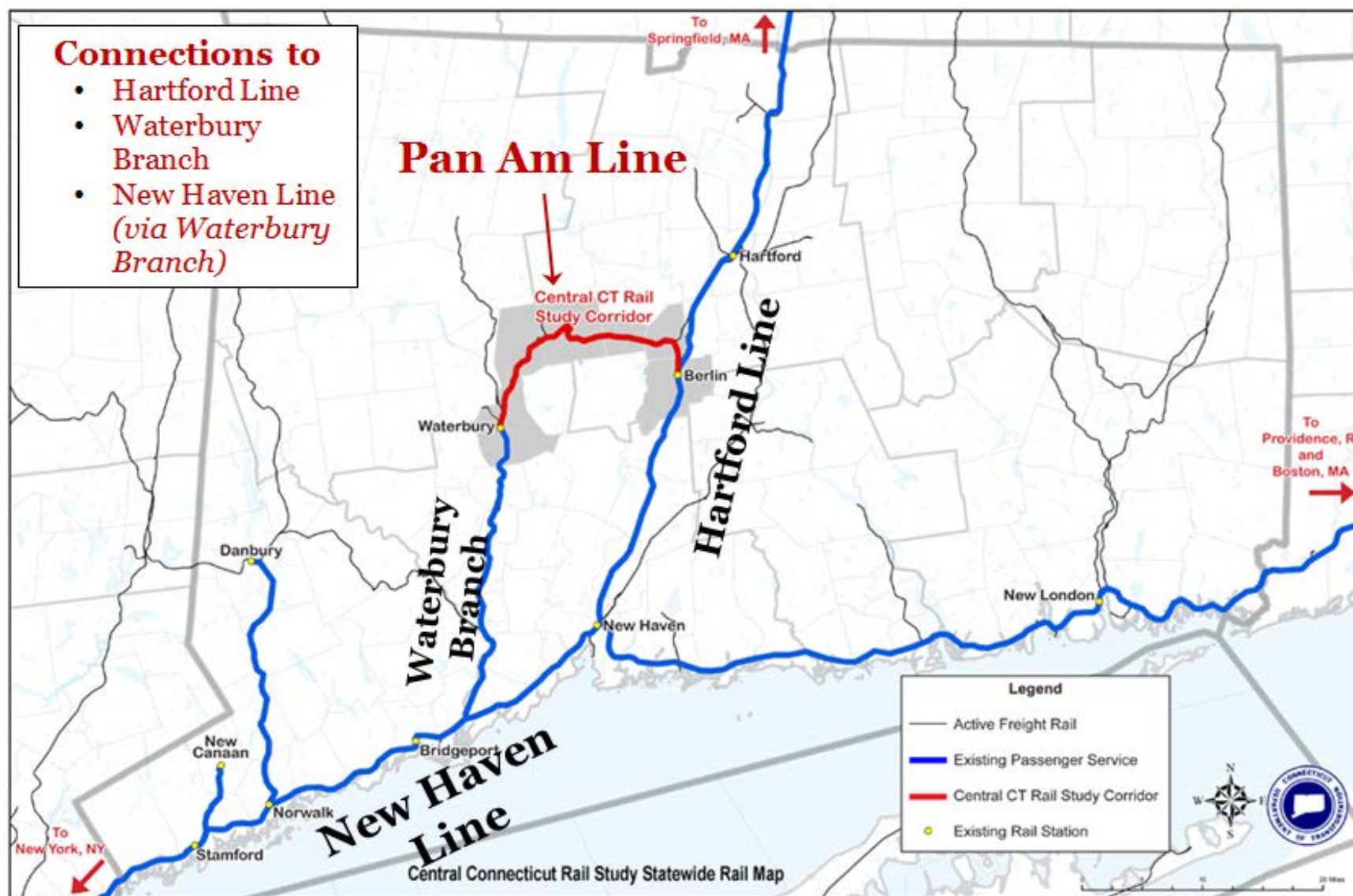
## **Chapter 1. Introduction**

The State of Connecticut, through the Connecticut Department of Transportation (CTDOT), has completed a needs and feasibility study, called the Central Connecticut Rail Study (CCRS), focusing on the Central Connecticut rail corridor between Waterbury and Berlin. Key tasks of the study included an examination of the existing freight rail service, the existing/potential market if track improvements are made, and how this could improve the overall freight rail market in Connecticut and its connectivity to the region. The study assessed existing rail freight activities and the potential for growth of the industry within the Study Corridor. In addition, the study evaluated the feasibility of implementing passenger rail or new bus transit service within the corridor. Figure 1 below shows the corridor location and its connectivity to other travel corridors within the region.

### **1.1 Study Corridor Definition**

The Study Corridor is defined as the six municipalities through which the existing Pan Am freight rail line passes. From west to east, this includes Waterbury, Plymouth, Bristol, Plainville, New Britain, and Berlin. Figure 2 shows an overview of the Study Corridor.

Figure 1: Freight line owned and operated by Pan Am Railways



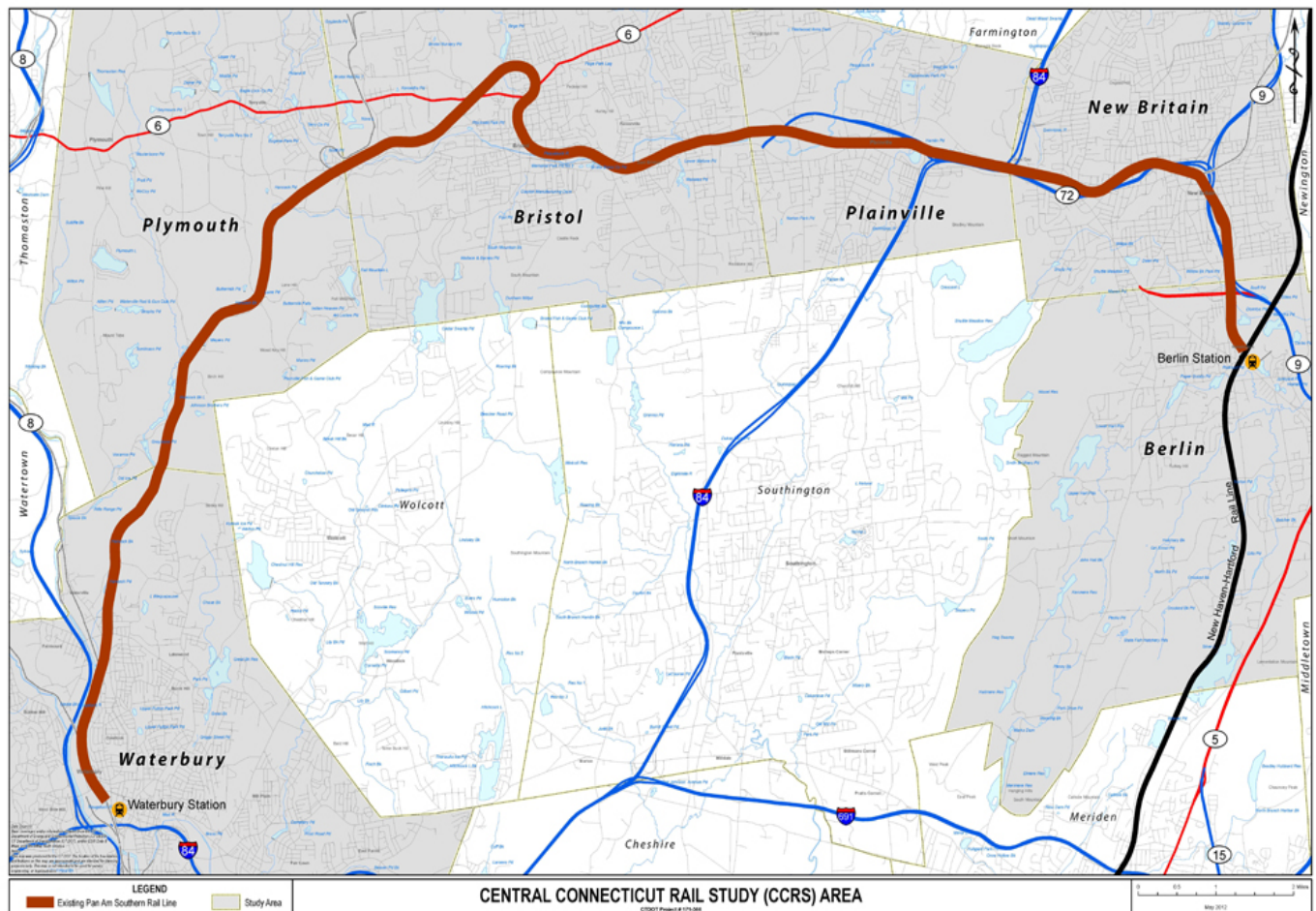


## 1.2 Study Objectives

The Study Team had the following objectives:

- to assess the existing condition of rail infrastructure in the corridor, specifically the Pan Am Railway line between Berlin and Waterbury
- to identify the potential for improvements to public transit in the corridor including potential fixed-guideway rail and bus options
- to identify and evaluate options to improve the existing freight rail service by assessing the existing and potential freight market.

**Figure 2: Map of Central Connecticut Rail Study Corridor**



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## Chapter 2. Project Overview

The study was conducted in several phases beginning with a detailed review and assessment of the existing transportation network in the corridor, as well as demographic, environmental and overall economic conditions. The potential for improved public transportation using the existing Pan Am freight rail line was explored, as well the potential to develop bus rapid transit options on roadways connecting the corridor's key communities. Potential rail and bus alignments were identified, and costs to develop viable rail and transit options along these alignments were presented. Also during this phase, Pan Am Freight rail service was reviewed, and preliminary physical inspections of the line were conducted. Interviews were also conducted with other freight rail carriers to better understand the regional context of Pan Am's freight service. Details of the findings of this phase of work were presented in several reports, including the *CCRS Existing Conditions Report*.

Results of the passenger rail assessment determined that development of a new commuter rail service on the Pan Am line was not practical at this time due to the high costs of construction and implementation, and the relatively low potential ridership.<sup>i</sup> Bus service improvements and extension of service into the corridor could address public transportation needs more effectively than rail. However, improvements to the existing rail freight line would be a logical first step and would preserve the line for future passenger service. As a result, the project's subsequent phase focused on a more detailed assessment of the existing infrastructure along the rail line. This included site inspections of the freight rail tunnel, bridges and track. A freight market study was also conducted, and a day-long freight rail workshop with a team of national freight rail experts was held to review market study findings and outline potential for future expansion of freight rail service. In addition, existing Pan Am customers in the corridor were interviewed to determine what products are being shipped and what is potential of future growth. Detailed results of these efforts are found in the *CCRS Infrastructure Assessment Report* and *Freight Market Analysis*. A summary of findings of the Infrastructure Assessment is presented below.

### 2.1 Rail Infrastructure Assessment

The study team conducted a more detailed infrastructure assessment of the rail line, including an inspection of the track and track bed, bridges and culverts as well as the Terryville Tunnel.

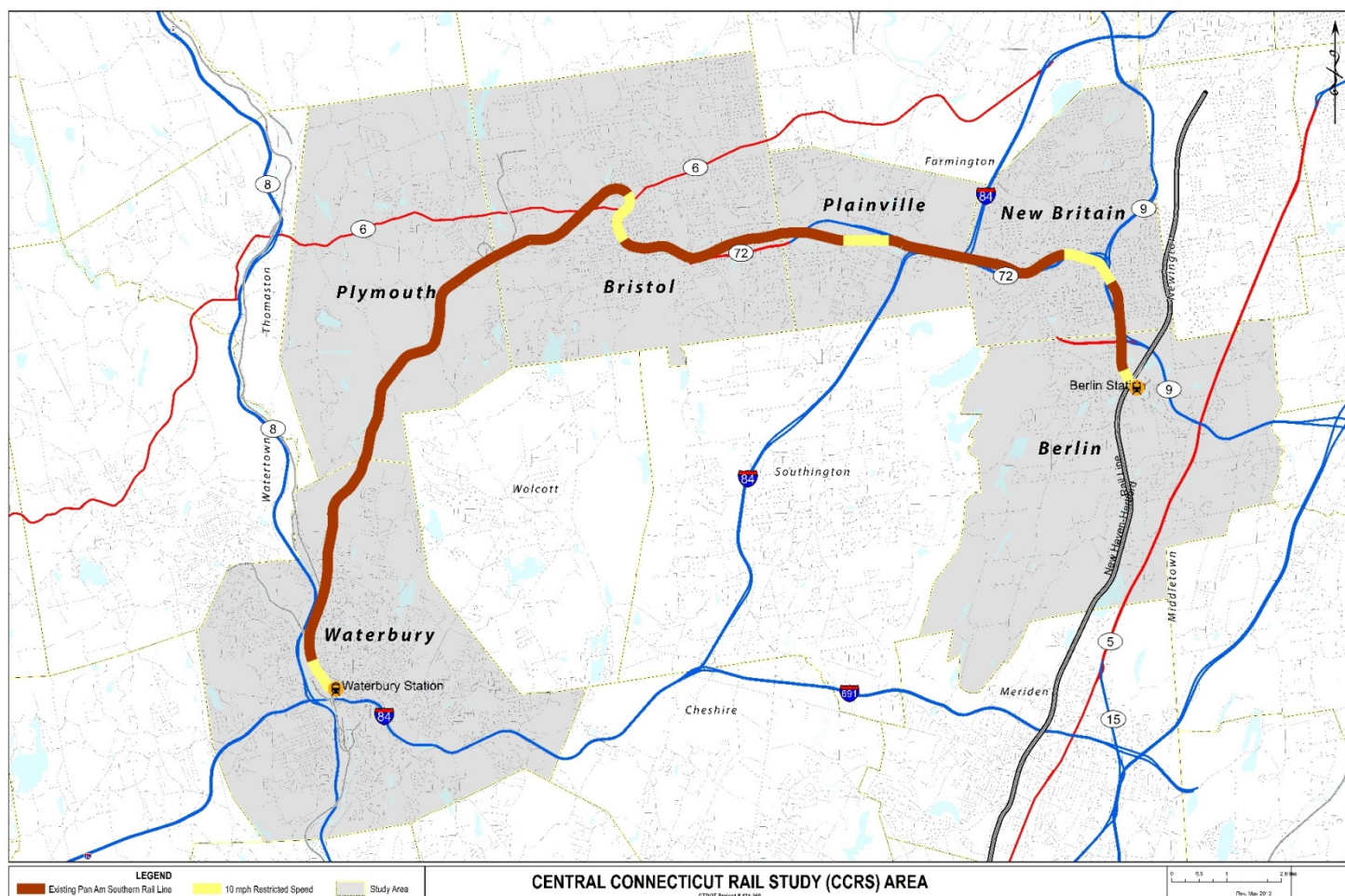
### 2.2 Existing Conditions - Track

The current CCRS Line consists of a single track for its entire length of approximately 24 miles, and the Line is classified as Class II with maximum track speeds of 25 MPH Figure 3. However, there are a number of sections where the track speed is limited to 10 MPH due to existing track conditions and track curvature at specific points, as shown in Figure 4. Similarly, the 10 MPH track speed through New Britain (MP2 to MP3) is likely speed limited due to the six closely spaced highway grade crossings within that section. Throughout these sections the line functionally provides only Class I service.

**Figure 3: FRA Track Classifications<sup>ii</sup>**

Track Class	Maximum Speed (mph)	
	Freight Trains	Passenger Trains
X	10	Prohibited
1	10	15
2	25	30
3	40	60
5	80	90
6	110	110
7	125	125
8	160	160
9	200	200

**Figure 4: Speed Limited to 10 mph along existing CCRS Line**





To improve the track and track bed and bring the entire line up to a state of good repair for FRA Class 2, the table below provides a breakdown of costs for track-related work required.

FTA SCC	ITEM DESCRIPTION	UNIT	QTY	UNIT COST	COSTS	CONTIN- GENCY	COSTS w/ CONTINGENCY
<b>10 Guideway and Track Structures</b>							
10.11	Track: Ballasted						
	Main Line Trackwork						
	Ballast Shoulder Replacement	Mile	20.9	\$ 150,000	\$ 3,135,000	40%	\$ 4,389,000
	Undercutting	Mile	3.0	\$ 270,000	\$ 810,000	40%	\$ 1,134,000
	Surface Track w/33% Timber Tie Replacement	Mile	23.9	\$ 291,000	\$ 6,955,000	40%	\$ 9,737,000
	RR Flagman/Protection	2%	of CCS Item		\$ 218,000	40%	\$ 305,000
	Mobilization, MPT, Grubbing	11%	of CCS Item		\$ 1,199,000	40%	\$ 1,679,000
					\$ 12,317,000		\$ 17,244,000
10	<b>Cost Category Total</b>				<b>\$ 12,317,000</b>		<b>\$ 17,244,000</b>

## 2.3 Existing Conditions – Bridges and Culverts

The bridges and culverts through the corridor were evaluated to determine the current condition and to provide an evaluation of the level of rehabilitation which may be required for upgrades of service and operations. The evaluation included a review of existing mapping and inspection reports provided by Pan Am Railroad, a site visit and a compilation of estimated effort and costs for rehabilitation.

Structures are considered in a state of good repair if the structure has a useful life in excess of 20 years with only routine maintenance required, if they can be expected to maintain 25 mph speeds without load restrictions for this period, and that there are no safety and operational issues. In order to bring the line up to a state of good repair, bridge rehabilitation and in some cases bridge replacement would be required. The bridge rehabilitations could be constructed in a phased sequence based upon prioritized needs.

Table 1 summarizes the costs by structure type. More details are provided in the *CCRS Infrastructure Assessment Report*.

**Table 1: Costs by Structure Type**

Structure Type	Qty.	Rehab	Replace	Opinion of Cost	Notes
Rte 9/72 Tunnels	2	0	0	\$0	
Terryville Tunnel	1	-----	-----	----	See Chapter 5
Culverts & Concrete Pipes	40	36	4	\$1,116,000	Inc. \$10k ea. for repairs
Concrete Pipe	1	0	0	\$0	
Stone Arches	3	3	0	\$540,000	
Concrete Arches	10	10	0	\$4,882,500	
Concrete Slab	1	1	0	337,500	
Prestressed with Closed Deck	1	0	0	\$0	
Steel with Closed Deck	6	1	0	\$960,000	
Steel Beam with Open Deck	21	21	0	\$10,377,600	
Rail Top with Closed Deck	2	2	0	\$360,000	
Timber Trestle	1	1	0	\$474,000	
Subtotal				\$19,047,600	
Minor Items (25%)				\$4,761,900	
Subtotal				\$23,809,500	
<b>Rounded Total</b>				<b>\$23,810,000</b>	Estimate does not include contingency



## 2.4 Existing Conditions – Terryville Tunnel

The Terryville Tunnel is the longest rail tunnel in Connecticut with a length of more than 3600 feet and is a significant infrastructure element of the Pan Am freight rail line between Bristol and Waterbury. Located in a primarily low density population area of Plymouth, the tunnel was opened in 1911 and has received no significant upgrades since it was built. The Study Team conducted an inspection of the tunnel lining, trackbed, drainage and overall condition. Findings showed the tunnel requires significant repairs to the lining and to improve drainage in order to improve existing freight operations. To upgrade to passenger rail service, major safety upgrades would also be required, including new lighting, ventilation and safe emergency egress. Costs to attain CTDOT's safety, condition and service objectives are presented below in Figure 5.



**Figure 5 – Conceptual Cost Estimate to Improve Terryville Tunnel**

FRA Track Class	Cost	Cost w/ Contingency
<b>Total Tunnel Structural Repairs</b>		
<i>1,933 feet x \$10,000/foot</i>	\$19,330,000	\$25,130,000
<b>Total Ventilation and Other Requirements</b>	\$13,000,000	\$13,000,000
<i>Standpipe System</i>	\$3,000,000	\$3,000,000
<i>Emergency Ventilation System</i>	\$7,000,000	\$7,000,000
<i>Other (power supply, egress walkway, lighting, contingency)</i>	\$3,000,000	\$3,000,000
<b>TOTAL</b>	<b>\$32,330,000</b>	<b>\$38,130,000</b>

## 2.5 Overall Costs For Rail Improvements in the Corridor

Total costs for improving rail within the corridor were broken down by Freight and Passenger services and also by FRA Track Class, either upgrading to state of good repair for Class 2 or Class 3 for freight and upgrading to Class 3 for passenger service. The lowest cost improvement is to upgrade freight rail to Class 2, at \$140 million. It is anticipated funding for these improvements would be private. The highest cost is to develop a passenger rail system on the line with new stations and new rail equipment. Costs to achieve that would be \$530 million (See Figure 6).

**Figure 6 – Cost to Attain Class 2 and Class 3 Rail – Freight and Passenger Rail Options**

<b><u>FREIGHT Service:</u></b>	
\$140 million	Class 2: Improvements needed to attain State of Good Repair <i>Eliminate 10 mph speed restrictions &amp; attain 25 mph)</i>
\$170 million	Class 3: Improvements needed to attain 40 mph
<b><u>PASSENGER Service:</u></b>	
\$410 million	Class 3: Passenger upgrades <i>Added cost (\$240M): <u>track</u>, <u>passing sidings</u>, <u>signal system</u>, <u>tunnel</u></i>
\$530 million	Class 3: Full cost with stations & train equipment

## Chapter 3. Future Conditions – Freight Rail Potential

To operate at a timetable speed of 25 MPH, the line must be at a minimum upgraded and maintained to FRA Class II track safety standards (as shown previously in Figure 3).

### 3.1 Alternatives

Freight infrastructure needs are assessed based on FRA Track Safety Standards to meet the following track classifications:

- Class II Rail (State of Good Repair)
- Improve the line to Class III Rail
- Improve the line to Class III Rail with additional passenger service upgrades

These track classifications are used as the alternatives for assessment for the CCRS line.

## 3.2 Freight Demand

Estimates of recent rail freight car volumes (2013) on the line are approximately 1,300 carloads annually. In the near term, annual demand may increase to 1,500-1,800 carloads.

The commodities being moved are typical of carload movements, similar to the current traffic mix, and include:

- Propane – an essential regional energy source; no alternative in rural areas.
- Lumber – Pan Am Southern access to New England lumber; Housatonic could ship on Pan Am Southern Line.
- Construction Debris – a growth area cited by railroads; new Naugatuck customer in 2015.
- Metals – a growth area cited by railroads; motivated local businesses want to increase rail use.
- Aggregate – a significant growth area, if weight restrictions on Springfield Line are resolved.

Long-term growth is dependent upon the railroads' ability to successfully capture potential markets based on:

- Access to the area –national standard 286K rail access is currently restricted to the study area. Some locations are also restricted in terms of national standard "Plate F" height and width access (e.g., Plate F cars are 17 ½ feet high).
- Available capacity, service levels, costs, and length and consistency of transit times.
  - Shipper interviews noted some service concerns that the railroad will need to address to attract additional volumes and customers.

## 3.3 Constructability

To meet minimum FRA guidelines to a state of good repair (Class II) the following guideway and track structures improvements must be made:

- Three miles of track would be undercut to remove fouled ballast
- Every 3rd cross tie replaced with a new crosstie
- Track lined, surfaced and regulated
- Potentially 10% of assemblies/bolts are missing/damaged and will need to be replaced
- Test all in-place and joint bars for internal defects
- Grade crossing surface improvements
- Improved drainage and mitigation of off-site drainage

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- Contingency in place to account for other possible repair and replacements (damaged tie plants, worn switch plates, rail welding for end battered rails, etc.)

Additional improvements for Class III status require:

- Grade crossing warning device circuits upgraded for higher train speeds.

To add passenger service on a Class III track requires further upgrades, including:

- All rails replaced with 136RECWR.
- Turnouts are all #9's or #10's and need to be replaced to match new 136RE rail. Main line turnouts to be #15 or #20 AREMA standard pattern turnouts.
- Two 5,000' sidings needed for passing meets.
- New signal and train control system needed for remote dispatcher control of all train movements on the Line, passing sidings, interlocking signals, and other Control Points as needed to increase operational efficiency and safety on the line.
- Turnouts need electric locks installed that will be under dispatch control.

### **3.4 Cost Effectiveness**

The preliminary findings of the Freight Market Analysis found that there is potential near term growth for freight between 1,500 and 1,800 annual carloads to a total demand of 2,800 – 3,100 carloads if the CCRS line was brought into a state of good repair. Table 2 outlines the estimated capital cost requirements by freight rail class and an additional 40 percent contingency requirement. However, participants in the study's Freight Workshop pointed out that significant growth in freight rail within the corridor is unlikely due to current infrastructure conditions on the existing line and, more important, the inability to bring in heavier car loads along the main lines that connect to the corridor due to weight restrictions on the existing track.



**Table 2 – Cost Estimates**




<b>Alternative</b>	<b>Total Structural Upgrade Construction Costs</b>	<b>Total Construction Costs with Contingency</b>	<b>Freight Load Served (carloads)</b>	<b>Cost Effectiveness (overall cost per carload)</b>
Existing	\$0	\$0	1,300	-
Class II Rail	\$12,317,000	\$17,244,000	2,800 – 3,100	\$5,566 - \$6,158
Class III Rail	\$21,745,000	\$30,443,000	2,800 – 3,100	\$9,820 - \$10,872
Class III Rail with Passenger Service	\$44,191,000	\$61,868,000	2,800 – 3,100	\$19,957 - \$22,095

### 3.5 Screening

To address the enhancement of goods and services movement throughout the region, each freight rail service alternative was screened for the ability to meet the following criteria:

1. Supports existing and projected freight demand (Table 3)
  - a. Meets requirements to support 1,300 existing carloads annually
  - b. Freight upgrades can support additional carloads of up to 3,100 annually for projected demand.
2. Constructability
  - a. Ranked by the number of structural upgrades required.
3. Cost Effectiveness
  - a. Lowest construction costs per carload of projected freight demand.
4. Be sound and meet industry standards for safety )
  - a. Ranked by lowest number of at-grade road crossings.
  - b. Ranked by lowest number of potential train-vehicular conflicts at at-grade crossings.
5. Directness, average speeds and travel times
  - a. Ranked by maximum operating speed.
  - b. Operating speed exceeds average 48 mph trucking freight speed in the region.

**Table 3 – Screening of Freight Demand according to FRA Class Guidelines**

Alternative	Support Current Freight Demand	Support Projected Freight Demand	Constructability (number of necessary structural upgrades)	Cost Effectiveness	Rating
Class II Rail	Yes	Yes	8	\$9,580 - \$11,496	 <b>BEST</b>
Class III Rail	Yes	Yes	9	\$16,912 - \$20,295	 <b>FAIR</b>
Class III Rail with Passenger Service	Yes	Yes	14	\$34,371 - \$41,245	 <b>POOR</b>

## Chapter 3. Conclusions

The study identified that major infrastructure investments are required to improve overall freight rail service in the corridor. Current operating speeds of Pan Am along the rail line within the corridor are very slow and speed restricted.

Freight rail was determined to be the most viable use of the rail corridor in the near term. Improvements of the freight line to reach Class II state of good repair status would be the most cost effective near term course of action for the corridor. This would meet freight demand beyond existing loads and allow for modest growth, based on the necessary service upgrades outlined above. This action supports existing businesses on the line and would allow for freight service expansion in the near term. Moreover, it would preserve the option for passenger rail in the long term.

Implementing passenger rail service at this time is not viable due to its high costs, potentially low ridership, and difficulties in upgrading the Terryville Tunnel. An alternative might be to extend bus service within the corridor and consider express service between Bristol and Waterbury as a near term improvement

<sup>i</sup> Details of the findings of this work can be found in the *CCRS Infrastructure Assessment and Tech Memo, CCRS Public Transportation Alternatives Assessment*.

<sup>ii</sup> Federal Railroad Administration, Office of Railroad Safety. *General Manual: Policies, Procedures, and General Technical Bulletins*, July 2014. <https://www.fra.dot.gov/eLib/details/L16208> (accessed May 7, 2015).