3.0 Alternatives

3.1 DEVELOPMENT OF ALTERNATIVES

3.1.1 INTRODUCTION

The restoration of passenger rail service to the South Coast region has been extensively studied for almost 20 years. Prior to 1958, the Middleborough, Stoughton and Attleboro rail lines were part of the New York, New Haven and Hartford Railroad system that provided service to Fall River and New Bedford from Boston's South Station, via Canton Junction, along the Stoughton Branch railroad (which included the Whittenton Branch in Raynham and Taunton, running around the northwest edge of the core of the City of Taunton and connecting the Stoughton Line with the Attleboro Secondary). Since discontinuation of this service, commuter rail has only been available to southeastern Massachusetts along the Boston-Providence Northeast Corridor, with stops in Attleboro and South Attleboro, and the Old Colony Middleborough Line, which terminates in Lakeville. However, none of these provide an opportunity for commuters from the Fall River or New Bedford areas to easily or efficiently access rail transportation to Boston.

In 2000, the MBTA completed a Draft EIR that analyzed six alternative routes for providing improved transportation between downtown Boston and the cities of Fall River and New Bedford. The Draft EIR focused on the following alternatives: (1) extending the existing MBTA Stoughton Line, (2) extending the existing MBTA Middleborough Line and (3) providing new service, branching off from the Providence Line near Attleboro. In 2002, a Final EIR was prepared by the MBTA and on August 30, 2002, the Secretary of Environmental Affairs issued a Final Certificate (Executive Office of Environmental Affairs [EEA] File # 10509).

Section 404 of the Clean Water Act Requires a Department of the Army permit for the discharge of dredged or fill material into waters of the United States, including adjacent wetlands. The Department of the Army permit program is administered by the U.S. Army Corps of Engineers (Corps). Since the South Coast Rail Build Alternatives would result in the discharge of fill material into greater than one acre of waters of the U.S., including wetlands, a Department of the Army Individual Standard Permit is required.[1]

Because the project would require a Clean Water Act permit from the U.S. Army Corps of Engineers in order to proceed with design and construction, federal environmental review is required by the National Environmental Policy Act (NEPA); however, previous environmental review studies did not take into consideration federal requirements. The Massachusetts Executive Office of Energy and Environmental Affairs also requires review, pursuant to the Massachusetts Environmental Policy Act, due to the lapse of time. To minimize duplication of effort, the Corps and MEPA office agreed that the concurrent NEPA and MEPA reviews should proceed through a combined state and federal environmental review document, in accordance with CEQ regulations at 40 CFR 1506.2. MassDOT (then, EOT) filed a draft Section 404 Permit Application. Subsequently, the Corps issued a Notice of Intent to prepare an EIS in the Federal Register on October 31, 2008. A public notice was issued by the Corps on November 10, 2008 (NAE 2007-00698).

This chapter explains the process that led to the Build Alternatives that are evaluated in this DEIS/DEIR. The alternatives development process is called alternatives screening because its purpose is to narrow

[1] 33 CFR 325.3(b)(1)

the range of possible alternatives to those likely to meet the project objectives and purpose and need, therefore warranting a more detailed analysis of transportation benefits and environmental impacts.

Both NEPA and MEPA require consideration of a reasonable range of alternatives that could meet the project purpose and need and explanation of why alternatives were eliminated from detailed study (40 C.F.R. § 1502.14(a) and MEPA 301 CMR 11.00(f)).

The alternatives evaluation described in this chapter was conducted in a manner compatible with the Corps' non-regulatory pre-application guidelines known as the *Highway Methodology*[2] to screen alternatives. These guidelines were established to ensure that a transportation agency's preferred alternative is consistent with federal wetland regulations. This chapter also summarizes the characteristics of the alternatives evaluated in this DEIS/DEIR in terms of their anticipated achievement of the Project Purpose, their practicability and their environmental impacts, which together with input from the public and relevant parties will form the basis for the determination of the Least Environmentally Damaging Practicable Alternative (LEDPA) by the Corps.

The alternatives analysis was conducted in several steps, narrowing down an initial range of 65 potential alternatives through a systematic process of evaluation using specific criteria and with public, agency and stakeholder input. The results of this process to date are reflected by the range of alternatives evaluated in the DEIS/DEIR in accordance with the federal (NEPA) and state (Massachusetts Environmental Policy Act [MEPA]) environmental review and appropriate permitting processes. Key steps of the alternatives analysis process are described below, beginning with the initial analysis of 65 potential alternatives and subsequent screening, followed by the Corps' Notice Of Intent to prepare an Environmental Impact Statement, the Environmental Notification Form (ENF) prepared by the applicant, the EOEA Secretary's Certificate on the ENF and subsequent studies and analyses during the preparation of the DEIS/DEIR.

Throughout this process public, agency and stakeholder input was taken into consideration in the development and evaluation of alternatives, through the federal process, the state environmental review process and public involvement efforts. The Interagency Coordinating Group (ICG)[3] provided an opportunity for input into the technical analyses for the DEIS/DEIR through this process.

An overview of key steps in the alternatives analysis process is provided below.

3.1.2 INITIAL ALTERNATIVES ANALYSIS OVERVIEW

The purpose of the initial alternatives analysis was to identify those alternative concepts that met or exceeded the project evaluation criteria, then to narrow the initial broad range of alternatives to a reasonable number of options that could be carried forward to a more detailed level of analysis in the

[2] U.S. Army Corps of Engineers New England Division. 1993. The Highway Methodology Workbook: Integrating Corps Section 404 Permit Requirements with Highway Planning and Engineering and the NEPA EIS Process. Corps Tech. Rpt. NEDEP-360-1-30, 28pp.

[3] The Interagency Coordinating Group (ICG) was convened by MassDOT and includes representatives of the United States Army Corps of Engineers; United States Environmental Protection Agency; United States Fish and Wildlife Service; Federal Highway Administration; Federal Transit Administration; National Marine Fisheries Service; Narragansett Indian Tribe; Wampanoag Tribe of Gay Head (Aquinnah); Massachusetts Executive Office of Energy and Environmental Affairs; Massachusetts Environmental Policy Act Office; Massachusetts Bay Transportation Authority; Massachusetts Department of Environmental Protection; Massachusetts Office of Coastal Zone Management; Massachusetts Department of Conservation and Recreation, Areas of Critical Environmental Concern Program; Massachusetts Department of Fish and Game, Natural Heritage and Endangered Species Program; Massachusetts Historical Commission and the Southeastern Regional Planning and Economic Development District.

NEPA/MEPA process. This section explains the process of how the alternatives were identified, evaluated, and dismissed or advanced for further evaluation.

3.1.2.1 IDENTIFICATION OF POTENTIAL ALTERNATIVES

An initial range of 65 potential alternatives was identified by reviewing previous studies and soliciting input from the MBTA, the Interagency Coordinating Group, the Commuter Rail Task Force[4], and interested stakeholders through an extensive civic engagement process conducted by MassDOT. The alternatives are described in detail in the *Analysis of South Coast Rail Alternatives: Phase 1 Report,* Appendix 3.1-A to this DEIS/DEIR. Table 3.1-1, presents the initial list of potential alternatives.[5]

The 65 alternatives included various mode types:

- commuter rail
  - conventional commuter rail
  - diesel multiple unit commuter rail
  - electrified commuter rail
- heavy rail (similar to the MBTA Red Line)
- light rail (similar to the MBTA Green Line)
- monorail
- bus rapid transit
- enhanced bus service

These alternatives also included several different components along five main corridors (shown on Figure 3.1-1):

- The Attleboro route (using the active freight rail lines from New Bedford and Fall River to Attleboro, then using the Northeast Corridor from Attleboro to South Station) with a new track bypass or connecting at the existing Attleboro Station.

- The Mansfield route (using the active freight rail lines from New Bedford and Fall River to Taunton, then using the abandoned rail line north to Mansfield Station, then using the active commuter rail line to South Station).

- The Stoughton route (using the active freight rail lines from New Bedford and Fall River to Taunton, then using the inactive rail bed north to Stoughton, then using the active commuter rail tracks to South Station).

- The Middleborough route (using the active freight rail lines from New Bedford and Fall River to the existing Middleborough/Lakeville Station, then using the Old Colony Middleborough Line to South Station)

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[4] The Commuter Rail Task Force was formed in 2004 and provides a forum for state officials and local representatives to review and discuss all aspects of the Project and to work toward consensus on strategies and actions to plan ahead for new growth in the region. The Task Force provides advice and assistance to MassDOT and the MBTA in the design of the South Coast Rail Project and in the implementation of the South Coast Rail Economic Development and Land Use Corridor Plan. Its membership includes representatives from the MBTA, regional transit authorities, cities and towns, environmental groups, and business and economic development organizations.

[5] Executive Office of Transportation and Public Works. Analysis of South Coast Rail Alternatives: Phase 1 Report, April 30, 2008.

Table 3.1-1 Initial List of Potential Alternatives

Route	Alt #	Name	Description	How we Propose to Address Alternative	Origin
THROUGH ATTLEBORO		***ATTLEBORO SECONDARY***			
	1	Commuter Rail to South Station via Attleboro Bypass	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; new track bypass along National Grid right-of-way to tie into Northeast Corridor north of Attleboro station	Advanced for further consideration	Executive Office of Transportation
	2	Commuter Rail to South Station via Attleboro Station with Reverse Move	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary to Northeast Corridor; reverse move at Attleboro Station to merge onto Northeast Corridor	Advanced for further consideration	Executive Office of Transportation
	3	Commuter Rail to South Station via Dartmouth Secondary, New Bedford Secondary, and Attleboro Bypass	Commuter rail along Dartmouth Secondary and New Bedford Mainline north to Cotley Junction, then west along Attleboro Secondary; new track bypass along National Grid right-of-way to tie into Northeast Corridor near Mansfield/Attleboro/Norton town line	Advanced for further consideration	Civic Engagement Process
	4	Bus Rapid Transit to Attleboro Station	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Cotley Junction, then adjacent to Attleboro Secondary west; transfer to Northeast Corridor at Attleboro Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	5	Diesel Multiple Units Commuter Rail to Attleboro Station	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; transfer to Attleboro Station	Advanced for further consideration	Civic Engagement Process
	6	Diesel Multiple Units to Attleboro Station with New Bedford to Fall River Connection via Dartmouth Secondary	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; transfer to Attleboro Station; additional line along Dartmouth Secondary between New Bedford and Fall River	Advanced for further consideration	Civic Engagement Process
	7	Electrified Commuter Rail to South Station via Attleboro Bypass	Electrified commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; new track bypass along National Grid right-of-way to tie into Northeast Corridor near Mansfield/Attleboro/Norton town line	Advanced for further consideration	Civic Engagement Process
	8	Light Rail to Attleboro	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; transfer to Commuter Rail at Attleboro Station	Similar operational benefits to Alternative 5 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
	9	Light Rail to Attleboro w/ New Bedford to Fall River connection	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; transfer to Attleboro Station; additional line along Interstate 195 or Dartmouth Secondary between New Bedford and Fall River	Similar operational benefits to Alternative 6 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
	10	Combination Connection to Boston and Providence via Northeast Corridor	Combination of commuter rail on Attleboro Secondary to Boston and commuter bus to connect to Providence, using Interstate 195 corridor	Boston service covered by other alternatives. Providence service does not meet basic Project Purpose	Civic Engagement Process
			MANSFIELD FORMER RIGHT-OF-WAY		
	11	Commuter Rail to South Station via Mansfield	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, northwest along Attleboro Secondary, then northwest along former right-of-way through Taunton, Norton, and Mansfield to tie into Northeast Corridor near Mansfield Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	12	Bus Rapid Transit to Mansfield Station	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Cotley Junction, then adjacent to Attleboro Secondary track, then northwest along former right-of-way through Taunton, Norton, and Mansfield; transfer to Northeast Corridor at Mansfield Commuter Rail Station	Advanced for further consideration	Civic Engagement Process

Table 3.1-1 (continued)

Route	Alt #	Name	Description	How we Propose to Address Alternative	Origin
THROUGH ATTLEBORO	13	Diesel Multiple Units Commuter Rail to Mansfield Station	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then northwest along Attleboro Secondary, then northwest along former right-of-way through Taunton, Norton, and Mansfield; then transfer to Mansfield Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	14	Diesel Multiple Units to Mansfield Station with New Bedford to Fall River Connection via Dartmouth Secondary	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then northwest along Attleboro Secondary to Whittenton Junction, then northwest along former right-of-way through Taunton, Norton, and Mansfield; then transfer to Mansfield Commuter Rail Station; additional line along Dartmouth Secondary between New Bedford and Fall River	Advanced for further consideration	Civic Engagement Process
	15	Electrified Commuter Rail to South Station via Mansfield	Electrified commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then northwest along Attleboro Secondary to Whittenton Junction, then northwest along former right-of-way through Taunton, Norton, and Mansfield to tie into Northeast Corridor near Mansfield Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	16	Light Rail to Mansfield	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then northwest along Attleboro Secondary to Whittenton Junction, then northwest along former right-of-way through Taunton, Norton, and Mansfield; then transfer to Mansfield Commuter Rail Station	Similar operational benefits to Alternative 13 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
THROUGH MIDDLEBOROUGH	***MIDDLEBOROUGH SECONDARY***				
	17	Commuter Rail to South Station via Middleborough	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line	Advanced for further consideration	Executive Office of Transportation
	18	Commuter Rail to South Station via Middleborough, convert Red Line Braintree Branch to Commuter Rail	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line at new Middleborough/Lakeville Commuter Rail Station relocated north; convert Red Line Braintree Branch to commuter rail	Advanced for further consideration	Civic Engagement Process
	19	Heavy Rail to Middleborough	Extend the Red Line to Middleborough/Lakeville Station via the Middleborough Commuter Rail Line with feeder bus from New Bedford and Fall River	Variation of Alternative 61 (greater infrastructure requirements with no transportation benefits)	Civic Engagement Process
	20	Bus Rapid Transit to Middleborough/Lakeville Station	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Cotley Junction, then east adjacent to Middleborough Secondary; transfer to Middleborough Line at Middleborough/Lakeville Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	21	Diesel Multiple Units Commuter Rail to Middleborough/Lakeville Station	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary; transfer to Middleborough/Lakeville Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	22	Diesel Multiple Units to Middleborough/Lakeville Station with New Bedford to Fall River Connection via Dartmouth Secondary	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary; transfer to Middleborough/Lakeville Commuter Rail Station; additional line along Dartmouth Secondary between New Bedford and Fall River	Advanced for further consideration	Civic Engagement Process
	23	Commuter Rail to South Station via Middleborough (via Cotley) -w/ reverse move	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line just north of Middleborough/Lakeville Commuter Rail Station w/ reverse move to serve Middleborough/Lakeville Station	Variation of Alternative 17 (similar infrastructure requirements with no transportation benefits)	Executive Office of Transportation
	24	Light Rail to Middleborough (via Cotley)	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary; transfer to Middleborough/Lakeville Commuter Rail Station	Similar operational benefits to Alternative 21 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process

Table 3.1-1 (continued)

Route	Alt #	Name	Description	How we Propose to Address Alternative	Origin
THROUGH MIDDLEBOROUGH	63	Commuter Rail to South Station via Middleborough, also extend Middleborough line to Wareham	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line; then extend Middleborough Commuter Rail Line to Wareham and/or Buzzards Bay	Advanced for further consideration	Civic Engagement Process
	64	Commuter Rail to South Station via Middleborough without Old Colony Main Line Improvements	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line; no improvements to Old Colony Main Line	Advanced for further consideration	Interagency Coordinating Group
			MIDDLEBOROUGH FORMER RIGHT-OF-WAY		
	25	Commuter Rail to South Station via Middleborough (via Myricks)	Commuter rail along New Bedford Main Line and Fall River Secondary north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville to tie into Middleborough Line at new Middleborough/Lakeville Commuter Rail Station relocated north	Variation of Alternative 17 with minimal transportation improvements and significant environmental impacts (right-of-way takings)	Civic Engagement Process
	26	Commuter Rail to South Station via Middleborough (via Myricks) -w/ reverse move	Commuter rail along New Bedford Main Line and Fall River Secondary north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville to tie into Middleborough Line just north of Middleborough/Lakeville Commuter Rail Station w/ reverse move to serve Middleborough/Lakeville Station	Variation of Alternative 17 with minimal transportation improvements and significant environmental impacts (right-of-way takings)	Civic Engagement Process
	27	Light Rail to Middleborough (via Myricks)	Light rail transit along New Bedford Main Line and Fall River Secondary north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville; transfer to Middleborough/Lakeville Commuter Rail Station	Similar operational benefits to Alternative 21 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
	28	Bus Rapid Transit to Middleborough (via Myricks)	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville; transfer to Middleborough Line at Middleborough/Lakeville Commuter Rail Station	Variation of Alternative 20 with minimal transportation improvements and significant environmental impacts (right-of-way takings)	Civic Engagement Process
	29	Diesel Multiple Units Commuter Rail to Middleborough (via Myricks)	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville; transfer to Middleborough/Lakeville Commuter Rail Station	Variation of Alternative 21 with minimal transportation improvements and significant environmental impacts (right-of-way takings)	Civic Engagement Process
THROUGH STOUGHTON	30	Commuter Rail to South Station via Stoughton	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton to tie into Stoughton Line at Stoughton Commuter Rail Station	Advanced for further consideration	Executive Office of Transportation
	31	Bus Rapid Transit to Stoughton Station	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton; transfer to Stoughton Line at Stoughton Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	32	Diesel Multiple Units Commuter Rail to Stoughton Station	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton; transfer to Stoughton Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	33	Diesel Multiple Units to Stoughton Station with New Bedford to Fall River Connection via Dartmouth Secondary	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton; transfer to Stoughton Commuter Rail Station; additional line along Dartmouth Secondary between New Bedford and Fall River	Advanced for further consideration	Civic Engagement Process
	34	Electrified Commuter Rail to South Station via Stoughton	Electrified commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton to tie into Stoughton Line at Stoughton Commuter Rail Station	Advanced for further consideration	Civic Engagement Process

Table 3.1-1 (continued)

Route	Alt #	Name	Description	How we Propose to Address Alternative	Origin
THROUGH STOUGHTON	35	Commuter Rail to South Station via Stoughton (Whittenton Branch)	then northwest along Attleboro Secondary to Whittenton Junction, northeast along Whittenton Branch, and north along existing right-of-way through Raynham, Easton, and Stoughton to tie into Stoughton Line at Stoughton Commuter Rail Station	Variation of Alternative 30 with similar transportation benefits (could be evaluated in Phase 2 as option to Alternative 30)	Civic Engagement Process
	36	Light Rail to Stoughton	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton; transfer to Stoughton Commuter Rail Station	Similar operational benefits to Alternative 32 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
THROUGH ATTLEBOROAND MIDDLEBOROUGH	62	Commuter Rail to South Station via Attleboro Bypass and Middleborough Line	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction; then one branch west along Attleboro Secondary with new track bypass along National Grid right-of-way to tie into Northeast Corridor north of Attleboro station; second branch along Middleborough Secondary to tie into Middleborough Line just north of Middleborough/Lakeville	Advanced for further consideration	Executive Office of Transportation
	65	Electrified Commuter Rail to South Station via Attleboro and Middleborough	Diesel and electric commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction; then one electric branch west along Attleboro Secondary with new track bypass along National Grid right-of-way to tie into Northeast Corridor north of Attleboro station; one diesel branch along Middleborough Secondary to tie into Middleborough Line just north of Middleborough/Lakeville Station (Middleborough Line not electrified)	Advanced for further consideration	Interagency Coordinating Group
USING HIGHWAY SYSTEM	37	Monorail to South Station via Route 140, Route 24, Route 128, and Southeast Expressway	Monorail along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east and Southeast Expressway right-of-way north to South Station	Advanced for further consideration	Civic Engagement Process
	38	Monorail to Quincy Adams Station via Route 140, Route 24, and Route 128	Monorail along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east; transfer to Quincy Adams Red Line Station	Advanced for further consideration	Civic Engagement Process
	39	Monorail to Route 128 Station via Route 140, Route 24, and Route 128	Monorail along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128 right-of-way west; transfer to Route 128 Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	40	Commuter Rail to South Station via Route 24 and Route 128 to Northeast Corridor	Commuter rail along New Bedford Main Line and Fall River Secondary north to just south of Cotley Junction, then new track along Route 24 right-of-way north to Randolph and along Route 128/I-93 right-of-way west; tie into Northeast Corridor north of Route 128 Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	41	Light Rail/Heavy Rail to Route 128 Station via Route 140, Route 24, and Route 128	Heavy or light rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128 right-of-way west; transfer to Route 128 Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	42	Heavy Rail to South Station via Route 140, Route 24, Route 128, and Red Line	Heavy rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east; tie into Red Line at Quincy Adams Red Line Station	Advanced for further consideration	Civic Engagement Process
	43	Express Bus in Dedicated Lane to Route 128 Station via Route 24 and Route 128	Add HOV lanes on Route 24 from Interstate 495 north to Randolph, then on Route 128 west; transfer to Route 128 Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	44	Express Bus in Dedicated Lane to South Station via Route 24, Route 128, and Southeast	Add HOV lanes on Route 24 from Interstate 495 north to Randolph, then on Route 128/93 east to Southeast Expressway HOV Lane to South Station	Advanced for further consideration	Civic Engagement Process

Table 3.1-1 (continued)

Route	Alt #	Name	Description	How we Propose to Address Alternative	Origin
USING HIGHWAY SYSTEM	45	Enhanced Bus Service on Existing Private Carrier Routes	Increased bus service and increased parking for bus commuters along existing private bus carrier lines from Fall River, New Bedford, and Taunton to South Station	Advanced for further consideration	Executive Office of Transportation
USING HIGHWAY SYSTEM (cont'd)	46	Light Rail to Route 128 Station	Light rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128 right-of-way west; transfer to Route 128 Commuter Rail Station	Included in Alternative 41	Civic Engagement Process
	47	Light Rail to Quincy Adams Station	Light rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east; transfer to Quincy Adams Red Line Station	Provides fewer transportation benefits (requires transfer) than Alternative 42 with similar environmental impacts/benefits	Civic Engagement Process
	48	Light Rail to South Station	Light rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east and Southeast Expressway right-of-way north to South Station	Provides similar transportation benefits to HOV lane and similar environmental impacts than Alternative 43	Civic Engagement Process
	49	Bus Lane to Route 128	Bus lanes on Route 24 from 495 north to Randolph, then on Route 128 west; transfer to Route 128 Commuter Rail Station	Same transportation and environmental benefits as Alternative 43	Civic Engagement Process
	50	Bus Lane to South Station	Bus lanes on Route 24 from 495 north to Randolph, then on Route 128/93 east to Southeast Expressway HOV Lane to South Station	Same transportation and environmental benefits as Alternative 44	Civic Engagement Process
	51	Combination Connection to Boston and Providence via Route 24	Combination of commuter bus services along I-195 and Routes 24/140 to connect South Coast cities with Providence and Boston	Boston service covered by other alternatives. Providence service does not meet basic Project Purpose	Civic Engagement Process
	52	Park-and-Ride Improvements	Improve the Park-and-Ride system serving the South Coast	Not a public transit alternative. Does not meet basic project purpose	Civic Engagement Process
	53	Advanced Rapid Transit to Route 128 Station	Advanced rapid transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128 right-of-way west; transfer to Route 128 Commuter Rail Station	Provides same transportation and environmental benefits/impacts as Alternative 37 (could be evaluated in Phase 2 as option to Alternative 37)	Civic Engagement Process
	54	Advanced Rapid Transit to Quincy Adams Station	Advanced rapid transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east; transfer to Quincy Adams Red Line Station	Provides same transportation and environmental benefits/impacts as Alternative 38 (could be evaluated in Phase 2 as option to Alternative 38)	Civic Engagement Process
	55	Advanced Rapid Transit to South Station	Advanced rapid transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east and Southeast Expressway right-of-way north to South Station	Provides same transportation and environmental benefits/impacts as Alternative 39 (could be evaluated in Phase 2 as option to Alternative 39)	Civic Engagement Process
Other	56	Commuter Rail to South Station via Providence	Commuter rail along Dartmouth Secondary and old right-of-way through Rhode Island to Providence; tie into Northeast Corridor just north of Providence Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	57	Enhanced bus on Interstate 195	Public transit service along Interstate 195 between Wareham and Providence	Advanced for further consideration	Civic Engagement Process
	58	Commuter Rail to Wareham via Middleborough	Extend the Middleborough Commuter Rail Line to Wareham and/or Buzzards Bay	Advanced for further consideration	Civic Engagement Process

Table 3.1-1 (continued)

Route	Alt #	Name	Description	How we Propose to Address Alternative	Origin
Other	59	Appoint a czar		Not a public transportation alternative	Civic Engagement Process
	60	Encourage Telecommuting/Video Conferencing		Not a public transportation alternative	Civic Engagement Process
	61	Feeder Bus Network to Middleborough/Lakeville Station	Feeder bus network from New Bedford/Fall River area feeding into existing commuter rail network (may require new station)	Advanced for further consideration	Interagency Coordinating Group

- The Highway route (using Routes 140, 79, 24, 128, and I-93 to the existing Route 128 commuter rail station, the existing Quincy Adams Red Line station, or South Station).

The alternatives analysis also evaluated using other transportation corridors, including the Dartmouth Secondary (a partially active and partially abandoned freight rail line between New Bedford and Fall River); Interstate 195 between New Bedford and Providence; and active freight rail lines between Lakeville and Wareham.

These 65 alternatives were combined into 38 alternatives by grouping similar alternatives together and dismissing alternatives that were not transportation alternatives, as presented in Table 3.1-2 (see Appendices A and B of the *Analysis of South Coast Rail Alternatives: Phase 1 Report,* Appendix 3.1-A to this DEIS/DEIR*)*. Specific screening criteria were developed for each tier of the three-tiered initial evaluation process, as described below.

3.1.2.2 SCREENING PROCESS AND CRITERIA

A three-step screening process was applied, compatible with the Corps' Highway Methodology. The first step evaluated whether an alternative would achieve the Project Purpose (this was a fail/pass criterion). The second step was an evaluation of whether an alternative was practicable, as defined by Section 404 (this was also a fail/pass criterion). The third step evaluated the environmental impact of an alternative, in order to assist in the identification of the Least Environmentally Damaging Practicable Alternative (LEDPA). Specific criteria were identified for each step to enable a consistent and systematic process of evaluation and elimination of alternatives, that reflected the Project Purpose and the characteristics of the affected environment in which the alternatives would be located and operate.

Step 1

Step 1 evaluated whether an alternative met the overall project purpose, "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts to enhance regional mobility". Two sub-criteria were used to evaluate the 38 alternatives:

- Criterion 1.1 – *Improve regional mobility*
- Criterion 1.2 – *Improve quality of service*

The Step 1 screening criteria were applied to the entire range of potential alternatives, and relied on easily identifiable attributes of the conceptual alternatives. Alternatives that did not meet the Step 1 criteria were dismissed from further consideration. Alternatives that were not dismissed at this stage were advanced to Step 2, which evaluated whether they were practicable to construct and operate.

Step 2

Step 2 evaluated those alternatives that met the project purpose as determined in Step 1. In Step 2, "practicable" was defined in accordance with Section 404 as "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose". Ridership was also included in this evaluation as it was a subset of the Project Purpose (i.e. alternatives that would not generate adequate ridership were not considered to achieve the Project Purpose), as were construction impacts as a subset of logistics and cost. Alternatives that were not practicable were dismissed from further consideration.

Table 3.1-2 Initial Screening List of 38 Alternatives

Route	Alt #	Name	Step 1 Analysis - *Would the Proposed Alternative Achieve the Project Purpose?*	Step 2 Analysis - *Is the Proposed Alternative Practicable?*	Step 3 Analysis - *Compare the Magnitude of Impacts to the natural Environment and Consistency with Smart Growth*
THROUGH ATTLEBORO OR MANSFIELD		***ATTLEBORO SECONDARY***			
	1	Commuter Rail to South Station via Attleboro Bypass	◑	○	○
	2	Commuter Rail to South Station via Attleboro Station with Reverse Move	○	⊗	
	3	Commuter Rail to South Station via Dartmouth Secondary, New Bedford Secondary, and Attleboro Bypass	◑	○	⊗
	4	Bus Rapid Transit to Attleboro Station	⊗		
	5	Diesel Multiple Units Commuter Rail to Attleboro Station	○	○	◑
	6	Diesel Multiple Units to Attleboro Station with New Bedford to Fall River Connection via Dartmouth Secondary	◑	○	⊗
	7	Electrified Commuter Rail to South Station via Attleboro Bypass	◑	○	○
		MANSFIELD FORMER RIGHT-OF-WAY			
	11	Commuter Rail to South Station via Mansfield	◑	⊗	
	12	Bus Rapid Transit to Mansfield Station	○	⊗	
	13	Diesel Multiple Units Commuter Rail to Mansfield Station	○	⊗	
	14	Diesel Multiple Units to Mansfield Station with New Bedford to Fall River Connection via Dartmouth Secondary	◑	⊗	
	15	Electrified Commuter Rail to South Station via Mansfield	◑	⊗	
THROUGH MIDDLEBOROUGH		***MIDDLEBOROUGH SECONDARY***			
	17	Commuter Rail to South Station via Middleborough	◑	⊗[1]	◑
	18	Commuter Rail to South Station via Middleborough, convert Red Line Braintree Branch to Commuter Rail	◑	⊗	
	20	Bus Rapid Transit to Middleborough/Lakeville Station	⊗		
	21	Diesel Multiple Units Commuter Rail to Middleborough/Lakeville Station	⊘		
	22	Diesel Multiple Units to Middleborough/Lakeville Station with New Bedford to Fall River Connection via Dartmouth Secondary	⊘		
	63	Commuter Rail to South Station via Middleborough, also extend Middleborough line to Wareham	◑	⊗	
	64	Commuter Rail to South Station via Middleborough without Old Colony Main Line Improvements	◑	○	◑
THROUGH ATTLEBORO AND MIDDLEBOROUGH	62	Commuter Rail to South Station via both Attleboro Bypass and Middleborough Line	◑	◑	○
THROUGH STOUGHTON	30	Commuter Rail to South Station via Stoughton	◑	◑	⊘
	31	Bus Rapid Transit to Stoughton Station	⊘		
	32	Diesel Multiple Units Commuter Rail to Stoughton Station	○	○	⊗
	33	Diesel Multiple Units to Stoughton Station with New Bedford to Fall River Connection via Dartmouth Secondary	◑	○	⊗
	34	Electrified Commuter Rail to South Station via Stoughton	◑	◑	⊘
USING HIGHWAY SYSTEM	37	Monorail to South Station via Route 140, Route 24, Route 128, and Southeast Expressway	◑	⊗	
	38	Monorail to Quincy Adams Station via Route 140, Route 24, and Route 128	○	⊗	
	39	Monorail to Route 128 Station via Route 140, Route 24, and Route 128	○	⊗	
	40	Commuter Rail to South Station via Route 24 and Route 128 to Northeast Corridor	◑	⊗	
	41	Light Rail/Heavy Rail to Route 128 Station via Route 140, Route 24, and Route 128	○	⊗	
	42	Heavy Rail to South Station via Route 140, Route 24, Route 128, and Red Line	◑	⊗	
	43	Express Bus in Dedicated Lane to Route 128 Station via Route 24 and Route 128	○	○	◑
	44	Express Bus in Dedicated Lane to South Station via Route 24, Route 128, and Southeast Expressway HOV Lane	◑	○	◑
	45	Enhanced Bus Service on Existing Private Carrier Routes	◑	◑	◑
Other	56	Commuter Rail to South Station via Providence	⊗		
	57	Enhanced bus on Interstate 195	⊗		
	58	Commuter Rail to Wareham via Middleborough	⊗		
	61	Feeder Bus Network to Middleborough/Lakeville Station	⊘		

LEGEND

- ● **Highly Favorable**
- ◑ **Favorable**
- ○ **Neutral**
- ⊘ **Unfavorable** (Step 1 alternatives resulting in unfavorable designations were dismissed from further consideration in Phase 1)
- ⊗ **Highly Unfavorable** (Any alternative resulting in highly unfavorable designations were dismissed from further consideration in Phase 1)
- [grey box] Alternative dismissed from further consideration

1 Alternative 17 was removed from further consideration in Step 2, Part 1 but was carried forward to Step 2, Part 2 for comparison purposes at the request of EOT.

For the Step 2 analysis, a quantitative and qualitative assessment of each alternative was conducted based on information on the route, typical cross-section of each mode, likely infrastructure improvements, and conceptual operating assumptions for each alternative (see *Analysis of South Coast Rail Alternatives: Phase 1 Report* Attachment A). Each alternative was assumed to have the same level of service to the terminal stations, to enable a uniform comparison in the Phase 1 analysis. Five sub-criteria were used to screen the alternatives evaluated in Step 2:

- Criterion 2.1 – *Is operationally compatible with the existing transportation infrastructure.*
- Criterion 2.2 – *Does not significantly adversely affect the existing or future capacity, reliability, and quality of the regional transportation system.*
- Criterion 2.3 – *Could be constructed without substantial impacts to the existing system and in a reasonable (four-year) timeframe.* (Note: For those alternatives that advanced to the MEPA/NEPA process, the operating assumptions (such as speed and trip times) have been refined and needed infrastructure improvements have identified. These changes are incorporated into the analysis in Chapter 4.)
- Criterion 2.4 – *Provides transportation system benefits at a reasonable capital cost.*
- Criterion 2.5 – *Provides sufficient capacity to meet demand.*

Step 3

The third step of screening determined if any of the remaining alternatives should be dismissed based on potential impacts to the aquatic or natural environment. Step 3 considered the potential for other significant adverse environmental consequences to occur as a result of each alternative, particularly to wetlands, federal- and state-listed rare species, public water supplies, and protected open space.

As stated in the guidelines at *40 Code of Federal Regulations 230.10(a)*, "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." Therefore, this third step of screening assessed impacts to the aquatic environment under the Clean Water Act, but also assessed other potential impacts to the overall natural environment, as is required under the guidelines.

Because of the large size of the Alternatives Analysis Study Area, and the large number of alternatives evaluated, the analysis utilized Geographic Information Systems (GIS) to process the vast amount of data, balancing a large data set with the appropriate level of detail necessary to conduct consistent evaluations and comparisons among alternatives. Step 3 compared the alternatives that were advanced to this step based on six sub-criteria:

- 3.1 – *The approximate level of wetland loss (in acres) and relative indirect impacts to wetlands.*
- 3.2 – *The number of new stream or river crossings with impacts.*
- 3.3 – *The number of acres of mapped Priority Habitat (state-listed rare species) that would be lost.*
- 3.4 – *The number of acres of protected public open space that would be directly impacted.* (Note: Open space is defined as lands that are protected under Massachusetts' State Constitution, Article 97 (parks, conservation lands, recreation areas, wildlife refuges)).
- 3.5 – *The number of acres of protected public water supply lands (Mapped Wellhead Zone 1, Mapped Surface Water Supply Zone A) that would be directly impacted.*
- 3.6 – *Consistency with smart growth strategies.*

3.1.3 ALTERNATIVES EVALUATED AND REJECTED

This section explains the step-wise evaluation of the initial range of alternatives. The methodology at each step, and the results of each analysis, were coordinated through an interagency coordination process enabled through the Interagency Coordinating Group. Table 3.1-2 lists the 38 alternatives advanced from the original group of 65 alternatives and the results of each step of the evaluation for these 38 alternatives.

3.1.3.1 STEP 1 EVALUATION

The 38 alternatives (Table 3.1-2) were evaluated based on the results of the Step 1 Screening Evaluation, based on the question: "Does the alternative meet the project purpose?" Nine alternatives did not have the ability to meet the project purpose and were dismissed as a result of this analysis. Chapter 5 of the *Analysis of South Coast Rail Alternatives: Phase 1 Report* (Appendix 3.1-A to this DEIS/DEIR) presents details of the Step 1 Screening Evaluation.

3.1.3.2 STEP 2 EVALUATION

Twenty-nine alternatives were advanced to Step 2, based on the question: "Is the alternative practicable to construct or operate?" Fourteen alternatives were dismissed based on the results of the Step 2 Screening Evaluation. Chapter 6 of the *Analysis of South Coast Rail Alternatives: Phase 1 Report* presents details of the Step 2 Screening Evaluation.

3.1.3.3 STEP 3 EVALUATION

Fifteen alternatives were advanced into the Step 3 evaluation, based on the question: "Would the alternative result in unacceptable levels of environmental impact?" Four of the alternatives were dismissed as a result of this analysis. Chapter 7 of the *Analysis of South Coast Rail Alternatives: Phase 1 Report* presents details of the Step 3 Screening Evaluation.

3.1.3.4 STEP 4 EVALUATION AND ANALYSIS

The purpose of the initial alternatives analysis was to identify a reasonable range of alternatives to advance into the NEPA/MEPA processes. However, at the conclusion of Step 3, eleven alternatives remained. These eleven included ten that passed through Steps 1, 2, and 3, and one alternative eliminated in a previous step for which further analysis was requested. In order to reduce the list of alternatives to a reasonable yet comprehensive number and range for the NEPA/MEPA process, it was necessary to "circle back" and reconsider the remaining alternatives in the context of the project purpose and all three steps in the initial screening. In addition, a new alternative was developed at the request of the Interagency Coordinating Group, bringing the total number of alternatives for this Step 4 analysis to twelve.

The twelve alternatives recommended to advance at the conclusion of Step 3 were re-evaluated to determine if there were other reasonable criteria by which additional alternatives should be dismissed or consolidated with other similar alternatives. Alternatives with similar transportation services were compared to each other, considering environmental impacts, transportation benefits, and available infrastructure.

This process took into account input received from the South Coast Commuter Rail Task Force, the Interagency Coordinating Group, and three Civic Engagement meetings held on March 10, 11, and 12, 2008. The recommendations of Step 4 were reviewed with the Interagency Coordinating Group on March 21 and April 1, 2008, which resulted in expanding the list of alternatives under consideration. In concurrence with the Interagency Coordinating Group, three of 12 alternatives were dismissed based on the results of the Step 4 Screening Evaluation. Nine alternatives located within five corridors were advanced to the NEPA/MEPA process for a more detailed evaluation.

3.1.3.5 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

This section provides a summary of common issues and concerns identified for those alternatives dismissed during the three-tiered initial alternatives analysis, particularly for those alternatives that were dismissed in Step 2 because they are not reasonable or practicable, especially when measured against other alternatives that would better meet the purpose and need of the project.

Highway Corridor Rail Alternatives

In several South Coast community meetings, residents suggested building a monorail or commuter rail line within the Route 24 highway corridor. These alternatives appeared to be potentially cost-effective and less harmful to the environment. Several members of the public suggested that this visible location would encourage riders to get out of cars since drivers caught in traffic would watch the rail or monorail speed by while they sat in traffic. The following section discusses why these alternatives were dismissed.

Monorail

Monorail could fly over the interchanges and would be elevated, reducing impacts on the land next to the highway. Monorail is also an appealing technology: it appears to be a clean, quiet, and more future-oriented form of transportation. Many people experience the monorails as visitors to Disneyworld or Las Vegas, or have read about them in Japan and Europe. However, there are substantial challenges to building a monorail along Route 24 that make it not reasonable or practicable to construct:

- No existing monorail service spans long distances. Monorail to the South Coast would be the longest such use of the technology in the world – spanning 60 miles. The longest monorail system that currently exists is in Japan, and it is only 15 miles long. Even in Japan, where monorail is a more widely used technology, the more conventional style rail with two tracks is more widely used, and monorails are not used to provide longer trips. Extending monorail over the proposed distance is not considered a proven technology and would raise serious issues with service reliability. Existing, proven technology for an intended application is necessary for an alternative to be considered practicable.
- While monorail technology can provide a solution over shorter distances; monorail over extended distances, such as would be required for this alternative, would not be cost-effective.
- Monorail would require retooling the MBTA for a new delivery service. As a technology new to the MBTA, monorail would require ordering new cars, constructing new maintenance and storage facilities, and hiring and training operators and repair crews for the new system.

Commuter Rail on Route 24

This alternative envisioned constructing the commuter rail within the Route 24, Route 128, and Route 140 rights-of-way. Along Route 24 (which does not have a median between I-495 and Stoughton), the Massachusetts Highway Department would have to rebuild 20 interchanges and widen the footprint of the highway in many places (causing impacts to nearby wetlands, including wetlands within the Hockomock Swamp Area of Critical Environmental Concern [ACEC], and private homes). The challenges of building rail along Routes 24 and 128 include:

- Adding rail would require rebuilding sections of Route 24 and 128, including every Route 24 interchange and bridge to accommodate the commuter rail track bed. Construction would impact Route 128, first at the interchange with Route 24, then at three more interchanges. This would mean rebuilding those interchanges to accommodate the commuter rail tracks. This construction could negatively impact part of the Blue Hills Reservation and the Fowl Meadow/Ponkapoag Bog ACEC.
- Rail requires flat land and Route 24 crosses rolling hills and curves in ways that won't work for commuter rail tracks. Extensive earth moving would be needed to make the profile of the highway work for the commuter rail. This major challenge, combined with the requirement to rebuild sections of the highways, means that reconstruction would be very expensive.
- Adding rail may preclude any future expansion or upgrades of Route 24.
- Adding rail would require widening the highway's footprint, which would impact wetlands and the Hockomock Swamp.

Using the highway corridor for transit would reduce the potential for the South Coast Rail project to catalyze smart growth and economic development in places where people are already living and working. The Interagency Coordinating Group concurred with the finding that constructing commuter rail along Route 24 would not be practicable to construct. Putting commuter rail on Route 24 would result in rebuilding the highway from I-495 north to Route 128. The impacts to the highway system, abutters, traffic, and adjacent wetlands; the larger project cost; and the length of construction would also be of concern. This alternative was therefore deemed not practicable.

Diesel Multiple Unit Commuter Rail

Diesel Multiple Units (DMUs) are self-propelled rail cars that can be combined into multiple-car trains. This option has the benefit of increasing regional mobility by providing more frequent trains than traditional commuter rail trains. DMU trains are generally shorter than conventional commuter rail trains; they operate more efficiently in consist lengths of three cars. The increased number of trains needed to meet anticipated demand would necessitate double-track lines throughout the alternative alignment, substantially increasing cost and environmental impacts. Riders would also be forced to transfer to the existing commuter rail system at the northern terminus of the alternative, increasing travel time and decreasing reliability and comfort. This alternative was therefore deemed not practicable.

The Attleboro Route Without a Bypass

The Attleboro Route, without a bypass, would bring commuter rail trains from New Bedford and Fall River to Attleboro along the existing active Attleboro Secondary (used as a freight rail line). This was suggested to avoid the operational, environmental, and community impacts of the Attleboro Bypass, which would roughly follow a National Grid right-of-way from the Northeast Corridor at 2.6 miles north of Attleboro Station to the Attleboro Secondary near Chartley Pond. The Attleboro Secondary ties into the Northeast Corridor tracks just north of the existing Attleboro Station, which would require the train to back into Attleboro Station. Under Federal Railroad Administration (FRA) regulations[6], the train engineer would be required to conduct a brake check to allow the train to reverse direction. The current track configuration only allows trains to move from the Attleboro Secondary to the Northeast Corridor in the southbound direction. It is not practicable to reverse direction at Attleboro Station, as this would increase trip times by at least ten minutes and increase the probability of mechanical failure, thereby reducing reliability. In addition, the rail line capacity used by reversing direction on the Northeast Corridor could require an additional track at the station to handle reverse movements. The construction of a wye track[7] at the junction of the Northeast Corridor and the Attleboro Secondary is not practicable (considering costs and logistics), because it would require the acquisition and demolition of a large number of residential and commercial properties, and would not avoid the need for a reverse move.

The Mansfield Route

The Mansfield route was also considered as an alternative to avoid needing the Attleboro Bypass. The Mansfield Route would use the abandoned rail right-of-way from the Attleboro Secondary in Taunton, north to the existing Mansfield Station along the Northeast Corridor. This route was found to be not practicable because of the construction problems and impacts of restoring commuter rail along this route. Specific issues include:

- The rail line would be within the Federal Aviation Administration-regulated object free area for the Mansfield Airport, violating federal safety regulations[8].
- The former right-of-way is currently a town street in Mansfield and is an essential component of the downtown area's one-way circulation pattern. Constructing a rail line would significantly disrupt downtown traffic flows and result in increased congestion.
- A new grade-separated crossing would have to be constructed at I-495, either raising the highway above the rail line or tunneling the rail below the highway.
- A bicycle path and major utility lines, recently constructed along the old right-of-way, would have to be relocated in Mansfield.
- A new grade-separated crossing would have to be constructed at Route 106, just south of the existing train station. There is not sufficient distance between this crossing and the Northeast Corridor to bring the rail line to the right elevation, which would necessitate lowering the roadway, causing major impacts to surrounding buildings.
- The recently reconstructed Mansfield Station would need to be demolished/relocated.

3.1.4 STATION SITE SCREENING

This section describes the station site selection process, identification and screening. Further detail is provided in the Station Siting Report (Appendix 3.1-B).[9] Potential station locations to serve each of the five public transportation alternatives were identified for each alternative and evaluated with regard to their ability to meet the Project Purpose, practicability and environmental considerations.

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[6] 49 CFR Part 238—Passenger Equipment Safety Standards

[7] A wye track is the term used to describe a track intersection shaped like the letter Y which allows direct movement of trains between any two legs.

[8] http://www.faa.gov/air_traffic/publications/notices/2010-08-10/gen06002.cfm. FAA NOTICES TO AIRMEN. "The Precision Object Free Zone (POFZ) is a volume of airspace above an area beginning at the runway threshold, at the threshold elevation, and centered on the extended runway centerline. The standard POFZ is 200 feet (60 meters) long and 800 feet (240 meters) wide."

[9] Station Siting Report. EOT's Final Recommendations (October 10, 2008).

Potential station locations for each of the alternatives were identified early in the process in order to identify potential environmental issues and to be able to calculate the number of riders projected to use each of the alternatives. The number of riders was projected through the use of a ridership computer model such as those used by transportation agencies to forecast the number of users of a transit service. The models are based on demographic and geographical factors and service quality variables. Identification of potential station locations also provided insight into the economic development potential of each alternative and opportunities to support economic development in accordance with Smart Growth principles. In addition to the consideration above, a list of guiding principles was used in station screening, consistent with the Commonwealth's Sustainable Development Principles, as described in the Station Siting Report.

Potential station locations for the South Coast Rail alternatives were initially identified by the Southeastern Regional Planning & Economic Development District (SRPEDD)[10], and screened in an iterative process by the multi-disciplinary project team. SRPEDD staff with input from the public identified a total of 73 rail and bus station locations, some of which overlapped, totaling 55 rail stations and 30 bus stations. The locations identified include stations that are located on all potential rail segments, including the Fall River Secondary, New Bedford Main Line, the rail bed that extends south of the Stoughton Station, Whittenton Branch variation on the Stoughton alternative, Attleboro Secondary, and Middleborough Secondary.

The initial criteria for station site identification were to:

- Provide appropriate track geometry (a tangent track section) and sufficient available land to construct 800-foot platforms for each rail station;
- Not require new development within an Area of Critical Environmental Concern (ACEC);
- Not be located within a public water supply Zone 1; and
- Be located on vacant land or with areas of foreseeable potential for redevelopment.

Table 1 in the Station Siting Report (see Appendix 3.1-B) lists the sites identified in this step, by municipality.

The sites identified in Table 1 of the Station Siting Report were screened based on criteria related to practicability, minimizing environmental impacts, and the ability to support smart growth principles. The criteria used in this screening process are described in detail in the Station Siting Report.

3.1.4.1 NEW BEDFORD STATION SITES

Nine potential station sites were initially evaluated in New Bedford:

1. State Pier
2. Elm Street
3. Whale's Tooth (parking lot)
4. Davis Street
5. Church Street
6. King's Highway
7. New Bedford Industrial Park (Lot 11)
8. Cove Street & JFK
9. NSTAR Site

[10] SRPEDD is a regional planning agency serving 27 cities and towns in Southeastern Massachusetts

The initial evaluation recommended that the following three sites be advanced: State Pier, Whale's Tooth (parking lot) and King's Highway. All three sites would serve the rail alternatives and the Rapid Bus alternative. Of the three sites initially selected, the State Pier site was subsequently eliminated pursuant to coordination between MassDOT and the City of New Bedford. The State Pier station would have been located at New Bedford's State Pier and was anticipated to be a platform-only station to serve the downtown area and ferry customers. The station site would not have included parking and would have served mainly walk-in and bike-in customers. It would not have full-length raised platforms and most likely would not have operated year-round.

The **State Pier Station** was eliminated for a number of reasons including its proximity to Whales Tooth approximately 2,000 feet north and the fact that it could not readily accommodate an 800-foot high-level platform due to the adjacent roadways, driveway entrances, and the developed nature of the area. As initial concepts were developed for this potential station they were reviewed by the City of New Bedford and MassDOT. Due to the physical constraints and proximity to the Whales Tooth station, it was agreed by the City of New Bedford and MassDOT to eliminate this station.

Whale's Tooth (parking lot) - The Whale's Tooth station, located at the Whale's Tooth parking lot would serve all of the rail alternatives, and the Rapid Bus alternative. This 14-acre site, located on the New Bedford waterfront, was identified as the preferred site in the 2002 Final Environmental Impact Report on South Coast Rail. The City of New Bedford has constructed a parking lot on the site in anticipation of the commuter rail project. The station would include intermodal connections, potentially including ferry services. The site would serve walk-in, bike-in and drive-in customers, as well as bus and ferry customers.

King's Highway - The King's Highway station, located in northern New Bedford along King's Highway east of Route 140, would serve all of the rail alternatives and the Rapid Bus alternative. This site would occupy part of an approximately 55-acre site that is now a shopping plaza. The site would serve walk-in, bike-in and drive-in customers.

3.1.4.2 FALL RIVER STATION SITES

Four potential station sites were identified in Fall River:
1. Battleship Cove (behind gate)
2. Battleship Cove (state salt shed)
3. Davol Street
4. Proposed LNG Site (Weaver's Cove)

The evaluation recommended the following two sites be advanced. These two sites would serve all of the rail alternatives and one of the sites also would serve the Rapid Bus alternative.

Battleship Cove (behind gate) - The Battleship Cove station, an approximately 2.2-acre site on the Fall River waterfront located behind the Ponte Del Gada monument, would serve all of the rail alternatives. The station is anticipated to be a platform only station that would not operate year-round. The station would serve the downtown area and the Battleship Cove tourist area. The station site would be geared to serve walk-in customers and pick up-drop off customers. There would be minimal parking. The City of

Fall River constructed a pickup-drop off loop road in anticipation of a future commuter rail station as part of the Ponte Del Gada monument.

Davol Street - The Fall River Depot station, located one mile north of downtown Fall River at Route 79 and Davol Street, would serve all of the rail alternatives and the Rapid Bus alternative. The site, an approximately 8-acre area near the Fall River waterfront, was the site of the historic train station. The site is envisioned to be a multi-modal transportation center with new mixed-use development and parking facilities. The site would serve walk-in, bike-in and drive-in customers.

3.1.4.3 FREETOWN STATION SITES

Seventeen potential station sites were identified in Freetown:
1. South Main Street (U-Storage Site)
2. South Main Street (South of bridge over tracks)
3. Exit 8 ½ Interchange
4. River Front Park
5. Copicut Road
6. North of Boston Beer Site
7. Boston Beer Site
8. NW Side of High Street
9. SE Side of Elm Street
10. NE Side of Chipaway Road
11. South of Chase Road
12. Fly Ash Site
13. Park & Ride off N. Main Street (Exit 10)
14. Northeast Corner of Exit 10
15. East Side of Gurney Road, South of Chase Road.
16. Northeast Side of Chase Road and Gurney Road.
17. Western Interchange of Route 140/ Chase Road.

The evaluation recommended one site to be advanced that would serve all of the rail alternatives.

South Main Street (U Storage) - The Freetown station, located at Site 6 on South Main Street would serve all of the rail alternatives. The site is approximately 18 acres, is currently occupied by a U Storage business, and is near the Fall River Executive Park and the River Front Park. The site would serve drive-in customers and customers shuttled between the station and the industrial parks.

3.1.4.4 LAKEVILLE STATION SITES

Two potential new station sites were identified in Lakeville:
1. West Lakeville
2. Howland Road

The evaluation recommended that neither site be advanced because of environmental impacts (wetlands, priority habitat, and floodplains) and because the sites would not support smart growth.

3.1.4.5 BERKLEY STATION SITES

Six potential station sites were identified in Berkley:
1. Myricks Junction
2. NW of Myricks Junction
3. Parcel 15
4. Parcel 14
5. Parcel 1
6. Parcel 2

The evaluation recommended that none of these sites be advanced. The land area for the sites considered for rail stations – Myricks Junction and NW of Myricks Junction – are not suitably sized. There are environmental constraints, as well. In evaluating the four “Parcel” sites considered for the Rapid Bus alternative, it was concluded that the Galleria Mall Overflow Parking Lot in Taunton provides a better connectivity to Routes 24 and 140 than these Berkley sites.

3.1.4.6 MIDDLEBOROUGH STATION SITES

Six potential station sites were identified (five in Middleborough and one in Rockland):
1. Existing MBTA Layover
2. Old Station Site
3. SW Route 44 (Striar Property)
4. SE Route 44 (Everett St.)
5. NE Route 44 (Everett St.)
6. Plymouth Street (Rockland)

The evaluation recommended the Old Station Site be advanced, which would serve the Middleborough rail alternative and the Attleboro-Middleborough rail alternative.

Old Station Site - The Middleborough Center station, located at the old station site in downtown Middleborough, would serve the Middleborough rail alternative and the Attleboro and Middleborough Hybrid alternative. The 7-acre site would primarily serve walk-in and bike-in customers. The station would attract some drop-off and pick-up customers, but the regional parking facilities are available at the nearby Lakeville station. No direct commuter rail service would be provided to the Lakeville station, because this would require a reverse move, which was previously dismissed as impracticable.

3.1.4.7 TAUNTON STATION SITES

Thirteen potential station sites were identified in Taunton:
1. Galleria Site (Mall)
2. Mini Golf Site
3. Target Plaza
4. Weir Junction
5. Dean Street
6. GATRA/ Oak Street
7. State Hospital
8. Whittenton Junction

9. Whittenton
10. Old Colony Ave. (East Taunton)
11. Galleria Mall Overflow Parking Lot
12. Industrial Park
13. Northwoods

The evaluation recommended that six sites, which would serve different alternatives, be advanced. One site would serve the Middleborough rail alternative and the Attleboro-Middleborough Hybrid alternative. Two sites would serve the Attleboro rail alternative and the Attleboro-Middleborough Hybrid alternative. Two sites would serve the Stoughton rail alternative and two sites would serve the Whittenton variation on the Stoughton rail alternative. Two sites would serve the Rapid Bus alternative.

Mini Golf Site - The East Taunton (south) station site, located off Route 140 in Taunton, would serve the Middleborough rail alternative and the Attleboro-Middleborough Hybrid alternative. This is an approximately 13-acre site currently occupied by a miniature golf business. The station would function as a regional magnet station, serving customers that drive to the station.

Target Plaza - The Taunton Depot station (formerly referred to as the East Taunton (north) station in the Station Siting Report), located at the rear of the Target Plaza, would serve the Attleboro and Stoughton rail alternatives. This site is approximately 14 acres and is located off of Route 140. The Plaza is a newer retail site that contains Target, Home Depot, and other large chain stores. There is vacant land near the existing freight tracks. The station would serve customers that drive to the station, as well as potential future walk-in or bike-in customers if redevelopment were to occur.

Dean Street - The Taunton station, located at the Dean Street site, would serve the Stoughton rail alternative. The site is approximately 8 acres, and is located off of Route 44 just north of the historic train station and within walking distance of downtown. The City of Taunton has invested in remediating this brownfield site in anticipation of a future train station. The site is zoned for mixed-use redevelopment and would be a multi-modal transportation center serving walk-in, bike-in and drive-in customers.

GATRA/Oak Street - The Downtown Taunton station (formerly referred to as the Taunton Depot station in the Station Siting Report), located adjacent to the GATRA/Former Oak Street Mall site, would serve the Attleboro rail alternative and the Attleboro-Middleborough Hybrid alternative, and would serve as a terminal station for the Rapid Bus alternative. This site is an approximately 6-acre site in the center of Taunton, and currently contains the GATRA maintenance facility and bus station and provides an opportunity for multimodal connections. The station would serve walk-in, bike-in and drive-in customers. GATRA would consider shifting the maintenance facility and the bus terminal just south of the site, and if this happens, the site has potential for redevelopment.

Whittenton Station - The Whittenton station would serve the Whittenton variation of the Stoughton rail alternative. This approximately 18-acre site is near downtown Taunton. The site would serve walk-in, bike-in and drive-in customers. This station was subsequently eliminated from further consideration.

Galleria Mall Overflow Parking Lot - The Galleria Station, located at the Galleria Mall Overflow Parking Lot, would serve the Rapid Bus alternative.

3.1.4.8 NORTON STATION SITES

Three site alternatives were identified in Norton:
1. Barrowsville (South Worcester Street)
2. John Scott Boulevard East
3. John Scott Boulevard West

The evaluation recommended the Barrowsville site be advanced. This site would serve the Attleboro rail alternative and the Attleboro-Middleborough Hybrid alternative.

Barrowsville (South Worcester Street) - The Barrowsville station, located on South Worcester Street in Norton, would serve the Attleboro rail alternative and the Attleboro-Middleborough Hybrid alternative. This approximately 7-acre site is near the former train station. The station would be village-style with limited parking, and serve primarily drop-off/pick-up customers.

3.1.4.9 ATTLEBORO STATION SITES

One alternative (Pleasant Street, Route 123) was identified in Attleboro. The evaluation did not recommend that this site be advanced because of the high level of potential wetland impacts, and the low ability of the site to support smart growth.

3.1.4.10 RAYNHAM STATION SITES

Eight site alternatives were identified in Raynham:
1. E. Brittania Street
2. Center Street/Route 138
3. Carver Street
4. Route 138/I-495 Overpass
5. Ryan Industrial Park
6. Greyhound Track
7. Staples Plaza
8. Flea Market

The evaluation recommended that the Greyhound Track site be advanced. This site would serve the Stoughton rail alternative.

Greyhound Track - The Raynham Place station, located at the Raynham-Taunton Greyhound Park in Raynham, would serve the Stoughton rail alternative. The site is now occupied by a former greyhound racing track and has large surface parking along Route 138 near the Raynham/Easton town line. The station would be located on a portion of this approximately 80-acre site. The site would be geared toward serving mostly drive-in customers with additional future walk-in customers being drawn from future redevelopment on the site.

3.1.4.11 EASTON STATION SITES

Four site alternatives were identified in Easton:
1. Easton Station (Route 123)

2. Center/Depot Street (Church)
3. Old Train Station (Downtown)
4. North Easton (Roche Brothers)

The evaluation recommended the Old Train Station and North Easton sites be advanced. Both sites would serve the Stoughton rail alternative.

Old Train Station - The Easton Village station, located south of the historic H.H. Richardson train station, would serve the Stoughton rail alternative. The site is limited to the railroad right-of-way and is within walking distance of downtown Easton. The site would be a village-style station serving walk-in and bike-in customers. Very little, if any, parking would be provided.

North Easton - The North Easton station, at the rear of the Roche Brothers plaza, would serve the Stoughton rail alternative. This existing retail plaza, anchored by Roche Brothers supermarket, occupies an approximately 10-acre site. New medical buildings have been constructed and two additional buildings are planned. The station would likely have shared structured parking facilities with the medical buildings and would primarily serve drive-in customers, although the station may attract some walk-in customers from the existing development on the plaza and from limited nearby residences.

The station sites above and described in greater detail in the Station Siting Report were included in the analysis. Several of the station sites were eliminated from consideration at a later stage of alternatives analysis. Specifically, station sites associated with the Middleborough alternatives were eliminated when those alternatives were eliminated as discussed below.

3.1.5 ALTERNATIVES IDENTIFIED IN THE NOTICE OF INTENT (NOI) AND IN THE ENVIRONMENTAL NOTIFICATION FORM (ENF)

The alternatives that were identified through the initial analysis were combined to form five alternatives, encompassing four routes and three modes that were advanced for further analysis in addition to the No-Build Alternative. The five build alternatives as described in the ENF are presented in Figure 3.1-2 and included:

- **No-Build Alternative – Enhanced Bus**

The No-Build Alternative would provide enhancements to existing bus services with limited improvements to the existing transit and roadway system.

- **Alternative 1 – Through Attleboro**

This Alternative would provide new commuter rail service to South Station through Attleboro using the New Bedford Main Line, Fall River Secondary, Attleboro Secondary, a new bypass track and the Northeast Corridor. Both electric and diesel commuter rail options were evaluated for this alternative.

- **Alternative 2 – Through Middleborough**

This Alternative would provide commuter rail service to South Station through Middleborough by using the New Bedford Main Line, Fall River Secondary, Middleborough Secondary, Middleborough Line and the Old Colony Main Line Corridors. Variations to this alternative include: 1) providing major infrastructure improvements, also called Middleborough Full, and 2) providing this service without major infrastructure improvements to the Old Colony Main Line between Braintree and South Station, also called Middleborough Simple.

- **Alternative 3 – Through Attleboro/Middleborough**

This Alternative would provide commuter rail service to South Station through Attleboro and Middleborough using the corridors described in Alternatives 1 and 2. Both electric and diesel commuter rail options were evaluated for the route through Attleboro, while only diesel commuter rail were evaluated for the route through Middleborough.

- **Alternative 4 – Through Stoughton (including Whittenton variation)**

This Alternative would provide commuter rail service to South Station through Stoughton, by the New Bedford Main Line, Fall River Secondary, Attleboro Secondary to Weir Junction in Taunton and an extension of the existing Stoughton Branch to Taunton. The Whittenton variation would follow the same route but rather than continuing north in a straight line towards Taunton, would swing northwest around Taunton in a more serpentine route, following the right-of-way of the former Whittenton Branch of the Stoughton Line. This option would serve the Whittenton section of Taunton. Both electric and diesel commuter rail options were evaluated for this alternative.

- **Alternative 5 – Rapid Bus**

This Alternative would provide rapid express bus service to Boston using a proposed dedicated, primarily reversible bus lane to be built along Routes 24 and I-93/128, the existing Interstate-93 HOV zipper lane, and a short portion through mixed traffic.

The ENF provided a summary of these alternatives with a preliminary comparison of the alternatives in terms of quality of service, constructability, schedule and cost. The alternatives above were advanced for more detailed analysis, especially with regard to infrastructure improvements and associated costs and schedule and operational performance.

3.1.6 CONSIDERATION OF ALTERNATIVES DURING SCOPING

Scoping is the initial process that was conducted under both NEPA and MEPA. It serves to identify the scope of environmental analysis and range of alternatives to be considered in the environmental review document and may identify new issues and alternatives not yet considered. After issuing its Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS), the Corps held scoping meetings and invited public and agency input on the range of alternatives and on the analyses, studies, and information to be included in the NEPA Draft Environmental Impact Statement (DEIS). As part of the MEPA process, EOT (currently known as MassDOT) submitted an Environmental Notification Form (ENF) to the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA). The ENF described the range of alternatives proposed to be evaluated in detail, identified the environmental resources likely to be affected, and identified the regulatory reviews and permits likely to be required for each alternative. The ENF was circulated for review by the public and the environmental resource agencies and the MEPA office held public scoping meetings in the fall of 2008 to solicit comments on the ENF, coinciding with the Corps Scoping Meetings on December 2 and December 3, 2008.

At the conclusion of the ENF review process, the Secretary of EOEEA issued a Certificate that specified the analysis, studies, and information that must be included in the DEIR. The Secretary's certificate and the public and agency comments received in response to the Notice of Intent, ENF, as well as other comments and input from agencies through the Interagency Coordinating Group (ICG) and other channels were taken into consideration by the Corps in its subsequent preparation of the DEIS/DEIR.

3.1.7 SUPPLEMENTAL RIDERSHIP ANALYSIS AND ALTERNATIVES DISMISSED

In response to comments received during the scoping period, a supplemental ridership analysis was conducted[11]. This analysis measured each alternative identified in the NOI and ENF against two standards:
1. Mode shift (the number of trips that shift from automotive to transit use) and
2. Transit ridership (the increase in total transit ridership along the entire transit system).

The supplemental ridership analysis, in combination with more detailed cost information resulted in the re-evaluation of the practicability of several alternatives, as described below.

Alternative 2 – Through Middleborough, Option 2A (Middleborough Full)

The findings of the Supplemental Ridership Memorandum, or *Travel Demand Analysis Results*[12], (Appendix 3.1-C) indicated that Alternative 2 – Through Middleborough, Option 2A (Middleborough Full) was not considered practicable due to its low projected ridership numbers, high cost and significant construction-related disruption to the existing public transit system and to the City of Quincy. The Middleborough Full Alternative would also add multiple trains in the morning and evening peaks to South Station operations, resulting in operational impacts at South Station similar to those discovered at a later stage in the alternatives analysis for the Attleboro Alternative, resulting in extensive delays to the operation of the alternative and system-wide impacts to the rail network. The operational impacts would render the Middleborough Full Alternative not practicable for this reason as well.

Alternative 2 – Through Middleborough, Option 2B (Middleborough Simple)

Option 2B (Middleborough Simple) does not include the major infrastructure improvements of the Option 2A (Middleborough Full) and would not have these issues. However, without these improvements Option 2B (Middleborough Simple) would not meet the minimum capacity requirements of MBTA for quality of service and the ridership would result in substantially lower projections than that of other alternatives. Because of its low projected ridership this alternative was not considered practicable.

Alternative 3 – Through Attleboro and Middleborough (Hybrid)

Alternative 3 would consist of commuter service to South Station using the Old Colony line and the Northeast Corridor with the intention of sending half the trains from the South Coast area via Attleboro and half via Middleborough to avoid the need for major infrastructure upgrades on either the Northeast Corridor or the Old Colony mainline. Because of limited capacity on the Northeast Corridor,, adding more than one new peak period train would require constructing a third track on the Northeast Corridor. This would result in combined costs and environmental impacts associated with the Alternative 1 – Through Attleboro and Alternative 2 – through Middleborough, Option 2A (Middleborough Simple). However, the ridership of this combined alternative would be similar to the ridership of Alternative 1 by itself, which would have fewer impacts and would be less costly. It was concluded that Alternative 3 was not a practicable alternative.

[11] Executive Office of Transportation. Supplemental Ridership Memorandum. February 17, 2009
[12] Central Transportation Planning Staff, South Coast Travel Demand Analysis Results, February 17, 2009.

3.1.7.1 ALTERNATIVES IDENTIFIED FOR ANALYSIS IN THE ENF CERTIFICATE

The Executive Office of Energy and Environmental Affairs in its April 3, 2009 Certificate[13] stated that the following alternatives should be evaluated in the DEIR:

- **No-Build Alternative (Enhanced Bus)**
- **Attleboro Electric Alternative**

(Previously referred to as Alternative 1 – Through Attleboro, Option 1B)

- **Attleboro Diesel Alternative**

(Previously referred to as Alternative 1 – Through Attleboro, Option 1A)

- **Stoughton Electric Alternative**

(Previously referred to as Alternative 4 – Through Stoughton, Option 4B)

- **Stoughton Diesel Alternative**

(Previously referred to as Alternative 4 – Through Stoughton, Option 4A)

- **Whittenton Electric Alternative**

(The Secretary requested that an electric option be evaluated for Alternative 4 – Through Stoughton, Option 4D)

- **Whittenton Diesel Alternative**

(Previously referred to as Alternative 4 – Through Stoughton, Option 4C)

- **Rapid Bus Alternative**

(Previously referred to as Alternative 5 – Rapid Bus)

3.1.8 EVALUATION OF THE MIDDLEBOROUGH SIMPLE/RAPID BUS COMBINATION ALTERNATIVE

A new alternative that combined the Middleborough Simple Rail Alternative with the Rapid Bus Alternative was evaluated at the request of EPA to determine whether it should warrant further analysis in the DEIS/DEIR. The consideration of this alternative was based on the potential of complementing the low ridership of the Middleborough Simple Alternative with the ridership of the Rapid Bus Alternative, thereby creating a potentially practicable alternative for further consideration in the DEIS/DEIR.

This section provides an evaluation of the Middleborough Simple/Rapid Bus Combination Alternative, at a level of detail consistent with the analysis conducted in the initial alternatives analysis. This section also includes a qualitative assessment of the alternative, and incorporates information from the DEIR/DEIS level analysis, where applicable.

The Middleborough Simple/Rapid Bus Combination Alternative would reroute the Middleborough Line to New Bedford and provide Rapid Bus service to Fall River. This option would meet the MBTA Service Delivery Policy for commuter rail to New Bedford, and provide a comparable level of bus service to Fall River. The Rapid Bus service component of this alternative would provide express bus service to Boston using a proposed dedicated, primarily reversible bus lane to be built along Routes 24 and I-93/128, the existing I-93 HOV zipper lane, and a short portion through mixed traffic.

The Middleborough Simple/Rapid Bus Combination Alternative would require two midday layover facilities: a midday layover facility near South Station for trains and a midday layover for buses. It would also require highway improvements to Route 24. The same capital improvements required for the Rapid

[13] The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form, South Coast Rail Project (EEA# 14346), April 3, 2009.

Bus Alternative north of Taunton would be required for the Middleborough Simple / Rapid Bus Combination Alternative.

The following evaluates the performance of the Middleborough Simple/Rapid Bus Combination Alternative when applying the criteria from the initial alternatives analysis for the 65 alternatives. Since the initial alternatives analysis in April 2008, the data that was used in that evaluation has been revised and updated. The following information was updated since the initial alternatives analysis, (as reflected in the Phase 1 Report):

- ***Travel Time*** – Travel time for Rapid Bus has been refined to reflect future travel conditions particularly at the Southeast Expressway zipper lane.
- ***Ridership*** – The ridership projections used in the initial alternatives analysis (as stated in the Phase 1 Report) were based on data and tools available at the time. Since then, CTPS developed a more robust Travel Demand Model that more accurately projects the future transportation demand from the South Coast Region.
- ***Capital Cost*** – Capital cost has been refined based on a better understanding of the design specifics of the Rapid Bus and Middleborough Simple alternatives.
- ***Cost-Effectiveness*** – The measure of cost-effectiveness has not changed since the initial analysis of alternatives. However, the values that are used within this calculation include cost and ridership, both of which changed as detailed above.

For the purposes of this evaluation, the more recent data was used in order to more accurately analyze the viability and practicability of the Middleborough Simple / Rapid Bus Combination Alternative.

3.1.8.1 INITIAL ALTERNATIVES ANALYSIS CRITERIA APPLIED TO THE MIDDLEBOROUGH SIMPLE/RAPID BUS COMBINATION ALTERNATIVE

Step 1 Evaluation

The Middleborough Simple/Rapid Bus Combination Alternative would meet the Basic Project Purpose because:

- Criterion 1.1 – *Improve regional mobility*
  - It would provide public transit connections between New Bedford/Fall River and Boston.
- Criterion 1.2 – *Improve quality of service*
  - It would provide a peak commuter rail transit trip of 89 minutes from New Bedford to Boston. The morning peak Rapid Bus travel time from Fall River to Boston is estimated at 91 minutes. This alternative would provide a comfortable transit trip with no transfers. The Rapid Bus connection between Fall River and Boston would provide low reliability service because portions of the route are shared with general purpose traffic and mixed HOV traffic.

Recommend: Advance to Step 2 evaluation. It should be noted that the ridership of this combined alternative is low, indicating that the demand for transit goes unmet to a substantial degree, resulting in only minimal achievement of the Project Purpose.

Step 2 Evaluation

The Middleborough Simple/Rapid Bus Combination Alternative was determined to be not practicable to construct and operate. See below for the alternative's ability to meet Step 2 criteria:

- Criterion 2.1 – *Is operationally compatible with the existing transportation infrastructure.*
  The Middleborough Simple/Rapid Bus Combination Alternative:
  - Would need to extend the Middleborough Line west along the Middleborough Secondary, providing a new commuter rail station stop at East Taunton (South).
  - Would need to provide track and railroad bridge improvements along the New Bedford Main Line south of Cotley Junction.
  - Would need to construct all the infrastructure improvements of the Rapid Bus Alternative, except the station stops in New Bedford (Whale's Tooth and King's Highway) and Taunton (Taunton Galleria and Taunton Depot).
  - Would need to provide expanded capacity at Boston's South Station Bus Terminal and new Rapid Bus station stops at Fall River Depot and Freetown.
  - Would require storage/maintenance facilities for both the bus and rail vehicles.

- Criterion 2.2 – *Does not significantly adversely affect the existing or future capacity, reliability, and quality of the regional transportation system*
  The Middleborough Simple / Rapid Bus Combination Alternative would adversely affect the transportation system, because it:
  - Reduces reliability of the Middleborough line and the Old Colony Main Line service by extending trips for all trains, and using all available capacity.
  - Precludes future commuter or passenger rail service from Boston to Wareham and Cape Cod without costly improvements on the Old Colony Main Line.
  - Restricts windows for freight operations on the Middleborough Secondary.
  - Decreases non-peak-direction capacity on Route 24 by taking a lane for use in the peak direction as the Rapid Bus zipper lane.
  - Decreases user capacity of existing Southeast Expressway HOV lane by increasing traffic volume in the lane.

- Criterion 2.3 – *Could be constructed without substantial impacts to the existing transportation system and within a reasonable timeframe*
  The Middleborough Simple / Rapid Bus Combination Alternative would adversely affect the transportation system, because it:
  - Would need to close the existing Middleborough/Lakeville Station and replace it with a station stop on the Middleborough Secondary close to Middleborough Center. The existing Middleborough/Lakeville Station would need to be closed because the extension of the line via the Middleborough Secondary bypasses this station. This station is heavily used and is the site of a new Transit Oriented Development (TOD); TOD implementation is one of the main goals of the South Coast Rail project.
  - Would impact existing freight service.
  - Could not be constructed within a 4-year timeframe.
  - Would have significant impacts to Route 3 at Braintree Split to construct bus lane.
  - Would have significant impacts to Route 24 to construct zipper lane (including bridge and interchange improvements).

- Criterion 2.4 – *Provides transportation system benefits at a reasonable capital cost*
  The Middleborough Simple / Rapid Bus Combination Alternative:
  - Has a combined cost-effectiveness score of 30 percent, which is below the 40 percent threshold for failing on this criterion in the initial alternatives analysis (Phase 1 Report).

- Criterion 2.5 – *Provides sufficient capacity to meet demand*
  The Middleborough Simple / Rapid Bus Hybrid Alternative:
  - Would have an operating capacity of 5,220 passengers, which represents 65% of the estimated regional demand of 8,000 work trips.

Recommendation: Dismiss from further consideration, due to higher cost and relatively low ridership, resulting in low cost-effectiveness, as noted below:

- The cost of the alternative is estimated at $1.41 billion in year of expenditure. This is as expensive as the Stoughton Diesel and Whittenton Diesel.
- Ridership is estimated to be 1,950 one-way boardings (3,800 daily boardings).

The Middleborough Simple/Rapid Bus Combination Alternative meets the Project Purpose only partially due to its low ridership and is not considered practicable in light of the infrastructure costs in combination with low ridership and the amalgamation of other factors described above. The combination alternative would require the entire Rapid Bus infrastructure, except for a few stations, plus a major investment in rail improvements, and thus includes much of the Rapid Bus Alternative and Middleboro Simple infrastructure improvements. Because the service areas of the separate bus and rail components of this alternative overlap the ridership of the combined alternative is less than the sum of the ridership of each individual alternative. To wit, ridership for the Rapid Bus Alternative by itself is projected to be approximately 2,100 one-way passengers per day (4,200 round trips), whereas the Middleboro Simple Alternative would draw approximately 1,550 passengers (3,100 round trips). The Middleborough Simple/Rapid Bus Combination Alternative is projected to have approximately 1,950 daily passengers (3,800 round trips). This mediocre ridership performance would come with the cost of infrastructure for both bus and rail components of the combined alternative.

When comparing the ridership projections to the capital cost of each alternative, it is estimated that the Rapid Bus Alternative would require a capital cost investment of approximately $0.8 billion and the Middleboro Simple Alternative an investment of approximately $1 billion. The Combination Alternative, however, would essentially require much of the infrastructure improvements of both alternatives although there is some cost saving as commuter rail improvements would not be needed for the Fall River portion (as Fall River would be served by Rapid Bus) and Rapid Bus improvements would not be needed for the New Bedford portion (as New Bedford would be served by rail). The cost of the Combination Alternative would amount to approximately $1.4 billion. With ridership less than Rapid Bus and just slightly more than Middleboro Simple (which was already considered underperforming in terms of ridership), the cost of the Hybrid Alternative becomes impractical (i.e. fewer riders but higher cost of either Rapid Bus or Middleboro Simple alone). By ways of comparison, the Rapid Bus Alternative would be approximately $100 per rider and the Hybrid Alternative would be roughly $107 per rider.[14]

The Middleborough Simple/Rapid Bus Combination Alternative would introduce a disparity of service between the Fall River and New Bedford communities. New Bedford would be served by commuter rail, which is not affected by motor vehicle traffic conditions or accidents, and is less affected by inclement weather; while snow occasionally causes switching problems, the speed of commuter rail is not affected by snow. Fall River would be served by bus, which can be substantially affected by traffic conditions and accidents, and is far more affected by weather; during snow conditions it would affect the operation of

[14] Cost per rider is demonstrated in terms of annualized capital cost and annual operating and maintenance cost in reference to annual boardings.

bus zipper lanes, and traffic in general purpose lanes would move more slowly due to hazardous road conditions.

With regard to Smart Growth, Taunton would be served by only one rail station: East Taunton South, the furthest from downtown of all Taunton station options, which decreases the potential for smart growth and provides less of a catalyst for revitalization of downtown Taunton.

3.1.9 ALTERNATIVES ADVANCED TO THE DEIS/DEIR

The following summarizes the alternatives that were advanced for further analysis in the DEIS/DEIR. Evaluation of these alternatives is required by the MEPA certificate. The alternatives analyzed in this DEIS/DEIR are as follows:

- No-Build (Enhanced Bus) Alternative
- Attleboro Electric Alternative
- Attleboro Diesel Alternative
- Stoughton Electric Alternative
- Stoughton Diesel Alternative
- Stoughton Electric (Whittenton Variation) Alternative
- Stoughton Diesel (Whittenton Variation) Alternative
- Rapid Bus Alternative

During the DEIS/DEIR analysis, conceptual operating plans, capital improvement requirements, capital costs, and operating and maintenance costs were developed for each alternative. DEIS/DEIR alternatives were modeled using the regional transportation model, providing quantitative results on the performance of each alternative in terms of ridership, highway/vehicular travel, air quality, and environmental justice. Detailed analyses of environmental impacts (to natural resources, air quality, noise and vibration, historic resources, social and economic impacts among others) were conducted. Smart growth strategies were as identified in the South Coast Rail Corridor Plan were evaluated for all Build Alternatives analyzed in the DEIS/DEIR. A detailed description of the Alternatives analyzed in the DEIS/DEIR is provided in Section 3.2. Section 3.3 summarizes the characteristics of each alternative with regard to their achievement of the Project Purpose and associated goals and objectives, their practicability and their beneficial effects and environmental impacts.

3.2 DESCRIPTION OF ALTERNATIVES EVALUATED IN THE DEIS/DEIR

This section provides a description of the alternatives evaluated in the DEIS/DEIR. The alternatives are distinguished between No-Build and Build. Among the Build Alternatives there is a rail mode and a bus mode. Within the rail mode, there are three different corridors (Attleboro, Stoughton and Whittenton) and two different propulsion alternatives: electrically powered and diesel powered, as follows:

- No-Build (Enhanced Bus) Alternative
- Commuter Rail Alternatives
  - Attleboro Alternative
    - Attleboro Electric
    - Attleboro Diesel
  - Stoughton Alternative
    - Stoughton Electric
    - Stoughton Diesel

  - o Whittenton Alternative
    - Whittenton Electric
    - Whittenton Diesel
- Rapid Bus Alternative

The corridor for the Whittenton Alternative is a variant of the Stoughton Alternative. The Whittenton Alternative corridor avoids the Pine Swamp by using the abandoned Whittenton Branch right-of-way. It is identical to the Stoughton Alternative corridor in all other respects.

Section 3.2-1 below summarizes the alternatives, including a discussion of the corridors in which they would be constructed and the operational modes they would use (e.g. commuter rail, rapid bus, etc.). Ridership characteristics of each alternative are discussed in Section 3.2.2. Section 3.2.4 provides a more in-depth description of each alternative and their specific components.

Table 3.2-1 provides a summary of key elements of the alternatives, each of which are discussed in this chapter.

Table 3.2-1 Summary of Elements by Alternative

		Travel Time (min)			
Alternatives	**Ridership[1]**	**New Bedford**	**Fall River**	**Station Stops [2]**	**Cost [3] (Billion)**
Attleboro Electric	9,360	75	72	8	$2.01
Attleboro Diesel	8,040	84	82	8	$1.72
Stoughton Electric	9,580	76	73	10	$1.88
Stoughton Diesel	8,140	85	83	10	$1.48
Whittenton Electric	9,640	87	85	10	$1.81
Whittenton Diesel	8,040	96	94	10	$1.41
Rapid Bus	4,200	103	91	6	$0.81

1 New daily round-trip transit trips at proposed South Coast Rail stations
2 Proposed new stations
3 Capital cost in year-of-expenditure dollars

3.2.1 SUMMARY OF ALTERNATIVES

3.2.1.1 NO-BUILD (ENHANCED BUS) ALTERNATIVE

The No Build Alternative is included in the DEIS/DEIR as a means of evaluating the impacts and benefits of the Build Alternatives. The No Build Alternative represents a continued investment in the regional transportation network, but does not address the fundamental need for improved public transit service between New Bedford/Fall River and Boston, as described in Chapter 2 – *Purpose and Need*. The No-Build Alternative would improve transit service to Boston from New Bedford, Fall River and Taunton by adding more buses with smaller capital investments than are proposed in the Build Alternatives. Under this alternative, no new rail or bus service would be provided to Southeastern Massachusetts. Improvements to the rail system underway and/or anticipated to be implemented under the No Build Alternative include the expansion of South Station, the construction of mid-day layover facilities in the Boston area and the reconstruction of railroad bridges in the New Bedford area.

Existing commuter bus service to Boston from New Bedford, Fall River, and Taunton is currently provided by three commuter bus carriers: DATTCO provides Boston – New Bedford bus service; Peter Pan provides Boston – Fall River bus service; and Bloom provides Boston – Taunton service. Figure 1.4-2 shows this routing.

There are six commuter park-and-ride lots that provide access to existing bus service to Boston:

- Route 106 near Route 24 – West Bridgewater Park-and-Ride Lot
- Route 24 Exit 12 – Silver City Galleria – Taunton Park-and-Ride Lot
- Oak Street Bloom/GATRA Bus Terminal – Taunton Park-and-Ride Lot
- Route 138 – Raynham/Taunton Greyhound Track – Raynham Park-and-Ride Lot
- Mount Pleasant Street – New Bedford Park-and-Ride Lot
- 72 Sycamore Street, DATTCO Bus terminal – Fairhaven Park-and-Ride Lot

The No-Build (Enhanced Bus) Alternative plan includes bus schedule enhancements, transportation demand management, and transportation policy enhancements for commuter bus. In addition to these enhancements, incentives would enable the private commuter bus service operators to acquire a new fleet of fuel efficient and clean emission buses. For analysis purposes, these buses would be assumed to provide rider comfort and amenities comparable to commuter rail service.

Route 24 Exit 12 - Silver City Galleria is currently a paved parking area that would be restriped to allow for better bus circulation and easier parking maneuvers. The current Park & Ride facilities referred to as Route 106/Route 24 in West Bridgewater and Mount Pleasant Street in New Bedford would remain at these locations and would be restriped. Additional discussion of this alternative is provided in Section 3.2.5.1.

3.2.1.2 ATTLEBORO RAIL ALTERNATIVES

The Attleboro Alternative would provide commuter rail service to South Station using the Northeast Corridor, proposed Attleboro Bypass, Attleboro Secondary, New Bedford Main Line, and Fall River Secondary. Both electric (Attleboro Electric) and diesel (Attleboro Diesel) commuter rail options were evaluated for this alternative. The New Bedford route would be 60.4 miles long and the Fall River route would be 57.9 miles long. Figure 1.4-3 shows the route of the Attleboro Alternative.

This alternative requires improvements to track infrastructure along the Northeast Corridor (construction of a third track between the proposed Attleboro Bypass and the Readville Interlocking in Boston, a distance of 18.7 miles); the Attleboro Bypass (a new two-track railroad on a new right-of-way between the Northeast Corridor and the Attleboro Secondary, a distance of 2.8 miles); and the Attleboro Secondary (reconstruction of existing tracks from the Attleboro Bypass to Weir Junction, as a single track with one siding, a distance of 9.7 miles). This alternative also requires reconstructing track on the Southern Triangle, which is common to all rail alternatives, including the New Bedford Main Line (reconstruct existing tracks from Weir Junction to New Bedford, as two to three tracks from Weir Junction to Myricks Junction and single track with three sidings from Myricks Junction to New Bedford, a distance of 18.9 miles); and the Fall River Secondary (reconstruct existing tracks from Myricks Junction to Fall River, as single track with three sidings, a distance of 11.8 mile). Infrastructure improvements for this alternative also include constructing, reconstructing, or widening 44 bridges and constructing or reconstructing 39 railroad at-grade crossings.

Based on the RAILSIM capacity simulations, the Attleboro Alternatives would operate with very poor on-time performance (especially in the evening peak period) and would negatively impact on-time performance of four other lines (See Appendix 3.2-A).

The Attleboro alternative (electric and diesel) would include eight new commuter rail stations (Barrowsville, Downtown Taunton, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction at three existing commuter rail stations (Canton Junction, Sharon, Mansfield) as well as minor work at the existing commuter rail station at Route 128. This alternative would include two overnight layover facilities, one on the New Bedford Main Line and one on the Fall River Secondary, to be chosen from the five overnight layover alternatives.

This alternative would utilize an expanded South Station and midday layover facilities in Boston proposed by MassDOT for future construction to address existing and future MBTA and Amtrak capacity needs, as discussed in the description of No Build Projects (Section 3.2.5.1.1). Because the expansion of South Station and new midday layover facilities in Boston are part of the No Build condition, their impacts are not analyzed as part of the Attleboro Alternative and these projects will proceed through their own environmental review.

For the electrified option, the traction power system would include one main substation in Taunton, one switching station in Attleboro, and six paralleling stations (one in Norton, one in Berkley, two in Freetown, one in New Bedford, and one in Fall River). Additional detailed information on the Attleboro electric and diesel alternatives is provided in Section 3.2.5.2, including station stopping pattern, infrastructure, new and modified stations, layover facilities, property acquisition, capital costs and construction methods.

3.2.1.3 STOUGHTON RAIL ALTERNATIVES

The Stoughton Alternative would provide commuter rail service to South Station using the Northeast Corridor, Stoughton Line, New Bedford Main Line, and Fall River Secondary. Both electric (Stoughton Electric) and diesel (Stoughton Diesel) commuter rail options were evaluated for this alternative. The New Bedford route would be 54.9 miles long and the Fall River route would be 52.4 miles long. Figure 1.4-4 shows the route of the Stoughton Alternative.

This alternative requires improvements to track infrastructure along the Stoughton Line including reconstruction of existing tracks from Canton Junction to Stoughton, as double track, a distance of 3.8 miles; construction of new tracks on existing, abandoned right-of-way from Stoughton to Winter Street in Taunton, as one to two tracks, a distance of 15.0 miles; and reconstruction of existing tracks from Winter Street in Taunton to Weir Junction, as a single track, a distance of 1.7 miles. This alternative also requires reconstructing track on the Southern Triangle, which is common to all rail alternatives, including the New Bedford Main Line (reconstruct existing tracks from Weir Junction to New Bedford, as two to three tracks from Weir Junction to Myricks Junction and single track with three sidings from Myricks Junction to New Bedford, a distance of 18.9 miles); and the Fall River Secondary (reconstruct existing tracks from Myricks Junction to Fall River, as single track with three sidings, a distance of 11.8 miles). Infrastructure improvements also include constructing, reconstructing, or widening 45 bridges and constructing or reconstructing 46 railroad at-grade crossings.

This alternative would have ten new commuter rail stations (North Easton, Easton Village, Raynham Place, Taunton, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction at two existing commuter rail stations (Canton Center and

Stoughton). This alternative would include two overnight layover facilities, one on the New Bedford Main Line and one on the Fall River Secondary, to be chosen from the five overnight layover alternatives.

This alternative would utilize an expanded South Station and midday layover facilities in Boston proposed by MassDOT for future construction to address existing and future MBTA and Amtrak capacity needs, as discussed in the description of No Build Projects. Because the expansion of South Station and new midday layover facilities in Boston are part of the No Build condition, their impacts are not analyzed as part of the Stoughton Alternative and these projects will proceed through their own environmental review.

For the electrified option, the traction power system would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River).

Additional detailed information on the Stoughton electric and diesel alternatives is provided in Section 3.2.5.2, including station stopping pattern, infrastructure, new and modified stations, layover facilities, property acquisition, capital costs and construction methods.

3.2.1.4 WHITTENTON RAIL ALTERNATIVES

The Whittenton Alternative would provide commuter rail service to South Station through Stoughton, connecting to the existing Stoughton Line using the Whittenton Branch through the City of Taunton. Both electric (Whittenton Electric) and diesel (Whittenton Diesel) commuter rail options were evaluated for this alternative. Figure 1.4-5 shows the Whittenton Alternative. The New Bedford route would be 56.5 miles long and the Fall River route would be 54.0 miles long.

This alternative requires improvements to track infrastructure along the Stoughton Line (reconstruct existing tracks from Canton Junction to Stoughton, as double track, a distance of 3.8 miles; and construct new tracks on existing, abandoned right-of-way from Stoughton to Raynham Junction, as one to two tracks, a distance of 11.6 miles); Whittenton Line (construct new tracks on existing right-of-way from Route 138 in Raynham to Whittenton Junction, as a single track, a distance of 3.5 miles); and Attleboro Secondary (reconstruct existing tracks from Whittenton Junction to Weir Junction, as a single track with one siding, a distance of 2.4 miles). This alternative also requires reconstructing track on the Southern Triangle, which is common to all rail alternatives, including the New Bedford Main Line (reconstruct existing tracks from Weir Junction to New Bedford, as two to three tracks from Weir Junction to Myricks Junction and single track with three sidings from Myricks Junction to New Bedford, a distance of 18.9 miles); and the Fall River Secondary (reconstruct existing tracks from Myricks Junction to Fall River, as single track with three sidings, a distance of 11.8 miles). Infrastructure improvements also include constructing, reconstructing, or widening 42 bridges and constructing or reconstructing 53 railroad at-grade crossings.

This alternative would have ten new commuter rail stations (North Easton, Easton Village, Raynham Place, Downtown Taunton, Taunton Depot, King’s Highway, Whale’s Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction at two existing commuter rail stations (Canton Center and Stoughton). This alternative would include two overnight layover facilities, one on the New Bedford Main Line and one on the Fall River Secondary, to be chosen from the five overnight layover alternatives.

This alternative would utilize an expanded South Station and midday layover facilities in Boston proposed by MassDOT for future construction to address existing and future MBTA and Amtrak capacity needs, as discussed in the description of No Build Projects (Section 3.2.5.1.1). Because the expansion of South Station and new midday layover facilities in Boston are part of the No Build condition, their impacts are not analyzed as part of the Whittenton Alternative and these projects will proceed through their own environmental review.

For the electrified option, the traction power system would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River).

Additional detailed information on the Whittenton Electric and Diesel alternatives is provided in Section 3.2.5.2, including station stopping pattern, infrastructure, new and modified stations, layover facilities, property acquisition, capital costs and construction methods.

3.2.1.5 RAPID BUS ALTERNATIVE

The Rapid Bus Alternative would provide commuter bus service to South Station via I-93, Route 140 and Route 24. North of I-495, buses would use a combination of new zipper bus lanes, new reversible bus lanes, two-way bus lanes, existing zipper HOV lanes, and existing HOV lanes, along with a short section in mixed traffic. South of the I-495 interchange in Raynham, buses would travel in the general purpose lanes with mixed traffic. The New Bedford route would be 56.4 miles long and the Fall River route would be 51.5 miles long. Figure 1.4-6 shows the Rapid Bus Alternative.

This alternative requires improvements to highway infrastructure along Route 24 (construct third lane from Route 140 to I-495, a distance of 5.8 miles; widen Route 24 to accommodate movable barriers; construct zipper bus lane from I-495 to Harrison Boulevard, a distance of 15.4 miles); and Route 128/I-93 (construct reversible bus lane from Harrison Boulevard on Route 24 to Logan Express Lot, a distance of 4.2 miles; and construct two-lane bus roadway from Logan Express Lot to existing HOV zipper lane on the Southeast Expressway, a distance of 1.6 miles). Infrastructure improvements also include constructing, reconstructing, or widening 20 bridges and reconstructing 11 highway interchanges.

This alternative would include six new rapid bus stations (Downtown Taunton, Galleria Station, King's Highway, Whale's Tooth, Freetown and Fall River Depot) and major expansion of the bus terminal at South Station. Expansion of the bus terminal from 35 to 50 bays is part of an existing agreement between MBTA and the Hines Development Group and the environmental review for this project has been completed. The proposed expansion of South Station, while independent of the bus facility project, would be coordinated with the bus terminal to facilitate intermodal connectivity. The expansion of the bus facility is independent of the South Coast Rail Rapid Bus Alternative and the facility would be constructed prior to being used by the Rapid Bus Alternative. Should the bus facility not be expanded, alternative means for providing adequate bus capacity would need to be developed separately for the Rapid Bus Alternative.

Additional detailed information on the Rapid Bus Alternative is provided in Section 3.2.5.3, including Rapid Bus operations (including stopping patterns and vehicles), infrastructure, new bus stations, bus layover facilities, property acquisition requirements, capital costs and construction methods.

3.2.2 OVERVIEW OF BUILD ALTERNATIVE CORRIDORS

The following sections describe the rail and highway corridors within which the proposed Build Alternatives would be constructed. Aspects discussed include corridor location, current conditions, constraints, issues, and ownership. The analyses of environmental impacts of the alternatives in Chapter 4 are organized along these same corridors.

3.2.2.1 RAIL ALTERNATIVE CORRIDORS

This section describes those transportation corridors associated with the Attleboro, Stoughton, and Whittenton (electric and diesel) rail options. The organization of the description of these corridors forms the basis for the characterization of the affected environment and environmental consequences of the rail alternatives in Chapter 4.

The "Southern Triangle"

This section, common to all rail alternatives, provides an overview of two components of the transportation system south of Weir Junction, referred to as the "Southern Triangle." These components include the New Bedford Main Line and the Fall River Secondary.

New Bedford Main Line Rail Segment

The New Bedford Main Line is an active rail line running from the Attleboro Secondary at Weir Junction in Taunton to the waterfront piers in New Bedford. The line connects with the Middleborough Secondary at Cotley Junction and the Fall River Secondary at Myricks Junction. The line is in service for freight only at the present time. The line is mostly single track (but was constructed to carry two tracks), with a two-track section north of Cotley Junction. The line was acquired from CSX by MassDOT.

The line passes through some environmentally sensitive areas, including the Assonet Cedar Swamp in Berkley and Lakeville and is adjacent to the Acushnet Cedar Swamp State Reservation in New Bedford. Other constraints include dense development along the line in New Bedford.

Fall River Secondary Rail Segment

The Fall River Secondary is an active rail line running between the New Bedford Main Line at Myricks Junction in Berkley and the waterfront in Fall River. The line is in service for freight only at the present time. The line is all single-track, and was acquired by MassDOT from CSX.

The line passes through some environmentally sensitive areas, including the Assonet Cedar Swamp in Berkley. Other constraints include dense development along the line in Fall River, and large slopes above and below the line in Fall River along the Taunton River.

Attleboro Alternatives Corridor

This section provides an overview of three components of the transportation corridor associated with the electric and diesel Attleboro alternatives that are under consideration. These components include the Northeast Corridor, the Attleboro Bypass, and the Attleboro Secondary.

Northeast Corridor Rail Segment

The Northeast Corridor is an active rail line running between New York and South Station in Boston. The portion of interest for this project runs from Attleboro to Boston. The corridor experiences heavy use, including Amtrak Regional and Acela service, MBTA commuter rail service, and freight rail service. The MBTA Providence Line uses the entire length of this portion of the corridor; the Stoughton Line, Franklin Line, and Needham Lines join farther north at Canton Junction, Readville, and Forest Hills, respectively.

The corridor has at least two tracks on this section, with three tracks from Readville to Boston. There are also two station siding tracks at Attleboro Station. The corridor is electrified, meaning that both diesel and electric trains can operate, and is designed and signaled for high-speed rail operations. The corridor is owned by the MBTA. Train operations are controlled by Amtrak.

Attleboro Bypass Rail Segment

The Attleboro Bypass would be a new double-track rail corridor connecting the Northeast Corridor and the Attleboro Secondary (described in the following section). The line would roughly follow an existing National Grid electric transmission line right-of-way from the Northeast Corridor near the Attleboro/Norton/Mansfield town line to the Attleboro Secondary near Chartley Pond at the Attleboro/Norton town line. The line would be owned by the MBTA.

Attleboro Secondary Rail Segment

The Attleboro Secondary is an active rail line running from the Northeast Corridor in Attleboro to the Stoughton Line and New Bedford Main Line at Weir Junction in Taunton. The line is in service for freight only at the present time. The line is mostly single track, with a two-track section just east of the Northeast Corridor in Attleboro. The line is currently owned by MassDOT and operated by CSX.

The line runs through some environmentally sensitive areas, including Chartley Pond and the Three Mile River Area of Critical Environmental Concern (ACEC). It also has many grade crossings in downtown Taunton, because it runs directly through the densely developed core of the city.

Stoughton Alternatives Corridor

This section provides an overview of the Stoughton Main Line, the main component of the transportation corridor for the Stoughton alternatives under consideration. Alternatives through Stoughton would also use the Northeast Corridor north of Canton Junction (for a description of the Northeast Corridor, see Section 3.2.1).

The Stoughton Main Line is a rail line running from the Northeast Corridor at Canton Junction to the Attleboro Secondary and New Bedford Main Line at Weir Junction in Taunton. The line is active between Canton Junction and Stoughton Station serving commuter rail on the MBTA Stoughton Line and freight rail to customers in Canton and Stoughton. A short piece of the line north of Weir Junction is active, serving freight only. The remainder of the line, from Stoughton Station to Taunton, is abandoned, and some tracks were removed.

The active sections of the corridor are single-track, except at the approach to Canton Junction, where there are two tracks. The corridor is owned by the MBTA, north of Britton Street in Raynham. Parts of the right-of-way north of Longmeadow Road in Taunton were sold and in various public/private ownership. The active rail segment north of Weir Junction is owned by MassDOT and operated by the MassCoastal Railroad.

The corridor runs through some environmentally sensitive areas, including Pine Swamp in Raynham and the Hockomock Swamp ACEC in Easton. Hockomock Swamp is one of the most important wetlands in the state for rare species habitat and protects regional water quality.

Whittenton Alternatives Corridor

This section provides an overview of the main component of the transportation corridor for the Whittenton alternatives under consideration. Like the Stoughton alternatives, the Whittenton alternatives would use the Northeast Corridor north of Canton Junction to the Stoughton Main Line to the Whittenton Branch. The Whittenton Branch is an abandoned rail line in Raynham and Taunton, running around the northwest edge of the core of the City of Taunton and connecting the Stoughton Line with the Attleboro Secondary.

The corridor runs through the Hockomock Swamp ACEC in Easton but would avoid impacts to Pine Swamp in Raynham. The Whittenton Branch is currently owned by the MBTA.

3.2.2.2 RAPID BUS ALTERNATIVE CORRIDOR

This section provides an overview of four components of the highway transportation system. These components include using Route 24, Route 140, Route 128 (Interstate 95/Interstate 93) and the Southeast Expressway (Interstate 93/Route 3).

I-93 and the Southeast Expressway (I-93/Route 3)

I-93 runs through the City of Boston, traveling from Canton to New Hampshire. The Southeast Expressway (I-93/U.S. Route 3) is the only freeway connecting the downtown core of Boston to points south and the Route 128 beltway. It runs from the “Braintree Split” (the Route 3/I-93 Interchange) to downtown. It is four lanes in each direction throughout, with one lane from the off-peak direction used to make an HOV lane for the peak direction during rush hours between the “Braintree Split” and Columbia Road in Boston.

The highway runs through very densely developed areas in Quincy, Milton, and Boston. It often experiences severe congestion in both directions, even during off-peak hours and on weekends.

South of the Southeast Expressway, the portion of concern for this project runs from the “Braintree Split” to MA Route 24 in Randolph. This section is four lanes in each direction. The median varies, and is widest near Route 24, but is generally less than 40 feet wide.

The highway runs through some environmentally sensitive areas, including the Fowl Meadow – Ponkapoag Bog ACECs in Randolph. It also borders the Blue Hills State Reservation on both sides in Quincy and Randolph. The highway experiences severe congestion in both directions during peak periods.

Route 24

Route 24 is a major north-south freeway, providing the primary link between the South Coast region and the Boston region. The highway is two lanes in each direction between I-195 and I-495, and three lanes in each direction between I-495 and MA Route 128. The median width varies, but is generally less than 20 feet wide.

The highway runs through some environmentally sensitive areas, including the Hockomock Swamp ACEC in West Bridgewater and the Fowl Meadow – Ponkapoag Bog ACECs in Randolph. It also borders portions of the Blue Hills State Reservation in Randolph. The highway experiences congestion during the peak periods, especially between MA Route 140 in Taunton and Route 128 in Randolph.

Route 140

Route 140 is a major north-south freeway connecting New Bedford to Route 24 in Taunton. The highway is two lanes in each direction throughout. The median width varies, but outside of New Bedford it is generally at least 40 feet wide.

3.2.3 DESCRIPTION OF BUILD ALTERNATIVE MODES

The following sections describe the modes used by the DEIS/DEIR alternatives and the operating assumptions used to evaluate each mode.

3.2.3.1 DIESEL COMMUTER RAIL

Diesel commuter rail refers to a fixed-guideway system with steel wheels operating on steel rails, with one or two locomotives pulling a number of passenger coaches; on the MBTA system, trains are generally six to nine coaches. Coaches would be bi-level, to increase capacity. Figures 3.2-1 and 3.2-2 depict a typical cross-section of a conventional commuter rail.

Diesel commuter rail maximum speed was assumed to be 79 mph, the maximum currently operated on the MBTA system. For purposes of comparing alternatives, headways[15] for commuter rail alternatives were set at 40 minutes on the branches and 20 minutes on the trunk, during the peak period in the peak direction. Scheduled travel times on existing services were not altered.

3.2.3.2 ELECTRIC COMMUTER RAIL

Electrified commuter rail refers to a fixed-guideway system with steel wheels operating on steel rails, with one or two locomotives pulling a number of passenger coaches. For consistency with the MBTA system, trains are assumed to be six to nine coaches. Coaches would be bi-level to increase capacity. Commuter rail locomotives are powered by an overhead electrical contact system. Figures 3.2-3 through 3.2-4 depict a typical cross-section of an electrified commuter rail.

[15] The interval of time between two trains boarded by the same unit at the same point. Dictionary of Military and Associated Terms. US Department of Defense 2005.

For electric commuter rail, the maximum speed was assumed to be 100 mph, the maximum speed that can be operated without incurring significant signal costs because of the need to signal civil restrictions. For purposes of comparing alternatives, headways for electric commuter rail alternatives were set at 40 minutes on the branches and 20 minutes on the trunk, during the peak period in the peak direction. Travel times on existing tracks were based on Amtrak schedules for the Attleboro and Stoughton corridors where possible or on track geometry.

3.2.3.3 RAPID BUS

Rapid Bus is a bus system designed to provide the quality and reliability of rail and the flexibility of bus. Buses operate in mixed traffic, exclusive lanes, or exclusive roadways. Vehicles have a capacity similar to a standard 45-foot highway motor coach (approximately 50 passengers) and would be clean diesel powered. Figure 3.2-5 depicts the typical cross-sections of a commuter bus exclusive busway envisioned for this alternative.

For the Rapid Bus Alternative, travel times were based on projected future conditions along the highway corridor, taking into consideration that the bus would operate within exclusive lanes for segments of the corridors. For purposes of comparing alternatives, the Rapid Bus Alternative was envisioned to operate at 15 minutes headways during peak hours in the peak direction.

3.2.4 RIDERSHIP OF THE BUILD ALTERNATIVES

In order to estimate future ridership projections for the South Coast Rail alternatives in greater detail, the Central Transportation Planning Staff (CTPS) refined their regional travel demand model set to include regional transportation projects, land use alternatives based on regional plans for the study area, and the proposed operation plans for the alternatives. Additional discussion of ridership modeling is provided in Chapter 4.1 – *Transportation (Affected Environment and Environmental Consequences)*. Technical background information regarding ridership modeling methodology is included in Appendix 3.2-C. Detailed information on the ridership projection results is provided in the Ridership Errata Sheet for the Alternatives Description Technical Report, dated January 14, 2010 (Appendix 3.2-D).

3.2.4.1 MODEL BASIS

The CTPS model used a modeling process consistent with those of other major transportation projects in eastern Massachusetts. This modeling method allowed for a consistent comparison of the alternatives based on their projected ridership and specific elements such as service plans and demographics.[16]

[16] South Coast Rail Travel Demand Analysis Results, Central Transportation Planning Staff, February 17, 2009

Existing Transit Modes

Connectivity to other transit modes provides a larger coverage area for the project while it increases mobility and regional opportunity. The model projections reflect riders coming by bus routes that come within one-half mile of the alternatives stations. The model also incorporates connections to commuter rail lines, the central subway system (including both light and heavy rail lines), and bus routes in regional communities.

Regional Plan

The demographic forecasts were created by the local Regional Planning Agencies (RPAs) in the model area such as the Southeastern Regional Planning and Economic Development District (SRPEDD), Old Colony Planning Council (OCPC), and Metropolitan Area Planning Council (MAPC) for use in their most recently adopted Regional Transportation Plan (RTP).[17] The transportation improvements included in the modeling for the South Coast Rail alternatives are those highway improvement projects most likely to be built by 2030 and which are included in the most recent federally approved and fiscally constrained Regional Transportation Plans in the modeling area. This includes the major transit projects assumed in the State Implementation Plan (SIP) and included in the Boston Region RTP, such as:

- Green Line Extension Project
- Urban Ring Project, Phase II
- Blue Line extension to Lynn
- Fitchburg commuter rail improvements
- Assembly Square, Orange Line Station
- Fairmont commuter rail station improvements
- MBTA commuter rail additional peak period trains
- Silver Line Phase I, II, and III
- 100 additional buses on heaviest load MBTA routes
- 1,000 additional parking spaces throughout the commuter rail system

Other transportation projects assumed in the modeling analysis, based on the SRPEDD and the OCPC RTPs are shown in Table 3.2-2 below.

Ridership forecasts were developed for all alternatives for the 2030 forecast year. For the No-Build (Enhanced Bus) Alternative, the ridership model assumes enhancements to the existing commuter bus service. For the Build Alternatives, the ridership model assumed that the transportation network would be updated to reflect the project improvements and the model was re-run for the various options. The outputs of these model runs were compared to the No-Build Alternative to see what changes in travel patterns would occur to the transportation system due to the South Coast Rail alternatives.

Population and Employment Densities

To establish where people are coming from and going to, the travel demand / ridership model takes into account the population and employment densities of the region. This is the basis for an origin/destination summary that ultimately translates into the number of people who would use the rail or bus alternatives. The model also accounts for the proximity of population densities to establish how the riders access the stations. Knowing whether riders walk, bike, drive or take the bus, for instance, is

[17] South Coast Rail Travel Demand Analysis Results, Central Transportation Planning Staff, February 17, 2009

Table 3.2-2 Regional Transportation Plan Highway Improvement Projects Included in the Travel Demand Analysis

Regional Planning Agency	RTP Highway Improvement Projects
OCPC	Widen Route 3 to six lanes from exit 16 to exit 12
	Route 3 southbound on-ramp from Cranberry Road in Kingston at interchange 8
	Route 3 northbound on-ramp from Long Pond Road in Plymouth at interchange 5
	Route 3 northbound off-ramp to Plymouth Plantation highway eastbound at interchange 4
	Route 18 widening to four lanes from Route 139 in Abington to Highland Place in Weymouth
	Route 24 capacity enhancement from I-495 to I-93
	Route 24 northbound on-ramp from Route 140 westbound in Bridgewater at interchange 15
	Route 25 interchange on route 25 at Bourne Road in Plymouth
	Route 106 widening to four lanes from Route 24 to Route 28 in West Bridgewater
SRPEDD	Route I-495 southbound on ramp from Route 140 in Mansfield
	Route 44 widening to four lanes from Route 58 in Carver to I-495 in Middleborough
	Route 24 widening to six lanes from Route 140 in Taunton to I-495 in Raynham
	Brightman Street bridge connecting Fall River and Somerset
	Route 24 Interchange on Fall/River Freetown line between interchanges 8&9

also relevant to ensure that the stations are properly designed with adequate sidewalks, bike storage capacity, parking capacity, and good connections to other transit modes.

3.2.4.2 RIDERSHIP MODEL INPUTS

The travel demand model relies on the following elements and assumptions to estimate future ridership projections:

- Operating Plan
- Station Locations
- Station Parking, Availability and Cost
- Fares

These elements are discussed below.

Operating Plan

The operating plan for the travel demand model was developed using minimum acceptable service assumptions based on the MBTA Service Delivery Policy. Rail travel times for the Attleboro and Stoughton/Whittenton Alternatives, which include dwell times at the stations, were calculated for the 2030 operation[18] and reflect future improvements and service modifications to the rail corridors. Rapid Bus travel times were developed based on existing constrained travel conditions where the alternative is envisioned to operate in mixed traffic but unconstrained where the alternative would operate within an exclusive bus lane along the highway corridors.

The headways were based on minimum service acceptable under the MBTA Service Delivery Policy; the rail alternatives were assumed to provide one train every 40 minutes or three trains per peak period and the Rapid Bus Alternative to run bus service once every 15 minutes.

[18] Technical Memorandum on Network Simulation Analysis of Proposed 2030 Amtrak/MBTA Operations

Station Locations

How well a transit alternative appeals to potential riders is directly related to how easily patrons can get to a station. The travel demand model, therefore, takes into account the surrounding transportation infrastructure and any barriers that make access to the station difficult, which could potentially add to the in-vehicle travel time to the stations.

Station Parking, Availability and Cost

In order to plan for and design station parking that accommodates future demand, the majority of proposed stations were modeled as if there were no constraints on the amount of available parking. Running the model unconstrained at the proposed stations ensures that the true attractiveness of a station would be reflected in the total number of riders who would be expected to use the new service. This applies to the riders who would arrive to the station by car. All other modes (i.e. patrons arriving to the station by walking or riding a bicycle) would be unaffected by the parking supply. Stations that do not offer parking, such as Battleship Cove and Easton Village, were modeled without parking. Parking constraints were applied at Taunton and Barrowsville stations where the desire to accommodate future transit-oriented development (TOD) was a driving factor. Stations where TOD is projected would limit the parking supply to the benefit of greater development intensity in the immediate vicinity of the station to encourage future transit riders to live and work within walking distance of the station.

Fares

The model also considers the economics of using the proposed transit system. This allows the model to weigh the economic attractiveness of riding the proposed system compared to the economics of continuing to drive or using the existing commuter bus service. Fares for the No-Build Alternative were based on the existing commuter bus monthly fare structure; fares for the build alternatives including both the rail and bus alternatives were based on the current MBTA commuter rail monthly fare structure.

3.2.4.3 SUMMARY OF RIDERSHIP MODELING RESULTS

For the purpose of portraying the ways in which this project shifts and adds new ridership, the results presented are new transit trips at the proposed South Coast Rail project stations, new linked-trips, new system-wide trips and the total reduction in vehicle miles travelled (VMT).

A summary of new station boardings pertains to the new South Coast Rail stations only and gauges the overall benefit to the region provided by each alternative.

The total number of linked trips per alternative represents the shift in mode choice due to a South Coast Rail project alternative. For instance, for mode of access, residents of the South Coast communities currently have few options outside driving to work. With the South Coast Rail project, people would have regional transit opportunity, which was previously not available, giving South Coast residents an additional mode by which they could get to work. The additional transit choice presented by the project would increase the number of people who would choose to take transit to work. This number is represented in the linked trips increase and represents the number of people who, without the project, would have otherwise driven to work.

New system-wide boardings represent the overall draw to the commuter rail transit system due to the South Coast Rail project, which represents an increase in capacity along other commuter rail lines as a particular alternative attracts system-wide new ridership. This total is also used to calculate overall cost-effectiveness of the project.

The Vehicle Miles Traveled (VMT) measure quantifies how many miles of travel would be removed from the region due to the project. As people switch from driving to using the new transit project, the reduction in VMT correlates to air quality benefits due to the project.

No-Build (Enhanced Bus) Alternative Ridership Projections

The No-Build Alternative is expected to generate an increase in linked transit trips of 400 daily linked trips as shown in Table 3.2-3. Transit ridership is projected to be 2,360 daily inbound (one way) boardings at six stations within the South Coast Rail study area.

Table 3.2-3 Ridership Breakdown – No-Build Alternative

Station	Ridership
Downtown Fall River	880
Galleria Station	340
Mount Pleasant Street	120
Raynham Place	70
SRTA Terminal	750
Taunton Depot	200
Total Station Inbound Boardings	**2,360**
Total Daily Ridership	**4,720**
Total New Linked Boardings	**400**
Total New System Wide Transit Boardings	**1,400**
Total Reduction in VMT	**75,100**

Attleboro Alternatives Ridership Projections

The ridership modeling indicates that the Attleboro Electric and Attleboro Diesel are expected to generate an increase in linked transit trips of 5,300 and 4,500 daily linked trips, respectively, as shown in Table 3.2-4. Transit ridership is projected to be 4,680 and 4,020 daily inbound (one way) boardings at eight new stations along the Attleboro alignment.

Stoughton Alternatives Ridership Projections

The ridership modeling indicates that the Stoughton Electric Alternative and the Stoughton Diesel Alternative are expected to generate an increase in linked transit trips of 5,900 and 5,000 daily linked trips, respectively, as shown in Table 3.2-5. Transit ridership is projected to be 4,790 and 4,070 daily inbound (one way) boardings at ten new stations along the Stoughton alignment.

Table 3.2-4 Ridership Breakdown – Attleboro Alternatives

Station	Attleboro Electric	Attleboro Diesel
Barrowsville	680	620
Battleship Cove	240	200
Downtown Taunton	1,350	1,010
Fall River Depot	760	700
Freetown	210	180
King's Highway	470	430
Taunton Depot	360	310
Whale's Tooth	610	570
Total Station Inbound Boardings	**4,680**	**4,020**
Total Daily Ridership	**9,360**	**8,040**
Total New Linked Boardings	**5,300**	**4,500**
Total New System Wide Transit Boardings	**11,130**	**9,570**
Total Reduction in VMT	**296,600**	**256,400**

Table 3.2-5 Ridership Breakdown – Stoughton Alternatives

Station	Stoughton Electric	Stoughton Diesel
Fall River Depot	740	650
Freetown	240	170
King's Highway	460	390
Whale's Tooth	600	520
Battleship Cove	210	170
Taunton Depot	410	390
Easton Village	320	290
North Easton	750	580
Raynham Place	550	510
Taunton (Dean St.)	510	400
Total Station Inbound Boardings	**4,790**	**4,070**
Total Daily Ridership	**9,580**	**8,140**
Total New Linked Boardings	**5,900**	**5,000**
Total New System Wide Transit Boardings	**11,510**	**9,800**
Total Reduction in VMT	**295,900**	**228,700**

Whittenton Alternatives Ridership Projections

The ridership modeling indicates that the Whittenton Electric Alternative and the Whittenton Diesel Alternative are expected to generate an increase in linked transit trips of 5,500 and 4,600 daily linked trips, respectively, as shown in Table 3.2-6. Transit ridership is projected to be 4,820 and 4,020 daily inbound (one way) boardings at ten new stations along the Whittenton alignment.

Rapid Bus Alternative

The ridership modeling indicates that the Rapid Bus Alternative is expected to generate an increase in linked transit trips of 1,700 daily linked trips, as shown in Table 3.2-7. Transit ridership is projected to be 2,100 daily inbound (one way) boardings at six new stations along the Rapid Bus alignment.

Table 3.2-6 Ridership Breakdown – Whittenton Alternatives

Station	Whittenton Electric	Whittenton Diesel
Fall River Depot	640	530
Freetown	160	130
King's Highway	390	340
Whale's Tooth	510	430
Battleship Cove	200	130
Taunton Depot	360	290
Easton Village	320	290
North Easton	750	580
Raynham Place	600	560
Downtown Taunton	890	740
Total Station Inbound Boardings	**4,820**	**4,020**
Total Daily Ridership	**9,640**	**8,040**
Total New Linked Boardings	**5,500**	**4,600**
Total New System Wide Transit Boardings	**10,430**	**9,570**
Total Reduction in VMT	**228,000**	**174,000**

Table 3.2-7 Ridership Breakdown – Rapid Bus Alternative

Station	Rapid Bus
Downtown Taunton	400
Fall River Depot	420
Freetown	290
King's Highway	280
Galleria Station	130
Whale's Tooth	580
Total Station Inbound Boardings	**2,100**
Total Daily Ridership	**4,200**
Total New Linked Boardings	**1,700**
Total New System Wide Transit Boardings	**3,720**
Total Reduction in VMT	**81,500**

3.2.5 OPERATION AND CONSTRUCTION OF ALTERNATIVES ANALYZED IN THE DEIS/DEIR

The following sections provide a comprehensive discussion of key aspects of the alternatives analyzed in the DEIS/DEIR. These aspects form the basis for the impact analysis in Chapter 4 – *Affected Environment and Environmental Consequences.* The following aspects are discussed below.

No Build (Enhanced Bus) Alternative
- No-Build Commuter Rail Service
- No-Build Commuter Bus Service
- Commuter Park-and-Ride Lots for Bus Service to Boston
- Potential Enhancements of Bus Service

Rail Build Alternatives
- Rail operations

- Track infrastructure
- Grade crossings
- Bridges and culverts
- Signals and communications
- Rolling stock
- South station expansion
- Electrification
- Train stations (new and modified)
- Layover facilities
- Property acquisition required for the rail alternatives
- Capital costs of rail alternatives
- Construction methods of the rail alternatives

Rapid Bus Alternative

- Rapid Bus operations
- Rapid Bus infrastructure improvements
- New Rapid Bus stations
- Rapid Bus layover facilities
- Property acquisition required for the Rapid Bus Alternative
- Capital cost of the Rapid Bus Alternative
- Construction methods for the Rapid Bus Alternative

3.2.5.1 NO-BUILD (ENHANCED BUS) ALTERNATIVE

The No-Build (Enhanced Bus) Alternative consists of enhancing the existing transit system that currently serves the study area including any programmed and funded improvements to that system. The South Coast Rail study area includes commuter rail and bus service and associated infrastructure such as commuter rail stations and park-and-ride lots. Also included in the No-Build Alternative are the expansion of South Station in Boston, the construction of new mid-day layover facilities in the Boston area and the reconstruction of railroad bridges in the New Bedford area. These improvements are proposed based on existing and future needs and would be implemented irrespective of the South Coast Rail alternatives.

No-Build Commuter Rail Service

No commuter rail service is offered within the South Coast area. Although commuter rail service is offered in nearby southeastern Massachusetts communities by the MBTA, this service is difficult for most residents to access and is approaching or over capacity under existing conditions, as shown in Table 3.2-8.

The Attleboro/Providence Line has stations in Providence, South Attleboro, Attleboro, Mansfield, and Sharon. The Stoughton Line has stations in Stoughton, Canton Center and Canton Junction and the Middleborough Line has stations in Brockton, Bridgewater, and Middleborough/Lakeville. Several communities located on the fringes of the South Coast area, including Easton, Raynham, Norton, and Lakeville, are near existing commuter rail stations.

Table 3.2-8 Ridership on Providence, Stoughton and Middleborough Rail Lines

Line	AM Peak Passengers	AM Peak Seating Capacity	AM Peak Utilization*
Providence	11,017	8,532	129%
Stoughton	2,771	3,558	78%
Middleborough	3,743	3,696	101%

Sources: MBCR Ride Check December 2006, MBTA South Side Equipment Schedule
* Assumes all passengers continue to South Station, Stoughton, Providence/Stoughton and Middleborough/Lakeville Lines.

Communities in the heart of the South Coast area, however, are outside a six-mile access radius of these stations, and some are more than 20 miles from the nearest commuter rail station.[19] Commuter rail is currently not a reasonable alternative for most South Coast area residents traveling to Boston, especially from the communities of Taunton, Berkley, Freetown, Fall River, New Bedford, Dartmouth, and Westport due to the distance from the nearest station.

While residents from Lakeville are able to use commuter rail to commute to Boston, system capacity is limited. Commuter rail station parking lots in Attleboro, Mansfield, Stoughton, and on the Middleborough Line are either unable or will not be able to handle any more growth, and communities are reluctant to increase parking lot capacity. In addition, some peak hour trains experience heavy passenger loads. Therefore, the existing commuter rail service, although within reach of some communities in the South Coast area, is not sufficient to handle the current demand and anticipated growth in ridership.

South Station Expansion

One of the rail improvements anticipated to be undertaken under No-Build conditions is the expansion of South Station. This project is needed to address both current and future needs of the MBTA rail system as well as Amtrak rail operations. The expansion of South Station is described in the application by MassDOT for federal funding for environmental review under the National Environmental Policy Act (NEPA) and Preliminary Engineering (PE) of the Boston South Station High Speed Intercity Passenger Rail (HSIPR) Expansion Project.[20] Federal funding for the NEPA/PE for the Boston South Station HSIPR Expansion Project was awarded in the fall of 2010. As described in the application, the Boston South Station HSIPR Expansion Project would add operating capacity at this northern terminus of the Northeast Corridor (NEC). The South Station Expansion Project is needed because the terminal is currently operating at capacity and substantial future service growth is planned. Anticipated service increases include 50% more Amtrak Acela Express trains, as well as the Northeast Corridor (NEC) Inland Route intercity passenger rail connection between Boston, New York, and Washington, DC via Hartford, CT. The South Station Expansion Project also enables increased MBTA commuter rail service, as about 67% of its service connects to South Station. The South Station Expansion Project would include adding 7 new terminal tracks, for a total of 20 South Station platform tracks. New platforms would be appropriately sized for intercity operations and several existing platforms would be extended to accommodate longer intercity trains. The longer platforms add terminal capacity and simplify some

[19] According to CTPS, most commuter rail riders live within 6- to 8-miles of a commuter rail station. This distance is generally used for estimating ridership.
[20] MA-NEC-Boston South Station High Speed Intercity Passenger Rail (HSIPR) Expansion Project. MassDOT, August 6, 2010.

moves in and out of the terminal. Station approach interlockings would be reconfigured to significantly increase terminal throughput. Together these investments enable higher-speed operations, improve on-time performance for existing train services, and make possible the projected service growth. Other improvements include an expansion of passenger terminal and pedestrian circulation facilities, upgraded train control and communication systems, and construction of a relocated United States Postal Service (USPS) distribution facility.

As described in the application for federal funding for South Station Expansion, expansion of the South Station (which is a terminal station) and enhanced interlocking throughput have been determined to be the only feasible near term solution to add Boston Northeast Corridor and south side commuter rail capacity. The alternative of run through service (the North-South Rail Link) would require a capital investment many orders of magnitude greater than terminal expansion, and is not readily available. According to the application document, terminal capacity is demanded today, and will be essential to operate services planned for implementation by 2030. Therefore, the application has identified expansion of South Station as the only near term solution to add Northeast Corridor operating capacity to Boston.

Other studies have also highlighted the need for expansion of South Station as well. The Regional Transportation Plan (RTP)[21] specifically identifies the need to expand South Station. The MBTA Program for Mass Transportation (2009) identifies South Station as having reached its terminal capacity. The document goes on to identify track expansion as the proposed solution to terminal capacity at South Station. The NEC Transportation Plan--New York City to Boston (1994) proposed a NEC Main Line operating plan following electrification of the corridor. This plan assumed that capital improvements would enable 3 hour trips between New York and Boston by 2010 (as opposed to the existing 3.5-hour trip for Acela Express). It also assumed that capacity enhancements would be implemented, including an expanded South Station, to enable the proposed operation. Several of these capacity enhancements have yet to be implemented. A rail network simulation performed by MassDOT to support its application for expansion of South Station indicates that the existing South Station cannot reliably support projected 2030 Amtrak and MBTA rail operations. The Network Simulation Analysis included with the application indicates that the proposed expansion of South Station and associated improvements would establish an efficient and reliable terminal for the projected 2030 operations.

As described in the application for federal funding, the expansion of South Station includes the relocation of the current United States Postal Service (USPS) South Annex operation from 25 Dorchester Avenue to a new location near the South Boston harborfront. The current post office facility would then be razed and the new tracks would be constructed on the site. The existing USPS site is owned by the Postal Service. South Station and the right-of-way required for track modifications are owned by MBTA. The majority of the site for the new USPS facility is owned by the Port Authority of Massachusetts (MassPort) and the balance of the site is owned by the US Department of Defense. The right-of-way limits of the South Station Expansion project are South Station, Cove Interlocking on the NEC Main Line, and Broadway Interlocking on the Dorchester/Old Colony branches. Project layover sites will be determined through a pending Alternatives Analysis process, separate from but in support of the planned expansion project.

As described in the federal funding application, the increase in South Station capacity is needed for both existing and future operations of both Amtrak and MBTA. Expansion of South Station has independent

[21] Boston Metropolitan Planning Organization (MPO) Journey to 2030 Amendment (2009)

utility[22],[23] from the South Coast Rail Project because, while it would be required to accommodate any of the commuter rail alternatives of the South Coast Rail project by 2030, the need for expansion of South Station capacity exists without the South Coast Rail project and the expansion of South Station would be constructed absent the construction of other projects in the project area. The expansion of South Station will be subject to its own environmental review process, as part of the NEPA/PE for which federal funding was awarded. MassDOT is working with the United States Postal Service to acquire rights to a portion of their property immediately adjacent to South Station.

Midday Layover Facilities

A layover solution, which is a project element of the expansion of South Station, is a parallel effort to the station expansion. As stated in the funding application for South Station expansion, both the station expansion and layover solution are needed today and have independent utility. According to the federal funding application, the layover solution would proceed on a faster schedule than the terminal expansion and would be available before the terminal expansion is complete. The South Station HSIPR Expansion Project has been developed in conjunction with the Northeast Corridor Infrastructure Master Plan (NEC Master Plan, 2010).[24]

Existing layover capacity for South Station is already severely constrained and the need for layover facilities is an existing need (i.e. independent of the South Coast Rail project) that has been identified for several years, most recently in communication from MBTA25, in the Northeast Corridor Infrastructure Master Plan (NEC Master Plan, Amtrak, 2010) and in the application by MassDOT for federal funding of the Boston South Station HSIPR Expansion Project (MassDOT, August 6, 2010).

As described in the documents, the increase in layover capacity is needed for both existing and future operations and has independent utility[26] from both the proposed expansion of South Station and the South Coast Rail Project. Although it would benefit these projects, the need for expansion of layover capacity exists without these projects and it would be constructed absent the construction of other projects in the project area. The layover solution proposed in the Boston South Station HSIPR Expansion Project would provide additional layover capacity for both Amtrak intercity and MBTA commuter rail equipment beyond that currently available at the Southampton Street Yard and Readville facilities where both Amtrak and the MBTA are already at capacity. Readville is located approximately 8.4 track miles from South Station, which requires considerable non-revenue operations compared to other East Coast systems with typical 2-mile travel distances to layover yards. The South Station Expansion project is anticipated to provide layover for all trains in an area between 2 and 4 miles from South Station. According to the application for federal funding, candidate sites have been identified and the layover solution will be defined through a pending Alternatives Analysis. As stated in the application, the layover solution would advance on a faster track than the South Station Expansion and would be operational before the station expands.

[22] Army Corps of Engineers (http://www.nao.usace.army.mil/technical%20services/Regulatory%20branch/PN/08-RP_LOP_Final/08-RP-19%20Permit.pdf).
[23] Federal Transit Administration 23 C.F.R. Sec. 771.111(f).
[24] Northeast Corridor Master Plan Version 1.a. NEC Master Plan Working Group. May 2010. http://www.amtrak.com/servlet/ContentServer/Page/1241245669222/1237608345018
[25] Letter from MBTA to EOT. October 10, 2009.
[26] Army Corps of Engineers (http://www.nao.usace.army.mil/technical%20services/Regulatory%20branch/PN/08-RP_LOP_Final/08-RP-19%20Permit.pdf). Federal Transit Administration 23 C.F.R. Sec. 771.111(f).

A Layover Solution Memorandum is included as Appendix B to the Boston South Station HSIPR Expansion Project federal funding application. The determination of the layover solution will be subject to its own environmental review process.

Reconstruction of New Bedford Railroad Bridges

On February 17, 2010, the Commonwealth of Massachusetts was awarded a federal stimulus Transportation Investment Generating Economic Recovery (TIGER) Grant to fund reconstruction of structurally deficient rail bridges in New Bedford. The bridges, currently used by freight rail cars, are more than 100 years old and are located just north of the future Whale's Tooth Station on New Bedford's waterfront. While the South Coast Rail rail alternatives would utilize the reconstructed bridges, the reconstruction of the bridges has independent utility[27,28] from the South Coast Rail project, as the need for reconstructing the structurally deficient bridges exists without the South Coast Rail project and the bridges would be reconstructed absent the construction of other projects in the project area. The reconstruction of the bridges is underway.

No-Build Commuter Bus Service

The study area is served by three major private commuter bus companies: DATTCO to New Bedford, Peter Pan Bus Lines to Fall River, and Bloom Bus Lines to Taunton. Each provides daily transportation to and from Boston. These bus companies offer a fare structure that is competitive to commuter rail service. The three commuter bus routes travel through the downtown core of New Bedford, Taunton, and Fall River. The routes all board passengers in the downtown before traveling to other locations to pickup/drop-off passengers at external bus stops/park-and-ride lots and intermediate flag stops. The Fall River commuter bus runs express to Boston with no intermediate stops.

In addition to the private commuter bus service to Boston, two regional transit authorities (RTAs) provide transit service in the study corridor: SRTA operates in New Bedford and Fall River sub-region, and GATRA operates in the Taunton/Attleboro area sub-region. Each RTA shares terminal facilities with commuter bus companies. These authorities share infrastructure and terminals with the commuter bus carriers and provide passengers an intermodal link from other points within the local communities to the Boston commuter bus service.

South Coast Regional Bus Service

SRTA serves the communities of New Bedford, Fall River, and Somerset with fixed route and demand responsive services. SRTA operates 10 routes in the New Bedford area, 11 routes in the Fall River area, and one route between New Bedford and Fall River. SRTA has downtown terminal stations, both in Fall River and New Bedford, where the commuters could transfer directly to the commuter buses to Boston. New Bedford weekday service generally begins between 5:30-6:30 AM and ends roughly between 6:30-7:30 PM. Fall River weekday service begins between 6:00-7:00 AM and ends between 5:30-6:30 PM. SRTA operates on Saturday from 7:00 AM to 6:00 PM in New Bedford and from 6:30 AM to 7:00 PM in Fall River. There is no Sunday bus service in either New Bedford or Fall River.

[27] Army Corps of Engineers (http://www.nao.usace.army.mil/technical%20services/Regulatory%20branch/PN/08-RP_LOP_Final/08-RP-19%20Permit.pdf).

[28] Federal Transit Administration 23 C.F.R. Sec. 771.111(f).

GATRA primarily serves the communities of Attleboro and Taunton with fixed route bus service and demand responsive service. GATRA operates 14 fixed routes and two intercity routes. GATRA has a terminal station on Oak Street in Taunton where commuters could transfer directly to commuter buses to Boston. The various GATRA bus routes operate Monday through Friday beginning between 5:30-6:30 AM and ending between 6:00-7:00 PM. GATRA Saturday bus service begins at 9:00 AM and ends at 5:00 PM. There is no Sunday bus service.

New Bedford to Boston Bus Service

New Bedford to Boston commute originates in Fairhaven at the bus terminal and maintenance facility at 72 Sycamore Street. This service has three intermediate stops along the route to Boston: SRTA Terminal in downtown New Bedford, Mt. Pleasant Street park-and-ride in New Bedford, and Silver City Galleria park-and-ride in Taunton. The SRTA terminal in downtown New Bedford is the main station stop that provides service to the SRTA fixed route bus service and provides covered terminal area for loading and unloading passengers for SRTA and DATTCO buses. The terminal is located in Downtown New Bedford at the corner of Elm Street and Pleasant Street. There is covered parking above the terminal for approximately 80 cars, but is permit only and is at capacity. These spaces are primarily used by employees who work in the downtown.[29] Commuters to Boston use the Elm Street Garage nearby or travel north to the Mt. Pleasant Street park-and-ride for all-day parking. The commuter bus terminates and originates service from South Station Bus Terminal in Boston. Figure 1.4-2 depicts the New Bedford bus route to Boston.

There is a small terminal area at the Fairhaven location that DATTCO uses to provide bus storage, maintenance, office space, and a waiting area for up to two buses. There are 28 striped parking spaces in the surface lot adjacent to the bus waiting area for commuters. Additional passengers are also likely to be dropped-off/picked-up and walk or bike to the terminal from the local neighborhoods.

SRTA's FY 2009-2012 Transportation Improvement Program (TIP) includes funds for renovations to the terminals and garages.

New Bedford to Boston Bus Operations - The weekday schedule for the bus from New Bedford to Boston includes 11 trips inbound and 11 trips outbound. The weekday inbound morning commute operates five trips on half-hour headways from 4:50 AM to 6:50 AM and then 120-minute headways for the remaining inbound trips. The weekday outbound evening commute operates five trips on various headways beginning with a 45-minute headway at 4:00 PM, and then half-hour headways, followed by one 60-minute headway with the last peak trip leaving at 6:45 PM. One final outbound trip departs at 9:00 PM. Weekend service includes four trips inbound and four trips outbound stopping at the same stops served during weekday service. The inbound service begins at 6:50 AM and operates on four-hour headways until 6:50 PM. The outbound service begins at 9:00 AM and also operates on four hour headways until 9:00 PM.

Based on the schedule, travel times inbound range from 120 minutes in the peak period to 95 minutes in off peak periods. Travel times outbound range from 100 minutes during peak period to 85 minutes during the off peak period.

[29] Based on discussion with SRTA administration.

Fall River to Boston Bus Service

The Fall River commuter bus service to Boston is an express service from downtown Fall River at the corner of Third Street and Borden Street to South Station Bus Terminal in Boston. The service originates in Newport, Rhode Island and then travels to the temporary trailer bus terminal located on Borden Street in Fall River. This temporary terminal serves both SRTA and Peter Pan buses and provides for ticketing purchases within the trailer bus terminal building. A new bus terminal is planned near or at the location of the current terminal. Figure 1.4-2 depicts the Fall River bus route to Boston.

The SRTA FY 2009 TIP includes plans to replace the SRTA bus terminal in Fall River (razed for the construction of the Fall River Courthouse). SRTA also plans continual renovations to the terminals and garages listed in the fiscal year 2009-2012 TIP.

Fall River to Boston Bus Operations - The weekday schedule for the bus from Fall River to Boston is more limited than that of New Bedford, offering six trips inbound and six trips outbound. The weekday inbound morning commute operates three trips with the first departing at 6:00 AM and then the next on a 40-minute headway and the next on a 120-minute headway. The weekday outbound evening commute operates three trips on 60-minute headways beginning at 4:30 PM. Weekend service is the same schedule as weekday except the 6:00 AM and 6:40 AM buses are eliminated inbound and the 5:30 PM and 6:30 PM are eliminated outbound.

Based on the bus schedule, travel times for the Fall River bus route vary from 85 minutes during peak periods to 60 minutes during off -peak periods.

Taunton to Boston Bus Service

The Taunton to Boston commuter bus service originates in Taunton at the GATRA/Bloom bus terminal and maintenance facility on Oak Street. The service has two official stops along the route to Boston: Raynham/Taunton Greyhound Track park-and-ride lot on Route 138 in Raynham and Route 106 near Route 24 overpass park-and-ride lot in West Bridgewater. Other flag stops are offered at the Friendly's restaurant on Route 138 and at the corner of Route 138/Route 106 in Easton. If requested, the inbound trip will stop at the Westgate Mall in Brockton. Based on requests for stops, the outbound trip includes up to four stops at the Westgate Mall throughout the day as needed.

Taunton to Boston service differs from the Fall River and New Bedford services as it does not use South Station Bus Terminal. The Taunton service has street rights to drop-off / pick-up passengers on street at Park Square at 212 Stuart Street and near South Station at the corner of Lincoln Street /Kneeland Street inbound, and at the corner of Lincoln Street/Beach Street, outbound. Figure 1.4-2 depicts the Taunton bus route to Boston.

The Taunton bus terminal has recently been upgraded with a new paved parking lot, new lot striping, and new lighting. There was also a new pedestrian walkway added down the center of the lot to link to the Oak Street sidewalks and emphasize pedestrian activity and multi-modal shared space at the terminal. The terminal parking lot has a capacity of 158 parking spaces, of which five are designated as handicapped parking.

GATRA has plans for terminal improvements identified in the fiscal year 2009-2012 TIP. The TIP does not indicate the nature or extent of the planned terminal improvements.

Taunton to Boston Bus Operations - The weekday schedule for the bus from Taunton to Boston provides 15 trips inbound and 14 trips outbound to Boston. The weekday inbound morning commute operates seven trips from 5:30 AM to 9:00 AM. The first five trips are on half-hour headways and the final two on 45-minute headways. The weekday outbound evening commute operates six trips from 3:35 PM to 7:05 PM. on various headways beginning with 45-minute headways, a 25-minute headway during peak period, back to a 45-minute headway and ending outbound service with 60-minute headways to the final bus at 7:05 PM.

Weekend commuter bus service is limited to two trips inbound and two trips outbound. During weekend service there is a 9:00 AM and 3:45 PM inbound trip and 9:50 AM and 4:55 PM outbound trip. Based on the published schedule, travel times inbound range from 90 minutes during the peak periods to 60 minutes during the off- peak periods. Travel times outbound are consistent with times approximately 70 minutes throughout the day.

Commuter Park-and-Ride Lots for Bus Service to Boston

Park-and-ride lots are located throughout the southeastern Massachusetts sub-region from Wareham to Attleboro. This study is primarily interested in the commute to Boston from the cities of Fall River, New Bedford, and Taunton and therefore does not included park-and-ride facilities that primarily serve the Providence, Rhode Island commute. The following are the primary park-and-ride locations for buses to Boston, based on the MassHighway database and research of the study area:

- Route 106 near Route 24 – West Bridgewater, MA
- Route 24 Exit 12 – Silver City Galleria- Taunton, MA
- Oak Street Bloom/GATRA Terminal – Taunton, MA
- I-495 Exit 8 – Route 138/Greyhound Track – Raynham, MA
- Mt. Pleasant Street – New Bedford, MA
- 72 Sycamore Street – Fairhaven, MA

Figure 1.4-2 depicts the major park-and-ride locations in southeastern Massachusetts. The following section describes each park-and-ride location and existing capacity for each lot.

Route 106 near Route 24 – West Bridgewater Park-and-Ride Lot

This parking lot is located on the southwest corner of the Route 24/Route 106 interchange in West Bridgewater. The lot has a capacity of 140 vehicles and is in high demand during all times of the year. During recent parking surveys at this lot, many vehicles are illegally parked as overflow parking exceeding capacity between five to 15 vehicles. Commuters can park here free and take the Bloom Bus to Boston. Bloom Bus drops-off/picks-up passengers at the corner of Pleasant Street and the southwest corner of the park-and-ride lot. The bus cannot circulate through the narrow parking lot so it stops just outside the lot at this location. Bus shelters are not provided at this lot. There are MassDOT plans to expand the park-and-ride lot by 40 parking spaces within the next five years.

Route 24 Exit 12 – Silver City Galleria – Taunton Park-and-Ride Lot

This parking lot is located within the main Silver City Galleria mall parking area as a separate small parking lot. The parking lot is designed as several rows of parking with a parking capacity for 187 vehicles that is near capacity in summer months based on field observations conducted in summer 2008.

The New Bedford bus serves this parking lot for the commute to Boston. Commuters can park here for free and take the New Bedford bus to Boston. The parking lot is designed so buses can circulate the parking lot to pickup/ drop-off passengers. One small bus shelter is provided at the rear of the lot.

During a survey completed in October 2008 another new park-and-ride area was identified near the existing lot. This 24-space parking lot is located within the main mall parking area across the street from the main park-and-ride lot. It was signed and striped with red paint for park-and-ride use and was observed at full capacity during the survey.

Oak Street Bloom/GATRA Bus Terminal – Taunton Park-and-Ride Lot

This parking lot is attached to the Taunton bus terminal located on Oak Street in downtown Taunton, MA. The lot has a capacity of 158 parking spaces including five designated for handicapped commuters. Commuters can park here free and take the Taunton bus to Boston. Based on historic parking utilization counts, the lot is underutilized with excess capacity during the typical weekday. Commuters board the buses via the rear of the terminal building at the bus bay. The terminal provides a ticket booth, café, and waiting area for passengers. Retail space is available for additional businesses.

Route 138 – Raynham/Taunton Greyhound Track – Raynham Park-and-Ride Lot

This parking lot is a small section of the overall Greyhound Track parking lot that has been designated for park-and-ride usage. There is no parking lot striping delineating the number of parking spaces. Based on data provided in the 2007 Southeastern Regional Planning Regional Transportation Plan, the capacity of this lot is 150 spaces. In June 2008 this lot was underutilized and partially being used for storage of telephone poles so the actual capacity may be less. There is one glass enclosed bus shelter at this park-and-ride.

Mount Pleasant Street – New Bedford Park-and-Ride Lot

This parking lot is a large surface lot with several rows of parking located off Mt. Pleasant Street, north of King's Highway in New Bedford. Based on a field visit to the site the lot has a capacity of 201 spaces, with five designated as handicapped parking. The lot is approaching capacity although there were a number of spaces available to the rear of the lot. The buses can access the parking lot easily and pick-up passengers at the two internal bus shelters. A field visit revealed illegal dumping occurring at the back of the site and drainage issues with large standing water occupying five parking spaces in the southeast corner of the parking lot. Due to the site design and depth of the parking lot from the street, there is concern about safety and security and a lack of adequate lighting.

72 Sycamore Street, DATTCO Bus terminal – Fairhaven Park-and-Ride Lot

This parking lot is a small surface lot adjacent to the terminal. The lot has a capacity of 28 vehicles. Based on MassHighway data, this location has up to 80 spaces available. However, based on discussions with DATTCO these additional spaces are located in the fenced area located adjacent to the main terminal building and are no longer available due to safety and security concerns and should not be included in the total available parking. Based on recent parking surveys, there were available spaces to park in this small lot. Bus shelters are not provided at this lot but there is a covered overhang attached to the terminal that is used as a waiting area.

Potential Service Enhancements for the No-Build (Enhanced Bus) Alternative

The No-Build (Enhanced Bus) Alternative enhancements include bus schedule enhancements, new and expanded park-and-ride facilities, transportation demand management, and transportation policy enhancements for commuter bus. In addition to these enhancements and incentives, other means would be considered to enable the private commuter bus service operators to acquire a new fleet of fuel-efficient and clean emission buses. Ideally, these buses would provide rider comfort and amenities comparable to commuter rail service.

Bus Schedule Enhancements

Bus service plan and schedule enhancements are an important option to improve commuter bus service to the South Central study area. The current bus schedules from Taunton and New Bedford offer good service for the most part with reasonable headways based on their current schedules. The Fall River service requires schedule improvements to provide more inbound and outbound options that would offer shorter headways and enhanced commuter flexibility on arrival and departure times. The following sections summarize possible enhancements to the existing services.

Fall River Bus Service

The Fall River commuter bus service for the Boston commute is limited with six inbound and six outbound trips. To offer better service and shorter headways, it is recommended that half hour headways be added to the schedule to enhance ridership during inbound and outbound peak periods to offer more flexible service for the Fall River commuter. During travel time surveys some Fall River commuters using Taunton bus service (Bloom) indicated the infrequent service is an issue and reason they commuted via Taunton bus service. The current schedule does not provide Fall River commuters with a flexible schedule and discourages ridership.

A 30-minute headway service in the peak periods would improve Fall River commuter options and provide for a more competitive balance between bus service and commuter rail and would closely match the existing bus schedules from New Bedford and the Taunton.

New Bedford Bus Service

The New Bedford commuter bus service uses five buses constantly running throughout the day to cover the 11 inbound trips and 11 outbound trips to Boston South Station Bus Terminal.

The service for the Boston commute offers a schedule similar to the Taunton service plan, although less extensive. There are half-hour headways provided for peak period commuters in the peak period direction. It is recommended that half-hour bus headways begin at 4:00 PM and continue to 6:00 PM. This would require a minor adjustment to the existing schedule with an additional bus required for the evening commute. This schedule would offer more frequent service and shorter headways and provide more flexible service for the New Bedford commuter.

Taunton Bus Service

The Taunton commuter bus service is extensive with 15 inbound trips and 14 outbound trips daily. This schedule provides half-hour headways during the morning and evening peak period commuter times and is adequate for current demands. The addition of more buses for 15 minute headways during the peak period is not warranted at this time based on current ridership demands.

Park-and-Ride Lot Expansion/Bus Stations

Based on parking utilization counts completed at the Silver City Galleria park-and-ride lot in Taunton, in summer 2008, the existing lot is at capacity. Additional parking was observed to be added during an October 2008 parking survey. This parking was also filled to capacity. There are existing paved parking lots nearby that appear to be vacant. These lots could be explored for a potential new expanded park-and-ride/bus station, or other sites could be identified in the immediate area around the Silver City Galleria and the Route 24/Route 140 highway interchange. A new facility at or near the mall could easily integrate local fixed route GATRA bus service which already serves the mall throughout the day. This linkage to local fixed route bus service could also encourage ridership on commuter buses.

Based on a review of available information and parking occupancy studies, a bus station/park-and-ride facility in the Bridgewater/West Bridgewater area, near the existing Route 106/Route 24 park-and-ride lot would be readily utilized. A bus station and park-and-ride could be combined into one potential intermodal station near the existing Route 106/Route 24 park-and-ride lot. Both the existing park-and-ride lots at Route 106 (West Bridgewater) and Route 104 (Bridgewater) are operating at capacity. These two lots also do not accommodate buses entering and exiting the lots to pickup and drop-off commuters. Although plans are underway to provide 40 more spaces at the West Bridgewater park-and-ride, a new park-and-ride/bus station could provide full bus access /egress and larger park-and-ride facilities, which might capture additional riders for all three commuter bus services that travel by this location via Route 24.

Based on review of available parking utilization studies for the Mt. Pleasant park-and-ride lot in New Bedford, this lot is operating at 80 percent of capacity. If future ridership projections for the area indicate a significant increase in ridership for this region, an expanded park-and-ride/bus station may have merit in the existing lot, on adjacent land, or at another suitable location in the general area.

Joint Ticketing System Bus/Rail

The commuter rail monthly fare provides a free ride on the MBTA bus or rapid transit for those commuters that purchase monthly passes. The bus companies do not offer this significant benefit, making bus travel less attractive to commuters. This service is a significant advantage to commuter rail versus private commuter bus.

SRPEDD and the commuter bus operators have advocated for transportation policymakers to address the transit fare inequity between modes with a joint ticketing system allowing the bus operators to offer the same pass as commuter rail with free access to MBTA bus and rapid transit. A joint ticket for commuter bus would enhance bus service to the region.

3.2.5.2 RAIL BUILD ALTERNATIVES

The following is a description of the major components of the Attleboro, Stoughton and Whittenton Commuter Rail Alternatives. The major components of these alternatives include:

- Rail Operations
- Track Infrastructure
- Grade Crossings

- Bridges
- Signals
- Communications
- Rolling Stock
- Electrification
- Ridership
- Stations
- Layover Facilities
- Construction Methods
- Cost

These aspects are discussed below for each alternative or for all rail alternatives where these features are shared or identical.

Rail Operations

The following sections describe the Northeast Corridor (NEC), Stoughton Line, Fall River Secondary, New Bedford Main Line, and Attleboro Secondary existing operations, the proposed operating plans for the South Coast Rail alternatives, and the stations stopping patterns.

Existing Rail Operations

The NEC, Stoughton Line, Fall River Secondary, New Bedford Main Line, and Attleboro Secondary all currently provide some element of freight or passenger service. The following sections describe the existing passenger and freight operations along these alignments. As discussed in the following sections, Figure 1.2-1 shows the existing rail transportation system and Figure 3.2-6 shows the ownership of the rail segments.

Northeast Corridor Existing Operations

The MBTA, Amtrak and CSX operate over the NEC within the state of Massachusetts. The MBTA is the owner of the line, but it is dispatched by Amtrak from their South Station Centralized Electric and Traffic Control (CTEC) facility. The CTEC facility exchanges data between Metro North Railroad Operations Control Center, the MBTA Operations Control Center and Amtrak's Penn Station Control facility.

The NEC between Providence and Readville is predominantly a two track electrified (25 kV 60 Hz) Class 8 railroad that is authorized at speeds up to 150 mph where civil infrastructure permits. Currently, only Amtrak reaches speeds above 79 mph on this section of the NEC. The MBTA commuter rail currently operates using diesel locomotives (F40's) with speeds up to 79 mph. CSX operates freight service predominately south of Mansfield, though they also provide service on the Stoughton Line.

The NEC Infrastructure Master Plan and other documents such as the application for federal funding for Expansion of Boston South Station have included operational studies regarding the type, amount and frequency of service that can be provided in this section of the NEC between Providence and Boston. These studies indicate that this is a very congested portion of the NEC and that the addition of high-speed service has reduced the reserve capacity on the NEC. This reduction in capacity is amplified by the substantial discrepancy in operating speeds between the different types of service on the corridor.

The MBTA operates five commuter lines on the NEC between South Station and the state line. Each line branches off the corridor with the exception of the Providence service which travels the entire NEC in the state of Massachusetts. The MBTA uses diesel locomotives with up to eight bi-level or single level coaches. The MBTA's maximum authorized speed on the NEC is 79 mph and 70 mph off of the NEC where civil conditions permit. The five branch lines include the Worcester Line, Needham Line, Franklin Line, Stoughton Line, and Providence Line. The existing (2009) service for these lines is summarized in the following Table 3.2-9.

Table 3.2-9 Existing Commuter Rail Operations

Passenger Service	AM Peak	PM Peak	Off Peak	Total Trips
Worcester	6	7	15	20
Needham	5	5	11	16
Franklin	6	6	12	24
Stoughton	3	5	9	17
Providence	5	3	9	17
Amtrak	1	4	13	18

Note: Short turn trains counted

Fall River Secondary, New Bedford Main Line, Attleboro Secondary Existing Operations

CSX transferred ownership of the Fall River Secondary and New Bedford Main Line to MassDOT in June 2010. CSX simultaneously transferred the freight operating easement along these corridors to Mass Coastal. Currently, the existing freight service for the Fall River Secondary and New Bedford Main Line is therefore owned by the State of Massachusetts and operated by Mass Coastal, while the Attleboro Secondary is owned by the State of Massachusetts and operated by CSX. This freight service operates at maximum authorized speed of 40 mph but with multiple speed restrictions along the lines. The line operates under Dark Territory Control (no vital wayside signaling system).

Mass Coastal serves both the New Bedford Main Line and Fall River Secondary. One train per weekday services the New Bedford and Fall River lines. New Bedford is serviced two days per week (Tuesday and Thursday), while Fall River is scheduled for the other three weekdays. It should be noted that this schedule can change in response to customer demands.

Proposed Rail Operations

The proposed commuter rail alternatives have similar operating plans. The plans were developed to meet the current minimum of the MBTA Service Delivery Policy for commuter rail. The infrastructure proposed for each alternative has been designed to support these levels of operations.

The commuter rail alternatives propose three peak period trains to each of the terminal stations of New Bedford and Fall River with a fourth train operating on the shoulder near the peak rush hour periods. This translates to approximately forty-minute service on both the Fall River Secondary and the New Bedford Main Line and a twenty-minute headway on the trunk (shared) portion of the route north of Myricks Junction.

During the off-peak periods six additional trains would operate on a three-hour frequency from the terminal stations and ninety minutes on the trunk portion. This translates to nine round trip trains per weekday operations from each terminal station with one additional round trip from East Taunton for a total of 38 weekday trains per day.

Stations and Stopping Patterns

Each commuter rail alternative would use the same station stops south of Taunton Depot. The alternatives utilize different rights-of-way once they extend north of Weir Junction in Taunton. Table 3.2-10 summarizes the proposed station stopping pattern for each of the alternatives.

The Stoughton and Whittenton alternatives have more station stops largely because the Stoughton and Whittenton alternatives are extensions of existing commuter rail service where established stopping patterns need to be maintained. There would be the possibility of creating a “skip stop” (not every train making every stop) and/or “zone express” (local to a point then express to Boston) operations plan in the future.

The Attleboro Alternative would be a new commuter rail service without established stopping patterns. Under this alternative, SCR trains would only stop at major stations along the existing NEC to not further congest the corridor.

Each commuter rail alternative has two overall run times established by the Train Performance Calculator (TPC)[30], one for electric locomotives and one diesel locomotives. The TPC uses track and system infrastructure to simulate one train operating over the line. TPC times are under “perfect” conditions, which never happen, so TPC times are shown for comparison purposes only. Under the electric variations of the alternatives, South Coast Rail project trains can operate at a Maximum Authorized Speed (MAS) of 100 mph where the civil infrastructure can support it. For the diesel alternatives, the MBTA trains are restricted to MAS of 70 mph on the branch portion of the line and 79 mph on the Northeast Corridor where the civil infrastructure can support it. Table 3.2-11 summarizes the total trip time from each terminal station (New Bedford and Fall River) to South Station based on the station stopping pattern in Table 3.2-10.

Feeder Bus Service to Train Stations

The feeder bus plan for the South Coast Rail project is envisioned by MassDOT to connect the urbanized communities in the study area to the South Coast stations. Feeder Bus would provide an alternative to driving to stations and would support development in the project area. The Feeder Bus network is envisioned to provide frequent, convenient service connections with trains.

Two regional transit authorities currently provide local bus service to the region: Southeastern Regional Transit Authority (SRTA) and Greater Attleboro Taunton Regional Transit Authority (GATRA). Current bus operators would provide enhanced Feeder Bus service to the proposed stations for the selected build alternative.

The following guidelines are recommended by MassDOT for the feeder bus system:

- Since the commuter rail system would primarily serve work commuters traveling to downtown Boston, priority would be given to improving access for residents to suburban stations’
- Feeder bus service would provide a direct connection to significant nearby destinations or origins including downtowns, universities, government centers, hospitals and higher density residential developments;

[30] Technical Memorandum on Network Simulation Analysis of Proposed 2030 Amtrak/MBTA Operations

Table 3.2-10 Train Station Stopping Pattern Table for All Rail Alternatives

Attleboro Alternatives		Stoughton Alternatives		Whittenton Alternatives	
New Bedford Trains	**Fall River Trains**	**New Bedford Trains**	**Fall River Trains**	**New Bedford Trains**	**Fall River Trains**
Whale's Tooth	Fall River Depot	Whale's Tooth	Fall River Depot	Whale's Tooth	Fall River Depot
King's Highway	Freetown	King's Highway	Freetown	King's Highway	Freetown
Taunton Depot	Taunton Depot	Taunton Depot	Taunton Depot	Taunton Depot	Taunton Depot
Downtown Taunton	Downtown Taunton	Taunton	Taunton	Downtown Taunton	Downtown Taunton
Barrowsville	Barrowsville	Raynham Place	Raynham Place	Raynham Place	Raynham Place
Mansfield	Mansfield	Easton Village	Easton Village	Easton Village	Easton Village
--	--	North Easton	North Easton	North Easton	North Easton
--	--	Stoughton	Stoughton	Stoughton	Stoughton
--	--	Canton Center	Canton Center	Canton Center	Canton Center
--	--	Canton Jct	Canton Jct	Canton Jct	Canton Jct
Route 128	Route 128	Route 128	Route 128	Route 128	Route 128
		Hyde Park	Hyde Park	Hyde Park	Hyde Park
		Ruggles		Ruggles	
Back Bay	Back Bay	Back Bay	Back Bay	Back Bay	Back Bay
South Station	South Station	South Station	South Station	South Station	South Station
9 Stops	9 Stops	15 Stops	14 Stops	15 Stops	14 Stops

Table 3.2-11 Train Trip Duration (hr:min) for all Rail Alternatives

	Attleboro Alternatives		Stoughton Alternatives		Whittenton Alternatives	
Motive Power	**New Bedford Trains**	**Fall River Trains**	**New Bedford Trains**	**Fall River Trains**	**New Bedford Trains**	**Fall River Trains**
Diesel	1:24	1:22	1:25	1:23	1:36	1:34
Electric	1:15	1:12	1:16	1:13	1:27	1:25

- All public transportation systems would reflect and incorporate the South Coast Rail service. This would include private shuttles. Where a new private shuttle service could prove beneficial, the feeder bus plan would identify and characterize that opportunity;
- Feeder bus plan would avoid duplications of service, minimize the need for patrons to transfer, and minimize total travel times for patrons;
- Preference would be given to rerouting existing services over providing new services where possible. Where rerouting would significantly inconvenience existing transit riders, including adding more than five minutes to their trips, alternatives to reduce or eliminate the inconveniences would be considered. This could include addition of more service to an existing route with the new service using buses designated as feeder bus service that would access the SCR station;
- Provide safe and convenient pedestrian connections to nearby bus stops. Plan for pedestrian connections to be ADA compliant and where such does not appear feasible, plan for an acceptable ADA compliant alternative. Consider patron safety of any new pedestrian connections as well as the gradients involved. Publicly visible pedestrian routes are preferred;

- Designated stopping locations would be provided for feeder buses within South Coast Rail stations; and
- Feeder bus frequencies would meet or exceed scheduled rail service frequencies.

Train Layover Facility Operations

The following sections describe operational aspects of midday and overnight train layover facilities associated with the rail alternatives. A more detailed discussion of train layover facilities is presented on page 92.

Midday Train Layover Facilities in the Boston Area

The midday train layover facilities are being planned in Boston as part of the South Station Expansion Project. As noted earlier in this chapter, the midday layover facility is necessary for future commuter rail operations on existing lines, Amtrak's future operations and other planned expansion projects, including South Coast Rail. The South Coast Rail project would require midday storage in the Boston area for approximately four additional train "consists"[31] for the Stoughton Alternative and eight additional consists for the Attleboro Alternative. This storage capacity will enable an adequate number of trains to be available at South Station to travel from Boston to the South Coast area in the evening peak. For the purpose of the operations simulations, all SCR trains enter and leave the system over the Fort Point Channel Bridge. Computer simulations were conducted to identify impacts to the operations of the Northeast Corridor and South Station.

Overnight Train Layover Facilities in New Bedford and Fall River

All rail alternatives would require overnight layover facilities at the terminal locations along the Fall River Secondary and New Bedford Main Line, so that trains are available for the morning commute from the South Coast region to Boston. The preferred locations for these facilities are near the terminal stations to minimize non-revenue movements. The two layover facility alternatives for the New Bedford terminal are located adjacent to the Whale's Tooth terminal station (Wamsutta Street) and at MP (Mile Post) 51.5 (Church Street) approximately 3 miles north of the Whale's Tooth terminal station. The three Fall River layover facility alternatives are located north of the terminal Fall River Station at MP 47.1 (ISP Site) and at MP 49.8 (Weaver's Cove East and Weaver's Cove West). For information on the analysis that led to the identification of the potential overnight layover facility locations, refer to Appendix 3.2-E.

New Bedford Main Line Train Layover Facility Site Options

Two alternative site options are being considered for the New Bedford Main Line layover facility: the Wamsutta Street and Church Street. The following sections describe each option in more detail.

Wamsutta Street Train Layover Facility Option- The proposed Wamsutta Street Layover site is located north of the Whale's Tooth terminal station (Figure 3.2-7). It is designed to store six train consists. This site is stub ended with rail access into and out of the facility only from the south. Train movements into and out of the site would need to be made from south of the terminal station. Trains either completing or initiating revenue runs would need to travel approximately three hundred feet south to clear the Whale's Tooth station, change ends (engineer walks through train to operate from other end), perform the required brake tests, and then proceed north into the layover facility. It is estimated that this

[31] A train "consist" is a set of cars that make up a train.

movement would consume approximately ten to fifteen minutes, but would not reduce main line capacity.

Church Street Train Layover Facility Option - The Church Street Site would result in three non-revenue miles per movement from the Whale's Tooth terminal station (Figure 3.2-8). The site is stub ended and can store six consists. The site is north of the terminal station and provides rail access only from the south. Whether the train is an outbound train from South Station or an inbound train coming from the layover facility to begin revenue service, the operations would be the same between Whale's Tooth Station and the layover facility. Trains would enter the Whale's Tooth Station from the north to the platform track where the engineer would change ends on the platform. The train would then proceed northward either to enter the layover facility or continue revenue service into Boston. During PM peak periods this could present a problem should trains arrive out of sequence. Trains heading south to the Whale's Tooth Station may need to wait on the double track section (1 mile north of the station) to wait for the train leaving the station heading to the layover facility.

Fall River Secondary Train Layover Facility Site Options

Three alternative site options are being considered for the Fall River Secondary layover facility: the ISP Site, Weaver's Cove East, and Weaver's Cove West.

The three alternative layover sites would operate in the same manner, with the only difference being in the amount of non-revenue miles. The ISP Site would result in six non-revenue miles from the terminal station and the Weaver's Cove sites would result in three non-revenue miles. All sites are stub ended and equivalent in design in that they contain room to store six consists. Each site is north of the terminal station and provides rail access only from the south (Figures 3.2-9 through 3.2-11). Whether a train is outbound from South Station or inbound from the layover facility to begin revenue service, the operations would be the same between Fall River Depot and the layover facility. Trains would enter Fall River Depot from the north to the platform track (westerly track only) where the engineer would change ends on the platform. The train would then proceed northward either to enter the layover facility or continue revenue service into Boston.

Effects on Freight Operations

The South Coast Rail alternatives proposed commuter rail service would not negatively impact existing freight operations. Planned infrastructure improvements have been identified to support the current levels (with some modest expansion identified by existing freight operators) of freight in a mixed operations corridor.

Freight service on alignments of rail alternatives that would include new track infrastructure or abandoned right-of-way, including Stoughton (beyond existing Stoughton station), Attleboro Bypass and Whittenton alternatives, would be restricted to standard freight size and weight, and would not support high-and-wide or double-stack operations. The Attleboro Alternatives would be designed to support high–and-wide freight operations and would not impose any additional restrictions that are not currently in place on the CSX freight operations for the Attleboro Secondary.

Fare Collection

Fare collection for the commuter rail alternatives would be the same as the existing MBTA commuter rail lines. Fares would be collected on board the trains by conductors or purchased from MBTA-contracted vendors at specific station locations. Passengers would have the option to purchase individual tickets on board the trains or purchase multiple ride or monthly passes from the MBTA or retail sites.

Track Infrastructure

All rail alternatives require reconstructing existing active tracks and constructing new tracks either on abandoned or new rights-of-way. The Attleboro Alternative requires a new third track along the existing two-track NEC. The new track infrastructure would consist of new 132 RE rail, concrete ties, new stone ballast, subballast and other track material. The horizontal and vertical geometry for the new track has been designed to conform to the applicable design speed for the diesel and electric alternatives in accordance with the MBTA commuter rail design standards and American Railway Engineering and Maintenance-of-Way Association design standards. The alignments have also been designed to minimize impacts to adjacent environmental resources and private properties. The proposed track typical sections are shown in Figures 3.2-1 through 3.2-4.
The following is a description of the track infrastructure required for each commuter rail alternative.

Track Infrastructure - Common to All Rail Alternatives

The New Bedford Main Line from Weir Junction in Taunton to the Whale’s Tooth terminal station and the Fall River Secondary from Myricks Junction to Battleship Cove Station are segments of track common to all the commuter rail alternatives. The alignments north of Weir Junction vary by commuter rail alternative. The proposed track alignments are the same for both the electric and diesel alternatives. The following is a description of the track infrastructure for the rail segments common to all rail alternatives.

New Bedford Main Line Track Infrastructure

The approximately 19-mile existing track along the New Bedford Main Line would be upgraded and maintained to FRA Class 5 for the diesel options and Class 7 for the electric options. The line would be double-track from Weir Junction to Myricks Junction, with a third track for freight movements near East Taunton Station. A short segment of the line would be double-track south of Myricks Junction, 0.8 miles. The remainder of the line would be single-track, with the exception of 1.8-mile double-track section in Freetown and a 2.7-mile section in New Bedford. These sidings are not required by the operations analysis, but are desirable for operations stability and to allow flexibility between commuter and freight operations.

Fall River Secondary Track Infrastructure

The approximately 12-mile existing track along the Fall River Secondary would be upgraded and maintained to FRA Class 5 for the diesel options and Class 7 for the electric options. The majority of this line would be single-track with a 0.7-mile double-track segment at Myricks Junction. Two double-track sections are also proposed in Freetown and Fall River, 0.6 and 0.5 miles long, respectively, to allow flexibility between commuter and freight operations. Near Myricks Junction, several public and private grade crossings would be closed to improve safety.

Track Infrastructure – Attleboro Alternative

In addition to the New Bedford Main Line and Fall River Secondary improvements common to all the commuter rail alternatives, the Attleboro Alternative requires track improvements and new track on the NEC, the new Attleboro Bypass, and Attleboro Secondary. Table 3.2-12 summarizes the track infrastructure along the Attleboro Alternative. The total distance from the Whale's Tooth Station in New Bedford to South Station in Boston is 60.4 miles and 57.9 from the Fall River Station to South Station.

Table 3.2-12 Track Infrastructure – Attleboro Alternatives

Track Segment	Single Track	Double Track	Triple Track	Total (miles)
Northeast Corridor	N/A	-	18.7	18.7
Attleboro Bypass	-	2.8	-	2.8
Attleboro Secondary	9.0	0.7	-	9.7
Fall River Secondary	10.0	1.8	-	11.8
New Bedford Main Line	8.8	9.4	0.7	18.9
TOTAL (miles)	**27.8**	**14.7**	**19.4**	**61.9**

Northeast Corridor (NEC) Track Infrastructure

The Attleboro Alternative depends on the ability to construct a third track on the NEC to support the increased train volumes which would result from the new commuter rail service to Fall River and New Bedford. Without a third track, according to the South Coast Rail 2030 Operating Plan[32], this alternative would be infeasible. The third track is required from the Readville Interlocking in the Readville section of Boston to the proposed Attleboro Bypass in Attleboro, a distance of 18.7 miles. Between the Transfer Interlocking and a point approximately 1 mile north of Sharon Station (approximately 7.6 miles), the proposed third track would be constructed on the west side adjacent to the existing Track 1. Between the point approximately 1 mile north of Sharon Station and the Attleboro Bypass connection (11.1 miles) the proposed third track would be constructed on the east side adjacent to track 2.

Constructing a new third track requires earthworks to prepare the new track bed, installing a new three-track overhead contact system, reconstructing three existing commuter rail stations (Canton Junction, Sharon, and Mansfield) and reconstructing fifteen railroad and highway bridges plus a new bridge parallel to the Canton Viaduct, a historic structure that is too narrow for three tracks. Only minor modifications are anticipated for the Route 128 Station since provisions were made for a third track when the station was reconstructed. Construction activities for the new third track must be phased to minimize impacts to the existing Amtrak, MBTA and CSX operations on the NEC. Additional information on stations, bridges, OCS and construction are provided in more detail in sections to follow. Figure 3.2-4 shows a typical section for the addition of the third track. Figures 3.2-12 through 3.2-14 illustrate the construction challenges at the Canton Viaduct and at the Mansfield station.

Attleboro Bypass Track Infrastructure

A new 2.8-mile long double-track line would be constructed and maintained to FRA Class 5 for diesel or FRA Class 7 for electric. This bypass is necessary for efficient connection from the NEC to the Attleboro

[32] Executive Office of Transportation and Public Works, *Capacity Utilization Analysis Technical Memorandum*, November 17, 2008

Secondary so trains can access the corridor at speed. The existing Attleboro Secondary connection to the NEC requires trains to make a reverse move onto the corridor to go north. This new connection from the NEC to the existing Attleboro Secondary would be located adjacent to the National Grid right-of-way and would cross several private properties. Figure 3.2-15 shows the alignment of the Attleboro Bypass.

Attleboro Secondary Track Infrastructure

Existing track would be upgraded and maintained to FRA Class 5 for diesel or FRA Class 7 for electric. The line would be single-track between the Attleboro Bypass and Weir Junction in Taunton, with a 0.7-mile double track section in Taunton. The last 0.3 miles approaching Weir Junction would be double-track, with the second track reserved for freight operations.

Track Infrastructure – Stoughton Alternative

The Stoughton Alternative would provide train service from South Station to Fall River and to New Bedford by extending the existing Stoughton Line service south along abandoned right-of-way and reconstructing an existing freight line in Taunton to Weir Junction. This new and reconstructed track infrastructure is in addition to the New Bedford Main Line and Fall River Secondary improvements common to all the commuter rail alternatives. Table 3.2-13 summarizes the track infrastructure along the Stoughton Alternative. The New Bedford route would be 54.9 miles long and the Fall River route would be 52.4 miles long.

Table 3.2-13 Track Infrastructure – Stoughton Alternatives

Track Segment	Single Track	Double Track	Triple Track	Total (miles)
Stoughton Line	-	3.8	-	3.8
Stoughton Line Extension	11.4	5.3	-	16.7
Fall River Secondary	10.0	1.8	-	11.8
New Bedford Main Line	8.8	9.4	0.7	18.9
TOTAL (miles)	**30.2**	**20.3**	**0.7**	**51.2**

Northeast Corridor Track Infrastructure

This alternative requires no track improvements on the NEC. The Stoughton Alternative would extend existing Stoughton commuter rail service to provide service to the South Coast region. Because the alternative would extend service rather than add new service, a third track would not be required on the NEC.

Stoughton Line Track Infrastructure

The existing single track commuter rail line would be upgraded and maintained to FRA Class 5 for diesel or FRA Class 7 for electric. A new second track would be constructed from Canton Junction to the existing Stoughton Station, where existing passenger service ends. A new double track would extend south of Stoughton Station to the proposed North Easton Station. The remainder of the line south to Weir Junction would be single- track, with a 2.2-mile long double-track section in Raynham, and a 0.6-mile long double-track section in Taunton. Approaching Weir Junction, additional tracks would be provided for freight use only.

A frontage road would be constructed in Stoughton to eliminate grade crossings, and a new grade separation is proposed at Route 138 in Raynham. A trestle section is proposed in Easton and Raynham to minimize environmental impacts to the Hockomock Swamp Area of Critical Environmental Concern.

Track Infrastructure – Whittenton Alternative

The route for the Whittenton Alternative is similar to the Stoughton Alternative except in Raynham and Taunton. This alternative would extend through the abandoned Stoughton Line, as previously described, and connect to the abandoned Whittenton Branch. The Whittenton Branch would extend south and west to the Attleboro Secondary. Along the Attleboro Secondary, the alternative would extend to Weir Junction in Taunton. In addition to the New Bedford Main Line and Fall River Secondary track improvements common to all the commuter rail alternatives, track infrastructure improvements would include 3.5 miles of new single-track on the Whittenton Branch and 1.4 miles of single-track reconstruction on the Attleboro Secondary with a siding. West of Weir Junction, 0.3 miles of double-track on the Attleboro Secondary would be provided, with the second track reserved for freight operations. Improvements on the Stoughton Line between Canton Junction and Route 138 in Raynham would be the same as the Stoughton Alternative. Table 3.2-14 summarizes the track infrastructure along the Whittenton Alternative. The New Bedford route would be 56.5 miles long and the Fall River route would be 54.0 miles long.

Table 3.2-14 Track Infrastructure – Whittenton Alternatives

Track Segment	Single Track	Double Track	Triple Track	Total (miles)
Stoughton Line	-	3.8	-	3.8
Stoughton Line Extension	7.7	4.7	-	12.4
Whittenton Branch	3.5	-	-	3.5
Attleboro Secondary	1.4	1.0	-	2.4
Fall River Secondary	10.0	1.8	-	11.8
New Bedford Main Line	8.8	9.4	0.7	18.9
TOTAL (miles)	**31.4**	**20.7**	**0.7**	**52.8**

Grade Crossings

The majority of existing public grade crossings on the active railroad rights-of-way have automatic grade crossing gates and flashers installed. All existing grade crossings to remain and all reactivated crossings would be equipped with new, state-of-the-art Automatic Highway Crossing Warning (AHCW) systems.

Grade crossings would be closed or consolidated whenever feasible. Private grade crossings would be closed, gated and locked if possible; if not, new AHCW systems would be installed.

The AHCW train detection would be based upon constant warning technology known as predictors. This system detects the speed of the train as it moves towards the crossing and “predicts” the arrival time. Each crossing would be set to provide a consistent thirty seconds of warning ahead of the train’s arrival at the crossing.

At a minimum each public grade crossing would consist of automatic gates, LED flashers, and an electronic bell. Where required, this standard arrangement may be supplemented with additional equipment such as additional gates and cantilevered flashers to provide the highest level of safety to the passengers and the general public.

The AHCW system would communicate with the MBTA Operational Control Center (OCC) through a dedicated Fiber Optic line that would be provided as part of the South Coast Rail project. This Fiber Optic line would allow MBTA train dispatchers to communicate with and receive indications directly from the AHCW system at each grade crossing.

Each crossing would be supported by a minimum eight-foot by eight-foot aluminum shed that would house the AHCW system. The houses would be placed at the most advantageous quadrant of the crossing to not impede sight distance of pedestrians, motorists or train engineers.

Each crossing would require a power utility feed from the nearest commercial source. Additional or supplemental devices may require additional system infrastructure to support a particular application such as traffic preemption or advance active warning signs.

Each AHCW system would be supported by storage batteries during times of power outages. These batteries would be housed in a separate box (battery well) located adjacent to the AHCW housing.

Appendix 3.2-F provides a list of public and private grade crossings and the proposed improvements for each. Table 3.2-15 provides a summary of the number of grade crossings by alternative.

Table 3.2-15 Summary of Grade Crossings by Rail Alternative

Commuter Rail Alternative	Existing Active Public Grade Crossings	Existing Active Public Grade Crossings Recommended for Closure	Proposed Active Public Grade Crossings
Attleboro Alternative	39	4	37
Stoughton Alternative	50	4	46
Whittenton Alternative	57	4	53

Bridges and Culverts

All rail alternatives require reconstructing undergrade bridges (railroad over road or river) and overhead bridges (highway over railroad) along the existing and new rights-of-way. The Attleboro Alternative requires a new third track along the existing two-track NEC that would require modifying and reconstructing existing bridges along the corridor.

The conditions of the existing railroad bridges were evaluated to determine the bridge's current state of repair and if the bridge can withstand Cooper E80 loadings, considered a reasonable approximation for the requirements of a main railway line. The bridges were also evaluated to determine if it was feasible to install additional track where required for the rail operations. Based on this evaluation, the following recommended improvements were developed. For additional information on the bridge work recommendations, refer to Appendix 3.2-G.

Typical Railroad (Undergrade) Bridge Structure Types

The following bridge structure types are currently proposes for the undergrade bridges on the rail alternatives. The structure type considered for specific locations is dependent on span length, number of spans, structure depth constraints, cost and constructability. For overhead (roadway bridges), a detailed type study in accordance with MassHighway criteria would be performed during preliminary design to determine the most appropriate structure type.

Concrete Box Girder: Concrete box girder superstructures are primarily used for single span bridges with smaller spans up to approximately 25 feet in length. The box girders are placed adjacent to each other, providing a deck for the ballast and track. This minimizes field construction duration and associated impacts to track service. The open deck configuration allows for adjustability in track alignments which can be advantageous during construction staging (Figure 3.2-16).

Steel Tub: Steel tub superstructures are primarily used for single span bridges with spans ranging from roughly 25 feet to 60 feet in length. Ballast is placed onto a ballast plate deck, which is supported by longitudinal stringers and intermediate diaphragms. Much of the fabrication can be done in the shop, minimizing field construction times and associated impacts to track service. The open deck configuration allows for adjustability in track alignments which can be advantageous during construction staging (Figure 3.2-17).

Steel Thru Girder: Steel thru girder superstructures are primarily used for single or multiple span bridges with spans greater than 60 feet in length. Ballast is placed onto a ballast plate deck supported by floor beams and the main load carrying plate girders. Multiple track through girder bridges utilize a shared plate girder between each set of tracks. This structure type minimizes structure depth for longer spans, although field construction is more time consuming than that for concrete box girder and steel tub superstructures. These structures do not allow for much adjustability in track alignment, in some instances making them difficult to stage (Figure 3.2-18).

Bridges and Culverts Common to All Rail Alternatives

The New Bedford Main Line and the Fall River Secondary are segments of the alignments that are common to all the commuter rail alternatives. The alignments north of Weir Junction vary based on the commuter rail alternative.

Existing culverts along the rail corridors would typically be replaced in-kind (widened, or otherwise modified if desirable and feasible, for environmental enhancement) to resist increased loading and to accommodate the wider track bed where necessary.

New Bedford Main Line Bridges and Culverts

Of the eighteen bridge crossings (both undergrade and overpass) on the New Bedford Main Line, twelve would require rehabilitation or reconstruction as part of the currently envisioned South Coast Rail project. The bridges being replaced are either unable to meet the load requirements for the commuter rail, have open decks, are too narrow, or are recommended for replacement to reduce maintenance costs.

Each bridge carries a single track. Eight of the new bridges would be designed to carry two tracks, while other four would still carry a single track. Many of the existing bridges have open timber decks. The new bridges would have solid decks on which ballast, ties, and rails would be placed.

Where the new bridge would have a longer span than the current structure, the new abutments would be located behind the old ones, the old ones would be demolished to the high water line, and the land between the old and new abutments restored to provide access under the bridge. This condition exists at Cotley River (MP 38.93 and MP 39.46), Cedar Swamp River (MP 42.14), and Freetown Brook (MP 45.43).

Where a new bridge would have an equal span to the current structure, the existing stone abutments would be rehabilitated and reused, if feasible. In some cases, the current bridge has multiple spans that the new bridge would replace with a single span, eliminating the mid-bridge piers required to support multiple spans. This occurs at Deane Street (MP 53.31), Sawyer Street (MP 53.57), Coggeshall (MP 53.67), Route 18 (MP 54.17), and Wamsutta Street (MP 54.21).

Table 3.2-16 provides a list of bridge crossings (both undergrade and overhead) that would require rehabilitation or reconstruction as part of the currently envisioned New Bedford Main Line segment of the South Coast Rail project.

Table 3.2-16 Summary of Railroad Bridges – New Bedford Main Line

Bridge	Municipality	Type	Mile Post	Improvements Required
Taunton River	Taunton	Undergrade	35.56	Yes
Brickyard Road	Taunton	Undergrade	35.79	Yes
Route 24	Taunton	Overhead	37.69	Yes
Cotley River	Berkley	Undergrade	38.93	Yes
Cotley River	Berkley	Undergrade	39.46	Yes
Cedar Swamp River	Lakeville	Undergrade	42.14	Yes
Howland Road	Lakeville	Overhead	43.26	No
Freetown Brook	Freetown	Undergrade	45.43	Yes
Route 140	New Bedford	Overhead	50.66	No
Deane Street (under construction)	New Bedford	Undergrade	53.31	Yes
Sawyer Street (under construction)	New Bedford	Undergrade	53.57	Yes
Coggeshall Street (under construction)	New Bedford	Undergrade	53.67	Yes
Cedar Grove Street	New Bedford	Undergrade	53.79	No
I-195 Ramp	New Bedford	Overhead	53.81	No
Weld Street/Route 18 Ramp	New Bedford	Undergrade	53.95	No
Logan Street	New Bedford	Undergrade	54.01	No
Route 18	New Bedford	Undergrade	54.17	Yes
Wamsutta Street	New Bedford	Undergrade	54.21	Yes

On February 17, 2010 the Commonwealth of Massachusetts was awarded a federal stimulus Transportation Investment Generating Economic Recovery (TIGER) Grant to fund reconstruction of structurally deficient rail bridges in New Bedford. The bridges, currently used by freight rail cars, are more than 100 years old and are located just north of the future Whale's Tooth Station on New Bedford's waterfront. While the South Coast Rail rail alternatives would utilize the reconstructed bridges, the reconstruction of the bridges has independent utility[33,34] from the South Coast Rail project, as the need for reconstructing the structurally deficient bridges exists without the South Coast Rail project and the bridges would be reconstructed absent the construction of other projects in the project area. The reconstruction of the bridges is underway. This project also includes reconstruction of an existing culvert.

Fall River Secondary Line Bridges and Culverts

Of the thirty-one existing bridge crossings (both undergrade and overpass) on the Fall River Line, twelve would require rehabilitation or reconstruction as part of the currently envisioned South Coast Rail project. In addition, one new bridge would be required (Golf Cart Road pedestrian bridge). The bridges being replaced are either unable to meet the load requirements for the commuter rail, or are too narrow.

Each bridge, except the Battleship Cove Bridge, carries a single track. Eight of the new bridges would be designed to carry two tracks, while the other four would still carry a single track. Many of the existing bridges have open timber decks. The new bridges would have solid decks on which ballast, ties and rails would be placed.

Where a new bridge would have an equal span to the current structure, the existing stone abutments would be rehabilitated and reused, if feasible. In some cases the current bridge has multiple spans that the new bridge would replace with a single span, eliminating the mid-bridge piers required to support multiple spans. This would be the case for at Cedar Swamp River (MP 41.51), Golf Club Road (MP48.11), and President's Avenue (MP 51.11).

Table 3.2-17 provides a list of bridge crossings (both undergrade and overhead) that would require construction, rehabilitation, or reconstruction as part of the currently envisioned Fall River Secondary segment of the South Coast Rail project.

Bridge and Culverts - Attleboro Alternative

This bridge and culvert improvements for this alternative would be in addition to the New Bedford Mainline and Fall River Secondary improvements common to all the commuter rail alternatives.

Attleboro Secondary and Northeast Corridor Bridges and Culverts

Of the thirty-one bridge crossings on the Attleboro Secondary and NEC, nineteen would require modification or replacement as part of the currently envisioned South Coast Rail project. Replacement would be required for eleven of those bridges. The bridges being replaced are either unable to meet the load requirements for the commuter rail, have open decks, or are too narrow. Modifications would be

[33] Army Corps of Engineers (http://www.nao.usace.army.mil/technical%20services/Regulatory%20branch/PN/08-RP_LOP_Final/08-RP-19%20Permit.pdf).
[34] Federal Transit Administration 23 C.F.R. Sec. 771.111(f).

Table 3.2-17 Summary of Railroad Bridges – Fall River Secondary

Bridge	Municipality	Type	Mile Post	Improvements Required
Cedar Swamp River	Freetown	Undergrade	41.51	Yes
Route 24/79	Freetown	Undergrade	45.58	No
South Main Street/Route 79	Freetown	Overhead	46.25	No
Farm Road	Freetown	Undergrade	46.63	Yes
Farm Road	Fall River	Undergrade	47.75	No
Golf Cart Road (Pedestrian)	Fall River	Overhead	47.90	New
Golf Club Road	Fall River	Overhead	48.11	Yes
Miller's Cove Road	Fall River	Undergrade	48.62	Yes
Clark Street	Fall River	Overhead	48.93	No
Collins Road	Fall River	Undergrade	49.06	Yes
Ashley Street	Fall River	Undergrade	49.21	Yes
Canedy's Underpass	Fall River	Undergrade	49.57	No
New Street	Fall River	Overhead	49.81	No
Western Expressway/Route 79	Fall River	Overhead	49.96	No
Western Expressway Ramps	Fall River	Overhead	50.06	No
Weaver Street	Fall River	Overhead	50.09	No
Cove Street	Fall River	Undergrade	50.43	No
Clinton Street	Fall River	Undergrade	50.49	No
Brightman Street	Fall River	Overhead	50.69	No
Brownell Street	Fall River	Undergrade	51.03	Yes
President's Avenue	Fall River	Undergrade	51.11	Yes
Pearce Street	Fall River	Undergrade	51.20	Yes
Turner Street	Fall River	Undergrade	51.40	Yes
Central Street	Fall River	Overhead	52.05	No
NB Ramp	Fall River	Overhead	52.05	No
SB Ramp	Fall River	Overhead	52.06	No
I-195	Fall River	Overhead	52.07	No
Quequechan River	Fall River	Undergrade	52.09	Yes
Route 138 / Davol Street	Fall River	Overhead	52.09	No
Western Expressway, NB & SB	Fall River	Overhead	52.09	No
Anawan Street	Fall River	Overhead	52.19	No
Channel near Battleship Cove	Fall River	Undergrade	52.38	Yes

needed to two other bridges to accommodate an additional track. An additional seven new bridges would be built adjacent to existing bridges to accommodate the additional track needed on the NEC for this alternative.

Of all the bridges affected, the Canton Viaduct/ Neponset Street Bridge (M.P. 213.74) is the most difficult. The existing structure is 175 years old and one of the two oldest multiple stone arch surviving railroad bridges still in active use in the United States. It is listed in the National Register of Historic Places and is designated a National Historic Civil Engineering Landmark. The structure is 615 feet long, 38 feet wide and is 70 feet above the Canton River.

To accommodate the proposed additional NEC track, a new structure would need to be constructed just west of this existing historic structure. However, the proximity of the proposed bridge would greatly diminish the aesthetics of the present structure. Minimizing the visual impact would result in a substantial construction cost for the new independent structure. The additional structure carrying a single track is envisioned to be constructed similar in detail to the existing structure. The existing viaduct is a stone arch with 21 chambers with six allowing the passage of water.

Table 3.2-18 provides a list of bridge crossings that would require rehabilitation or reconstruction as part of the currently envisioned Attleboro Alternative for the South Coast Rail project.

Table 3.2-18 Summary of Railroad Bridges – Attleboro Alternatives

Bridge	Municipality	Type	Mile Post	Improvements Required
Rt. 128 NB	Dedham	Overhead	217.49	No
Rt. 128 SB	Dedham	Overhead	217.48	No
Neponset River East Branch	Canton	Undergrade	216.30	Yes
Dedham Road	Canton	Overhead	216.18	No
I-95 SB	Canton	Overhead	215.79	Yes
I-95 NB	Canton	Overhead	215.74	Yes
Chapman Street	Canton	Overhead	214.35	Yes
Spaulding Street	Canton	Overhead	214.22	No
Canton Viaduct/Neponset St.	Canton	Undergrade	213.74	Yes
High Street	Canton	Overhead	212.95	Yes
Canton Street	Sharon	Undergrade	212.02	Yes
Maskwonicut Road	Sharon	Overhead	211.62	Yes
Depot Street	Sharon	Overhead	211.07	No
South Main Street	Sharon	Overhead	209.95	Yes
Wolomolopoag Street	Sharon	Overhead	209.95	No
Cocasset Street	Mansfield	Undergrade	206.42	Yes
North Main Street	Mansfield	Undergrade	204.44	Yes
Route 106	Mansfield	Undergrade	204.17	Yes
Copeland Drive	Mansfield	Undergrade	203.85	Yes
Route 140 NB	Mansfield	Overhead	203.35	No
Route 140 SB	Mansfield	Overhead	203.34	No
I-495 NB	Mansfield	Overhead	202.97	No
I-495 SB	Mansfield	Overhead	202.95	No
School Street	Mansfield	Overhead	202.51	Yes
Elm Street	Mansfield	Overhead	203.34	No
Wading Brook	Mansfield	Undergrade	200.55	Yes
Gilbert Street	Mansfield	Overhead	200.49	Yes
Chartley Pond	Attleboro	Undergrade	25.92	Yes
Goose Branch Brook	Norton	Undergrade	28.22	Yes
Taunton Avenue (Rte. 140)	Norton	Overhead	30.39	No
Three Mile River	Norton	Undergrade	30.31	Yes

Bridge and Culverts - Stoughton Alternative

Of the eighteen existing bridge crossings (both undergrade and overpass) along the Stoughton Alternative, fourteen would require rehabilitation or reconstruction as part of the currently envisioned Stoughton alternative segment of the South Coast Rail project. In addition, six completely new bridges are required. The bridges being replaced are unable to meet the load requirements for the commuter rail.

Two of the reconstructed bridges would involve new bridges being built over existing stone masonry arched bridges (Forge Pond and Beaver Meadow Brook) to preserve their appearance. Three of the new bridges that pass over the rail right-of-way are in locations where previous bridges have been filled in (Main Street, Bridge Street and Thrasher Street). Two new bridges would be built where none now exist (Route 138 Bridge, MP 30.20 in Raynham, to provide a grade separation and the Black Brook Bridge, MP 26.17, to span Black Brook. By far the largest new bridge would be the trestle through the Hockomock Swamp with about 284 spans. It would be about 8500 feet long and 24 feet wide at the level of the bridge deck, with a minimum 3 feet clearance above grade and incidental excavations to allow large mammal passage. Figure 3.2-19 shows the typical cross section of the trestle through the Hockomock Swamp.

The bridges listed for replacement have open timber decks (or none at all). The new bridges would have solid decks on which ballast, ties and rails would be placed. Where the existing bridge abutments are stone, and the span length remains the same, the stonework may be rehabilitated and reused, if feasible.

In some cases the current bridge has multiple spans that the new bridge would replace with two spans, eliminating the mid-bridge piers required to support multiple spans. This would be the case for at Taunton River where three bridges have 11 spans, 16 spans and 17 spans. Each would be replaced by a two span bridge.

Table 3.2-19 provides a list of bridge crossings (both undergrade and overhead) that would require rehabilitation or reconstruction as part of the currently envisioned Stoughton Alternative for the South Coast Rail project.

Bridge and Culverts - Whittenton Alternative

The Whittenton Branch would require rehabilitation or reconstruction of all three of its existing bridges. A new bridge would replace the bridge that once spanned King Phillips Street. The existing stacked stone abutments may be partly reused in the new structure. The Bay Street Bridge was recently filled in and would need to be reconstructed to provide adequate track clearance for the rail service. The Mill River Bridge is now a five-span structure over Mill River. It would be replaced by a two span bridge carrying a single track. The existing abutments would be demolished and the new abutments constructed behind the existing abutments. The existing abutments would then be demolished down to the high water level and the space between the old and new abutments graded to recreate the stream banks under the bridge. Table 3.2-20 provides a summary of the bridges along the Whittenton Branch. The Whittenton Alternatives also include all Stoughton Line bridges between Revere Street and I-495.

Table 3.2-19 Summary of Railroad Bridges – Stoughton Alternatives

Bridge Over	Municipality	Type	Mile Post	Improvements Required
Revere Street	Canton	Undergrade	15.21	No
Forge Pond	Canton	Undergrade	15.79	Yes
Bolivar Street	Canton	Undergrade	16.11	Yes
Beaver Meadow Brook	Canton	Undergrade	16.56	Yes
Coal Yard Road	Stoughton	Undergrade	19.07	Yes
Totman Farm Road	Stoughton	Undergrade	20.85	Yes
Day's Farm Road (private)	Easton	Undergrade	21.57	Yes
Whitman Brook	Easton	Undergrade	21.75	Yes
Ames & Pond Streets	Easton	Undergrade	22.80	Yes
Queset Brook	Easton	Undergrade	22.84	Yes
Main Street	Easton	Overhead	22.93	New
Bridge Street	Easton	Overhead	23.27	New
Black Brook	Easton	Undergrade	26.17	New
Hockomock Swamp Trestle	Easton	Undergrade	27.00	New
Bridge Street	Raynham	Overhead	30.20	Yes
I-495	Raynham	Overhead	30.48	No
Rt. 138	Raynham	Overhead	31.31	New
Thrasher Street	Taunton	Overhead	33.33	New
Taunton River	Taunton	Undergrade	34.38	Yes
Taunton River	Taunton	Undergrade	34.38	Yes
Taunton River	Taunton	Undergrade	34.73	Yes
Summer Street	Taunton	Overhead	34.80	No
Mill River	Taunton	Undergrade	34.90	Yes
High Street	Taunton	Overhead	35.00	No

Table 3.2-20 Summary of Railroad Bridges – Whittenton Alternatives

Bridge Over/Under	Municipality	Type	Mile Post	Improvements Required
King Phillips Street	Taunton	Undergrade	30.38	Yes
Bay Street	Taunton	Overhead	31.58	Yes
Mill River	Taunton	Undergrade	32.16	Yes

Summary of Bridge Improvements

Table 3.2-21 provides a summary of railroad bridge improvements by alternative including a list of railroad bridges to be reconstructed and new railroad bridges for grade separation.

Signals and Communications

All rail alternatives require a new signal system throughout, with the exception of the NEC, which is affected as described under each alternative.

Table 3.2-21 Summary of Railroad Bridge Improvements by Alternative

Commuter Rail Alternative	Reconstruct Undergrade (Railroad) Bridges	Reconstruct Overhead (Highway) Bridges	New Bridges for Grade Separation or Environmental
Attleboro Alternatives	33	11	0
Stoughton Alternatives	35	4	6
Whittenton Alternatives	33	4	5

The new signal systems would be required to include Positive Train Control (PTC) as mandated by Congress in the Rail Safety Act of 2008; the new signal system would be capable of stopping the train ("positive stop") if the train engineer fails to operate the vehicle as directed by the signal system. For the purposes of this document, it has been assumed that the new signal system would be the same as the existing signal system technology implemented on the NEC. The FRA has already deemed this system compliant with the new regulations for PTC.[35] The NEC system is a cab-based signal system, meaning that the signal and the allowable speed is presented to the engineer in the cab of the locomotive. This system is compliant with the regulations issued by the FRA in January 2010 regarding PTC.

The communications system would include a new fiber optic backbone along the chosen route. This would allow the signal system and grade crossings to be connected to the MBTA Operations Control Center (OCC). The communications system would also connect the MBTA OCC to systems at station stops, including passenger warning, public information and address, security, fire alarm, and police call back systems. Provisions would be made for future expansion of systems, such as for fare collection.

Attleboro Alternatives Signals and Communications

The Attleboro Alternatives require a new Positive Train Control signal system for the New Bedford Main Line, Fall River Secondary, Attleboro Secondary and Attleboro Bypass.

The existing Northeast Corridor signal system would require extensive modifications to accommodate the new third mainline track necessary for this alternative. The signal system modification includes installing new signal equipment at the proposed Norton Interlocking, where the Attleboro Bypass connects to the corridor, at the existing Junction Interlocking, where the Stoughton Line connects to the corridor, and at the Transfer and Hill Interlockings, where the Northeast Corridor, Dorchester Branch, and Franklin Line meet. The new interlocking at Norton and the extensive changes to existing interlockings would require re-spacing many signal blocks on the corridor, resulting in major reconstruction of the signal system.

Stoughton Alternatives Signals and Communications

The Stoughton Alternatives require a new Positive Train Control signal system for the New Bedford Main Line, Fall River Secondary, and the Stoughton Line.

Modifications to the existing Northeast Corridor signal system are limited to updating the signal logic at the Junction Interlocking. These minor improvements would be needed to make the signal logic on the corridor consistent with the signal logic of the new system on the Stoughton Line.

[35] http://www.fra.dot.gov/downloads/Safety/PTC_Final_Rule_20100112_(FedReg)_(final).pdf

Whittenton Alternatives Signals and Communications

The Whittenton Alternatives require a new Positive Train Control signal system for the New Bedford Main Line, Fall River Secondary, Attleboro Secondary, Whittenton Line, and Stoughton Line.

Modifications to the existing Northeast Corridor signal system are limited to updating the signal logic at the Junction Interlocking. These minor improvements would be needed to make the signal logic on the corridor consistent with the signal logic of the new system on the Stoughton Line.

Rolling Stock

Two common vehicles and power sources are proposed among the alternatives: diesel and electric locomotives. The rail alternatives would use commuter rail technology on a fixed-guideway system with steel wheels operating on steel rails, with typically a single locomotive pulling a number of passenger coaches; on the MBTA system, coaches can be either single level or bi-level. Commuter rail trains would be powered by diesel or electric locomotives, depending on the alternative. The electric locomotives would be powered by a 25 kV/60Hz overhead contact system (OCS).

Coaches

Commuter rail trains would consist of five to eight coaches. The coaches would be either single level or bi-level if additional capacity is needed. The MBTA currently uses coaches manufactured by Bombardier, Kawasaki, Messerschmitt-Bolkow-Blohm (MBB) and Pullman Standard BTC. It is anticipated that modified versions of these same coaches would be used for electric operations to achieve a 100 mph rating, while similar versions would be used for the diesel commuter rail alternatives. Existing coaches on the MBTA system are rated for a top operating speed of 90 mph. Single level coaches can carry 125 to 130 passengers and bi-level coaches can carry 175 to 185 passengers.

Locomotives

There are three differences between diesel and electric locomotives that are noteworthy. First, electric trains have higher performance characteristics, particularly in terms of quicker acceleration. Second, top travel speeds differ: for diesel-powered commuter rail, the maximum speed is assumed to be 79 mph, the maximum currently operated on the MBTA system; for electric commuter rail, the maximum speed is assumed to be 100 mph, the maximum speed that can be operated without incurring significant signal costs. The last difference is that the electric locomotive requires an overhead wire (a catenary) to distribute power to the electric locomotive. MBTA does not currently have electric locomotives in their system, though some diesel powered trains travel on the electrified Northeast Corridor. In almost all other ways these two versions of commuter rail are nearly identical.

The following is a description of the diesel and electric locomotives:

Electric Locomotives

- Type – HHP-8 manufactured by Bombardier or similar
- Acceleration performance is better than diesel locomotives
- Top Travel Speed – 125 mph
- Fuel – electric using an 25 kV/60 Hz overhead wire (catenary) to distribute power to the electric locomotive

- See Figure 3.2-20, Photo 1 for the typical electric locomotive

Diesel Locomotives
- Type – F40PH's manufactured by EMD or similar
- Acceleration performance is less than electric locomotives
- Top Travel Speed – 103 mph
- Fuel – diesel or bio-diesel
- See Figure 3.2-20, Photo 2 for the typical diesel locomotive

Table 3.2-22 summarizes the number of new coaches and locomotives required for each commuter rail alternative.

The Attleboro Alternatives would require all new rolling stock for the South Coast Rail project while the Stoughton and Whittenton Alternatives would extend existing service. As such, and as shown in Table 3.2-22, the Attleboro Alternatives would require 3 additional locomotives, 21 additional coaches and 3 additional cabs than would the Stoughton or Whittenton Diesel Alternatives. The electric alternatives would all require the same number of rolling stock, as the electric service would be new to all three alignments.

Table 3.2-22 Train Rolling Stock Purchase Summary by Rail Alternative[1]

	Diesel Alternatives			Electric Alternatives		
Alternatives	**Locomotives**	**Coaches**	**Cab Cars**	**Locomotives**	**Coaches**	**Cab Cars**
Attleboro	7	49	7	7	49	7
Stoughton	4	28	4	7	49	7
Whittenton	4	28	4	7	49	7

1 Includes spare locomotive, coaches and cab cars since the MBTA currently does not have electric locomotives

Electrification

A new traction electrification system is required to provide electric power to locomotives for the electric commuter rail alternatives. The traction electrification system includes the traction power systems, overhead catenary, wayside power, signaling, Supervisory Control and Data Acquisition (SCADA) system & communications and the return circuits.

The new traction electrification system would tie into the existing NEC electrification system with some modifications to that system. The traction electrification system would provide power to the trains from wayside traction power facilities through an overhead contact system (OCS), which distributes the power to the trains' pantographs. The pantographs, mounted on the roof of the rolling stock, would collect the electrical power from the OCS through mechanical contact by sliding under the OCS contact wire. The electrical circuit would be completed back to the source substation via multiple return paths, including running rails and static wires.

Three major elements would make up the traction electrification system:
- **Traction Power System**, which include traction power substations, switching stations and paralleling stations. Figure 3.2-21 illustrates a typical Traction Power Station.

- **Overhead Contact System (OCS)**, which distributes the electrical power to the rolling stock, and includes the messenger and contact wires, and the associated supporting structures and hardware. The track negative feeder wires are considered associated with the OCS. Figure 3.2-22 illustrates a typical OCS.
- **Traction Power Return System**, which makes up the running rails, impedance bonds and static wires.

Traction Power System

The traction power system would provide a network of electric traction power facilities that transform power from the utility power grid at 115kV to the 25kV voltage required by electric locomotives. The power is distributed from the traction power facilities to the trains via the overhead contact system (OCS). For South Coast Rail, the proposed traction power system would be similar to the one currently in use on the Northeast Corridor between New Haven, CT and Boston, MA, in order to take advantage of this existing infrastructure. This system is a 2x25 kV autotransformer alternating current system requiring three types of traction power facilities:

- **Main Substations**, which draw power from the utility power grid. They are typically located near high voltage, overhead transmission lines. A typical main substation site is 150 feet by 200 feet. Figure 3.2-21 illustrates a Traction Power Station.
- **Switching Stations**, where two sections of the traction power system powered from different main substations meet. Electricity can be distributed to different sections, and different sections can be energized, de-energized, isolated or interconnected. They are typically mid-way between main substations and can be as large as 60 feet by 150 feet.
- **Paralleling Stations**, which are between main substations and switching stations, spaced about 6 miles apart. They allow sections to be connected in parallel. They contain less equipment than the main substation and switching stations and require a 40-foot by 80-foot site.

The Attleboro, Stoughton and Whittenton Alternatives would require a switching station where they interface with the Northeast Corridor. The Attleboro Alternative would require one main substation and six paralleling stations. The Stoughton and Whittenton Alternatives, due to their longer alignments, would require two main substations, one additional switching station and six paralleling stations. Figures 3-23 through 3-25 show the traction power system for each of the electric rail alternatives.

Overhead Contact System

The overhead contact system would be a network of catenary wires that distributes power from the traction power system to electric locomotives. This system would have a contact wire and a messenger wire strung above every electrified track in the system, negative feeder wires and static wires and supporting structures to hold the catenary wire in place. The support system for the catenary would consist of pole structures with foundations, poles, guys, insulators, brackets, cantilevers, and other assemblies and components. For South Coast Rail, there would be three types of catenary supports: single-track cantilever poles, twin-track cantilever structures and multiple track portals.

Modification to the Existing Electrification

The Attleboro Alternatives would impact the existing electrification system on the Northeast Corridor because of the construction of the third track. In most places, no provision was made for a third track in the OCS system or in the traction power system. The traction power facilities affected by the proposed electrified Track 3 between the Attleboro Bypass and Readville would be the Sharon Substation (MP 212), the Readville Paralleling Station (MP 219) and the East Foxboro Paralleling Station (MP 205). A new OCS system would need to be installed and the existing system modified to construct and electrify the new third track, and wayside power at interlockings would be modified. In conjunction with this work, the Supervisory Control and Data Acquisition (SCADA) control system for the traction power system would need to be updated.

Sharon Electrical Power Substation

Sharon substation is one of four main substations on the system. It receives power from NSTAR's utility grid (115kV). The overhead transmission lines run over the center of the site. Adjacent to these lines, Amtrak has two step down transformers (rated at 40MVA capacity). No main equipment can be located directly under these lines. The transformer secondary voltage (2x25kV) is distributed to the catenary by two 25kV supply buses. A number of modifications would be required at the Sharon Substation (MP 212), including new connections, breakers, poles, grounding, new strain gantry, switches, relays and controls.

East Foxboro Electrical Power Substation

The paralleling stations are also connected to the catenary system but do not have an incoming utility power supply. The East Foxboro Power Substation (MP 205) would require a new single pole circuit breaker, disconnect switch, switching gantry and pole, modifications of the SCADA system and control room. The compact site of the East Foxboro Power Substation would need to be extended eastward to accommodate the new equipment.

Readville Electrical Power Substation

The Readville Power Substation (MP 219) would have to be relocated about 200 feet eastward to make way for new tracks, necessitating land acquisition, slope stabilization and construction and installation of the necessary equipment before the current PS can be shut down and demolished.

Wayside Electrical Power at Interlockings

At interlockings, typically under the scope of the traction power system, are wayside power locations used to power other systems such as signals and lighting. Each wayside power location provides for power and remote control of interlocking lighting and OCS disconnect switches. The heart of the wayside power location is the wayside power cubicle, which houses much of the equipment.

At Transfer and Junction Interlockings (both of which are existing interlockings that would be modified), new OCS sectionalizing switches would be required, with the existing wayside cubicle modified to provide AC and DC power and remote control of the motorized switches. New direct buried cables and manholes would be placed near each new switch and new interlock light location. In addition, the existing interlocking lighting area would be increased to include the new track crossovers to facilitate maintenance. If completed early enough this would facilitate construction.

At Norton Interlocking (MP 200) and other new interlockings too far from an existing interlocking, a new wayside power cubicle, OCS pole mounted transformers, switching and control equipment and all associated cabling in buried conduit would be installed.

Stations

New commuter rail generally would consist of high-level platforms, canopies, commuter parking, a pick-up/drop-off area for buses and vehicular drop-off parking spaces that conform to MBTA Commuter Rail Station design criteria and the Americans with Disabilities Act (ADA). High-level platforms would be constructed at a height that is 4 feet above the track level, allowing for level-boarding onto all the commuter rail coaches for a 9-car train set (approximately 800' long). Platform configurations (i.e. side platform or center island platform) are dependent on the number of tracks, operations, and existing site constraints.

It is a goal of the project that the new commuter rail station designs would include amenities such as bike storage areas, pedestrian connections to neighboring streets/developments (where applicable), and commuter-related services such as newspaper stands and payment boxes. The MBTA would also explore implementing green technologies like solar panels, Energy Star compliant products, and environmentally friendly designs to the maximum extent practicable. Stations are intended to function similarly to the majority of existing MBTA commuter rail stations; they would be unattended and would require self-pay parking. Proposed station sites would not include station buildings, and water/sewerage facilities would not be required.

Most of the new commuter rail parking lots were sized to accommodate the park and ride ridership projected by CTPS for the particular station, plus a 20% increase to meet the 2030 parking demand. However, three of the station parking areas were designed to provide parking space counts that differ from the unconstrained park and ride projections. Taunton Station and Barrowsville Station were designed with fewer spaces than the ridership model projected. Although there would be sufficient area to provide the required parking, the parking spaces were constrained to provide an area that could be used for transit-oriented development opportunities to improve the economic conditions of the local communities. The third commuter rail parking lot with a different design than projected demand levels was the East Taunton Station parking lot. This station would have more spaces than the projected demand in order to capture the ridership that might be unable to find adequate parking at Taunton Station, because these stations would be in close proximity to each other and Taunton Station was designed with constrained parking.

Existing Train Stations Affected by the Alternatives

Several existing commuter rail stations would be impacted by constructing an additional track along segments of the existing rights-of-way. As a result of the new track construction, existing platforms and parking areas would be impacted. All of the existing stations impacted have low-level platforms with mini-high-level platforms. MBTA, ADA and Federal guidelines require that stations that are to be modified shall be upgraded to include full-length high-level platforms, unless track geometry is such that installation of full-length high-level platforms would result in train inoperability or create passenger safety issues.

Sharon, Mansfield and Canton Junction Stations would require installation of full-length high-level platforms, as proposed track construction would impact existing platforms. Track geometry at these stations is such that installation of full-length high-level platforms can readily be accommodated. Stoughton and Canton Center Stations are both on curved sections of track. Although proposed construction would impact existing platforms at these two stations, track geometry may preclude installation of full-length high-level platforms due to safety concerns with the gap between trains and the high-level platform.

Local roads and parking lots would also be impacted due to installation of additional tracks/platforms. Existing parking and access drives have been replicated as closely as possible to avoid major disruption to existing stations and communities. It is the intended goal that the existing commuter rail station designs would be updated to include amenities such as bike storage areas, pedestrian connections and commuter-related services such as newspaper stands and payment boxes. The MBTA would also explore implementing green technologies like solar panels, Energy Star compliant products and environmentally friendly designs to the maximum extent practicable.

Summary of New and Modified Train Stations

Table 3.2-23 summarizes the existing train stations affected by each rail alternative and provides a matrix identifying the train stations included in each of the alternatives. Following the table is a description of each station, including a general site description, number of parking spaces, platform description, driveway access, bus and vehicular drop-off accommodations. Figure 3.2-26 shows the typical rail station platforms.

Table 3.2-23 Summary of Stations

Station Name	**Municipality**	**Type**	**Attleboro Alternatives**	**Stoughton Alternatives**	**Whittenton Alternatives**
Barrowsville	Norton	New	x		
Battleship Cove	*Fall River*	*New*	x	x	x
Canton Center	*Canton*	*Existing*		x	x
Canton Junction	Canton	Existing	x		
Taunton Depot	Taunton	New	x	x	x
Easton Village	*Easton*	*New*		x	x
Fall River Depot	Fall River	New	x	x	x
Freetown	Freetown	New	x	x	x
King's Highway	New Bedford	New	x	x	x
North Easton	*Easton/Stoughton*	*New*		x	x
Mansfield	Mansfield	Existing	x		
Raynham Place	*Raynham*	*New*		x	x
Sharon	Sharon	Existing	x		
Stoughton	*Stoughton*	*Existing*		x	x
Taunton (Dean St.)	Taunton	New		x	
Downtown Taunton Depot	Taunton	New	x		x
Whale's Tooth	New Bedford	New	x	x	x
TOTAL – NEW STATIONS			8	10	10
TOTAL – MODIFICATIONS TO EXISTING STATIONS			3	2	2

Notes: Underlined stations are common to all rail alternatives
Italicized stations are common between Stoughton and Whittenton Alternatives

Barrowsville Train Station (new) – Attleboro Alternative

The new Barrowsville Station would be located on South Worcester Street in Norton (Figure 3.2-27). The station would be village-style with constrained (limited) parking and would also serve drop-off/pick-up customers. The following is a summary of the station design:

- **Parking Spaces** – 317 total spaces consisting of 12 handicapped accessible and 305 standard spaces.
- **Parking Lot Type** – Proposed paved surface parking.
- **Station Access Drive** – driveway access off of South Worcester Street.

- **Bus/Vehicular drop-off Accommodations** – independent driveway would accommodate up to three 40-foot buses and 10 vehicular drop-off parking spaces.
- **Platform Type** – one side platform.
- **Platform Dimension** – 800-foot high-level platform; 16 feet wide.
- **Track Configuration** – single track.
- **Pedestrian Accommodations** – sidewalks would be installed from the platform out to South Worcester Street for future walk connections.
- **Feeder Bus** – extend Norton-Mansfield Connection 2-miles to access station

Battleship Cove Train Station (new) – All Rail Alternatives

Battleship Cove Station would be located behind the Ponte Delgada monument along Water Street in Fall River (Figure 3.2-28). The station is a platform-only station that would not operate year-round. Serving the downtown and the Battleship Cove tourist area, the station site is planned to accommodate walk-in and pick-up/drop-off customers. The City of Fall River constructed the Ponte Delgada monument, which includes a pick up-drop off loop road, in anticipation that this site would be utilized as a commuter rail station. The following is a summary of the station design:

- **Parking Spaces** – pick-up/drop-off only.
- **Parking Lot Type** – pick-up/drop-off area on existing paved loop driveway.
- **Station Access Drive** – driveway access off Water Street.
- **Bus/Vehicular drop-off Accommodations** – the paved loop driveway would accommodate up to three 40-foot buses and passenger vehicles for pick-up and drop-off of commuter rail passengers.
- **Platform Type** – one side platform.
- **Platform Dimension** – 800-foot high-level platform; 10 feet wide.
- **Track Configuration** – single track.
- **Pedestrian Accommodations** – a walkway would be installed from the platform to existing sidewalks along the pick-up/drop-off loop road.
- **Feeder Bus** – improve pedestrian connections to Fall River's central block, which also would provide access to SRTA Route 6; extend SRTA Route 7 to the station.

Canton Center Train Station (modified) – Stoughton, Whittenton Alternatives

Canton Center Station is an existing station site off of Washington Street that would be modified to accommodate a second track (Figure 3.2-29). Two new 800-foot long low-level platforms with mini-high platforms would be constructed (one adjacent to each track). Modifications to the tracks and platforms would require minor changes to the parking layout in the existing lots near the station, and no adjustments to the amount of existing parking spaces would be expected. This station would continue to serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – approximately 210 existing parking spaces would remain.
- **Parking Lot Type** – existing paved surface parking.
- **Station Access Drive** – driveway access from Washington Street.
- **Bus/Vehicular drop-off Accommodations** – no designated areas for bus or vehicular drop-off.
- **Platform Type** – two side platforms.
- **Platform Dimension** – 800-foot low-level platforms; 9.5-12 feet wide with mini-high platforms.
- **Track Configuration** – double track.
- **Pedestrian Accommodations** - a walkway would be installed from each platform to existing sidewalks along the Washington Street.

Canton Junction Train Station (No Change (Stoughton) or Modified (Attleboro))

Canton Junction Station is an existing train station located off of Jackson Street (Figure 3.2-30). Under the Stoughton Alternative, no work is expected at the Canton Junction Station. No additional tracks are proposed.

Under the Attleboro Alternative, the existing Canton Junction Station would be reconstructed to accommodate a third track. Proposed improvements include demolition and reconstruction of the existing low-level and mini-high platforms, construction of two new high-level platforms (one adjacent to existing Track 2 and one adjacent to the new Track 3), reconstruction of the existing overhead pedestrian bridge, and reconfiguration of existing parking lots to replace the parking spaces impacted by the proposed construction. Only the platforms serving the Northeast Corridor tracks would be reconstructed; the platforms on the Stoughton Line would remain as they are. This station would continue to serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – approximately 186 existing parking spaces to be relocated. Approximately 684 spaces would remain undisturbed.
- **Parking Lot Type** – existing paved surface parking.
- **Station Access Drive** – driveway access from Jackson Street and Fulton Street extension to west side of station. Driveway access from Beaumont Street to east side of station.
- **Bus/Vehicular drop-off Accommodations** – no designated areas for bus or vehicular drop-off.
- **Platform Type** – two side platforms
- **Platform Dimension** – 800 foot high-level platforms; 12 feet wide (Northeast Corridor platforms only; Stoughton Line platforms to remain)
- **Track Configuration** – triple track (along the Northeast Corridor)
- **Pedestrian Accommodations** – limited existing walkways are present on-site. A proposed sidewalk would extend along the Fulton Street extension to Jackson Street. A portion of the overhead pedestrian bridge would be reconstructed to accommodate the third track. All other walkways would be maintained as existing.

Taunton Depot Train Station (New) – All Rail alternatives

Taunton Depot Station would be located off of Route 140 at the rear of a shopping plaza that contains Target, Home Depot, and other stores (Figure 3.2-31). This station would serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – 456 total spaces consisting of 8 handicapped accessible, 434 standard spaces, and 14 vehicular drop-off spaces
- **Parking Lot Type** – paved surface parking
- **Station Access Drive** – driveway access through the existing Target Plaza off of Route 140 connecting with a new driveway behind the Target to the new station parking area
- **Bus/Vehicular drop-off Accommodations** – independent access driveway that would accommodate two 40-foot buses. 14 Vehicular drop-off spaces would be designated within the parking area
- **Platform Type** – one center platform with a pedestrian bridge over the tracks (stairs and ramps)
- **Platform Dimension** – 800-foot high-level platform; 22 feet wide
- **Track Configuration** – triple track (two for commuter rail adjacent to the platform and one freight track not adjacent to the platform)

- **Pedestrian Accommodations** – a sidewalk would be installed adjacent to the proposed access driveway out through the Target Plaza, connecting with the existing sidewalk on Taunton Depot Drive
- **Feeder Bus** – no feeder bus connection is anticipated at this station

Easton Village Train Station (new) – Stoughton, Whittenton Alternative

Easton Village Station would be located immediately south of an historic H.H. Richardson train station along Sullivan Street (Figure 3.2-32). The site is within walking distance of downtown Easton and would be a village-style station serving walk-in and bike-in customers. The former train station contains a small parking facility; approximately 10 of the spaces would be utilized for pick-up/drop-off only. The following is a summary of the station design:

- **Parking Spaces** – no commuter parking would be provided, though some spaces in an existing private lot would be designated for vehicular drop-off.
- **Parking Lot Type** – existing paved surface parking.
- **Station Access Drive** – driveway access from Sullivan Street and Oliver Street
- **Bus/Vehicular drop-off Accommodations** – no accommodation for buses is proposed. An existing parking facility would provide approximately 10 vehicular drop-off spaces.
- **Platform Type** – one side platform.
- **Platform Dimension** – 800-foot high-level platform; 10 feet wide
- **Track Configuration** – single track
- **Pedestrian Accommodations** – a ramp from the northern end of the platform down to Oliver Street would convey pedestrians to an existing sidewalk on the north side of Oliver Street. A ramp near the southern end of the platform down to an existing pedestrian underpass (under the tracks) would connect to an existing sidewalk on the west side of Sullivan Street.
- **Feeder Bus** – provide a Stonehill College shuttle; extend BAT Route 9.

Fall River Depot Train Station (New) – All Rail Alternatives

Fall River Depot Station would be located one mile north of downtown Fall River at Route 79 and Davol Street and is the site of an historic train station (Figure 3.2-33). A proposed parking deck would be installed at this location to limit surface parking thereby reserving space for future transit-oriented development. This station would serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – 513 total spaces consisting of 11 handicapped accessible and 502 standard spaces
- **Parking Lot Type** – paved surface parking with a single parking deck
- **Station Access Drive** – driveway access off Davol Street
- **Bus/Vehicular drop-off Accommodations** – independent access driveway that would accommodate up to four 40-foot buses and 10 vehicular drop-off parking spaces
- **Platform Type** – one side platform
- **Platform Dimension** – 800-foot high-level platform; 12 feet wide
- **Track Configuration** – double track
- **Pedestrian Accommodations** – sidewalks would be installed along the frontage of Davol, Pearce, and Turner Streets connecting to existing sidewalks in the vicinity of the site. Additionally, sidewalks would be extended through the site and connect with ramps and stairs for platform access.
- **Feeder Bus** – improve pedestrian connection providing a connection to SRTA Route 2; reroute SRTA Route 14 to access the station.

Freetown Train Station (New) – All Rail Alternatives

Freetown Station would be located on South Main Street (Figure 3.2-34). The site is currently occupied by a self-storage business, and is near the Fall River Executive Park and the proposed River Front Park. The site would serve drive-in customers and customers shuttled between the station and the industrial parks. The following is a summary of the station design:

- **Parking Spaces** – 174 total spaces consisting of 7 handicapped accessible, and 167 standard spaces
- **Parking Lot Type** – paved surface parking
- **Station Access Drive** – driveway access off South Main Street
- **Bus/Vehicular drop-off Accommodations** – independent access driveway that would accommodate two 40-foot buses and 8 vehicular drop-off parking spaces
- **Platform Type** – one side platform
- **Platform Dimension** – 800-foot high-level platform; 12 feet wide
- **Track Configuration** – double track
- **Pedestrian Accommodations** – sidewalks would be installed from the platform out to South Main Street for future walk connections.
- **Feeder Bus** – extend SRTA Route 2 one mile to the proposed station

King's Highway Freetown Train Station (New) – All Rail Alternatives

King's Highway Station would be located in northern New Bedford along King's Highway, immediately east of Route 140 (Figure 3.2-35). This station would occupy part of a site that is an existing shopping plaza. The site would serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – 360 total existing spaces consisting of 12 handicapped accessible and 348 standard spaces. Spaces would be shared with existing retail (Movie Theater) uses.
- **Parking Lot Type** – existing paved surface parking.
- **Station Access Drive** – access from King's Highway through existing shopping complex to shared parking area and bus drop-off.
- **Bus/Vehicular drop-off Accommodations** – bus drop-off area to accommodate two 40-foot buses and 10 vehicular drop-off parking spaces.
- **Platform Type** – one side platform.
- **Platform Dimension** – 800-foot high-level platform; 12 feet wide.
- **Track Configuration** – double track.
- **Pedestrian Accommodations** – a ramp would be installed at the northern end of the platform down to a sidewalk that would be extended adjacent to the tracks northward to connect into existing sidewalks in King's Highway.
- **Feeder Bus** – extend SRTA Route 8 and North End Shuttle to connect to the station.

North Easton Train Station (New) – Stoughton, Whittenton Alternatives

North Easton Station would be located at the rear of the Roche Brothers plaza off of Route 138 (Figure 3.2-36). This existing retail plaza is anchored by Roche Brothers supermarket. New medical buildings have been recently constructed, and two additional buildings are planned. This station would primarily serve drive-in customers, although the station may attract some walk-in customers from the existing development on the plaza and from some nearby residences. The following is a summary of the station design:

- **Parking Spaces** – 509 total spaces consisting of 12 handicapped accessible and 497 standard spaces.

- **Parking Lot Type** – paved surface parking.
- **Station Access Drive** – driveway access from Roche Bros. Way.
- **Bus/Vehicular drop-off Accommodations** – independent access driveway that would accommodate two 40-foot buses and 10 vehicular drop-off parking spaces.
- **Platform Type** – one center platform with a pedestrian bridge (stairs and ramps).
- **Platform Dimension** – 800-foot high level platform, 22 feet wide.
- **Track Configuration – double track**.
- **Pedestrian Accommodations** – a sidewalk would be installed along the access road that would connect with an existing sidewalk along Roche Bros. Way.
- **Feeder Bus** – there are no feeder bus connection envisioned for this station.

Mansfield Train Station (Modified) - Attleboro Alternative

Mansfield Station is an existing station off of Route 106 that would be reconstructed to accommodate the third track on the Northeast Corridor (Figure 3.2-37). Proposed improvements include demolishing the existing low-level and mini-high platforms and constructing two new high-level platforms, reconstruction/relocation of the existing station building on the east side of the track, reconstruction/relocation of Mansfield Avenue, reconfiguration of North Common Park near the existing station, extension of two railroad bridges (over Route 106 and N. Main Street), and reconfiguration/extension of parking lots to replace parking spaces impacted by the proposed construction. This station would continue to serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – approximately 153 existing parking spaces to be relocated. Due to the reconfiguration, a net gain of 11 spaces would occur. Approximately 957 spaces would remain undisturbed.
- **Parking Lot Type** – existing paved surface parking.
- **Station Access Drive** – driveway access from Mansfield Avenue and Route 106.
- **Bus/Vehicular drop-off Accommodations** – no designated areas for bus or vehicular drop-off.
- **Platform Type** – two side platforms.
- **Platform Dimension** – 800-foot high-level platforms; 10 feet wide.
- **Track Configuration** – triple track.
- **Pedestrian Accommodations** – ramps and stairs would be constructed on the southern end of the platforms to provide ADA accessibility between inbound and outbound service. The ramps and stairs would connect to an existing sidewalk under the Route 106 railroad bridge. Sidewalks would also be connected from the relocated station building to sidewalks in North Common Park. Relocation of the station building would require a finished floor elevation equal to the top of the platform, allowing for a barrier-free pedestrian access from the station.

Raynham Place Train Station (New) – Stoughton, Whittenton Alternatives

Raynham Place Station would be located at the Raynham-Taunton Greyhound Park off of Route 138, which was until 2010 operated as a former greyhound racing track and has since been continued as a diversified entertainment facility. (Figure 3.2-38). The site would be utilized for future transit-oriented development and would serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – 448 total spaces consisting of 8 handicapped accessible and 440 standard spaces.
- **Parking Lot Type** – paved surface parking.

- **Station Access Drive** – access from Route 138 through the existing complex to parking area and bus drop-off.
- **Bus/Vehicular drop-off Accommodations** – independent access driveway that would accommodate two 40-foot buses and 7 vehicular drop-off parking spaces.
- **Platform Type** – one center platform with a pedestrian bridge (stairs and ramps).
- **Platform Dimension** – 800-foot high level platform, 22 feet wide
- **Track Configuration** – double track.
- **Pedestrian Accommodations** – **walkways would be i**nstalled around the exterior of the parking facilities for future walkway connections.
- **Feeder Bus** – there are no feeder bus connection envisioned for this station.

Sharon Train Station (Modified) – Attleboro Alternative

Sharon Station is an existing station off of Depot Street that would be reconstructed to accommodate the third track (Figure 3.2-39). Proposed improvements include demolishing and reconstructing the existing low-level and mini-high platforms, constructing two new high-level platforms and reconfiguring/extension of parking lots to replace parking spaces impacted by the proposed construction. This station would continue to serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – approximately 108 existing parking spaces to be relocated. Due to the reconfiguration, a net gain of 2 spaces would occur. Approximately 742 spaces would remain undisturbed.
- **Parking Lot Type** – existing paved surface parking.
- **Station Access Drive** – driveway access from Depot Street.
- **Bus/Vehicular drop-off Accommodations** – no designated areas for bus or vehicular drop-off.
- **Platform Type** – two side platforms.
- **Platform Dimension** – 800 foot high-level platforms; 12 feet wide.
- **Track Configuration** – triple track.
- **Pedestrian Accommodations** – ramps and stairs would be installed at each end of the new platforms.

Stoughton Train Station (Modified) – Stoughton, Whittenton Alternatives

Stoughton Station is an existing station off of Route 138 that would be modified to accommodate a second track (Figure 3.2-40). Proposed improvements include relocating the station stop from its present location between Porter and Wyman streets to a new location south of the Wyman Street at-grade crossing. Two new 800-foot long, full-length low-level platforms with mini-high platforms would be constructed (one adjacent to each track). These modifications to the tracks and platforms would require changes to the parking layout in the existing lots near the station, including south of Wyman Street, between Wyman Street and Porter Street, and north of Porter Street. This station would continue to serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – approximately 185 existing parking spaces to be relocated. Due to the reconfiguration, a net loss of 28 spaces would occur. Approximately 350 spaces would remain undisturbed.
- **Parking Lot Type** – existing paved surface parking.
- **Station Access Drive** – driveway access from Washington Street, Wyman Street, Porter Street, and Canton Street.

- **Bus/Vehicular drop-off Accommodations** – no accommodation for bus riders is proposed. Nine vehicular drop-off spaces are included in the proposed improvements.
- **Platform Type** – two side platforms.
- **Platform Dimension** – 800-foot low-level platforms; 12 feet wide with mini-high platforms.
- **Track Configuration** – double track.
- **Pedestrian Accommodations** – sidewalks would be constructed at the northern end of each low-level platform connecting to existing sidewalks, allowing pedestrians to utilize the existing at-grade pedestrian crossing at Wyman Street.

Taunton Train Station near Dean Street (New) – Stoughton Alternative

Taunton Station would be located along Arlington Street near Dean Street (Route 44), adjacent to an historic train station (Figure 3.2-41). The City of Taunton has begun the process of remediating this brownfield site in anticipation of a future train station. The site is within walking distance of downtown, would be utilized for future transit-oriented development and would serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – 209 total spaces consisting of 7 handicapped accessible and 202 standard spaces.
- **Parking Lot Type** – paved surface parking.
- **Station Access Drive** – driveway access from Arlington Street.
- **Bus/Vehicular drop-off Accommodations** – independent access driveway that would accommodate two 40-foot buses and 8 vehicular drop-off parking spaces.
- **Platform Type** – one side platform.
- **Platform Dimension** – 800 foot high level platform, 12 feet wide.
- **Track Configuration** – single track (with a freight siding).
- **Pedestrian Accommodations** – walks would be installed from the platform along the access driveway out to Arlington Street for future walkway connections.
- **Feeder Bus** – reroute GATRA Route 7 for access to the station; reroute GATRA Routes 6 and 18 for better transfer access at Taunton Green

Downtown Taunton Depot Train Station (New) – Attleboro, Whittenton Alternatives

Downtown Taunton Depot Station would be located on Oak Street adjacent to the GATRA/Former Oak Street Mall site (Figure 3.2-42). This site is in the center of Taunton, and a large portion of the property currently contains the GATRA maintenance facility. Providing an opportunity for multi-modal connections, the station would serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – 726 total spaces consisting of 13 handicapped accessible spaces and 713 standard spaces.
- **Parking Lot Type** – paved surface parking.
- **Station Access Drive** – driveway access from Oak Street and Mason Street.
- **Bus/Vehicular drop-off Accommodations** – Bus riders would utilize the existing GATRA depot as a drop-off/pick-up point for access to the train station.
- **Platform Type** – one side platform.
- **Platform Dimension** – 800 foot high-level platform; 12 feet wide.
- **Track Configuration** – single track.
- **Pedestrian Accommodations** – sidewalks would be installed out to Porter and Mason Streets, connecting to existing sidewalks. A ramp and stairs would be constructed at the northern portion of the platform that would connect into an existing sidewalk on Oak Street.

- **Feeder Bus** – there are no feeder bus improvements envisioned for this station as it is currently well served by local bus routes.

Whale's Tooth Train Station (New) – All Rail Alternatives

Whale's Tooth Station would be located on Acushnet Avenue at the existing Whale's Tooth parking lot, which was constructed by the City of New Bedford in anticipation of the commuter rail project (Figure 3.2-43). The station would include intermodal connections, potentially including ferry services. The site would serve walk-in, bike-in and drive-in customers. The following is a summary of the station design:

- **Parking Spaces** – 694 total spaces consisting of 15 handicapped accessible and 679 standard spaces.
- **Parking Lot Type** – existing paved surface parking.
- **Station Access Drive** –driveway access off of Acushnet Avenue.
- **Bus/Vehicular drop-off Accommodations** – bus drop-off area to accommodate two 40-foot buses and reserved spaces for passenger vehicles for pick-up/drop-off**.**
- **Platform Type** – one side platform.
- **Platform Dimension** – 800 foot high-level platform; 16 feet wide.
- **Track Configuration** – single track.
- **Pedestrian Accommodations** – ramps and stairs from the platform would be installed to connect with existing sidewalks adjacent to the existing parking facility.
- **Feeder Bus** – improve pedestrian connections to the station; extend SRTA Routes 1, 3 and 11.

South Station – All Rail Alternatives

The South Coast Rail Alternatives would utilize future expanded operational capacity at South Station already being planned by MassDOT to fulfill existing and future needs independent of the South Coast Rail project; described in Section 3.2.5.1 as part of the No Build Alternative.

The initial operational analyses conducted for the Attleboro and Stoughton Alternatives assumed expansion of South Station up to a capacity of fifteen tracks, which was the expansion considered reasonably foreseeable at that time. The operational analyses showed that while the Stoughton Alternative would be operationally feasible, the Attleboro Alternative would result in severe operational problems at South Station that would not only affect the performance of the Attleboro Alternative but would also deteriorate the performance of other rail operations. Without expansion of South Station the operational performance of the Stoughton and the Attleboro Alternatives would suffer, with the operation of the Attleboro Alternative most severely affected, due its need for more additional trains than the Stoughton Alternative.

Layover Facilities

The following sections describe the overnight layover facilities and the selection process for the midday layover facility in Boston.

Overnight Train Layover Facilities

The operations of all three rail alternatives would require overnight train layover facilities. The overnight layover facilities ideally would be located close to the terminal stations at the end of the New Bedford Main Line and Fall River Secondary. If the layover facility is near the terminal stations, trains do not have to travel far to get to the start of their morning trips or from the end of their evening trips. If the layover facilities are distant from the terminal, trains need to make a long distance non-revenue (deadhead) movement before they start their morning trips or after they end their evening trips.

Based on an evaluation of available sites along the New Bedford Main Line and Fall River Secondary, two alternative sites have been identified for the former and three for the latter. The sites were identified since they provide ample space for the layover facility program that includes:

- Six tracks approximately 940' long; five to store train sets and one track for maintenance equipment
- A 25-foot wide roadway around the perimeter and between track pairs
- Parking for approximately 40 cars including 2 handicapped spaces
- Lighting for parking lot and between the tracks
- Storage building and electrical substation

Based on the program for the overnight layover facility, the following alternative locations have been included.

New Bedford Main Line Overnight Train Layover Site Options

Wamsutta Overnight Train Layover Facility Site - This site is located on the east side of the right-of-way, opposite the proposed Whale's Tooth Station and adjacent to an existing CSX freight yard, near milepost 54.7 (see Figure 3.2-7).

- Distance from Terminal – 0.3 miles south of Whale's Tooth Station
- Lead Track – single lead track
- Highway Access – 400-foot driveway to Wamsutta Street

Church Street Overnight Train Layover Facility Site - This site is located on the west side of the right-of-way, on the site of an existing waste disposal industry, near milepost 51.5 (see Figure 3.2-8).

- Distance from Terminal – 3.1 miles north of Whale's Tooth Station
- Lead Track – double lead track
- Highway Access – directly off existing private Pig Farm Road, connecting to Church Street

Fall River Secondary Overnight Train Layover Site Options

ISP Overnight Train Layover Facility Site - This site is located on the west side of the right-of-way, opposite the existing ISP Facility, near milepost 47.1 in Freetown (see Figure 3.2-9).

- Distance from Terminal – 4.2 miles north of Fall River Depot Station; 5.3 miles north of Battleship Cove Station
- Lead Track – single lead track; potential for a long lead track or siding exists and can be assessed in FEIS/FEIR
- Highway Access – 2440-foot driveway to south of layover on west side of right-of-way, new bridge or grade crossing across right-of-way at that point for 860-foot driveway to Horizon Way

Weaver's Cove East Overnight Train Layover Facility Site - This site is located on the east side of the right-of-way, opposite the existing Weaver's Cove facility in Fall River, near milepost 49.8 (see Figure 3.2-10).

- Distance from Terminal – 1.5 miles north of Fall River Depot Station; 2.6 miles north of Battleship Cove Station
- Lead Track – single lead track; potential for a long lead track or siding exists and can be assessed in FEIR

- Highway Access – 440-foot driveway to North Main Street

Weaver's Cove West Overnight Train Layover Facility Site - This site is located on the west side of the right-of-way, on the part of the land of the existing Weaver's Cove facility in Fall River, near milepost 49.8 (see Figure 3.2-11).

- Distance from Terminal – 1.5 miles north of Fall River Depot Station; 2.6 miles north of Battleship Cove Station
- Lead Track – single lead track; potential for a long lead track or siding exists and can be assessed in FEIR
- Highway Access – direct access to site off of New Street

Midday Train Layover Facilities

The South Coast Rail rail alternatives would require midday storage of consists (train sets) in the Boston area to ensure that enough trains would be available for South Coast Rail trains to depart from South Station for the evening peak. The Attleboro Alternative would require midday layover capacity for eight additional consists (train units) and the Stoughton Alternative would require layover capacity for four additional consists. The South Coast Rail Alternatives would utilize layover facilities already being planned by MassDOT independent of the South Coast Rail project, as described in Section 3.2.5.1 as part of the No Build Alternative.

Should a layover solution not be available at the projected opening year of the South Coast Rail project, the projected operational performance for the rail alternatives may not be attainable, reducing the rail alternatives' ability to meet the project purpose and potentially affecting system-wide rail operational performance. If midday layover capacity in Boston is not increased over existing capacity, the operational performance of the Attleboro Alternative, which would require mid-day storage of an additional eight consists (train sets), would be more severely affected than the Stoughton Alternative which requires additional mid-day storage for only four consists.

Property Acquisition Required for the Rail Alternatives

This section describes property acquisition required for operation of the rail alternatives, and the property acquisition that would be required for construction only. Property acquisition for the commuter rail alternatives includes land required for the construction of the railbed and track, bridges and culverts, rights-of-way, retaining walls, grade crossings, stations, layover facilities, and electrification of the alternatives.

For purposes of this discussion, "property acquisition" is defined as obtaining greater than a 500-square-foot portion, or a sliver of land more than 10 feet wide, of any parcel outside of the existing rights-of-way to accommodate permanent construction impacts, based upon conceptual engineering plans. Narrow slivers of parcels are not considered in the evaluation of property acquisition, given the scale and accuracy of the conceptual design. Temporary construction impacts beyond the limits of the existing rights-of-way would not require land acquisition (utilizing temporary construction easements instead) and are therefore not considered in this evaluation. Aerial photographs and public Massachusetts GIS information were examined in reference to preliminary engineering plans to identify encroachments onto adjacent parcels. Final engineering plans may show an increase or decrease of the actual area of acquisition required.

When evaluating each property acquisition, conceptual design plans (in CAD format) were compared with public GIS information. Where proposed construction required full-parcel acquisition, property size for each of these parcels was gathered from existing information contained at Assessors' offices in each municipality. The design endeavored to limit property impact to partial acquisitions wherever possible, unless partial-parcel acquisitions resulted in the remaining parcel being unusable to the existing owner. In these instances, the analysis accounts for full-parcel acquisitions. Where partial-parcel acquisition was required, property acquisition was calculated utilizing the public GIS information contrasting to proposed limits of work at each function. Parcel acquisition would be re-evaluated once the LEDPA has been determined and/or more specific property line information for identified parcels is available.

For new track right-of-way, layover facilities and electrification equipment, property acquisition has been limited to minimum footprints required to support each function (as described above) and related amenities. Related amenities include access roads for maintenance, stormwater management facilities, and employee parking areas where required.

Where property acquisition is required, the goal for MassDOT would be to reach agreements with existing owners for purchase of properties required by the project. However, the Eminent Domain process may be required. Once property has been acquired for the project, it is expected that the Commonwealth (or one of its assigns) would retain ownership of each parcel. Property acquisition by alternative has been summarized in Table 3.2-24. Values in the table reflect both full and partial takings required for each alternative. Table 3.2-25 provides a summary of property acquisitions by layover facility.

Table 3.2-24 Summary of Property Acquisition by Alternative (Acres)

	Stations	Right of Way	Electrification	Total
Attleboro Electric	42.11	45.56	2.92	90.59
Attleboro Diesel	42.11	45.56	0.00	87.67
Stoughton Electric	58.82	44.23	3.75	106.80
Stoughton Diesel	58.82	44.23	0.00	103.05
Whittenton Electric	54.57	20.79	3.69	79.05
Whittenton Diesel	54.57	20.79	0.00	75.36

Table 3.2-25 Summary of Property Acquisition by Layover Site (Acres)

Layover Facility	Total
ISP Layover Facility (Fall River Secondary)	44
Weaver's Cove East Layover Facility (Fall River Secondary)	18
Weaver's Cove West Layover Facility (Fall River Secondary)	58
Church Street Layover Facility (New Bedford Main Line)	39
Wamsutta Layover Facility (New Bedford Main Line)	11

The mid-day layover storage for the rail alternatives would not require property acquisition, as mid-day layover capacity would be provided by a new mid-day layover solution proposed by MassDOT to be developed independently from the South Coast Rail project, as described in the section on Capital Costs.

Increase of operational capacity at South Station benefitting the South Coast Rail rail alternatives would not require property acquisition by the rail alternatives, as expansion of South station is proposed by MassDOT independent from the South Coast Rail project, as described in the section on Capital Costs.

Technical analyses on specific subjects pertinent to land use are presented in Chapter 4.2 – *Land Use and Zoning*, which provides a more specific breakdown of property acquisition relative to each alternative.

Capital Costs of Rail Alternatives

This section summarizes the estimated capital costs for the rail alternatives. Capital equipment costs are presented as the incremental cost of the life of the equipment as defined by FTA guidelines. The net result of this analysis is the identification of the annual funding requirements above and beyond the costs already programmed for the horizon year (No-Build Alternative).

Capital costs include the cost of new infrastructure such as new track and stations, and cost of new transportation equipment, such as rail cars. The first step in developing the financial impact analysis is to convert the capital and operating cost estimates from base year (2009) dollars to the projected year-of-expenditure dollars. For all the alternatives, it was assumed that construction would commence in FY2012. The duration of construction varies by alternative as described below.

The capital cost estimates for both infrastructure and equipment were escalated to year-of-expenditure based on current FTA criteria. These costs were then annualized based on the useful life of each element and a discount rate of 7 percent, in accordance with FTA guidelines.

The projected costs do not include those associated with the Boston mid-day layovers solution and the expansion of South Station, as they are independent projects from the South Coast Rail project.

Table 3.2-26 provides a summary of the cost estimate and analysis for each rail alternative.

Construction of the Rail Alternatives

This section describes the conceptual construction methods that would be used to construct the commuter rail alternatives, including railbed and track, bridges & culverts, retaining walls, grade crossings, stations, layover facilities and electrification infrastructure. More detailed construction plans and sequencing would be provided for final design and permitting.

Segments of the infrastructure construction would occur on active track where service would need to be maintained during construction activities. Construction methods were developed with the intent to minimize disruption to these services. The following is a summary of track segments with active track:

- **Northeast Corridor:** The Northeast Corridor has passenger and freight service by Amtrak, the MBTA and CSX. The MBTA operates from 4 AM to 2 AM; Amtrak operates from 5 AM to 1 AM. Service operates seven days a week.
- **Stoughton Line:** The MBTA's Stoughton Line has commuter rail service from the existing Stoughton Station north to Canton Junction, where it connects to the Northeast Corridor. The MBTA operates from 5 AM to 12 AM during weekdays only.

Table 3.2-26 Summary of Capital Costs – Rail Alternatives

	Attleboro Electric[1]	Attleboro Diesel[1]	Stoughton Electric	Stoughton Diesel	Whittenton Electric	Whittenton Diesel
Total Infrastructure Cost ($M)	$979,059,000	$826,786,000	$944,904,000	$762,925,000	$905,202,000	$719,612,000
Real Estate Cost ($M)	$64,004,000	$63,784,000	$65,226,000	$64,316,000	$62,984,000	$62,064,000
Professional Services Cost ($M)	$132,662,000	$112,030,000	$128,034,000	$103,376,000	$122,655,000	$97,507,000
Contingency ($M)	$310,362,000	$262,091,000	$299,535,000	$241,847,000	$286,949,000	$228,117,000
Vehicle Cost ($M)	$180,970,000	$163,972,000	$180,970,000	$103,832,000	$180,970,000	$103,832,000
Total ($M)	$1,667,057,000	$1,428,663,000	$1,618,669,000	$1,276,297,000	$1,558,760,000	$1,211,132,000
Year-of-Expenditure ($M)	$2,013,643,000	$1,722,471,000	$1,884,465,000	$1,484,652,000	$1,814,719,000	$1,408,751,000

Notes: Total infrastructure costs were estimated in 2009 dollars.
Professional services are 13.55% of infrastructure costs without contingency. Professional services include Design, Permitting, Construction Phase Inspection & Project Management.
Contingencies are 31.70% of infrastructure costs and include Indirect Soft Costs, Mitigation Contingency, and Construction Contingency.
Escalation was calculated at 3.25% per year per FTA criteria.
1. Attleboro Alternatives do not include the cost associated with a fourth track on a segment of the NEC

- **New Bedford Main Line:** Mass Coastal has an active freight railroad operation on the New Bedford Main Line from New Bedford to Taunton where it connects to the Attleboro Secondary at Weir Junction. Mass Coastal currently operates along this line two days per week between New Bedford and Cotley Junction and weekdays between Cotley Junction and Weir Junction.
- **Fall River Secondary:** Mass Coastal has an active freight railroad operation on the Fall River Secondary from Fall River to where it connects to the New Bedford Main Line at Myricks Junction. Mass Coastal currently operates on this line three days per week.
- **Attleboro Secondary:** CSX has an active freight railroad operation on the Attleboro Secondary lines from Weir Junction to the Northeast Corridor. CSX operates on this line five days per week.
- **MassDOT Right-of-Way (Taunton/Dean Street):** Mass Coastal has an active freight railroad operation that utilizes the Fall River Secondary line and the MassDOT track right-of-way through Taunton to the Dean Street area. Mass Coastal operates on this line up to seven days per week.

Track Construction

The proposed track work consists of construction of new track structure along existing active freight and passenger service areas and construction of new track along abandoned or new rights-of-way. The new track construction consists of single, double and triple track sections, passing sidings, replacement of existing industry turnouts, and special track work. Common elements of the track construction include excavation, constructing a new track bed, ditches, ballast, concrete ties, and new steel rail. These improvements include the following specific elements:

- The existing ballast would either be undercut to remove silt, returning the existing ballast material to current specifications, or be removed and replaced by new ballast. Undercutting would clean the entire ballast section by lifting it into vibrating screens and returning the clean ballast to the track, while silt would be wasted onto the shoulder in a controlled manner and contained by silt fencing or other barriers or carried away. Regardless of which technique is utilized, at least 12 inches of clean ballast is required below the ties.

- The existing subballast would either remain in place with possible regrading or excavated and replaced with new material to meet current specifications.
- Ties would be completely replaced. At this time it is anticipated that the entire line would be outfitted with concrete ties, elastomeric pads and compression Pandrol rail clips.
- The existing jointed rail would be replaced with new 132-lb continuously welded rail.
- Existing embankments would be modified to accommodate the new track cross section, including (where appropriate) side drainage ditches, ballast side slopes, and retaining walls.

The construction methodology for the track construction for each alternative is described in the following sections.

Track Construction Methods Common to All Rail Alternatives

The New Bedford Main Line from Whale's Tooth station to Weir Junction in Taunton and the Fall River Secondary from Battleship Cove station to Myricks Junction in Berkley are track segments that are common to all the commuter rail alternatives. The proposed track construction consists of installing new track along existing active freight rail rights-of-way.

The construction sequencing for the track construction would allow freight operations to be maintained throughout the majority of the track construction activities. Freight operations on the New Bedford Main Line and Fall River Secondary currently operate at a low frequency schedule. The construction activities would occur in small segments so the contractor can ensure that existing freight activities are maintained. The following summarizes the construction sequence.

Single Track Sections Construction Methods

In proposed single-track sections, work must be staged to maintain freight traffic during the construction period. The general sequence of work in single-track sections would be as follows:

- Construct retaining walls and earthworks to the extent possible without affecting existing track.
- Construct bridges in the recommended phasing as outlined in the Bridge section of this construction methodology summary in order to maintain freight service.
- Culverts would be both precast concrete box and pipe culverts that would be installed while the track is temporarily out of service. Many new culverts would be an extension of existing culvert structures and would be designed by MassDOT in consideration of existing hydrology necessary to sustain existing habitat in coordination with the Army Corps and DEP. Requirements would be included in contractor construction specifications.
- Construct new track in final position. Construction to be coordinated with freight service since existing track would be removed and existing ballast excavated in order to install the new track structure; temporary connections to existing tracks would be provided at limits of work segments.

Double/Triple Track Sections Construction Methods

In proposed double and triple track sections, the new track can be constructed without significantly disturbing the existing track, facilitating the construction of the new track structure while maintaining freight service on the existing track during construction. The existing track would be reconstructed after the new second track is constructed. The general sequence of work would be as follows:

- Construct retaining walls and earthworks to the extent possible without affecting existing track

- Construct bridges in the recommended phasing as outlined in the Bridge section of this report summary in order to maintain freight service
- Construct second track (and third track where proposed) in final position while maintaining freight operations on the existing track. The existing freight track may need to be realigned in some segments to allow space for construction of the new track structure on its proposed alignments.
- Construct turnouts at ends of double-track section. It is assumed that turnouts can be constructed while the track is out of service (i.e. overnight or during weekends).
- Shift freight service to completed second track.
- Construct remaining portions of abutments and bridges.
- Reconstruct first track in final position.

Track Construction Methods for the Attleboro Alternative

This section describes construction on the Northeast Corridor between Readville and the new Attleboro Bypass, the proposed Attleboro Bypass and Attleboro Secondary for the Attleboro Electric and Diesel Alternatives. The segments are described as follows:

- Northeast Corridor from Readville to the new Attleboro Bypass, an active passenger and freight corridor
- Attleboro Bypass from the Northeast Corridor to the Attleboro Secondary in Attleboro, a new right-of-way corridor
- Attleboro Secondary from the new Attleboro Bypass to Weir Junction in Taunton, an active freight corridor

Northeast Corridor Track Construction Methods

The work in this section requires constructing a new third track, new turnouts, new crossovers, new interlockings, alignment shifts, station modifications, bridge modifications, and culvert replacements and extensions. The new third track would be designed for the higher passenger train speeds on the NEC and would be constructed and maintained to FRA Class 8 tolerances. Amtrak and the MBTA operate passenger service along the Northeast Corridor seven days a week. Amtrak provides both regional and Acela high speed service and the MBTA provides commuter rail service from Providence. This passenger service would need to be maintained during construction of the new third track. CSX also uses the Northeast Corridor for freight service. The general sequence of work would be as follows:

Construction to Occur Prior to Track Construction:

- Construct retaining walls and earthworks to the extent possible without affecting existing track and electric catenary structures.
- Reconstruct or widen bridges in the recommended sequence as outline in the Bridge section of this construction methodology summary
- Construct required temporary station, platform and passenger access modifications at Canton Junction, Sharon and Mansfield Stations.
- Remove and/or relocate all pole lines, catenary structures, abandoned tracks and utilities along new third track alignment.
- Make NEC Amtrak traction power substation modifications to accommodate the third track. This involves relocating trackside structures and therefore needs to be carried out before the new third-track construction.
- The sequence of relocating the catenary structures and wire is as follows:

- The existing catenary poles are currently located where the proposed third track would be located and therefore need to be replaced to construct the third track.
- The new catenary structures required generally fall into two types: three track portals and twin track cantilever (TTC) poles.
- The three track portals are required where there are existing two track portals, the TTCs are required where there are existing single track cantilever poles.
- New OCS structures would be constructed approximately 15-20 feet from existing OCS structures, so that catenary wires could be transferred from existing to new structures with as little service disruption as possible.
- Grade right-of-way and prepare subgrade for new third-track construction.

Construct New Track without Disruption to Current Service:

- Construct northerly sections of new third track in final (Track 3) position along the west side of right of way.
- Construct southerly section of new third track in final (Track 4) position along the east side of right of way.
- Install Canton Junction Interlocking track components, including two Track 3 to 1 crossovers, one Track 1 to 3 crossover, one Track 2 to1 crossover and one Track 1 to 2 crossover.
- Install Mansfield Interlocking track components, including one Track 2 to 4 crossover.

Construct Track with Track Outages and Disruption to Current Service:

- Shift and connect existing Track 3 to future Track 3.
- Shift and connect future Track 3 to existing Track 1, existing Track 1 to existing track 2, and existing Track 2 to future Track 4.
- Shift and connect existing Track 1 to future Track 1.
- Shift and connect existing Track 2 to future Track 2.
- Install Norton Interlocking track components, including two Track 1 to 2 crossovers and one Track 2 to 4 crossover, one Track 3 to 1 turnout and two track 2 turnouts to the future bypass Tracks 1 and 2.
- Remove one existing Track 1 turnout, one freight siding turnout and track. Construct sections of new Track 1, freight siding and third track in final (Track 3) position along the west side of right of way including one new Track 3 and one new siding turnout and connection to Cambridge Sound Works.
- Remove one existing Track 1 turnout and freight track. Construct sections of new Track 1, freight siding and third track in final (Track 3) position along the west side of right of way including one new turnout on Track 3 and connection to Cambridge Sound Works.
- Remove existing freight track and three turnouts from Track 2. Construct sections of new third track in final (Track 4) position along the east side of right of way from, including two new turnouts and siding connections to Tighe Industrial and Merken's Chocolate.
- Install Transfer Interlocking track components, including two Track 2 to 1 crossovers, one Track 1 to 3 crossover, one Track 1 turnout connecting the NEC to the existing Dorchester Branch connecting track, and one Track 1 turnout connecting the NEC to the future Dorchester Branch connecting track.
- Shift the existing Dorchester Branch connecting track and construct the future Dorchester Branch connecting track, including one track crossing and one crossover which connect the Dorchester Branch and the Franklin Branch at Hill Interlocking.
- Restore passenger service.

Attleboro Bypass Track Construction Methods

This segment of the corridor would be an entirely new railroad right-of-way and would connect the Northeast Corridor segment to the Attleboro segment. Construction can proceed unimpeded. Construction would be similar to the double track construction as outlined in the construction methodology for the Track Construction Common to All Rail Alternatives. The only impacts to service would occur where the bypass track connects to the Northeast Corridor and the Attleboro Secondary.

Attleboro Secondary Track Construction Methods

This segment has active freight service that would need to be maintained during construction activities for the track. Construction would be similar to the single and double track construction as outlined in the construction methodology for the Track Construction Common to All Rail Alternatives. However, some segments of the Attleboro Secondary extend through the downtown Taunton area that would constrain and slow construction due to narrow right-of-way and the number of at-grade crossings, as well as due to the proximity of homes along the alignment. This would make it more difficult to maintain existing rail and highway traffic.

Track Construction Methods for the Stoughton Alternative

The following sections describe the track construction required for the abandoned Stoughton right-of-way and the existing Stoughton Line.

Abandoned Stoughton Right-of-Way Track Construction Methods

The abandoned Stoughton right-of-way segment of the corridor is an existing abandoned railroad right-of-way connects the New Bedford Main Line at Weir Junction and the existing Stoughton Line at Stoughton Station. Construction can proceed unimpeded. Construction would be similar to the single and double track construction as outlined in the construction methodology for the Track Construction Common to All Rail Alternatives, except for portions involving trestle construction across Hockomock Swamp

Existing Stoughton Line Track Construction Methods

The existing Stoughton Line has active MBTA commuter rail and freight service that would need to be maintained during construction activities to construct a new second track. Construction would be similar to the double track construction as outlined in the construction methodology for the Track Construction Common to All Rail Alternatives. However, due to the higher frequency of commuter rail service during the morning and evening peak periods (higher than the freight service), construction activities would be restricted during those times to minimize service impacts. It is assumed that freight deliveries can occur during the week and the corridor would be available for any construction activity for the entire weekend (Friday night through Monday morning), as there is currently no passenger service on the weekend.

Route 138 Crossing Track Construction Methods

The Route 138 Crossing in Raynham is recommended for grade separation due to the high traffic volume on Route 138 and severe skew angle of the crossing. The current design is to depress the railroad under Route 138, though other options could be considered in the FEIR if the Stoughton Alternative advances.

Since the profile of the railroad cannot exceed a 3 percent slope and the topography is very flat in this area, a boat section/retaining walls would be required for approximately 600 feet on either side of the underpass to depress the railroad into a cut section.

Track Construction Methods for the Whittenton Alternative

This segment of the corridor would be a new railroad on an abandoned right-of-way and would connect the Attleboro Secondary to the Stoughton Line in Raynham. Construction can proceed unimpeded. Construction would be similar to the single track construction as outlined in the construction methodology for the Track Construction Common to All Rail Alternatives, Attleboro Alternative and Stoughton Alternative.

Bridge and Culvert Construction Methods

The existing undergrade (railroad) bridges along the existing New Bedford Main Line, Fall River Secondary, Attleboro Secondary and the abandoned rights-of-way do not meet current design standards for commuter rail service. In order to accommodate the requirements for the commuter rail alternatives, the bridges would be rehabilitated or replaced. The reconstruction of bridges in the New Bedford area is subject a federal TIGER grant and has independent utility from the South Coast Rail project, as described above. The existing undergrade bridges along the Northeast Corridor are currently designed and maintained to handle commuter rail, Amtrak and freight trains. However, many of these bridges would need to be replaced or modified to accommodate the new third track. Since the majority of the existing freight and passenger service must be maintained during construction activities, the proposed undergrade bridge improvements would be constructed and staged to allow the passage of trains while they are under construction. The construction staging strategy is especially important where bridges are over environmental resource areas like rivers and wetlands to minimize impacting these resources.

In some cases, the overhead (highway) bridges would need to be reconstructed to increase the railroad vertical or horizontal clearance under the bridge. However, if existing vertical and horizontal clearances are sufficient, overhead bridges would not be modified.

For all undergrade bridges, the majority of the work area would be limited to the area behind the existing abutments. Only during erection of the superstructure would work be done over existing roadways or waterways. This phase of construction must be coordinated with local and state officials and would follow an accepted traffic management plan for bridges over roadways.

For bridges over waterways, the contractor would ensure that all construction is performed within the temporary and permanent impact limits set forth by the environmental permits. Any dewatering, if required, would also be performed in accordance with the environmental conditions. No debris shall be allowed to enter the watercourse. For longer spans over watercourses, particularly the Taunton River, it may be necessary for the work to be done using barges. The three Taunton River bridges on the Stoughton Line and the Cedar Swamp River bridge on the Fall River Line would be constructed while the tracks are out of service since installing temporary structures would have a significant impact on the environmental resources at these locations.

For construction in areas where the track is active, the construction must be properly phased so that service is not interrupted. In order to maintain service, support of excavation and of the track may be necessary. All work would be coordinated with the railroad and accepted prior to construction. For all bridges, any demolition materials would be removed from the site and properly discarded off-site. For construction of the three Taunton River bridges on the Stoughton Line, it is assumed that the existing track would be taken out of service for a period to construct the new bridges to minimize impacts to the river.

Construction sequencing is an important consideration at railroad bridges where active rail must be maintained. For track segments without active rail, or with rail which can be deactivated, construction on undergrade bridges can proceed unimpeded. At locations where rail must be kept active, bridge staging would generally be similar to one of the schemes described below depending on the number of tracks the existing structure can accommodate and the number of tracks being proposed over the crossing. Structural staging may be affected by track staging along the alignment, staging requirements of nearby structures, and property or wetland boundaries.

Two Existing Tracks, Two Proposed Tracks Construction Methods: At existing undergrade railroad bridges that can accommodate two or more tracks and where two tracks are being proposed, the typical construction sequence would be as follows:

- Divert all railroad traffic to Track 2 over the bridge
- Demolish Track 1 portions of existing structure, construct proposed Track 1 structure, and relocate all railroad traffic to new Track 1 structure
- Demolish remaining existing structure, construct proposed Track 2 structure, and relocate Track 2 to its final position

One Existing Track, One Proposed Track Construction Methods: At existing undergrade railroad bridges that can accommodate only one track and where one track is being proposed, the preferred approach is to construct new abutments with widths greater than typically needed for a single track bridge. This increased width would permit the construction of a temporary superstructure to support the relocated track while the existing structure is replaced. The typical construction sequence would be as follows:

- Demolish portions existing structure, as necessary, and construct applicable portions of new substructure and install temporary superstructure
- Relocate track onto temporary superstructure
- Demolish remaining portions of the existing structure, complete construction of new substructure, and construct new superstructure
- Adjust track to final position

One Existing Track, Two Proposed Tracks Construction Methods: At existing undergrade railroad bridges that can accommodate one track and where two tracks are being proposed, the typical construction sequence would be as follows:

- Demolish portion of existing structure, as necessary, to construct new Track 2 structure, while maintaining railroad traffic on existing structure
- Divert all railroad traffic to new Track 2, demolish remaining portions of existing structure
- Construct new Track 1 structure and relocate tracks to final positions

Culvert Construction Methods: For culverts that would remain in place, the existing culverts would be extended to accommodate the wider rail bed. The culvert extensions would be installed before the slope embankment is modified for the new track structure. At each location, the inlet could be sand bagged to temporarily stop the flow of water and pumps can be used to divert the flow for construction of the culvert end base of gravel and stone in the dry. The pipe extensions would be fitted to the existing culverts and stone pads installed to minimize erosion at the culvert ends.

For construction of new culverts to replace existing culverts, typical sequence of construction would be to excavate above the slab and behind the abutment walls of the existing culvert. The inlet could be sand bagged to stop the flow of water and pumps can be used while constructing the new gravel and stone foundation in the dry. After the foundations are constructed a precast concrete box culvert and cast-in-place headwalls can be installed.

Trestle Construction through the Hockomock Swamp

The proposed trestle in the Hockomock Swamp consists of a multi-span, ballasted superstructure supported by deep pile foundations.

The construction of the proposed trestle through the Hockomock Swamp ACEC would be performed in an area that consists of existing railroad grade that has been in place for more than a hundred years. The trestle would be constructed in a manner that minimizes the disturbance to the wetland resource areas and existing topography. The construction method would be kept consistent throughout the corridor, even in sections where the right-of-way and embankment widens.

Access to the site would be via Foundry Street (MP 11.8) and Race Track Crossing (MP 14.10), the site of the proposed Raynham Park Station.

The construction activities within the Hockomock Swamp for the construction of the trestle and track would be performed within the constraints of a set boundary either side of a working area. This boundary would be defined by the installation of sedimentation and erosion controls along the existing earth embankment that was the railroad bed when this was an active track through the Hockomock Swamp.

The following paragraphs describe the general construction methods and sequence that would be used to construct the trestle on the existing railroad grade across Hockomock Swamp:

- **Install Erosion Controls and Selective Trimming of Vegetation:** The Limits of Vegetated Wetland and construction site would be clearly delineated and defined to represent the minimum area necessary to construct the trestle. Erosion controls (staked, embedded siltation fencing and/or hay bales) would be installed at the limits of work. Vegetation within the limit of work would be cleared and tree branches trimmed to prepare the work area. Any remaining ties or rail would be removed and disposed of in accordance with Massachusetts regulations.
- **Install Trestle Foundations (substructure):** The trestle is envisioned to be supported by deep foundations, i.e. steel h-piles or drilled shafts. Installation of deep foundation system would occur starting at the midpoint of the trestle and work backwards towards both ends. This would allow the utilization of two sets of installation crews. It is anticipated that the deep foundation system would be completed leaving the top portion of the piles exposed. Subsequently, temporary timber cribbing would be installed, as necessary, to allow construction equipment to drive over the exposed pile (shaft) tips.
- **Install Trestle Pier Cap Reinforcement (substructure):** The trestle substructure is envisioned to consist of steel reinforced cast-in-place concrete pier caps at each span. Work would begin at the midpoint of the trestle and work backwards towards both ends, allowing the utilization of two sets of construction crews. Work would consist of installation of prefabricated steel reinforcement cages

onto the pile (shaft) tips. Formwork would also be installed. It is anticipated that this work would be completed in groups of three or four pier caps at a time. After the completion of each group of pier caps, concrete would be brought onsite and pumped into the forms. The process would repeat, working backwards to both ends of the trestle.

- **Construct Approach Walls:** Based on the current vertical alignment, approach walls are required at each end of the proposed trestle to provide the required transition up to the topside of the trestle. It is currently envisioned that retained soil approach walls would be required for approximately 1,000 feet before, and 2, 000 feet after, the trestle limits. Construction of these approach walls would most likely need to occur at this stage of construction. This would provide easy access to the topside of the trestle structure to facilitate installing the superstructure.
- **Install Trestle Box Girders (superstructure):** The trestle superstructure is envisioned to consist of precast / prestressed concrete box girders supporting ballasted rail and a cast-in-place concrete walkway. Elastomeric bearing pads would be installed onto the first and second pier caps and the first span of box girders would be dropped into place. Installation of the girders would require equipment that can move the girders from the flatbed and onto the pier caps while staying within the limits of cleared vegetation. This can be accomplished by careful location of the crane, or by the use of a launching system. This process would be repeated for all spans. The box girders would be transversely post-tensioned to ensure adequate distribution of structural live loads.
- **Install New Ballast and Track:** After placement of any cast-in-place concrete walkways and steel ballast plates, installation on ballast and rail can commence in conjunction with off-bridge rail installation.

Grade Crossing Construction Methods

The majority of existing public grade crossings on active track have automatic grade crossing gates and flashers. These existing grade crossings and the new crossing along abandoned rights-of-way would have new automatic highway-grade crossing signals including gates and flashers. The highway/rail crossing surface would be reconstructed with new ballast, ties, pavement surface and rubber rail seal at the rail-pavement interface. New pavement markings and signs would also be installed at the roadway approaches to the crossing. The grade crossing improvements would be constructed in accordance with the requirements of the USDOT Manual on Uniform Traffic Control Devices.

The grade crossing improvements would be constructed with construction work zones that may require temporary travel lane closures and/or lane width reductions. The majority of the work would be performed while maintaining vehicular and rail traffic during construction activities. Existing grade crossing equipment would be removed and new equipment installed in place.

Electrification Construction Methods

Construction for the electric commuter rail alternatives includes construction of new electrification systems and modification of the existing electrification system on the NEC that would be impacted by the construction of the new third track for the Attleboro Alternative.

New Electrification System Construction Methods

New electrification infrastructure would be required for the electric commuter rail alternatives south of where the route diverges from the NEC. For the Attleboro Alternative, a new system would be required from the Attleboro Bypass to Fall River and New Bedford; for the Stoughton and Whittenton Alternatives, from Canton Junction to Fall River and New Bedford.

The new electrification infrastructure would include traction power facilities and an overhead catenary system (OCS) as well as modification to the signal system to make it compatible with electrified rail service. Since operations would utilize part of the electrified NEC, the project would use a similar system.

The existing NEC system is a 2x25kV autotransformer system with utility intake at 115kV, stepped down to 50kV and center grounded to provide distribution to the trains via the OCS at 25kV with a 'negative feeder' routed along the OCS structures also at 25kV. The traction power system providing power to the OCS is made of three different types of traction power facilities: Traction Power Substation, Switching Station and Paralleling Station.

The Attleboro Alternative electrification system would consist of one main substation, one switching station and six paralleling stations. The Stoughton and Whittenton Alternatives electrification system would consist of two main substations, two switching stations, and six paralleling stations.
Each traction power facility would include:

- Switchgear
- Transformers (Main traction power and autotransformers)
- Protection relaying & controls
- Disconnect switches (structure mounted)
- Auxiliary transformers and power systems
- Grounding and Bonding System
- SCADA Equipment

The traction power substation is the largest type of facility and requires a high voltage (115kV) utility power interface to provide power to the rest of the system. Switching stations and paralleling stations are smaller facilities that do not require a high voltage utility supply.

The traction power facilities would be adjacent to the existing right-of-way, so construction could be staged with little or no impacts to the existing train service. Typically, the construction of each site would proceed independently early in the overall construction process. The main substations are more complex and construction would be started as early as possible. Once construction is complete, each substation would be tested and energized prior to completion of the OCS and other systems.

The OCS consists of concrete foundations, steel poles, contact wire, feeder wire, static wires and sectionalizing switches. It is largely dependent on the track installation. Therefore, the OCS would typically be installed after the track is in place. OCS pole foundations are set with respect to the center of the track. Pole footings would be installed using off track equipment during track foul-time periods to minimize impact to existing operations. In areas where access along the right-of-way is limited, excavation for the foundations would be completed by on-track equipment. This would have more impact on rail operations, especially in single track areas, and may be restricted to nights or weekends. Precast foundations could be used to reduce the installation time. In areas where there is no existing service, construction could proceed more quickly, as construction would not be restricted by operations. After the foundations are in place, the catenary poles would be erected. Pole mounted steel work (cantilevers, drop tubes, disconnect switches, etc.) would then be installed. With the steel and poles in place, the OCS conductors would be strung, tensioned and anchored, hangers installed, clipped in place and registered. This work would all be done during foul time or track out-of-service using on or off track, space permitting. Once a section is complete, cable connections, wire terminations, and jumpers would be installed.

The system would not be energized until all signal and communications systems were fully installed and operational, to ensure that all remote monitoring and control facilities were working correctly.

The wayside power system requirements are set with respect to the track alignment and location of equipment at interlockings. Therefore, the wayside power cubicles, required to remotely control and operate the OCS sectionalizing switches and control interlocking lighting, would be installed at the same time as the OCS.

Construction Method for Modification of the Existing Northeast Corridor Electrification

The NEC between the proposed Norton Interlocking and the existing Readville Interlocking is a two-track railroad electrified at 25kV AC. The electrification system consists of traction power facilities and the OCS. The traction power facilities affected by the proposed Track 3 between Attleboro (MP 200) and Readville (MP219) would be the Sharon Substation (MP 212), the Readville Paralleling Station (PS) (MP 219) and the East Foxboro Paralleling Station (MP 205). East of Readville, the Northeast Corridor is a three-track railroad; Amtrak is in the process of electrifying the third track from Readville to Back Bay.

Sharon Substation is one of four main substations on the system. It is supplied power from NSTAR's utility grid at 115kV. The overhead transmission lines run over the center of the site. Adjacent to these lines, Amtrak has two step-down transformers rated at 40MVA capacity. No main equipment can be located directly under these lines. The transformer secondary voltage is 2x25kV and is distributed to the catenary system using indoor gas insulated switchgear and outdoor gantry mounted motor operated disconnect switches. The indoor switchgear is not extendable and no spare circuit breakers are provided.

There are two 25kV supply buses at Sharon. One bus feeds the OCS east to Boston; the other feeds the OCS west to Norton. The buses are operated at the same voltage but from different utility lines and phases and main transformers. Each bus section consists of two poles, one the feeder bus and the other the catenary bus. The north and south supplies must be separated by a phase break in the OCS, feeder circuits of each track, and a bus-tie breaker in the switchgear. The OCS phase break, located outside the substation, consists of two sets of in-line insulation with de-energized wires between. One phase break is required for each track.

The paralleling stations are connected to the catenary system but do not have an incoming utility power supply. The catenary supply is switched using indoor gas insulated switchgear and outdoor gantry mounted motor operated disconnect switches. The switchgear is not extendable. Each paralleling station has a catenary connection for each track and a connection for each feeder wire. Each paralleling station includes a 10MVA Autotransformer, switchgear and control building and an auxiliary transformer tapped to the catenary.

At each traction power facility, the connections to the catenary system are made via a switching gantry and a strain gantry. Between the gantries are across track span wires for each traction power circuit with drop down connections to the catenary wires. The strain gantries do not have adequate space for additional switches.

At interlockings, wayside power is provided under the scope of the traction power system. Each wayside power location provides for power and remote control of interlocking lighting and OCS disconnect switches. The wayside power location includes a wayside power cubicle (WPC) which houses a remote terminal unit (RTU), batteries, transfer switch, auxiliary transformer, power conditioner and field marshalling terminals.

Construction Methods for New Electrical Power Requirements for Track 3 along the Northeast Corridor

In order to provide power for the new Track 3, additional switching equipment would be required at the Sharon Substation, the East Foxboro PS and the Readville PS as well at wayside power locations. In conjunction with this work, the Supervisory Control and Data Acquisition (SCADA) control system for the traction power system would need to be updated. The control center is located in Boston. The changes would include software modifications.

Sharon Substation Modifications Construction Method

- A new connection would be required from each bus. A cable connection would be made to each bus and routed outside via duct banks to outdoor pad mounted circuit breakers.
- The outdoor breakers would be connected to the OCS by two new single pole switches.
- The single pole switches would be extended to the existing switching and strain gantries, or new poles to be erected. New poles would be constructed for the Track 3 connections, because extension to the switching gantry is impractical due to a stepped retaining wall. The poles would be installed within the existing site. Mounted on the poles would be the catenary disconnect switch, potential transformer, lightning arrester, grounding switch and Track 3 bypass switch. The new poles would be located at both ends of the gantry to provide power to each side of the phase break. Poles would be constructed on the opposite side of the tracks to provide the cross-track spans and drops.
- The existing strain gantry would be replaced approximately 14 ft behind the existing. The new gantry would replicate the existing and all connections would be relocated.
- A new disconnect switch would be required to provide emergency power to the center of the phase. The phase break switch would be powered and controlled via Sharon Substation.
- The circuit breaker and motorized disconnect switches would receive AC and DC control power supplies from the existing control room. New control switches and interlocking would be required.
- Protection relays would be installed in the control room to provide distance protection for the Track 3 circuits. The existing bus differential and electrical interlocking schemes would incorporate the new breakers.
- The new relays and controls would be installed within the existing enclosures.

East Foxborough Power Station Construction Method

- The station would require a new outdoor pad mounted single pole circuit breaker, which would be connected via cable and duct bank to the catenary bus of the switchgear. A new Track 3 disconnect switch would be mounted on the switching gantry or a new OCS pole. Control room and SCADA modifications would also be required.
- The site would be extended approximately 20 feet to the east to accommodate the new equipment. A pole would be constructed on the opposite side of the tracks to provide a connection to the new third track.

Readville Power Station Construction Method

- Currently, the Dorchester Branch is connected to the mainline via a single non-electrified turnout. As part of the Attleboro Alternative, track would be modified to provide a two track connection. The new track alignment would be directly through the existing Readville PS site. A replacement facility would be constructed approximately 200 feet east of the existing site. The new facility would replicate the existing facility and would need to be in service prior to disconnecting and removing the existing equipment.
- The new track 3 equipment would be incorporated into the switchgear line-up and on the switching gantry at the new site. There would be no need for additional outdoor circuit breakers.
- The strain gantry would be replaced in similar fashion.

Wayside Power at Interlocking Construction Method

- At existing interlockings where new OCS sectionalizing switches are required, the existing wayside cubicle would be modified to provide the AC and DC power and remote control of the motorized switches. New direct buried cables and manholes would be required from the cubicle to each new switch and new interlocking light location. Existing interlocking lighting areas would be expanded to include the new track crossovers for maintenance, and to facilitate construction. Interlocking lights would be installed on the OCS poles.
- Transfer Interlocking (MP 203) and Junction Interlocking would be modified as described above.
- At new interlockings, OCS pole mounted transformers, switching and control equipment and all associated cabling would be constructed. Norton Interlocking (MP 200) would include these improvements.

3.2.5.3 RAPID BUS ALTERNATIVE

The Rapid Bus Alternative would provide express bus service to South Station in Boston using existing Route 140 and Route 24 highway corridors from New Bedford and Fall River, a zipper (contraflow) lane along Route 24 from Route 495 to Route 128, a new permanent bus lane in the median of Route 128, the existing I-93/Route 3 HOV zipper lane, and a short portion of mixed traffic on I-93 to South Station. The Rapid Bus routes would depart from stations in Fall River, New Bedford and Taunton with service to Boston.

The following section describes the Rapid Bus Alternative including the stations, highway infrastructure improvements, vehicles for this alternative, operations, ridership projections, cost estimates and cost-effectiveness.

Rapid Bus Operations

Rapid Bus Operating Plan

The operating plan for the Rapid Bus Alternative assumes 15-minute peak headways on the branches with express service from each station to Boston. These headways match the modeled ridership demand for the service. The alternative provides eight peak period trips between each terminal station and Boston's South Station. The alternative would provide a new transportation service, not an extension or modification of an existing service.

During the morning peak, buses would use the general purpose travel lanes of Route 24 and Route 140 from the terminal stations to a new zipper lane on Route 24 starting at the Interstate 495 interchange. A moveable barrier system, stored against the permanent median barrier during non-peak hour traffic, would be shifted to create the zipper lane for the buses using a barrier transfer machine before the bus service starts. The zipper lane would utilize the southbound, off-peak direction of Route 24. The movable barrier technology available today can move the barrier at a rate of up to 10 mph. Once the morning peak service is complete, the movable barrier system would be shifted back to the center median to open three general purpose lanes in each direction of Route 24. For the evening peak, the barriers would be shifted again to create a zipper lane for the buses utilizing a lane from the northbound, off-peak direction of Route 24.

The service would provide at least one trip per hour in the off-peak direction during peak periods and one trip per hour in both directions during off-peak periods. The actual reverse peak and off-peak trips would be greater if vehicles recycle to provide more than one peak directional trip. Buses travelling in the off-peak direction would use the bi-directional exclusive bus lanes along Route 128 between the Braintree Split and the Logan Express terminal if this provides a travel advantage. These buses would use general purpose lanes for the remainder of the trip since the zipper lanes would be one-directional.

Should ridership on any of the branches require additional service beyond that provided by 15-minute headways, buses would depart in platoons. Table 3.2-27 summarizes the operational characteristics of the Rapid Bus alternative.

The estimated travel times have been updated since the ENF to reflect future traffic conditions along the highway corridors where the buses would operate. The travel time from New Bedford to Boston presented in the ENF was based on measured existing drive times between the cities, not the 2030 projected time. Since the ENF, the Central Transportation Planning Staff (CTPS) has provided studies that better project future travel time for the Rapid Bus Alternative. These studies used a travel demand model that more accurately simulates current travel speeds through the corridors and incorporates information on future traffic conditions along the highway corridors to better project future travel speeds and travel times.

CTPS studies conducted since the ENF indicated that the existing zipper lane along I-93 would reach capacity by the year 2030. This capacity constraint would increase the travel time within the zipper lane to that of the general-purpose lanes. While the average drive time would increase for both cars and buses, average travel time for buses would increase slightly more than for cars. This is because buses accelerate more slowly than cars and on average, have lower travel speeds than cars. The existing zipper lane along I-93 would thus no longer provide a travel time savings. In consideration of this, alternative bus operations plans were developed to ascertain how different policy assumptions on the South East Expressway Zipper Lane would affect the operations plan and the performance of the Rapid Bus Alternative in terms of travel time and ridership as well as impacts on vehicular commuter traffic. The analysis concluded that the bus operations plan that constitutes the Rapid Bus Alternative reflects the optimal, feasible scenario. Additional background information regarding the future performance of the zipper lane and a discussion of the range of options considered and evaluated is included in Appendix chapter4.1-J.[36] [37]

[36] Memorandum from CTPS to ICG Files: South Coast Rail Zipper Lane Analysis – Response to Questions. May 17, 2010
[37] Memorandum from VHB to MassDOT: Response to EPA memo of September 18, 2009. May 19, 2010.

Table 3.2-27 Peak Directional Operations Summary

	Estimated Travel Time (hr:min)	Peak Frequency (min)
New Bedford	1:43	15
Fall River	1:31	15
Downtown Taunton	1:08	15
Galleria Station	1:06	15

Travel times have also been updated to reflect changes in station locations and future capacity constraints in the South Coast region. Speed data provided by CTPS was used to reflect future travel time along these corridors.

Contracted Rapid Bus Operation

Service would be operated by a private contractor, for two reasons. First, the MBTA is prevented by existing legislation from operating bus service outside of the current MBTA bus service area. Second, multiple existing private operators use similar vehicles and travel similar distances to the alternative. Some of these operators are well positioned to provide this service by expanding their current operations. The capital and operating costs include appropriate subsidies to enable one or more private operators to purchase, operate and maintain the bus fleet and for terminal maintenance and layover facilities in the South Coast region.

Rapid Bus Station Stopping Patterns

The alternative would include four branches in the project area. Inbound service would originate from New Bedford, Fall River, downtown Taunton, and Taunton Silver City Galleria. Each branch would operate with a maximum of two stations in the South Coast region. The Taunton branches would have only one Taunton station per branch. While all four branches converge on Route 24 near Taunton, the only station shared by all the branches is South Station. Table 3.2-28 summarizes the station stopping patterns for the four branches.

Table 3.2-28 Rapid Bus Station Stopping Patterns along Four Branches

New Bedford Buses	Fall River Buses	Taunton (Downtown) Buses	Taunton (Galleria) Buses
Whale's Tooth	Fall River	Downtown Taunton	Galleria Station
King's Highway	Freetown		
South Station	South Station	South Station	South Station
3 Stops	3 Stops	2 Stops	2 Stops

Rapid Bus Vehicles

The vehicle for the service would be a highway motor coach with forward facing seats for all passengers. Similar vehicles are used by private operators of existing commuter bus service in the corridor and public operators of long distance commuter bus service in other regions. They are also used for interstate, long distance charter, and airport services throughout North America and the world. A common motor coach vehicle is 45-feet long with capacity for around 50 seated passengers.

Vehicles could provide the following amenities: comfortable seating similar to private long-distance bus services, seating for all patrons (the vehicles would not be equipped for standees), restrooms, reading lights, individual air controls, electrical outlets, state-of-the-art communication including Wi-Fi internet access, televisions, and either streaming audio or an audio outlet at every seat. The vehicles could also be equipped with Global Positioning System signal system interface and passenger information systems. There are several alternative fuel buses available (including compressed natural gas and clean diesel electric), but for the long distance coach application for this alternative, a "Clean diesel" bus is proposed. It should be noted that CNG buses would likely be disallowed in the South Station bus terminal due to safety concerns.

Based on the current operating plan, 58 new buses would be required.

Rapid Bus Infrastructure Improvements

The intent of this alternative is to minimize impacts to the existing infrastructure; therefore, the recommended proposed improvement consists of a movable barrier (zipper) lane along the Route 24 corridor and a permanent barrier separated facility along Route 128. Infrastructure improvements would be required along the highway corridors to improve capacity and to accommodate the movable barrier, install the zipper lanes, construct a permanent exclusive bus lane, and modify the existing interchanges to accommodate the proposed improvements.

For the purpose of this description, the corridor is divided into four segments:

- South Station to Braintree Split (I-93/Route 3)
- Braintree Split (I-93/Route 3) to Route 24
- Route 24 from Route 139 to I-495
- Route 24 from I- 495 to Route 140

Constructing these improvements would require rebuilding eight interchanges on Route 24, as well as the Braintree Split and the Route 24/I-93 interchange in Randolph. This would also require reconstructing 22 highway bridges.

Improvements to I-93 from South Station to Existing HOV Lane

I-93 currently consists of four travel lanes in each direction. A HOV zipper lane is used in the peak hours along a section of I-93 for about 7 miles, between the Braintree Split and Savin Hill Ave. The zipper lane is created by taking away a lane from off-peak direction traffic. South Coast buses would use this zipper lane. From Savin Hill Ave to Massachusetts Ave, there are only general purpose lanes. At Massachusetts Ave, there is a permanent HOV lane that connects directly to the South Station Bus Terminal. The buses would share the zipper lane, general purpose lanes, and permanent HOV lane with the regular traffic permitted in those facilities along this section.

Improvements at the Braintree Split

Separate single-direction ramps would be constructed within the I-93 interchange area that would not only allow the continuous operation of the exclusive bus lanes, but also significantly improve traffic operations during the peak hours. The weaving that occurs during the PM peak hour in the southbound direction at the terminus of the HOV lane would be eliminated. Currently, as traffic exits the HOV lane, significant delays occur because traffic heading southbound in the general purpose travel lanes is in conflict with vehicles trying to maneuver to the Route 128 or Route 3 ramps. The Quincy Center on-ramp to I-93 northbound would be modified so that the merge distance for vehicles wanting to enter the HOV lane would be increased by 1,000 feet. The existing lane drop merge would be eliminated by extending the Quincy Center on-ramp acceleration lane to connect with the Furnace Brook Parkway off-ramp deceleration lane to create an auxiliary lane. Each approach to I-93 would have exclusive lanes. Figure 3.2-44 illustrates these improvements.

Improvements at the Ramp into Logan Express

A connection to the existing Logan Express lot would be provided via an elevated structure from the median bus lane to the lot. Figure 3.2-45 shows this proposed connection. A two-lane, two-way, barrier-separated bus lane (see typical section in Figure 3.2-5) would be constructed between the Logan Express Lot and the I-93 existing HOV zipper-lane. The existing zipper lane maintenance building at the entrance to the existing HOV lane would be relocated to the south. Figure 3.2-46 shows the typical section south of the Logan Express lot.

Improvements to I-93 from the Existing HOV Lane to Route 24 at Route 139

This segment consists of an existing three to four lanes in each direction with a varying median width. The minimum median width is approximately 46 feet. Proposed improvements include constructing a barrier-separated permanent reversible lane in the median from the Route 139 interchange to the proposed Logan Express parking lot connection in Braintree. Figure 3.2-47 illustrates the proposed typical section. At the I-93/Route 24 interchange (the Randolph split), a new viaduct would carry the bus lane up and over the existing interchange from the median of Route 24 to the median of I-93, as shown in Figure 3.2-48.

Table 3.2-29 summarizes the interchange improvements along this segment.

Table 3.2-29 Summary of Interchange Improvements –
Route 24 and I-93 from I-93 HOV Lane to Route 24 at Route 139

Interchange	Modifications
I-93/Route 24	Construct a new ramp from the Route 24 median to the Route 128 median to accommodate the permanent bus lane
I-93/N. Main Street (Route 28)	Widen bridge to accommodate bus lane
I-93/Granite Street (Route 37)	Widen bridge to accommodate bus lane

Improvements to Route 24 from Route 139 to I-495

This 15-mile segment of Route 24 is 3 lanes in each direction with a varying width median. Route 24 would be widened to provide 12-foot shoulders necessary to accommodate zipper lanes using the moveable barriers. The median would consist of two rows of the moveable barrier, one on each side of the permanent median barrier, each one moved daily for the respective peak hour. Figure 3.2-49 shows the proposed typical section for the contraflow lanes.

Existing ramp geometry at each interchange would be modified to accommodate the wider highway section along Route 24. Table 3.2-30 summarizes the major interchange improvements along this segment.

Table 3.2-30 Summary of Interchange Improvements – Route 24 from Route 139 to I-495

Interchange	Modifications
Route 140	Reconstruct to provide collector-distributor roads on Route 24, improve existing ramp geometry, and add two new ramps to eliminate two of the three left turn movements
Route 44	Remove the inner northbound and southbound off-ramp loops and modify the gore area
I-495	Modify Route 24 northbound off ramp gore area
W. Center Street (Route 106)	Remove the inner northbound and southbound off-ramp loops
Belmont Street (Route 123)	Remove the inner northbound and southbound off-ramp loops
Reynolds Memorial Highway (Route 27)	Remove the inner northbound and southbound off-ramp loops
Harrison Boulevard	Modify ramp geometry of all ramps to accommodate widening and new intersection on Harrison Boulevard
Lindelof Avenue (Route 139)	Replace the Route 139 bridge

Shoulder widths would be reduced at the bridges to reduce impacts to the existing infrastructure.

Emergency/enforcement access points would be located at the approximate midpoint of the segment. A summary of which bridges would remain and which would be replaced is shown later in this section. All undergrade bridges along the corridor that carry the bus lane would be widened to accommodate the proposed typical section.

Improvements to Route 24 from I-495 to Route 140

This 5.8-mile segment of Route 24 is currently has two lanes in each direction, consisting of 12-foot travel lanes, 10-foot outside shoulders, and a 20-foot grassed median. A highway capacity analysis for this segment of Route 24 shows a poor level of service in 2030 since this segment of highway has only two lanes in each direction and a substandard interchange at Route 140. As part of this alternative, a new travel lane would be constructed in each direction. With the third lane in each direction, the roadway would provide a level of service appropriate for the bus to operate in the general purpose lanes. As part of the improvements, the median would be widened to accommodate a future permanent barrier separated, reversible lane should additional capacity for the bus be required. Figure 3.2-50 shows the proposed typical section along this segment of the corridor.

Improvements to the Route 140 interchange are shown in Figure 3.2-51. The current interchange is a partial clover-leaf and includes five ramps. Some of the ramps do not provide free flow conditions, which results in significant backups on the ramps, Route 24, and Route 140. Improvements would include constructing an almost full cloverleaf interchange with seven ramps. This would provide free flow conditions and eliminate all but one left turn movement from Route 140 to access Route 24. A new ramp from Route 140 southbound to Route 24 northbound cannot be constructed due to the proposed Park and Ride lot in the southeast quadrant of the interchange.

Moveable Barrier Operation (Daily and Emergency)

A moveable barrier system would be purchased for this operation. There are several systems available by suppliers. The moveable barrier system would be stored against the permanent median barrier during non-peak hour traffic and would be shifted to create the zipper lane for the buses using a barrier transfer machine. The barriers can be moved at a rate of up to 10 mph with a lateral transfer of up to 26 feet in a single pass of the transfer machine. The barrier transfer machines would be stored at each end of the run within the median area where a garage and crew quarters would be constructed.

The barrier systems have a hinge design that facilitates opening the barrier wall at any point along the line of barriers manually by removing a pin and pushing the barrier with a vehicle to create an opening. This eliminates the need to have many openings in the barrier system for emergency access and having to provide protection for the exposed ends. The proposed barrier would be designed to provide permanent openings for emergency access into the bus lane at strategic locations should an incident occur. These locations would be identified in the future as they can be constructed within the footprint of the proposed median.

Improvements to Bridges

There are 30 bridges along Route 24 and I-93 highway corridors. Of the 30 bridges, 5 would be replaced, 15 would be widened and 10 would require no modification. Four of the bridges to be replaced are the result of widening Route 24 between Route 140 and I-495 to accommodate the new 6-lane section. Table 3.2-31 summarizes the proposed roadway bridge reconstruction.

New Rapid Bus Stations

New Rapid Bus stations would consist of canopies, commuter parking, a pick-up/drop-off area for buses and vehicular drop-off parking spaces that conform to ADA requirements. The proposed stations would not provide any buildings. The new buses would be fitted with a lift type system to allow for ADA accessibility from the waiting area onto the bus. It is a goal of the project that the new bus stations designs would include amenities such as bike storage areas, pedestrian connections and commuter-related services such as newspaper stands and payment boxes. Green technologies like solar panels, Energy Star compliant products and environmentally friendly designs would also be explored. The stations would be unattended and would require pay-for-parking. Table 3.2-32 provides a summary of the stations for the Rapid Bus Alternative.

Five of the six stations for the Rapid Bus Alternative are common to the rail stations, including:
- Fall River Depot
- Freetown
- King's Highway
- Downtown Taunton
- Whale's Tooth

South Station Rapid Bus Station (New)

The Rapid Bus alternative requires the use of bus bays at South Station (the destination station). The MBTA has indicated that the existing bus terminal is currently at capacity. Expansion of the bus terminal from 35 to 50 bays is part of an existing agreement between MBTA and the Hines Development Group

Table 3.2-31 Summary of Roadway Bridge Improvements

Bridge Location	Station	Over or Under Route 24	Work Required
Rte 140	10+50	Under	Widen
Railroad Bridge	25+00	Under	Widen
Hart Street	52+00	Over	Replace
Taunton River Bridge	122+25	Under	Widen
Rte 44	141+00	Over	Replace
Orchard Street	155+50	Over	Replace
King Street	207+50	Over	Replace
S. Pleasant Street	269+50	Over	No Modification
I-495	301+00	Under	Widen
N. Pleasant Street (104)	373+50	Over	No Modification
Town River Bridge	465+25	Under	Widen
S. Elm Street	515+25	Under	Widen
W. Center Street (106)	562+00	Over	No Modification
West Street	595+50	Over	No Modification
Walnut Street	664+75	Over	No Modification
W. Chestnut Street	713+25	Under	Widen
Belmont Street (123)	741+50	Over	No Modification
Torrey Street	775+25	Under	Widen
Pleasant Street	838+75	Over	No Modification
Rte 27 (Reynolds Mem. Hwy)	859+50	Over	Replace
Oak Street	886+00	Under	Widen
South Street	916+50	Under	Widen
Harrison Blvd.	975+00	Over	No Modification
Page Street	1043+00	Under	Widen
Lindelof Avenue (Rte 139)	1092+50	Over	No Modification
Canton Street	1198+25	Under	Widen
Blue Hill Bridge	1225+75	Over	No Modification
N. Main St. (Rte 28)	1295+75	Under	Widen
Blue Hill River Bridge	1310+25	Under	Widen
Granite St.	1412+50	Under	Widen

Table 3.2-32 Summary of Stations (New and Modified) – Rapid Bus Alternative

Station Name	Municipality	Station Type	Rapid Bus Alternative
Fall River Depot	Fall River	New	x
Freetown	Freetown	New	x
Whale's Tooth	New Bedford	New	x
King's Highway	New Bedford	New	x
Downtown Taunton	Taunton	New	x
Galleria Station	Taunton	New	x
South Station	Boston	Existing	x
TOTAL – New Stations			6
TOTAL – Existing Stations Modifications			1

and the environmental review for this project has been completed. Since the schedule for the private development is unknown, it is assumed that the cost of the bus bay expansion would be funded by the South Coast Rail project. According to the application for federal funding for expansion of South Station, the expansion of South Station would proceed independent of but compatible with the expansion of the bus terminal. Should the bus facility not be expanded, alternative means for providing adequate bus capacity would need to be developed separately for the Rapid Bus Alternative.

Galleria Station Rapid Bus Station (New)

The Galleria Station would be located at the Galleria Mall Overflow Parking Lot. Portions of the existing paved parking areas at this 9-acre Galleria Mall site would be used for the station layout (Figure 3.2-52).

- **Parking Spaces** – 486 total spaces consisting of 10 handicapped accessible and 476 standard spaces
- **Parking Lot Type** – paved surface parking
- **Station Access Drive** – driveway access off of Route 140 and Route 24 to West Stevens Street
- **Bus/Vehicular drop-off Accommodations** – bus drop-off area to accommodate 40-foot buses and passenger vehicles for pick-up/drop-off
- **Highway Intersection Improvements** – to be determined

Rapid Bus Layover Facilities

Overnight Rapid Bus Layover Facilities

The overnight storage and maintenance facilities for the Rapid Bus Alternative would be located close to the South Coast and Taunton terminals. This avoids buses having to travel far to get to the start of their morning trips or from the end of their evening trips. If the nighttime storage facilities are distant from the terminal, buses need to make a long distance non-revenue (deadhead) movement before they start their morning trips or after they end their evening trips.

The area of the nighttime storage and maintenance facility sites must be large enough to accommodate the number of buses required for each branch. In addition, the facility should provide some area for future expansion of service and some area for vehicle maintenance.

The site would also accommodate necessary support facilities, including a maintenance shop, employee parking, and storage space for maintenance equipment.

It is assumed that this alternative would be operated by a private bus company. The bus provider would secure an overnight layover facility and include the cost of acquiring and operating the site as part of the contract bid.

Midday Rapid Bus Layover Facilities

The Rapid Bus Alternative would require midday parking in the Boston area for approximately 35 to 40 buses. The site identified for the midday layover is the Logan Express station site on Interstate 93 in Braintree.

The Logan Express site is currently used as a park-and-ride station for buses serving Logan Airport. Direct bus access ramps between the site and the exclusive busway would be constructed. A parking deck would be required to replicate park-and-ride spaces lost to bus storage.

Property Acquisition Required for the Rapid Bus Alternative

This section describes the methodologies that have been used for calculation of land acquisition required for the Rapid Bus Alternative. Land acquisition for the Rapid Bus alternative includes land required for the construction of the highway and interchange modifications, bridges & culverts, retaining walls, stations and layover facilities.

For purposes of this report, "land acquisition" is defined as obtaining greater than a 500-square-foot portion, or a sliver greater than 10 feet wide, of any parcel outside of the existing rights-of-way to accommodate permanent construction impacts, based upon conceptual engineering plans. Narrow slivers of parcels are not considered in the evaluation of land acquisition, given the scale and accuracy of the conceptual design. Temporary construction impacts outside of the existing rights-of-way would not require land acquisition (utilizing temporary construction easements instead) and are therefore not considered in this evaluation. Aerial photographs and public Massachusetts GIS information were examined in reference to preliminary engineering plans to identify encroachments onto adjacent parcels. Final engineering plans may show an increase or decrease of the actual area of acquisition required.

When evaluating each property acquisition, conceptual design plans (in CAD format) were compared with public GIS information. Where proposed construction required full-parcel acquisition, property size for each of these parcels was gathered from existing information contained at Assessors' offices in each municipality. The design endeavored to limit property impact to partial acquisitions wherever possible, unless partial-parcel acquisitions resulted in the remaining parcel being unusable to the existing owner. In these instances, the analysis accounts for full-parcel acquisitions. Where partial-parcel acquisition was required, property acquisition was calculated utilizing the public GIS information contrasting to proposed limits of work at each function. Parcel acquisition would be re-evaluated once the LEDPA has been determined and/or more specific property line information for identified parcels is available.

Where property acquisition is required, it is MassDOT's goal to reach agreements with existing owners for purchase of properties required by the project. However, the Eminent Domain process may be required. Once property has been acquired for the project, it is expected that the Commonwealth (or one of its assigns) would retain ownership of each parcel.

The alternative would require the following land acquisitions:
- Stations: 21 acres
- Right of Way: 5 acres
- Total: 26 acres

Capital Cost of the Rapid Bus Alternative

This section summarizes the estimated capital costs presented as incremental funding needs over a 30-year period for the Rapid Bus Alternative. Capital equipment costs are presented as the incremental cost of the life of the equipment as defined by FTA guidelines. The net result of this analysis is the identification of the annual funding requirements above and beyond the costs already programmed for the horizon year (No-Build Alternative).

Capital costs include the cost of new infrastructure such as modification to bridges, the highway, stations and the new zipper lane as well as the cost of new transportation equipment, such as buses.

The first step in developing the financial impact analysis is to convert the capital cost estimates from base year (2009) dollars to the year-of-expenditure. For the Rapid Bus Alternative, it was assumed that construction could commence in FY2012. The duration of construction is described in the Construction of the Rail Alternatives chapter.

The capital cost estimates for both infrastructure and equipment were escalated to year-of-expenditure based on current FTA criteria.

Table 3.2-33 provides a summary of the cost estimate for the Rapid Bus Alternative.

Table 3.2-33 Summary of Capital Costs – Rapid Bus Alternative

	Rapid Bus
Total Infrastructure Cost ($M)	$449,777,000
Real Estate Cost ($M)	$12,770,000
Eng./Services Cost ($M)	$60,945,000
Contingency ($M)	$142,579,000
Vehicle Cost ($M)	$34,800,000
Total ($M)	$700,871,000
Year-of-Expenditure ($M)	$811,579,000

Notes: Total infrastructure costs were estimated in 2009 dollars.
Professional services are 13.55% of infrastructure costs without contingency.
Professional services include Design, Permitting, Construction Phase Inspection & Project Management.
Contingencies are 31.70% of infrastructure costs and include Indirect Soft Costs, Mitigation Contingency, and Construction Contingency.
Escalation was calculated at 3.25% per year +

Construction Methods for the Rapid Bus Alternative

The following summary describes the major phases of construction for the Route 24 mainline widening, accommodation of bus lane within the median of I-93, interchange modifications and bridge replacement. The objective is to minimize disruption to traffic and maintain the number of existing lanes open to traffic throughout the construction duration. Lane closures may be required during non-peak hour travel times.

I-93 From Braintree Split To Route 24 And Route 24 From I-93 To Route 139 Construction Methods

The improvements in this section consist of construction of a permanent barrier separated bus lane in the median of Route 24 and I-93. A portion of the lane would need to be elevated to allow access to the Logan Express Lot. Because the work would be performed within the median, construction would not be significantly constrained by existing traffic. Traffic control may include shifting traffic away from the median and use of the outside shoulder for travel.

There are two interchanges that would be modified in this segment, Route 24/Route 128 (Randolph Split) and Route 128/I-93/Route 3 (Braintree Split). Two new bridges would be required within the Route 24/Route 128 interchange. One would be constructed over the northbound Route 24 ramp to northbound Route 128 and one would be constructed over southbound Route 128. Impacts to traffic would be minimal and should not require shutting down the ramp or Route 128 except for time required to erect beams, which would be done at night.

The Braintree Split would require three new bridges and minor re-configuration to the Burgin Parkway ramp to I-93 northbound. Two new bridges would be constructed over the I-93 southbound ramp to Route 3 southbound and one new ramp would be constructed over southbound Route 128. Construction of these bridges would not require shutting the roadway down with the exception of the time that is needed to erect the beams, which would be done at night. All roadway work in this area would be completed within the interchange area except for the tie-in points along the roadway.

The connection to the Logan Express parking lot would require construction of a new bridge over Route 128 southbound. Construction of the bridge would not require shutting the roadway down other than the time needed for erecting beams, which would be done at night.

Route 24 from Route 139 to I-495 Construction Methods

The improvements to this section of Route 24 would include widening to accommodate moveable barrier contraflow lanes.

The general sequence of construction would include:

- Install temporary barrier along the shoulder line in the southbound direction. Restripe pavement to provide 11-foot temporary lanes and shift traffic as far toward the median as possible. Provide temporary pavement where required. Construct widening to the outside including retaining walls and new roadway.
- Shift southbound traffic to new lanes constructed to maximize central work area. This work zone would be located in the median area.
- Shift northbound lanes to central area constructed. Install temporary barrier at east edge. Construct remainder of highway to the outside. This phase of work can be combined with this first phase of work.
- It is assumed that bridges carrying Route 24 traffic that require widening would be constructed in the respective phases where the highway is widened. Some of these bridges may require full reconstruction to meet current standards. This bridge construction would be phased to use both existing and new structure to manage traffic.

Route 24 from Route 140 to I-495 Construction Methods

The improvements to this section of Route 24 would include widening to accommodate an additional travel lane in each direction and wider median to accommodate a future permanent barrier separated bus lane.

The general sequence of construction includes:

- Install temporary pavement within the median in both northbound and southbound directions. Using the temporary pavement area, shift traffic to the median area, maintaining two 12-foot travel lanes and two 10-foot shoulders. Install temporary median barrier at the edge of the temporary shoulder and construct the required widening to the outside.

- Shift traffic to the newly constructed pavement and reconstructing the median to accommodate 12-foot inside shoulders. The new median would be constructed to accommodate a future reversible bus lane.

It is assumed that bridges carrying Route 24 traffic would be widened in the respective phases. The construction improvements to the Route 140 interchange must be completed while maintaining existing traffic movements. The general sequence of construction includes:

Phase I - Maintain existing traffic while constructing the following:
- Widen the Route 24 bridge to accommodate the proposed frontage roads.
- Construct the proposed frontage road.
- Construct the new southbound ramps in the northwest quadrant.
- Construct the new tie-in points for the ramps to Route 24.

Phase II – Complete construction on the southwest quadrant ramps
- Close the southbound off-ramps in the southwest quadrant to complete construction while providing access to Route 24 via the new ramps in the northwest quadrant.
- Complete construction of the ramps.

Phase III – Complete construction on the northeast quadrant ramps
- Close the Route 24 northbound to Route 140 northbound off-ramp and provide a temporary connection to Route 140 northbound from the Route 24 northbound to Route 140 southbound off-ramp in the southeast quadrant. Shutting down the Route 140 northbound to Route 24 northbound on-ramp would be limited to temporary closures since it is the only northbound connection to Route 24. Construction would need to be completed under traffic conditions and would most likely require a small temporary ramp segment.

Phase IV – Route 140 Construction
- Complete improvements to Route 140.

Bridge Replacement Construction Methods

As indicated earlier, five bridges would need to be replaced to accommodate the proposed improvements. Each of these bridges carries traffic over Route 24. All other bridge modifications would be performed within the respective phasing of the roadway construction. The bridges to be replaced including:
- Hart Street
- Route 44
- Orchard Street
- King Street
- Route 27

In each case, the new structure would be built off-line parallel to the existing structure and the approach road modified, or a temporary structure be built and the bridge be replaced in the same location. In either case, traffic would be maintained at all times.

3.3 PRELIMINARY EVALUATION OF DEIS/DEIR ALTERNATIVES

This section provides an overview of the performance of the alternatives with regard to achievement of the Project Purpose, their practicability and their environmental impacts, in particular with regard to aquatic resources.

The ENF Certificate stated that the DEIR should describe the method and criteria used in the comparative analysis of alternatives and discuss the alternatives and their viability in the context of statewide transportation improvement plans and other state and regional plans and policies. Furthermore the DEIR should provide a detailed assessment of the relative ability of the respective alternatives to achieve the stated project goals in a cost-effective manner and should include a comparative evaluation of the alternatives in terms of quality of service, constructability, schedule, cost (including mitigation costs), and opportunity for smart growth.

The ENF Certificate also stated that the DEIR should describe the method and criteria used in the comparative analysis of alternatives. This should include a discussion of the relative importance of factors such as ridership, cost and smart growth planning in the evaluation process, and the metrics and approach to weighting used when quantifying impacts to the environment. Given the substantial/difference in state-listed species and wetland resource impacts among the alternatives, the ENF stated that it is particularly important that the potential benefits and costs be clearly understood. The DEIR should include a comprehensive analysis and quantification of the trade-offs involved.

The evaluation described below was conducted following the requirements of the ENF certificate, in a manner compatible with the process described in the *Highway Methodology*[38] and in consultation with the Interagency Coordinating Group. The Highway Methodology outlines a set of non-regulatory pre-application guidelines to screen alternatives and to ensure that a transportation agency's preferred alternative is consistent with federal wetlands regulations. The information developed in preparation of the DEIS/DEIR, the results of that analysis as described in this section and in other sections of the DEIS/DEIR and the subsequent comments received will be considered by the Corps in determining the Least Environmentally Damaging Practicable Alternative (LEDPA).

During the preparation of this DEIS/DEIR, conceptual operating plans, capital improvement requirements, capital costs, and operating and maintenance costs were developed for each alternative. The alternatives analyzed in this DEIS/DEIR were modeled using the regional transportation model, providing quantitative results on the performance of each alternative in terms of ridership, highway/vehicular travel, air quality, and environmental justice. Detailed analyses of environmental impacts (to natural resources, air quality, noise and vibration, historic resources, social and economic impacts among others) were conducted and documented as well as mitigation measures and smart growth strategies recommended for each alternative.

This section summarizes and compares the characteristics of the build alternatives analyzed in this DEIS/DEIR. The discussion includes a set of evaluation criteria that are consistent with the evaluation criteria utilized in the earlier stages of alternatives screening, but more refined in consideration of the more detailed level of information available. Specific screening criteria were refined from the earlier stages of the Alternatives Analysis based on operational and environmental issues. The earlier analysis criteria were expanded with subcriteria to include a more detailed evaluation of how well the

[38] United States Army Corps of Engineers. NEDEP-360-1-30, *The Highway Methodology.* October 1993.

alternatives would meet the project purpose, how practicable they are to construct and operate, and the magnitude of their environmental impacts and/or benefits.

To facilitate an understanding of how the alternatives differ regarding the various criteria, each alternative was characterized through a scoring process of relative performance on a specific criterion. The scoring was developed for each criterion using the best performing alternative as a baseline. How well an alternative performed on a criterion was weighed against that baseline. For instance, in the case of evaluating ridership, the highest ridership would be the baseline – the measure against which all other alternatives were weighed. If evaluating cost, the lowest cost would be the baseline.

For criteria, like ridership, where the focus is to achieve the highest possible draw, the scoring formula was:

Score = criteria value of alternative / MAXIMUM value in that criteria metric

For criteria, like cost, where the focus is to achieve the lowest possible value, the scoring formula was:

Score = MINIMUM value in that criteria metric / criteria value of alternative

Which of the two scoring formulas was used is explained in the individual discussions of each criterion. The numeric scores were then converted to letter grades as shown in Table 3.3-1 to enable easier digestion of the large amounts of data contained in this report.

Table 3.3-1 Scoring of Alternatives

Percentage Range	Letter Grade
90 to 100	A
80 to 89	B
70 to 79	C
60 to 69	D
0 to 59	F

The results of the scoring process described below provides a general and relative indication of each alternative's performance and impacts and was used to facilitate a general understanding of a broad range of impacts and benefits. Site specific or resource specific impacts as well as indirect and cumulative impacts are discussed in detail in the resource chapters (Chapter 4) and in Chapter 5. The analyses results in these chapters form the more detailed basis for comparison of alternatives.

3.3.1 PROJECT PURPOSE MEASURE

This section describes the screening to evaluate how well each of the proposed alternatives would meet the project purpose "to more fully meet the existing and future demand for public transportation between Fall River/ New Bedford and Boston, Massachusetts to enhance regional mobility. The following sub-criteria were applied to the alternatives analyzed in this DEIS/DEIR.

- Ridership demand – This screening criterion evaluates how well each alternative meets the demand for public transportation.

- Improve quality of service – This screening criterion evaluates how well each alternative provides a transit trip that is competitive to travel by car. It also evaluates how well each alternative meets MBTA's Service Delivery Policy.
- Reduce vehicle miles traveled – This screening criterion evaluates how well each alternative provides public transit connections between New Bedford/Fall River and Boston that offers the opportunity to shift from auto mode reliance to using the transit mode.
- Improve regional mobility – This screening criterion evaluates how well each alternative provides public transit connections between New Bedford/Fall River and Boston and provides public transit connections between South Coast cities (New Bedford, Fall River, Taunton and others).

It should be noted that the projections presented in this section for the Attleboro Alternative do not take into consideration subsequent RAILSIM modeling results, which indicated that reliability of the Attleboro Alternative would be severely degraded with the existing three-track configuration between Forest Hills Station and Back Bay Station. The ridership results for the Attleboro Alternative below were not adjusted to reflect the adverse impact on ridership of the Attleboro Alternative due to reduced reliability.

3.3.1.1 RIDERSHIP DEMAND

This criterion evaluates how well an alternative would be able to meet existing and future demand for public transportation between Fall River/New Bedford and Boston. In order to estimate overall transit demand for the region, an optimal transit system with no constraints such as construction costs or environmental impacts would have to be simulated. While this optimal transit demand has not been quantified, demand was measured in terms of the number of daily work-related trips between South Coast communities and Boston. For this screening analysis, transit demand was based on 2000 Journey-to-Work (JTW) data.

Total service to the South Coast Region was considered the total station boardings as projected for each alternative in addition to boardings at existing commuter bus services, which is anticipated to continue to operate with the South Coast Rail project in place. According to the JTW data, the number of daily work trips from the South Coast region to Boston is approximately 8,000. The ability of the alternative to meet possible future ridership potential was calculated as the percent of met ridership demand.

As shown in Table 3.3-2, the rail alternatives would result in 4,425 to 5,050 daily boardings. Of the rail alternatives, projections of daily boardings were highest for the Whittenton Electric Alternative (5,050 daily boardings), with the Stoughton Electric Alternative (4,876 daily boardings) a close second and lowest for the Attleboro Diesel Alternative (4,475 daily boardings) and the Whittenton Diesel Alternative (4,460 daily boardings).

For the Whittenton Electric Alternative most of the boardings would originate in the Taunton area, especially at the Downtown Taunton station and far fewer station boardings would originate at Southern Triangle stations (Table 3.2-6). The Stoughton Electric Alternative, in contrast, would have most of its boardings originate in the Southern Triangle area, especially in Fall River and New Bedford (Table 3.2-5),

The Rapid Bus Alternative would result in substantially lower ridership than any of the rail alternatives, with a total of 4,200 daily round-trips at the proposed bus stations.

The ridership projections assume that the various alternatives would have reasonable on-time performance. The ridership projections do not account for reductions in ridership that would accrue from poor on-time performance should any of the alternatives fail to meet MassDOT's Service Delivery Policy (see Section 3.3.1.2).

3.3.1.2 QUALITY OF SERVICE

The following two sections evaluate how well each alternative provides a transit service. It focuses on two factors: travel time and reliability. Travel time measures how quickly an alternative would be able to get a passenger from the South Coast Region into Boston and reliability measures how often that service would be on time and, therefore, how dependable the service would be to the passengers who ride it. An alternative that does not improve the quality of transit services over the existing services provided in the region provides no functional benefit to the communities. Quality of service is assessed based on commuting time, reliability, comfort, convenience and safety. For the purpose of using quantifiable criteria, only run time and reliability are used as subcriteria.

Table 3.3-2 Ridership Demand by Alternative

Name	New Station Boardings	Boardings at Existing Commuter Bus Services	Total Service to South Coast Region	Percentage of Met Ridership Demand [1]	Score [2]	Grade
Attleboro Electric Alternative	4,680	125	4,805	60%	95%	**A**
Attleboro Diesel Alternative	4,020	455	4,475	56%	89%	**B**
Stoughton Electric Alternative	4,790	85	4,875	61%	97%	**A**
Stoughton Diesel Alternative	4,070	355	4,425	55%	88%	**B**
Whittenton Electric Alternative	4,820	230	5,050	63%	100%	**A**
Whittenton Diesel Alternative	4,020	440	4,460	56%	88%	**B**
Rapid Bus Alternative	2,100	1,430	3,530	44%	70%	**C**

1 Total Service to South Coast Region divided by the number of daily work trips from the South Coast region to Boston (approximately 8,000)
2 Percentage of met ridership demand of an alternative divided by the maximum percentage of met ridership demand (in this case, the maximum ridership demand met by an alternative would be provided by the Whittenton Electric Alternative)

Travel Time

Since New Bedford/Fall River commuters currently rely on cars and private bus services, an improved quality of service would provide a comparable or competitive travel time and improved reliability with respect to existing commuter options during peak commuting periods. The average commuting time by car during rush hour is currently 90 minutes. The CTPS travel demand model projects slower commutes as congestion along already slow corridors continues to increase. A future (2030) commute from New Bedford and Fall River to Boston is expected to be approximately 10 to 30 minutes longer than in 2009 (in the peak period).

Travel time for the rail alternatives was based on operational analyses[39], which identified the segments of the rail corridors that would operate at top speed as well as segments where speed is constrained due to speed restrictions, geometry, vehicles, power mode, dwell times and number of stations and civil restrictions. Each commuter rail alternative has two overall run times: one for electric locomotives and one for diesel locomotives, as maximum speeds under the electric alternatives are 100 mph and under diesel alternatives, 70-79 mph. Rapid Bus travel time was calculated based on existing travel times

[39] Capacity Utilization Analyses Technical Memorandum, Systra USA, November 17, 2008.

projected to future conditions and the posted speed limit in the exclusive lanes. Speed data provided by CTPS were used to determine future travel time along these corridors.

For this evaluation, the alternatives were weighted against each other based on their longest travel time (New Bedford to Boston) and their reliability. Table 3.3-3 summarizes travel time provided by each alternative and how the alternatives score against each other with regards to meeting the quality of service project purpose.

Table 3.3-3 Travel Times by Alternative

Name	Travel Time (min)	Travel Time Score [1]	Grade
Attleboro Electric Alternative	75	100%	**A**
Attleboro Diesel Alternative	84	89%	**B**
Stoughton Electric Alternative	76	99%	**A**
Stoughton Diesel Alternative	85	88%	**B**
Whittenton Electric Alternative	87	86%	**B**
Whittenton Diesel Alternative	96	78%	**C**
Rapid Bus Alternative	103	73%	**C**

1 Minimum travel time (in this case, Attleboro Electric with a 75-minute travel time) divided by the travel time provided by an alternative.

The Attleboro Electric and Stoughton Electric Alternatives achieve the fastest travel times. The Rapid Bus Alternative receives the worst score, with travel times exceeding 100 minutes, which would still be faster than travel by car in the year 2030.

Service Delivery Policy

While an alternative might offer benefits for the transit system in the South Coast region, it may be an unattractive service for the communities it is designed to serve because it offers too few trips. In order to maintain acceptable service, the MBTA has established a Service Delivery Policy[40] to ensure it provides quality transit services that meet the needs of the riding public. The minimum frequency of service levels provides the guidelines by which the MBTA maintains accessibility to the transportation network within a reasonable waiting period. The minimum frequency of service standards is the minimum frequency that must be maintained in a service. Commuter Rail and Commuter Bus minimum frequencies should provide 3 trips in a peak direction during the AM and PM peak periods.[41]

Although the South Coast Rail alternatives were all designed to provide this minimum standard, operational analysis indicated that the Attleboro Alternatives would not be able to meet the minimum service standard during the PM peak period.

Several factors contribute to the Attleboro Alternatives' inability to meet the service delivery standard. These factors are outlined in greater detail in section 3.3.2 - *Practicability Measure*. Table 3.3-4 summarizes whether the alternatives meet the MBTA's Service Delivery policy.

[40] Massachusetts Bay Transportation Authority, *Service Delivery Policy*, MBTA Board of Directors approved January 14, 2009.
[41] Between LIRR, MNRR, MBTA, and METRA, the average service provided is 2.9 peak period trains.

Table 3.3-4 MBTA Service Delivery Policy by Alternative

Name	Meets MBTA Service Delivery Policy?	Travel Time Score	Grade
Attleboro Alternatives	No	0%	**F**
Stoughton Alternatives	Yes	100%	**A**
Whittenton Alternatives	Yes	100%	**A**
Rapid Bus Alternative	Yes	100%	**A**

3.3.1.3 VEHICLE MILES TRAVELED

Vehicle Miles Traveled (VMT) is an important gauge for an alternative's transportation system benefits. VMT measures the extent of motor vehicle operation or the total number of vehicle miles travelled within the study area on given day. This particular measure quantifies how many miles of travel would be removed from the regional roadway network by commuters who elect to travel by train or bus rather than drive. This reduction in driving has several environmental benefits, notably cleaner air and a reduction in greenhouse gas emissions. Fewer cars on the road also eases congestion along highway corridors, resulting in time benefits. The alternative with the greatest VMT change (reduction) receives the highest score under this criterion.

Table 3.3-5 summarizes the daily reduction in vehicle miles traveled provided by each alternative based on CTPS projections and how the alternatives score against each other with regards to meeting the project purpose to reduce vehicle miles traveled.

Table 3.3-5 VMT Reductions by Alternative

Name	VMT Reduction (daily miles)	VMT Score [1]	Grade
Attleboro Electric Alternative	(296,569)	100%	**A**
Attleboro Diesel Alternative	(256,421)	86%	**B**
Stoughton Electric Alternative	(295,922)	100%	**A**
Stoughton Diesel Alternative	(228,705)	77%	**C**
Whittenton Electric Alternative	(228,018)	77%	**C**
Whittenton Diesel Alternative	(173,961)	59%	**F**
Rapid Bus Alternative	(81,495)	27%	**F**

1 Reduction in VMTs provided by an alternative divided by the maximum reduction of VMTs (in this case, Attleboro Electric and Stoughton Electric with roughly 296,000 fewer vehicle miles traveled per day)

The Attleboro Electric and Stoughton Electric Alternatives achieve the greatest reduction in daily vehicle miles travelled of all the alternatives. The reduction difference between these alternatives and their respective Diesel alternatives is approximately 40,000 for Attleboro and 67,000 for Stoughton. The Rapid Bus Alternative would achieve the least reduction in vehicle miles traveled of all the alternatives.

3.3.1.4 REGIONAL MOBILITY

The following sections discuss the interregional connectivity provided by each alternative and how well each alternative meets the project purpose to improve regional mobility. As all the alternatives provide a connection from Fall River and New Bedford to Boston, an alternative will be considered more favorable if it also enhances mobility between points within the region by including interregional links that provide one-seat rides from one municipality to another. Connections within a municipality were not counted. For instance, New Bedford, which would accommodate two stations, would provide a one-seat ride from Whale's Tooth to King's Highway. However, this connection was not considered an improvement to regional mobility as it is confined to just New Bedford.

Table 3.3-6 summarizes the number of interregional links provided by each alternative and how the alternatives score against each other with regard to meeting the regional mobility project purpose.

The following sections discuss the results presented in Table 3.3-6.

Table 3.3-6 Regional Mobility Improvements by Alternative

Name	Interregional Links	Interregional Links Score [1]	Grade
Attleboro Alternatives	34	83%	**B**
Stoughton Alternatives	41	100%	**A**
Whittenton Alternatives	41	100%	**A**
Rapid Bus Alternative	5	12%	**F**

1 Interregional links provided by an alternative divided by the maximum number of interregional links of an alternative (in this case, Stoughton and Whittenton with 41 interregional links)

Attleboro Alternatives

The Attleboro Alternatives (Electric and Diesel) would provide commuter rail service to South Station using the Northeast Corridor, proposed Attleboro Bypass, Attleboro Secondary, New Bedford Main Line and Fall River Secondary. This alternative would include eight new commuter rail stations (Barrowsville in Norton, Downtown Taunton in Taunton, Taunton Depot in Taunton, King's Highway in New Bedford, Whale's Tooth in New Bedford, Freetown in Freetown, Fall River Depot in Fall River and Battleship Cove in Fall River). Table 3.3-7 illustrates the interregional links provided by the alternative.

Table 3.3-7 Interregional Links – Attleboro Alternatives[1]

	Boston	Westwood	Canton	Sharon	Mansfield	Norton	Taunton	Freetown	Fall River	New Bedford
Boston		X				X	X	X	X	X
Westwood	X					X	X	X	X	X
Canton						X	X	X	X	X
Sharon						X	X	X	X	X
Mansfield						X	X	X	X	X
Norton	X	X	X	X	X		X	X	X	X
Taunton	X	X	X	X	X	X		X	X	X
Freetown	X	X	X	X	X	X	X		X	
Fall River	X	X	X	X	X	X	X	X		
New Bedford	X	X	X	X	X	X	X			

1 Inter-municipal connections not included.

As shown in Table 3-44, the Attleboro Alternatives would provide 34 interregional one-way links (68 two-way links), which would connect Fall River and New Bedford not only to Boston but also to communities that include Westwood, Canton, Sharon, Mansfield, Norton and Taunton. In comparison to the other alternatives, the Attleboro Alternatives score 83 percent. This is the second highest score for meeting the regional mobility project purpose.

Stoughton Alternatives

The Stoughton Alternatives (Electric and Diesel) would provide commuter rail service to South Station using the Northeast Corridor, Stoughton Line, New Bedford Main Line and Fall River Secondary. This alternative would have ten new commuter rail stations (North Easton in Easton, Easton Village in Easton, Raynham Place in Raynham, Downtown Taunton in Taunton, Taunton Depot in Taunton, King's Highway in New Bedford, Whale's Tooth in New Bedford, Freetown in Freetown, Fall River Depot in Fall River and Battleship Cove in Fall River). Table 3.3-8 highlights the interregional links provided by the alternative.

As shown in Table 3.3-8, the Stoughton Alternatives would provide 41 interregional links, which would connect Fall River and New Bedford not only to Boston but also to communities such as Canton, Stoughton, Easton, Raynham and Taunton. In comparison to the other alternatives, the Stoughton Alternatives score 100 percent and are tied for the highest score for meeting the regional mobility project purpose.

Table 3.3-8 Interregional Links – Stoughton Alternatives[1]

	Boston	Westwood	Canton	Stoughton	Easton	Raynham	Taunton	Freetown	Fall River	New Bedford
Boston		X		X	X	X	X	X	X	X
Westwood	X			X	X	X	X	X	X	X
Canton				X	X	X	X	X	X	X
Stoughton	X	X	X		X	X	X	X	X	X
Easton	X	X	X	X		X	X	X	X	X
Raynham	X	X	X	X	X		X	X	X	X
Taunton	X	X	X	X	X	X		X	X	X
Freetown	X	X	X	X	X	X	X		X	
Fall River	X	X	X	X	X	X	X	X		
New Bedford	X	X	X	X	X	X	X			

1 Inter-municipal connections not included.

Whittenton Alternatives

The Whittenton Alternatives (Electric and Diesel) would provide commuter rail service to South Station through Stoughton, connecting to the existing Stoughton Line using the Whittenton Branch through the City of Taunton. This alternative would have ten new commuter rail stations (North Easton in Easton, Easton Village in Easton, Raynham Place in Raynham, Downtown Taunton in Taunton, Taunton Depot in Taunton, King's Highway in New Bedford, Whale's Tooth in New Bedford, Freetown in Freetown, Fall River Depot in Fall River and Battleship Cove in Fall River). Table 3.3-9 highlights the interregional links provided by the alternative.

As shown in Table 3.3-9, the Whittenton Alternatives would provide 41 interregional one-way links (82 two-way links), which would connect Fall River and New Bedford not only to Boston but also to communities such as Canton, Stoughton, Easton, Raynham and Taunton. In comparison to the other alternatives, the Whittenton Alternatives score 100 percent and are tied for the highest score for meeting the regional mobility project purpose.

Table 3.3-9 Interregional Links – Whittenton Alternatives[1]

	Boston	Westwood	Canton	Stoughton	Easton	Raynham	Taunton	Freetown	Fall River	New Bedford
Boston		X		X	X	X	X	X	X	X
Westwood	X			X	X	X	X	X	X	X
Canton				X	X	X	X	X	X	X
Stoughton	X	X	X		X	X	X	X	X	X
Easton	X	X	X	X		X	X	X	X	X
Raynham	X	X	X	X	X		X	X	X	X
Taunton	X	X	X	X	X	X		X	X	X
Freetown	X	X	X	X	X	X	X		X	
Fall River	X	X	X	X	X	X	X	X		
New Bedford	X	X	X	X	X	X	X			

1 Inter-municipal connections not included.

Rapid Bus Alternative

The Rapid Bus Alternative would provide commuter bus service to South Station via I-93, Route 140 and Route 24. The Rapid Bus Alternative proposes four service branches in the southern project area. Inbound service would originate from downtown New Bedford, Fall River, downtown Taunton, and Taunton Silver City Galleria. Each branch would operate with a maximum of two stations in the South Coast region. The Taunton branches would have only one Taunton station per branch. While all four Rapid Bus routes converge on Route 24 near Taunton, the only shared station shared by the all the routes is South Station. This alternative would include six new rapid bus stations (Downtown Taunton in Taunton, Galleria Station in Taunton, King's Highway in New Bedford, Whale's Tooth in New Bedford, Freetown in Freetown and Fall River Depot in Fall River). Table 3.3-10 highlights the interregional links provided by the alternative.

As shown in Table 3.3-10, the Rapid Bus Alternatives would provide five interregional one-way links (10 two-way links), which would connect Fall River, New Bedford and Taunton to Boston. In comparison to the other alternatives, the Rapid Bus Alternative scores 12 percent, which does not meet the regional mobility project purpose. The Rapid Bus Alternative received the lowest score of all alternatives in terms of meeting the regional mobility project purpose. This is because it only enables five regional connections, compared to 41 provided by the Stoughton and Whittenton Alternatives.

Table 3.3-10 Interregional Links – Rapid Bus Alternative[1]

	Boston	Taunton	Freetown	Fall River	New Bedford
Boston		X	X	X	X
Taunton	X				
Freetown	X			X	
Fall River	X		X		
New Bedford	X				

1 Inter-municipal connections not included.

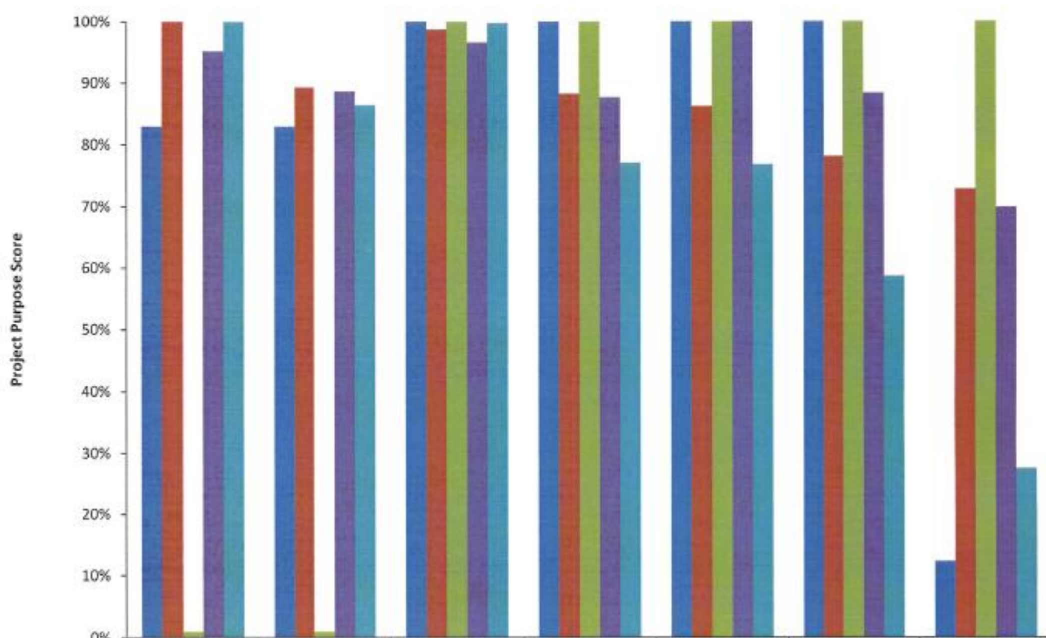
The Rapid Bus Alternative has two inherent constraints that prevent it from linking to more communities. The first constraint includes the need to minimize travel time of the service in order for it to remain competitive between alternatives and appealing to potential riders. The alternative was designed for fast, attractive connections from Taunton, Fall River and New Bedford to Boston, which would be provided in four express branches. Serving additional communities with these branches would significantly slow service to unacceptable levels, which would result in fewer transit riders.

The second constraint that limits the alternative's regional connections is bus capacity. The Rapid Bus routes would need to operate on short headways and in a platooning-effect (multiple buses leaving a station at one time) in order to accommodate ridership demand. The buses would operate at or near capacity, which would preclude additional stops along the branches. Any additional stations would need to operate as exclusive routes and would not provide any additional interregional connectivity.

3.3.1.5 PROJECT PURPOSE PERFORMANCE SUMMARY

The following sections describe how well each alternative meets the project purpose. A graphic representation is presented in Figure 3.3-1.

Figure 3.3-1 Summary of Project Purpose Results



	Attleboro Electric	Attleboro Diesel	Stoughton Electric	Stoughton Diesel	Whittenton Electric	Whittenton Diesel	Rapid Bus
Regional Mobility	B	B	A	A	A	A	F
Travel Time	A	B	A	B	B	C	C
Service Delivery Policy	F	F	A	A	A	A	A
Ridership Demand	A	B	A	B	A	B	C
VMTs	A	B	A	C	C	F	F

As shown in Figure 3.3-1, Stoughton Electric meets all five project purpose measures with scores greater than or equal to 97 percent and fares best of all the alternatives. Stoughton Diesel and Whittenton Electric follows closely behind, meeting all five project purpose measures with scores equal to or greater than 77 percent. Rapid Bus, however, fails on two points: Regional Mobility and VMT reduction. The Attleboro Alternative, while it meets four of the five, it fails to meet the basic service delivery requirements. The next section describes the cascading negative effect this would have on the entire MBTA commuter rail system and the subsequent decrease in ridership.

3.3.2 PRACTICABILITY MEASURE

This section describes the practicability of construction or operation for each of the proposed alternatives analyzed in this DEIS/DEIR.

Section 3.3.1 documented how each of the build alternatives meets the Project Purpose. The discussion below provides data on how practicable each of the alternatives would be to implement based on the Permit 404 definition of practicable: "capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose." Four sub-criteria were used to evaluate how practicable the alternatives are:

- *Cost per Rider*– Measures how costly it would be to provide an alternative compared to the number of riders expected to use the system.
- *Construction Schedule* – The time required to construct each alternative is also a measure of practicability because longer construction schedules become increasingly more expensive, as well as delay the delivery of project benefits.
- *On-Time Performance* – Measures how well the alternatives would be able to serve the South Coast Region in terms of providing the passengers an assurance that they will arrive on time and measures how capacity constraints translate into impacts on the overall MBTA commuter rail system.

3.3.2.1 COST PER RIDER

This criterion evaluated how well an alternative performs based on how a balance of capital and operating and maintenance cost to the benefit of the service, or the number of riders projected to use the system. The metric for this criterion is cost per rider, which includes infrastructure construction, land acquisition, environmental mitigation, brownfield site remediation and other construction elements based on the more refined preliminary engineering design as well as the cost of operating and maintaining the system. Detailed breakdown of capital cost and operation and maintenance cost estimates can be found in Section 3.2 - *Description of Alternatives Evaluated In the DEIS/DEIR*.

A measure of 2030 ridership for each alternative was evaluated using the Central Transportation Planning Staff (CTPS) regional model. CTPS refined their regional travel demand model set to include regional transportation projects, land use alternatives based on regional plans for the study area, and the proposed operation plan for each project alternative. Further information incorporated into their analysis includes station locations, station parking availability and cost, and fares. Table 3.3-11 compares the cost per rider of each alternative.

As shown in Table 3.3-11, the Rapid Bus Alternative would be the least cost-effective of all the alternatives with a cost of approximately $100 per rider. The Attleboro Alternatives would be roughly $58 per rider. The Stoughton and Whittenton Alternatives would provide the most cost-effective service with approximately $44 to $48 per rider.

Table 3.3-11 Cost per Rider by Alternative

Name	Cost per Rider [1]	Score [2]	Letter Grade [3]
Attleboro Electric	$57.03	77%	**C**
Attleboro Diesel	$58.29	75%	**C**
Stoughton Electric	$45.76	96%	**A**
Stoughton Diesel	$43.73	100%	**A**
Whittenton Electric	$48.16	91%	**A**
Whittenton Diesel	$46.25	95%	**A**
Rapid Bus	$99.79	44%	**F**

1 Annualized capital cost and annual operating and maintenance cost estimates divided by annual passengers.
2 Cost per rider of an alternative divided by the minimum cost effectiveness (in this case, Stoughton Electric with $43.73 per trip)
3 90% to 100% = Grade A; 80% to 89% = Grade B; 70% to 79% = Grade C; 60% to 69% = Grade D; 0% to 59% = Grade F

3.3.2.2 CONSTRUCTION SCHEDULE

The time required for construction affects the length of short-term impacts and the startup date for new transit services. Alternatives were evaluated to determine whether each alternative could be constructed within a reasonable, four-year, timeframe in order to achieve the project. A four-year construction schedule has been outlined in Governor Patrick's *South Coast Rail, A Plan for Action*. In addition to trying to maintain this schedule, a shortened construction period would ensure lower construction costs. Construction costs, which typically escalate over time, would increase significantly with longer construction periods (particularly with regard to the cost of materials such as steel and concrete).

Construction schedules were established based on construction sequencing outlined in Section 3.2. Construction of track, bridges, culverts, grade crossings, electrification and whether the construction would occur along active or inactive corridors, among other components, all contribute to the construction duration required. Table 3.3-12 compares the construction schedules of the alternatives.

Table 3.3-12 Construction Schedule by Alternative

Name	Construction Schedule (years)	Score [1]	Grade [2]
Attleboro Electric	7.0	57%	**F**
Attleboro Diesel	7.0	57%	**F**
Stoughton Electric	4.5	89%	**B**
Stoughton Diesel	4.0	100%	**A**
Whittenton Electric	4.5	89%	**B**
Whittenton Diesel	4.0	100%	**A**
Rapid Bus	4.5	89%	**B**

1 Construction schedule of an alternative divided by the minimum construction time (in this case, Stoughton and Whittenton Diesel which could be constructed in 4.0 years)
2 90% to 100% = Grade A; 80% to 89% = Grade B; 70% to 79% = Grade C; 60% to 69% = Grade D; 0% to 59% = Grade F

As shown in Table 3.3-13, the Attleboro Alternative has the longest construction duration (7 years). The reason the Attleboro Alternatives would have a lengthier construction period than the rest is largely due to the fact that construction activity along the existing Northeast Corridor would need to be limited to a few hours during the night.[42] Night construction would not begin until the electrified catenary system is de-energized after the last Acela or Amtrak Regional train. This catenary system would need to be re-energized prior to the first train of the following morning. The process of de-energizing and re-energizing the catenary would require approximately 2.5 hours, leaving a maximum of 4.5 hours nightly (approximately 1 AM to 5 AM). The rest of the alternatives, including Stoughton, Whittenton, and Rapid Bus, fare relatively well against each other with approximate construction schedules of 4 to 4.5 years.

3.3.2.3 ON-TIME PERFORMANCE

While project travel time is an important initial criterion in evaluating the practicability of an alternative (as was done during the initial evaluation phases), the reliability of meeting that travel time on a consistent basis (as expressed by on-time performance) is another key factor to consider. Infrastructure constraints in particular can affect on-time performance and an alternative's reliability. "On time" is defined as being no more than 5 minutes late, particularly for routes with published schedules such as a commuter rail or commuter bus service and for which this particular metric, the system on-time performance is evaluated. While on-time performance of one commuter rail or bus route is an important measure, the on-time performance of a combined system more accurately measures how well both a particular alternative will perform and how well it will do so without impacting the commuter system as a whole. As a point of reference, the MBTA System Wide Commuter Rail On-Time Performance for calendar year 2008 ranged from 78 to 95 percent. The on-time performance of each alternative is summarized in Table 3.3-13.

Table 3.3-13 On-Time Performance by Alternative

Name	On-Time Performance [1]	Score [2]	Grade [3]
Attleboro Electric Alternative	52.4%	54%	**F**
Attleboro Diesel Alternative	47.6%	49%	**F**
Stoughton Electric Alternative	97.9%	100%	**A**
Stoughton Diesel Alternative	95.9%	98%	**A**
Whittenton Electric Alternative	97.9%	100%	**A**
Whittenton Diesel Alternative	95.9%	98%	**A**
Rapid Bus Alternative	88.3%	90%	**A**

1 On-time performance for south side terminals as a result of the alternative's operating plan. On-time performance based on Systra's Network Simulation Analysis of Proposed 2030 MBTA/Amtrak Operations
2 On-time performance by an alternative divided by the maximum on-time performance (in this case, Stoughton and Whittenton Electric with a 97.9% on-time performance).
3 90% to 100% = Grade A; 80% to 89% = Grade B; 70% to 79% = Grade C; 60% to 69% = Grade D; 0% to 59% = Grade F

As shown in Table 3.3-13, the Stoughton, Whittenton and Rapid Bus Alternatives achieve an acceptable on-time performance, while the Attleboro Alternative does not.

There are several factors that contribute to the Attleboro Alternatives' on-time performance. Some of these factors are outlined in the preceding Section 3.3.1 - *Project Purpose Performance*. In addition to the reliability factors in Section 3.3.1, Network Simulation Analysis[43,44] indicated that the Attleboro

[42] Minutes of August 13, 2009 meeting between EOT and Amtrak
[43] Systra Consulting, Inc., Technical Memorandum, Network Simulation Analysis of Proposed 2030 MBTA/Amtrak Operations, August 11, 2009

Alternative is operationally infeasible due to the capacity issue of Tower 1 Interlocking at South Station in Boston. The network simulation indicated that the Attleboro Alternative would fail to achieve the MBTA on-time standard in the morning peak. In the evening, the Attleboro Alternative would experience even worse on-time performance. In addition to poor on-time performance of the Attleboro Alternatives on its own route, the Attleboro Alternatives would also contribute to a cascading negative impact on the on-time performance of the south side commuter rail system, including Worcester, Franklin, Needham, and Providence Lines.

Subsequent sensitivity analyses indicated that even with substantial reduction of service frequency of the Attleboro Alternative to below the MBTA service Policy (in itself a performance criterion), the Attleboro Alternative would still receive a failing grade for on-time performance and affect the regional transportation system.

Attleboro NEC Fourth Track Option

Additional network simulation was conducted to evaluate whether the performance of the Attleboro Alternative could be improved independent of the capacity issue of Tower 1 Interlocking at South Station.[45] This condition was simulated by stopping trains at Back Bay in lieu of continuing trains on to South Station. The simulation indicated unacceptable delays south of Back Bay Station encountered after implementation of the South Coast Rail Attleboro Alternative, independent of any South Station constraints. The cause of the unacceptable delays was determined to be the lack of adequate capacity on the NEC north of the Readville Station to support the increased train volumes that would result from the Attleboro Alternative.

In order to increase the capacity on the NEC that would be consumed by the Attleboro Alternative and improve performance, a fourth track would have to be constructed (similar to the reason why a *third track* had to be added to the NEC south of Readville Station). An analysis was conducted of the construction costs and schedule implications as well as key property and other impacts associated with the construction of a fourth track. A discussion of these aspects is provided in the January 14, 2011 Northeast Corridor Fourth Track Construction Assessment included in Appendix 3.3-A. Figures 3.3-2 and 3.3-3 show the location of the fourth track within the NEC corridor and the location of the line diagram for the proposed track alignment. Considering the types of construction activities required the fourth track portion of the NEC can be divided into the following three sections:

Section 1 – Between Readville Station and Forest Hills Station

Required construction: Placement of the fourth track on the north side of the NEC within existing real estate. This would require reconstruction of bridge structures, reconstruction of stations and acquisition of residential or commercial properties.

Section 2 – Between Forest Hills Station and Ruggles Station/Massachusetts Avenue

Required construction: Placement of the fourth track on the south side of the NEC by demolishing the existing southern retaining wall and expanding the existing cut section. This section of the corridor is where the Orange Line meets the NEC. The Orange Line, which runs on the north side of the commuter

[44] Systra Consulting, Inc., Technical Memorandum, Network Simulation Analysis of Proposed MBTA/Amtrak Operation, Rev. 1.1, August 28, 2009

[45] Systra Consulting, Inc., Technical Memorandum, Analysis of South Coast Rail Attleboro Alternative PM Peak Period, Using Back Bay as Northerly Terminal (Tower I and South Station Effects Removed). October 29, 2009.

rail tracks, adds another layer of complexity due to the fact that there are many Orange Line stations that would need to be reconstructed to accommodate the addition of the fourth track on the north side of the NEC.

In addition to the multiple overhead bridge crossings, this section of the corridor contains a large amount of area where the existing track cut section is covered with parks or other recreational spaces. In these sections, the existing parks on the roofs would be removed and then replaced after the cut section has been widened. This includes Southwest Corridor Park, a 4.7 mile, 52-acre linear park stretching from Forest Hills Station to Back Bay Station that opened in 1987 and is owned and maintained by the Massachusetts Department of Conservation and Recreation. Permanent impacts to Southwest Corridor Park would result from the loss of 2.85 acres of parkland, and temporary impacts would include the loss of 8.54 acres of parkland throughout construction, for approximately 3-6 years at each construction zone. A typical cross-section and a typical lay-out for the fourth track are provided on Figure 3.3-4 and Figure 3.3-5 to illustrate the issues associated with construction and operation of a fourth track. In addition to the impacts described above, there are other impacts that would potentially affect the fourth track. There are existing utilities, as shown in Figure 3.3-6, which run along the corridor, including Southwest Corridor Park, on the south side of the existing tracks that would need to be relocated in order to extend the cut section to the south.

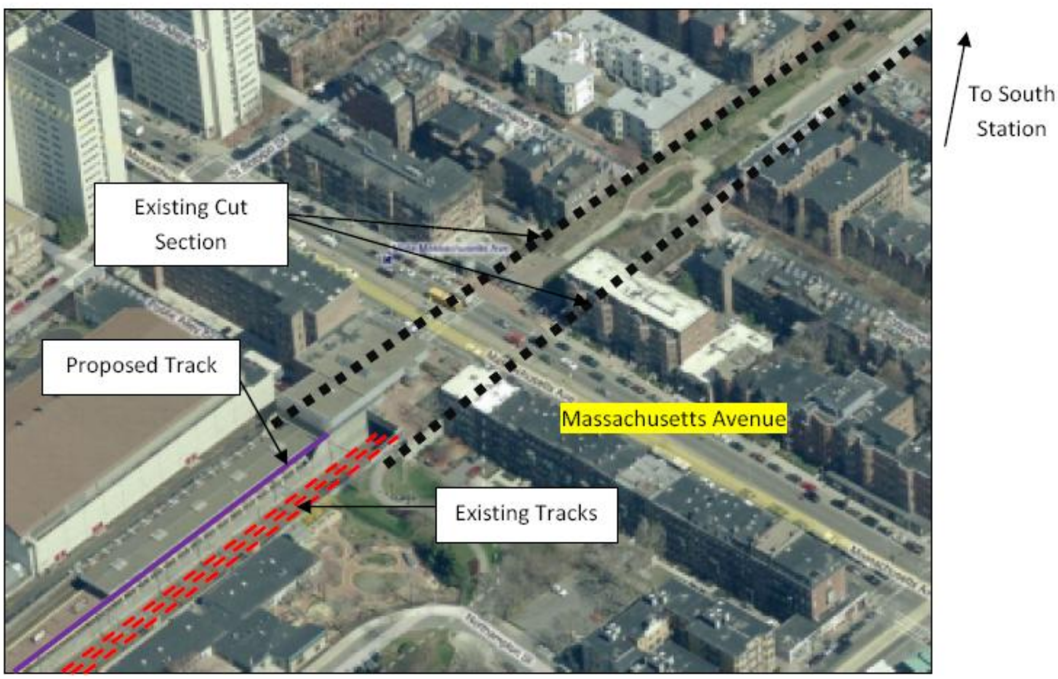
Figure 3.3-6 Utility Structures Along Southwest Corridor Park

Section 3 – Between Ruggles Station/Massachusetts Avenue and Back Bay Station

Required construction: Placement of the fourth track on the north side of the NEC, along the existing MBTA Orange Line alignment. The MBTA Orange Line would be replaced by extending a tunnel under the NEC approximately two miles from just east of Back Bay to just east of Ruggles Station.

Major constraints in this section of the corridor include that the NEC and the Orange Line enter a cut section with a structural cap that runs under the Southwest Corridor Park north towards Back Bay and along a dense urban setting with many residential and commercial buildings in the South End abutting the right-of-way. Widening this section through the South End would be problematic and costly. Many high rise buildings adjacent to the NEC would be impacted, with a large number of business owners and residents displaced (see Figure 3.3-7). Adding the proposed fourth track adjacent to the existing alignment would involve acquisition of and demolition of the many business owners and residents. In order to avoid the need to widen the existing cut/capped section, which runs under the South End, the Orange Line would be relocated into a new tunnel section beginning east of Ruggles Station and in to the existing Orange Line east of Back Bay Station. This would free up the space currently used by the Orange Line for use by the fourth NEC track (to accommodate the added volume of the Attleboro Alternative), with some necessary upgrades. MBTA's Orange Line would begin to descend to meet the new tunnel entrance just east of the Ruggles Station platforms and proceed through a new tunnel through Back Bay Station (approximately 2 miles), and connect with the existing Orange Line tunnel. The fourth NEC track would then utilize the space vacated by the existing Orange Line through this section of the corridor.

Figure 3.3-7 Tunnel Section After Massachusetts Avenue Station



The construction impacts through this section of the corridor would be even more substantial than those described for the previous sections due to the addition of a new tunnel for the Orange Line. This section would require the reconstruction of two Orange Line stations (Massachusetts Avenue and Back Bay). In order to construct the new tunnel underneath the existing Orange Line tracks and connect in to the existing tracks at the ends, Orange Line service from Tufts Medical Center to Forest Hills would need to be suspended and replaced with bus service for two years.

Construction Schedule of the Fourth Track

The critical construction item that must be completed before other work can proceed is the rerouting of the Orange Line into a new tunnel from Ruggles to Tufts Medical Center. The tunnel work is estimated to take approximately five years, after which the construction of the fourth track in that area could begin. It is assumed that the contractor would be able to construct the majority of the tunnel beneath the existing Orange Line tracks before having to shut down the Orange Line to connect to the existing track sections. Due to the proximity to the Commuter Rail tracks and existing catenary structures, the connections at both ends of the proposed Orange Line tunnel would be constrained to construction during the night when train service is not running and the catenary system could be de-energized. Because of these constraints, construction of the tie-in points would take approximately 2 years.

It is assumed that adjacent bridges would serve as detour routes during the construction of a bridge. A conservative assumption would be that approximately six overhead bridges could be completed per year. The reconstruction of these bridges must be complete prior to construction of the new track in order to provide adequate space for the new track.

As with all construction work which needs to occur on operating tracks, the length of time allotted for construction over the portions that could foul the catenary system is approximately three hours during the night when train service is not running and the catenary system could be de-energized. This would add considerable construction time to the schedule.

Considering all of these factors, the length of time it would take to complete the fourth track would be approximately 10 to 12 years. Even considering that some of the fourth track construction activities could coincide with other construction activities for the Attleboro Alternative, the total construction period would be more than double that of any of the other alternatives under consideration, for which construction is estimated at 4 to 5 years and would far exceed the four-year construction schedule outlined in Governor Patrick's *South Coast Rail, A Plan for Action*.

Costs Associated with the Fourth Track

There are several substantial cost items associated with the construction of the fourth track. One of the primary items would be placing the Orange Line in a tunnel from Ruggles Station to Massachusetts Avenue, approximately 1.4 miles. This is assumed to occur while maintaining service on the Orange Line. Total cost of implementing a new Orange Line tunnel and retrofitting the existing tunnel to accommodate Commuter Rail trains (with new ventilation) is approximately $621 Million.

Shuttle service would need to be provided to continue servicing the riders of the Orange Line during construction of the connections to the tunnel on either end. The cost of the shuttle would be the total bus-days and the operating cost, at approximately $2,200 per bus per day. This results in a total cost of approximately $281 Million.

Another major cost item associated with the installation of the fourth NEC track would be the structural items, such as bridges, pedestrian overpasses, cut section roofs and retaining walls. The approximately 21 overhead bridge crossings would cost $67 million. Adding in the undergrade crossings, the cut section roofs, the pedestrian overpasses and the retaining walls, the total cost for the structural items would be approximately $284 Million.

In addition to construction costs and bus shuttle service costs, the fourth track would also incur costs associated with property acquisition.

Table 3.3-14 summarizes the Order of Magnitude Cost Summary for the items listed above as well as for other items conceptually identified for the Fourth Track.

Table 3.3-14 Northeast Corridor Fourth Track Cost Estimate (2011 Dollars)

Description	Unit	Quantity	Cost
Trackwork			
Commuter Rail Track	LF	45,900	$23,300,000
Orange Line Track	LF	14,500	$5,400,000
Crossover (#20)	EA	2	$4,900,000
Turnout (#20)	EA	1	$900,000
Structural			
Overhead Bridges	EA	21	$66,400,000
Cut Section Roofs	EA	11	$180,500,000
Undergrade Crossing	EA	1	$900,000
Pedestrian Overpass	EA	2	$1,100,000
Retaining Walls	LF	19,000	$40,300,000
Tunnel			
Orange Line Tunnel	LF	7,200	$401,300,000
Back Bay Station Tunnel Upgrades	LF	4,400	$220,000,000
Station Tunnel Upgrades	EA	2	$109,000,000
Signals and Communication	LF	53,100	$14,200,000
Power			
Traction Power	LF	31,900	$6,900,000
Overhead Contact System Wiring	LF	19,700	$3,200,000
Main Substation	EA	1	$14,000,000
Wayside Power/Interlocking (Needham)	EA	1	$800,000
Wayside Power/Interlocking (Franklin)	EA	1	$600,000
Stations			
Major Renovations	EA	6	$120,000,000
Minor Renovations	EA	3	$9,000,000
New Platforms	EA	4	$8,000,000
Right-of-Way Acquisition			
Private Commercial	EA	3	$6,800,000
Private Residential	EA	5	$5,600,000
Public Park	EA	1	$22,500,000
Contingency (Construction Items)	PERCENT	30%	$379,680,000
	Subtotal (Construction Items)=		***$1,645,300,000***
Alternative Transportation	BUS-DAY	127,750	$281,400,000
Contingency (Alt. Transportation)	PERCENT	20%	$56,300,000
	Subtotal (Alt. Transportation)=		***$337,700,000***
Subtotal (Alt. Transportation and Construction Items)=			***$1,983,000,000***
Professional Services/Soft Costs	PERCENT	25.00%	$495,800,000
		Total Cost =	***$2,478,800,000***

Note: LF = Linear Foot
EA = Each

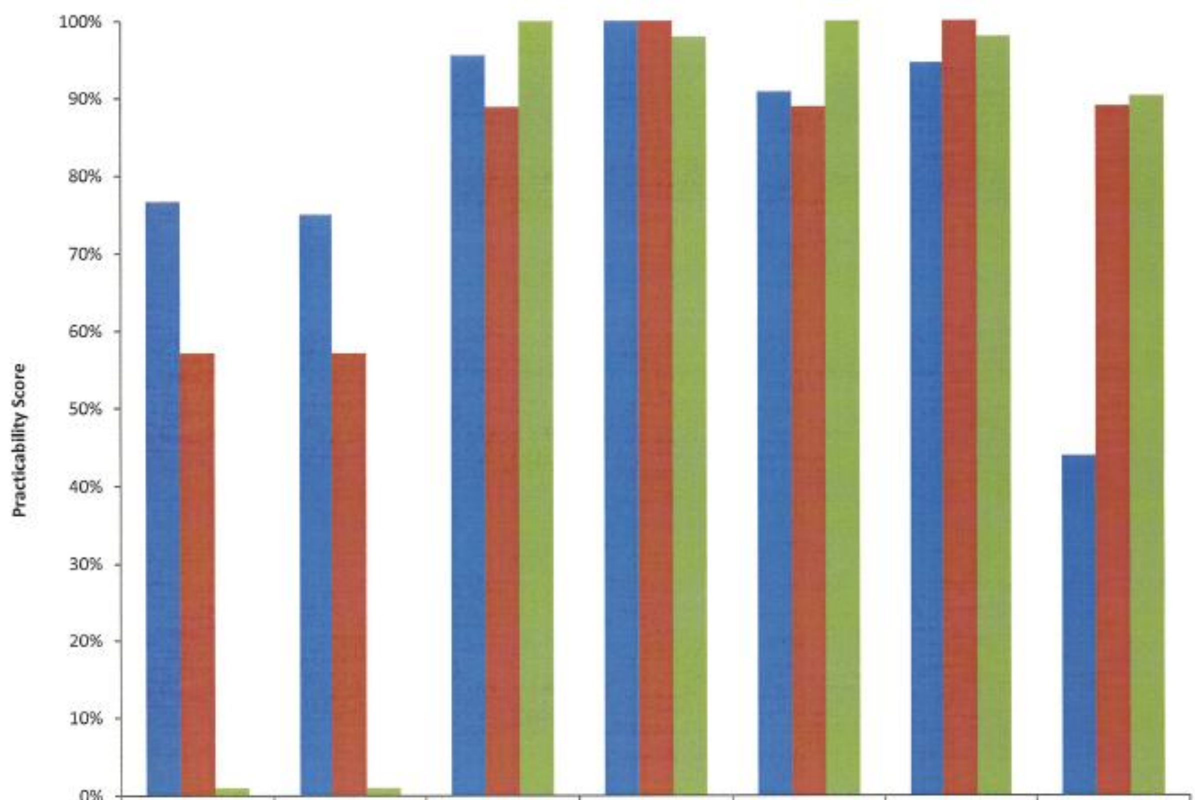
Construction of a fourth track to avoid the above delays would result in an additional construction cost for the Attleboro Alternative of more than $2.4B. This places it far above the other alternatives and even above the Middleborough Alternative, which was eliminated from further consideration earlier in the screening process, partially due to cost.

The potential impacts, construction costs and construction schedule and other aspects of the fourth track along the NEC would render implementation of this infrastructure requirement infeasible. In a previous study, the FRA (a cooperating federal agency) also explored the option to expand capacity of the NEC north of Canton Junction Station. However, due to substantial constraints, it was proposed that such capacity expansion end at Forest Hills in Jamaica Plain. In reviewing the RAILSIM capacity simulations conducted for the Attleboro Alternative, the FRA has indicated to the Corps that it considers this alternative infeasible and appropriate to delete from any further environmental review/ consideration.[46] A more detailed discussion of the fourth track and associated issues is presented in Appendix 3.3-A.

3.3.2.4 PRACTICABILITY SUMMARY

The following sections describe the results for the seven build alternatives evaluated in the alternatives analysis for practicability (Figure 3.3-8).

Figure 3.3-8 Summary of Practicability by Alternative



	Attleboro Electric	Attleboro Diesel	Stoughton Electric	Stoughton Diesel	Whittenton Electric	Whittenton Diesel	Rapid Bus
Cost per Rider	C	C	A	A	A	A	F
Schedule	F	F	B	A	B	A	B
On-Time Performance	F	F	A	A	A	A	A

46 Email correspondence from FRA to Army Corps. March 3, 2010.

As shown in Figure 3.3-8, the Attleboro Alternatives perform poorest on the practicability measure. The network simulation analysis indicated that the Attleboro Alternatives are operationally infeasible as they do not meet the MBTA on-time standard in the morning peak and would experience even worse on-time performance during the evening peak commute. The Attleboro Alternatives would also contribute to a cascading negative impact on the on-time performance of the southerly commuter rail system, including Worcester, Franklin, Needham and Providence commuter rail lines. The fourth track option which was evaluated to address this fundamental deficiency of the Attleboro Alternatives was not considered feasible based on cost, schedule and impact considerations, as described above.

The Rapid Bus alternative does not perform well on the practicability measure, particularly on the cost per rider, which has the Rapid Bus Alternative at a cost of close to $100 per rider.

The Stoughton and Whittenton Alternatives perform well across the board on the practicability measure with all grade B or better.

3.3.3 BENEFICIAL EFFECTS AND ENVIRONMENTAL IMPACTS MEASURE

This section describes the screening process used to determine the relative magnitude of each alternative's beneficial and adverse impacts to the aquatic, natural and human environment. This screening process was undertaken in a manner compatible with the Corps' *Highway Methodology*[47] to screen alternatives and ensure that a transportation agency's preferred alternative is consistent with federal wetlands regulations.

The previous two steps of the preceding discussion described how well each of the alternatives would meet the project purpose and then how practicable each of the alternatives would be to implement (in terms of logistics, technical aspects and cost) and second which are environmentally less damaging. The discussion below identifies beneficial or adverse impacts to the aquatic, natural and human environment to occur as a result of each alternative, particularly to wetlands, Areas of Critical Environmental Concern (ACECs), threatened and endangered species, protected open space, public water supplies, land use, noise, air quality and environmental justice communities. These resources were selected from a full range of environmental impacts criteria because they are principal categories that either must be considered for permits and approvals and/or resulted in the greatest magnitude of change between all of the alternatives.

As stated in the Guidelines at 40 Code of Federal Regulations 230.10(a), "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." Therefore, the discussion below identifies impacts to the aquatic environment under the Clean Water Act, but also identifies other impacts to the overall natural environment, as is required under the Guidelines, and also to the human environment. The specific measures for each criterion are listed below.

The environmental impacts measure was based on two primary criteria: "What are the beneficial effects and what are the adverse impacts?" These criteria were evaluated based on the following sub-criteria, which were selected based on their relevance to the Project Purpose, relationship to applicable statutes and regulations and the extent to which they would be likely to differ among alternatives:

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[47] United States Army Corps of Engineers. NEDEP-360-1-30, *The Highway Methodology Workbook*. October 1993.

- ***Beneficial Effects***
  - How well does an alternative serve environmental justice populations?
  - What are the air quality benefits that would be provided by each alternative?
  - What are the climate change benefits that would be provided by each alternative?
  - What smart growth opportunities would be provided by each alternative?
- ***Adverse Impacts***
  - What would be the permanent wetland loss (in acres) (edge and interior wetlands and floodplains) and wetland loss in ACECs?
  - What would be the number of acres of protected open space[48] that would be directly impacted, acres of land acquisition and municipal tax loss?
  - What would be the number of acres of protected public water supply lands (active and inactive Mapped Wellhead Zone 1) that would be directly impacted?
  - What would be the noise impacts of each alternative?
  - What would be the number of acres of mapped Priority Habitat (state-listed rare species) that would be lost (edge and interior habitat)?

The following sections describe the impacts of the Build Alternatives only as the No-Build Alternative would not have impacts on the environment.

Section 3.3.3.1 identifies the beneficial environmental effects of each alternative in terms of environmental justice, air quality, climate change, and smart growth. Section 3.3.3.2 compares the alternatives based on key environmental impact criteria.

3.3.3.1 BENEFICIAL EFFECTS

This section focuses on the environmental benefits of each alternative by summarizing the benefits that would be provided to environmental justice populations, air quality, climate change, and smart growth. Environmental Justice and smart growth were evaluated qualitatively and do not receive scores. Air quality and climate change were evaluated quantitatively and follow the Alternatives Analysis scoring system.

Environmental Justice

Potential benefits to environmental justice communities in Taunton, Fall River, and New Bedford were evaluated as an indirect effect of the South Coast Rail alternatives in terms of travel accessibility and mobility.[49] Table 3.3-15 summarizes the relative beneficial effects to environmental justice populations potentially resulting from each South Coast Rail Build Alternative.

The beneficial effects to environmental justice populations that would result from the South Coast Rail Project vary considerably by alternative and community. Compared to the No-Build Alternative, improvements in access and travel time to jobs, colleges, hospitals, and Boston would result from most alternatives. Some alternatives would result in no change (as compared to the No-Build Alternative) or even decreases in access or increases in travel time.

[48] Protected public open space lands are protected under Massachusetts' State Constitution, Article 97 (parks, conservation lands, recreation areas, wildlife refuges) and Section 4(f) of the Department of Transportation Act.

[49] Central Transportation Planning Staff (CTPS). 2009. *South Coast Rail Environmental Justice Study*. Memorandum from CTPS to the South Coast Rail Project Interested Parties. Boston Metropolitan Planning Organization, Central Transportation Planning Staff: Boston.

The environmental justice populations in Fall River would see the greatest improvement in access and travel time to jobs, while the environmental justice populations in New Bedford would receive the least benefit. A broad range of improvements in access to jobs for environmental justice populations in Taunton would result from the entire range of Build Alternatives.

None of the impacts would result in disproportionately high and adverse human health or environmental effects to environmental justice populations, meeting the requirements of the Executive Order, DOT Order, and EPA guidance.

The Attleboro Electric Alternative would show the greatest improvement in the largest number of parameters (averaged access to jobs from Taunton, access and travel time to colleges, access and travel time to hospitals, and travel time to Boston). The Attleboro Diesel Alternative and both Stoughton Alternatives also have the most improvement results for other parameters. The Rapid Bus Alternative showed the least improvements for all parameters.

Table 3.3-15 Relative Benefits to Environmental Justice Populations [1]

Effects	Attleboro Electric	Attleboro Diesel	Stoughton Electric	Stoughton Diesel	Whittenton Electric	Whittenton Diesel	Rapid Bus
Access to Jobs-[2]							
Taunton	143	94	118	77	67	44	16
Fall River	167	134	187	151	140	113	103
New Bedford	17	3	21	4	-1	-2	11
Travel Time to Jobs-[3]							
Taunton	2	2	2	3	0	1	1
Fall River	9	9	9	10	8	8	6
New Bedford	1	2	0	1	-1	0	3
Access to Colleges[4]	108	63	78	46	53	33	15
Travel Time to Colleges[5]	2	5	3	4	3	4	4
Access to Hospitals[4]	196	136	188	135	133	102	144
Travel Time to Hospitals[5]	39	39	38	39	35	37	45
Travel Time to Boston[6]	53	39	47	32	33	23	51
Station Area TOD[7]	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1- Beneficial Effects (percent improvement compared to No-Build Alternative)
2- Provided as an average in improvement, as compared to the No-Build Alternative, in access to basic, service, and retail jobs within a 90-minute radius of each municipality. Source: CTPS 2009.
3- Provided as an average in improvement, as compared to the No-Build Alternative, in travel time to basic, service, and retail jobs. Source: CTPS 2009.
4- Provided as an average in improvement, as compared to the No-Build Alternative, in access from Taunton, Fall River, and New Bedford to colleges and hospitals. Source: CTPS 2009.
5- Provided as an average in improvement, as compared to the No-Build Alternative, in travel times from Taunton, Fall River, and New Bedford to colleges and hospitals. Source: CTPS 2009.
6- Provided as an average in improvement, as compared to the No-Build Alternative, in travel times from Taunton, Fall River, and New Bedford to Boston's South Station. Source: CTPS 2009.
7- Qualitative assessment of the potential for transit-oriented development in the vicinity of the station site that would benefit environmental justice populations. Source: Goody-Clancy 2009.

The Stoughton Electric Alternative would provide the greatest improvement in access to jobs for both Fall River and New Bedford environmental justice populations (187 and 21 percent, respectively). The Attleboro Electric Alternative would result in the greatest improvement in access to jobs for environmental justice populations in Taunton.

In summary, the Attleboro and Stoughton Alternatives would provide the greatest benefits to environmental justice populations, while the Rapid Bus Alternative would provide the least benefits.

Air Quality

The predominant sources of air pollution anticipated from the proposed South Coast Rail project include emissions of carbon monoxide (CO), nitrogen oxides (NO_x), and volatile organic compounds (VOCs) from locomotive engines and from motor vehicles traveling to and from the train stations. To document impacts of the alternatives, the mesoscale analysis evaluated the regional air quality impacts (VOCs, NO_x, CO, and PM emissions) from the proposed project by determining the change in total ozone precursor emissions (volatile organic compounds and nitrogen oxides) for the existing and future conditions within the study area; the microscale analysis calculated the CO and PM concentrations for the same conditions at congested intersections near the proposed stations. Results for this criterion are provided in Table 3.3-16.

As shown in Table 3.3-16 and Figure 3.3-9, the Attleboro Electric and Stoughton Electric Alternative would have the most substantial air quality benefits of all the alternatives. The Whittenton Electric alternative would follow closely behind with the Rapid Bus Alternative offering the least air quality benefits of all the alternatives.

Table 3.3-16 Air Quality Benefits by Alternative

Name	Reduction in VOCs (kg/day)	Score	Reduction in NO_X (kg/day)	Score	Reduction in $PM_{2.5}$ (kg/day)	Score	Reduction in CO (kg/day)	Score
Attleboro Electric	(55.9)	100%	(43.3)	100%	(1.7)	100%	(2,575.5)	100%
Attleboro Diesel	(46.3)	83%	(10.9)	25%	(0.7)	41%	(2,115.2)	82%
Stoughton Electric	(52.9)	95%	(40.8)	94%	(1.5)	88%	(2,459.7)	96%
Stoughton Diesel	(41.5)	74%	(8.7)	20%	(0.3)	18%	(1,884.0)	73%
Whittenton Electric	(41.9)	75%	(31.3)	72%	(0.7)	41%	(1,890.5)	73%
Whittenton Diesel	(23.3)	42%	(3.5)	8%	0	0%	(1,501.3)	58%
Rapid Bus	(9.3)	17%	0	0%	0	0%	(612.3)	24%

Contribution to Climate Change

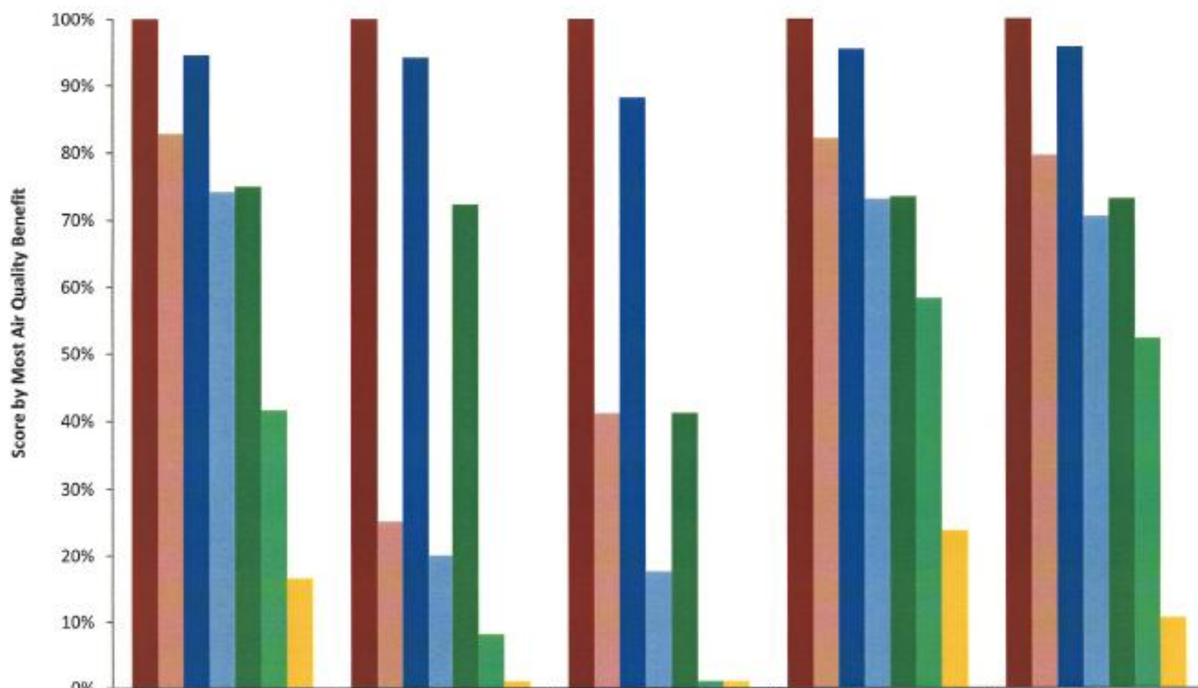
Climate change is an important consideration in evaluating the South Coast Rail project alternatives. Recent studies predict the effects of climate change in New England that could dramatically change the distribution of plant communities and the distribution of some animal species. The primary greenhouse gas emitted by transportation sources is Carbon Dioxide (CO_2). This analysis looked at CO_2 emitted by locomotives as well as reduction from reduced vehicle miles traveled (Table 3.3-17).

As shown in Table 3.3-17 and Figure 3.3-9, all commuter rail alternatives perform fairly well in reducing CO_2. Attleboro Electric and Stoughton Electric perform the best in this regard, with scores at or near 100 percent (CO_2 is a leading contributor to climate change). The alternatives achieve this by shifting commuters from cars to electrified commuter rail. These two real world comparisons offer perspective on how well the Attleboro Electric and Stoughton Electric perform in reducing CO_2 emissions:

Table 3.3-17 Greenhouse Gas Benefits by Alternative

Name	Reduction in CO_2 (tons/year)	Score
Attleboro Electric	(62,333.7)	100%
Attleboro Diesel	(49,612.0)	80%
Stoughton Electric	(59,715.1)	96%
Stoughton Diesel	(44,007.1)	71%
Whittenton Electric	(45,583.9)	73%
Whittenton Diesel	(32,601.3)	52%
Rapid Bus	(6,588.0)	11%

Figure 3.3-9 Summary of Beneficial Air Quality Effects



	VOCs Reduction	NO_x Reduction	$PM_{2.5}$ Reduction	CO Reduction	CO_2 Reduction
Attleboro Electric	A	A	A	A	A
Attleboro Diesel	B	F	F	B	B
Stoughton Electric	A	A	B	A	A
Stoughton Diesel	C	F	F	C	C
Whittenton Electric	C	C	F	C	C
Whittenton Diesel	F	F	F	F	F
Rapid Bus	F	F	F	F	F

- The Attleboro Electric and Stoughton Electric alternatives would reduce as much regional CO_2 production as removing an 18 megawatt power plant from operation.
- One mature deciduous tree (such as a large maple or oak found in eastern Massachusetts) removes 31 pounds of CO_2 from the atmosphere in a year. 65 mature deciduous trees remove approximately one ton of CO_2 over a year. During a one-year operating period, the Attleboro Electric and Stoughton Electric alternatives reduce about 61,400 tons of regional CO_2 production compared to

present conditions. To reduce that same amount, eastern Massachusetts would need an additional four million trees.

Smart Growth

As stated in the *South Coast Rail Economic Development and Land Use Corridor Plan*[50]*,* commuter rail service to the South Coast will generate nearly $500 million in new economic activity every year. This is new growth by the year 2030 that would not occur without the new infrastructure. The rail connection is projected to create between 3,500 and 3,800 net new jobs within the Commonwealth by 2030—about two-thirds of which would locate in the South Coast region with the remaining third in Boston-Cambridge and other communities outside the region.

The Corridor Plan would be implemented by MassDOT throughout the 31-community region regardless of which alternative was selected, so there would be no substantive difference among alternatives with regard to the majority of smart growth benefits. These benefits include protecting the Priority Preservation Areas, and concentrating development in the Priority Development Areas. The principal differences among the alternatives would be with regard to their ability to promote concentrated development (transit-oriented development) at station areas. Transit-oriented development (or redevelopment), as illustrated by the concepts included in the Corridor Plan report, would include mixed high-density residential, retail, and commercial/office development at certain station locations. The benefits of this transit-oriented development would be to increase local tax revenues; decrease vehicle miles traveled, and decrease Greenhouse Gas emissions. As outlined in the Corridor Plan, transit-oriented development would be likely as new development or re-development at the Downtown Taunton, Taunton, Freetown, Fall River Depot, King's Highway, Whale's Tooth, Easton Village, and Raynham Place stations.

While the alternatives would provide varying magnitudes of TOD potential, all the Build Alternatives provide opportunity for smart growth.

Summary of Beneficial Air Quality and Greenhouse Gas Reduction Effects

As shown in Figure 3.3-9, Attleboro Electric and Stoughton Electric would provide the most consistent beneficial air quality and greenhouse gas reduction effects as compared to the other alternatives. The Stoughton Electric has a marginally smaller reduction in $PM_{2.5}$ emissions compared to the Attleboro Electric (a reduction of 1.5 kg/day for Stoughton Electric versus 1.7 kg/day for Attleboro Electric on a total of 1,704.7 kg/day for the No Build Alternative). The Rapid Bus Alternative, , has the lowest beneficial effect on air quality and greenhouse gas reduction with scores no higher than 67 percent on all beneficial effects criteria, reflecting both its lower VMT reduction (fewer shifts from automobiles to transit) and bus emissions.

The ridership projections and associated air quality benefits for the Attleboro Alternatives were developed prior to the RAILSIM modeling which indicated reduced reliability of the Attleboro Alternatives (electric and diesel). Reduced reliability (on-time performance) of a transit alternative makes such alternative a less attractive option resulting in fewer shifts away from automobile to transit

[50] Massachusetts Executive Office of Transportation and Massachusetts Executive Office of Housing and Economic Development. *South Coast Rail Economic Development and Land Use Corridor Plan*. June 2009.

and hence less reduction in automobile Vehicle Miles Traveled (VMT). Application of the reduced reliability of the Attleboro Alternatives to the ridership model would result in less reduction of VMT and thus less reduction of emissions and less air quality benefits for the Attleboro Alternatives than projected above.

3.3.3.2 ADVERSE IMPACTS

The following sections compare the alternatives based on five adverse environmental impacts:

- The amount of permanent wetland loss (in acres) (edge and interior wetlands and floodplains) and wetland loss in ACECs.
- The number of acres of protected open space that would be directly impacted, acres of land acquisition and municipal tax loss. Protected public open space lands are protected under Massachusetts' State Constitution, Article 97 (parks, conservation lands, recreation areas, wildlife refuges) and Section 4(f) of the Department of Transportation Act.
- The number of acres of protected public water supply lands (active and inactive Mapped Wellhead Zone 1) that would be directly impacted.
- The amount of noise impacts.
- The number of acres of mapped Priority Habitat (state-listed rare species) that would be lost (edge and interior habitat).

Permanent Wetland Loss

Wetland impacts are the principal category of environmental impacts that must be considered for Section 404 permits and variances under the Massachusetts Wetlands Protection Act. Direct wetland impacts, both temporary and permanent, are anticipated for each of the proposed alternatives.

Temporary impacts include short term disturbances (erosion controls, temporary structures, etc.) to wetlands and waterways during construction that would cease once construction activities are complete.

Permanent impacts are those that would result in the loss of wetlands. Permanent impacts may include, but are not limited to, wetland fill, dredging, and watercourse relocation or alteration. This analysis also evaluated the amount of wetland fill within an ACEC, as wetlands within ACECs receive a higher level of state regulatory protection. Results for this criterion are provided in Table 3.3-18.

Table 3.3-18 Permanent Wetland Impacts by Alternative

Name	Edge (Acres)	Interior (Acres)	Interior Score	Interior Grade	Total Wetlands (Acres)	Total Wetlands Score	Total Wetlands Grade	ACEC (Acres)	ACEC Score	ACEC Grade
Attleboro Electric	15.85	4.71	100%	**A**	20.56	50%	**F**	2.59	68%	**D**
Attleboro Diesel	15.56	4.71	100%	**A**	20.27	51%	**F**	2.59	68%	**D**
Stoughton Electric	5.46	6.40	74%	**C**	11.86	87%	**B**	1.77	100%	**A**
Stoughton Diesel	5.43	6.40	74%	**C**	11.83	87%	**B**	1.77	100%	**A**
Whittenton Electric	5.45	4.89	96%	**A**	10.34	100%	**A**	1.77	100%	**A**
Whittenton Diesel	5.43	4.88	97%	**A**	10.31	100%	**A**	1.77	100%	**A**
Rapid Bus	21.48	0.00	100%	**A**	21.48	48%	**F**	4.03	44%	**F**

The Attleboro, Whittenton and Rapid Bus Alternatives have the least interior wetland impact. In terms of total wetland and ACEC impact, the Stoughton and Whittenton Alternatives have the least impact.

Protected Open Space Impacts and Property Acquisition

Direct impacts to public open space, land acquisition, and municipal tax loss are summarized below.

Open Space

This section discusses direct impacts to public open space (parks, conservation lands, recreation lands, and wildlife refuges), which are protected under Article 97 of the Massachusetts Constitution, and to publicly-owned wildlife sanctuaries and refuges which are considered "special aquatic sites" under the federal 404(b)(1) Clean Water Act Guidelines. Although the South Coast Rail Project is currently not undergoing review by a federal transportation agency, this criterion also includes those properties protected under Section 4(f) of the federal Department of Transportation Act because the FTA and FHWA are cooperating agencies under NEPA. Table 3.3-19 presents the results of the public open space analysis by alternative.

Table 3.3-19 Protected Open Space Impacts by Alternative

Name	Land Acquisition (Acres)	Score	Grade
Attleboro Electric	8.93	11%	**F**
Attleboro Diesel	8.93	11%	**F**
Stoughton Electric	2.22	45%	**F**
Stoughton Diesel	1.57	64%	**D**
Whittenton Electric	<1.00	100%	**A**
Whittenton Diesel	<1.00	100%	**A**
Rapid Bus	4.50	22%	**F**

As shown in Table 3.3-18, the Whittenton Alternatives have the least open space impact. The Attleboro Alternatives fare the worst largely due to the projected need to acquire land along the Attleboro Bypass.

Property Acquisition

In addition to open space analysis, a land use impacts analysis was conducted to determine if property acquisition would be required, and identify the ownership and use of parcels designated for acquisition. Final engineering plans may show an increase or decrease of the actual area of acquisition required. Table 3.3-20 presents the results of the acquisitions summary by alternative.

As shown in Table 3.3-20, the Rapid Bus Alternative would require the least amount of property acquisition and, in comparison to other alternatives, performs the best for this impact criterion.

Municipal Tax Loss

Property tax revenue data were obtained from review of on-line resources of the municipalities through which the alternatives pass. Estimates of annual (in 2009 dollars) property tax revenue loss from parcels were made based upon each municipality's property tax formula. Results for this criterion are provided in Table 3.3-21.

Table 3.3-20 Property Acquisition by Alternative

Name	Acquisition (Acres)	Acquisition Score	Acquisition Grade
Attleboro Electric	90.59	28%	**F**
Attleboro Diesel	87.67	29%	**F**
Stoughton Electric	106.80	24%	**F**
Stoughton Diesel	103.05	25%	**F**
Whittenton Electric	79.05	33%	**F**
Whittenton Diesel	75.36	34%	**F**
Rapid Bus	25.70	100%	**A**

Table 3.3-21 Municipal Tax Loss by Alternative[1]

Name	Municipal Tax Loss ($)	Tax Loss Score	Tax Loss Grade
Attleboro Electric	-81,333	51%	**F**
Attleboro Diesel	-81,333	51%	**F**
Stoughton Electric	-68,186	61%	**D**
Stoughton Diesel	-68,186	61%	**D**
Whittenton Electric	-59,614	70%	**C**
Whittenton Diesel	-59,614	70%	**C**
Rapid Bus	-41,638	100%	**A**

1 Provided values are for 100 percent acquisitions of parcels at station sites. Additional property tax revenue losses may result from small and/or partial acquisitions, such as those that would occur along the alignment corridors and cannot be determined at this phase.

As shown in Table 3.3-21, the Rapid Bus Alternative would have the least municipal tax loss of all the alternatives. Trailing close behind on municipal tax loss would be the Whittenton Alternatives.

Protected Public Water Supply Land Impacts

This criterion considered impacts to protected public water supply lands. Surface and ground water resources are protected under several state and federal regulatory programs, including the federal Clean Water Act (Section 404) and the Massachusetts Clean Waters Act (MGL Chapter 21, §26-53). Other applicable regulations include the Massachusetts Section 401 Discharge Regulations (314 CMR 9.00), Groundwater Quality Standards (314 CMR 6.00), Surface Water Quality Standards (314 CMR 4.00), and Wetland Protection Regulations (310 CMR 10.00).

The limits of work proposed for each alternative were assumed to be the maximum extent of direct impacts. Results for this criterion are provided in Table 3.3-22.

As shown in Table 3.3-22, the Attleboro and Whittenton Alternatives would both have impact to public water supply. The remaining alternatives would have no impact to active or inactive water supply.

Table 3.3-22 Protected Public Water Supply Land Impacts by Alternative

Name	Zone 1 Existing Active (linear feet)	Zone 1 New Inactive (linear feet)	Impacts YES/NO?
Attleboro Electric	3,482	0	YES, active
Attleboro Diesel	3,482	0	YES, active
Stoughton Electric	0	0	NO
Stoughton Diesel	0	0	NO
Whittenton Electric	0	750	YES, inactive
Whittenton Diesel	0	750	YES, inactive
Rapid Bus	0	0	NO

Noise Impacts

The noise analysis for the South Coast Rail project identified potential noise impacts by comparing the existing sound levels to projected future sound levels. The projected future noise levels would impact the human environment. There were two levels of impact (severe and moderate). Results for this criterion are provided in Table 3.3-23.

Table 3.3-23 Noise Impacts by Alternative

Name	**Moderate Impacts** (# of Sensitive Receptors)	**Severe Impacts** (# of Sensitive Receptors)	Total	Score	Grade
Attleboro Electric	2,199	469	2,668	67%	**D**
Attleboro Diesel	1,863	405	2,268	79%	**C**
Stoughton Electric	1,728	408	2,136	84%	**B**
Stoughton Diesel	1,446	347	1,793	100%	**A**
Whittenton Electric	1,826	417	2,243	80%	**B**
Whittenton Diesel	1,617	370	1,987	90%	**A**
Rapid Bus	0	0	0	n/a	**n/a**

As shown in Table 3.3-23, the Stoughton Diesel and Whittenton Diesel Alternatives would have the least noise impact of all the alternatives. Noise impacts are lower for diesel alternatives largely due to the traveling speeds of commuter trains; electric-powered trains travel faster than diesel-powered trains and therefore generate more noise. Trailing close behind on least noise impacts are the Stoughton and Whittenton Electric Alternatives. Attleboro Electric and Diesel perform worst on this criterion.

Loss of Priority Habitat

Rare species are considered an important environmental resource, protected under the Massachusetts Endangered Species Act and Wetlands Protection Act. Temporary and permanent direct impacts to rare species and their habitat are anticipated for each of the alternatives. Direct impacts include impacts from construction, grading, vegetation management, and mortality associated with potential collisions with rail traffic. These activities may result in degradation of ecological function, loss of habitat, as well as loss of rare plant and animal species.

This criterion also describes the amount of 'barrier effect' for each alternative. A railroad corridor may act as a barrier that interferes with the movement of some mammals, amphibians, birds and reptiles from one habitat to another. The width of a railroad corridor can influence the frequency of wildlife crossings, as well as the mortality associated with potential collisions with rail traffic. The rail itself can create a barrier to smaller species such as amphibians, reptiles, and smaller mammals.

Table 3.3-24 summarizes the results of this criterion.

As shown in Table 3.3-24, the Stoughton Diesel Alternative would have the least habitat loss of all the alternatives. However, in evaluating the barrier effect, the Rapid Bus and Attleboro Alternatives would have the least impact.

Table 3.3-24 Loss of Priority Habitat by Alternative

Name	Habitat Loss, Edge (Acres)	Habitat Loss, Interior (Acres)	Total (Acres)	Score	Habitat Loss Grade	Barrier Effect (Linear Feet)	Score	Barrier Effect Grade
Attleboro Electric	13.4	4.4	17.8	49%	**F**	4,700	100%	**A**
Attleboro Diesel	13.4	4.4	17.8	49%	**F**	4,700	100%	**A**
Stoughton Electric	6.5	3.4	9.9	89%	**B**	19,500	24%	**F**
Stoughton Diesel	6.5	2.3	8.8	100%	**A**	19,500	24%	**F**
Whittenton Electric	6.5	6.1	12.6	70%	**C**	21,600	22%	**F**
Whittenton Diesel	6.5	5.0	11.5	77%	**C**	21,600	22%	**F**
Rapid Bus	16.3	0.0	16.3	54%	**F**	0	100%	**A**

3.3.3.3 SUMMARY OF ENVIRONMENTAL IMPACTS

The following sections describe the key impact results for the Build Alternatives. Figure 3.3-10 provides a summary of the results of this analysis.

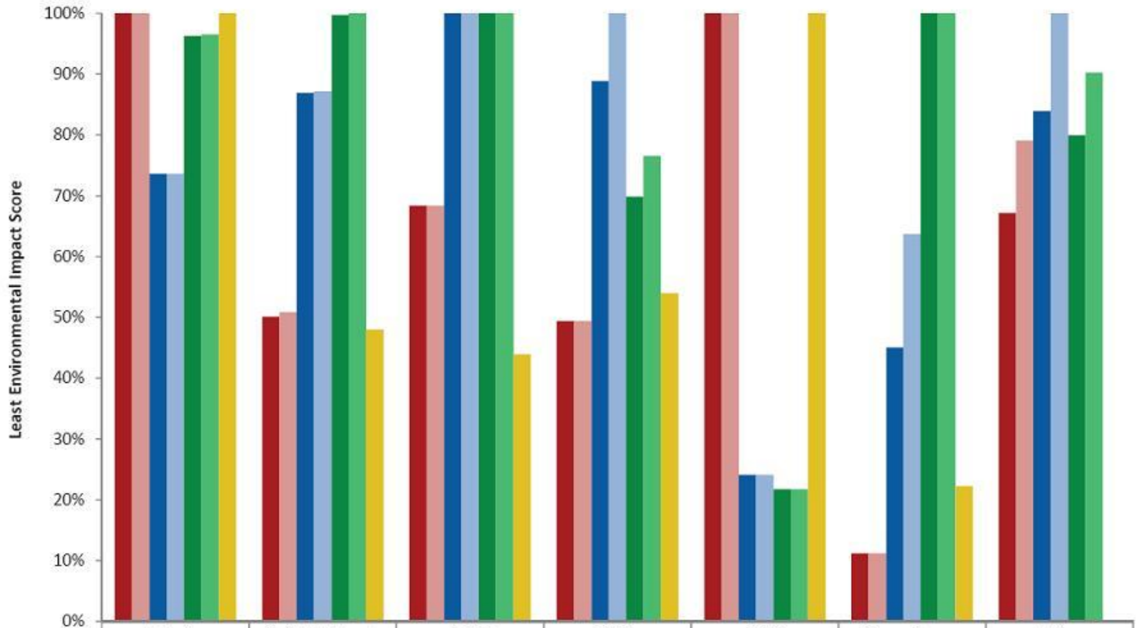
As shown in Figure 3.3-10, there is no clear alternative with least overall environmental impact. While the Stoughton and Whittenton Alternatives have the least amount of failing grades on resource impacts, it is important to note that not all resources have equal weight.

3.3.4 SUMMARY

As presented in previous sections, this summary provides an overview of the alternatives and how they compare to one another with respect to Project Purpose, practicability and environmental consequences. The first alternatives analysis measure includes how well the project meets the project purpose. Table 3.3-25 summarizes how well each alternative performed on the project purpose measure and how often the alternative received an "F" in that measure.

As shown in Table 3.3-25, the Rapid Bus Alternative receives two Fs out of four project purpose measures. While it was not eliminated from the remaining analysis, the focus remained only on the alternatives that met the project purpose. The Attleboro Alternatives and the Whittenton Diesel Alternative all receive one F. The Stoughton Alternatives and Whittenton Electric received no Fs in the measure of how well the alternative meets project purpose.

Figure 3.3-10 Summary of Magnitude of Impacts



	Interior Wetlands Score	Total Wetlands Score	ACEC Score	T&E Habitat Score	T&E Barrier Score	Open Space Acquisition Score	Noise Score
Attleboro Electric	A	F	D	F	A	F	D
Attleboro Diesel	A	F	D	F	A	F	C
Stoughton Electric	C	B	A	B	F	F	B
Stoughton Diesel	C	B	A	A	F	D	A
Whittenton Electric	A	A	A	C	F	A	B
Whittenton Diesel	A	A	A	C	F	A	A
Rapid Bus	A	F	F	F	A	F	N/A

Table 3.3-25 Summary of Project Purpose Scores

	Meeting Ridership Demand Score	Travel Time Score	Service Delivery Policy	VMT Score	Interregional Links Score	Counts of Grade "F"
Attleboro Electric	95% (A)	100% (A)	0% (F)	100% (A)	83% (B)	**1**
Attleboro Diesel	89% (B)	89% (B)	0% (F)	86% (B)	83% (B)	**1**
Stoughton Electric	97% (A)	99% (A)	100% (A)	100% (A)	100% (A)	**0**
Stoughton Diesel	88% (B)	88% (B)	100% (A)	77% (C)	100% (A)	**0**
Whittenton Electric	100% (A)	86% (B)	100% (A)	77% (C)	100% (A)	**0**
Whittenton Diesel	88% (B)	78% (C)	100% (A)	59% (F)	100% (A)	**1**
Rapid Bus	70% (C)	73% (C)	100% (A)	27% (F)	12% (F)	**2**

The second alternatives analysis measure includes practicability. Table 3.3-26 summarizes how well each alternative performed on the practicability measure and how often the alternative received an "F" in that measure.

As shown in Table 3.3-26, the Attleboro Alternatives received two Fs in the practicability measure. The Rapid Bus Alternative received one F, which was on the Cost per Rider criterion. The Stoughton and

Whittenton Alternatives received no Fs on the practicability measure and had scores no less than 89 percent.

Table 3.3-26 Summary of Practicability Scores

	Cost per Rider Score	Construction Schedule Score	On-Time Performance	Counts of Grade "F"
Attleboro Electric	77% (C)	57% (F)	54% (F)	**2**
Attleboro Diesel	75% (C)	57% (F)	49% (F)	**2**
Stoughton Electric	96% (A)	89% (B)	100% (A)	**0**
Stoughton Diesel	100% (A)	100% (A)	98% (A)	**0**
Whittenton Electric	91% (A)	89% (B)	100% (A)	**0**
Whittenton Diesel	95% (A)	100% (A)	98% (A)	**0**
Rapid Bus	*44% (F)*	*89% (B)*	*90% (A)*	***1***

The third alternatives analysis measure includes two sub-criteria: beneficial environmental effects and environmental impacts. Table 3.3-27 summarizes how well each alternative performed on the measure of beneficial environmental effects and how often the alternative received an "F" in that measure.

As shown in Table 3.3-27, the Attleboro Electric and Stoughton Electric Alternatives receive no "F"s on the beneficial effects measure. Whittenton Electric received one F and the Attleboro Diesel and Stoughton Diesel receive two Fs. Whittenton Diesel and the Rapid Bus Alternative receive the most Fs in this measure with four and five Fs, respectively.

Table 3.3-27 Summary of Beneficial Effects Scores

Name	VOCs Score	NO_X Score	$PM_{2.5}$ Score	CO Score	CO_2 Score	Counts of Grade "F"
Attleboro Electric	*100% (A)*	*100% (A)*	*100% (A)*	*100% (A)*	*100% (A)*	***0***
Attleboro Diesel	*83% (B)*	*25% (F)*	*41% (F)*	*82% (B)*	*80% (B)*	***2***
Stoughton Electric	95% (A)	94% (A)	88% (B)	96% (A)	96% (A)	**0**
Stoughton Diesel	74% (C)	20% (F)	18% (F)	73% (C)	71% (C)	**2**
Whittenton Electric	75% (C)	72% (C)	41% (F)	73% (C)	73% (C)	**1**
Whittenton Diesel	42% (F)	8% (F)	0% (F)	58% (F)	52% (F)	**5**
Rapid Bus	*17% (F)*	*0% (F)*	*0% (F)*	*24% (F)*	*11% (F)*	***5***

Table 3.3-28 summarizes how well each alternative performed on the measure of environmental impacts and how often the alternative received an "F" in that measure.

As shown in Table 3.3-28, the Attleboro Alternatives received five Fs on the measure of environmental impact, while the Rapid Bus Alternative followed as a close second with four Fs. Stoughton Electric received three Fs while Stoughton Diesel and the Whittenton Alternative performed best on the measure of Environmental impact with only two Fs out of nine criteria.

In summary, Table 3.3-29 shows the cumulative Fs across all measures included in the Alternatives Analysis.

Table 3.3-28 Summary of Environmental Impacts Scores

	Interior Wetlands Score	Total Wetlands Score	ACEC Score	T&E Habitat Score	T&E Barrier Score	Open Space Acquisition Score	Land Acquisition Score	Municipal Tax Score	Noise Score	Counts of Grade "F"
Attleboro Electric	*100% (A)*	*50% (F)*	*68% (D)*	*49% (F)*	*100% (A)*	*11% (F)*	*28% (F)*	*51% (F)*	*67% (D)*	***5***
Attleboro Diesel	*100% (A)*	*51% (F)*	*68% (D)*	*49% (F)*	*100% (A)*	*11% (F)*	*29% (F)*	*51% (F)*	*79% (C)*	***5***
Stoughton Electric	74% (C)	87% (B)	100% (A)	89% (B)	24% (F)	45% (F)	24% (F)	61% (D)	84% (B)	**3**
Stoughton Diesel	74% (C)	87% (B)	100% (A)	100% (A)	24% (F)	64% (D)	25% (F)	61% (D)	100% (A)	**2**
Whittenton Electric	96% (A)	100% (A)	100% (A)	70% (C)	22% (F)	100% (A)	33% (F)	70% (C)	80% (B)	**2**
Whittenton Diesel	97% (A)	100% (A)	100% (A)	77% (C)	22% (F)	100% (A)	34% (F)	70% (C)	90% (A)	**2**
Rapid Bus	*100% (A)*	*48% (F)*	*44% (F)*	*54% (F)*	*100% (A)*	*22% (F)*	*100% (A)*	*100% (A)*	*n/a*	***4***

Table 3.3-29 Summary of Performance Measures

	PROJECT PURPOSE: Counts of Grade "F"	PRACTICABILITY: Counts of Grade "F"	BENEFICIAL EFFECTS: Counts of Grade "F"	ENVIRONMENTAL IMPACTS: Counts of Grade "F"	TOTAL Count of Grade "F"
Attleboro Electric	*1*	*2*	*0*	*5*	***8***
Attleboro Diesel	*1*	*2*	*2*	*5*	***10***
Stoughton Electric	0	0	0	3	**3**
Stoughton Diesel	0	0	2	2	**4**
Whittenton Electric	0	0	1	2	**3**
Whittenton Diesel	1	0	5	2	**8**
Rapid Bus	*2*	*1*	*5*	*4*	***12***

As shown in Table 3.3-29, the Stoughton Electric and Whittenton Electric Alternatives receive the least Fs across the cumulative measures. Stoughton Diesel is a close second with four Fs while Attleboro Diesel Electric, Whittenton Diesel and the Rapid Bus Alternatives perform the worst.

These ratings provide a relative indication of performance across-the-board and do not pertain to site-specific or systemic impacts to a specific resource that could exceed the importance of the performance as indicated in the preceding discussion. For resource and site specific impacts please refer to Chapter 4 – *Affected Environment and Environmental Consequences* and for indirect effects and cumulative impacts please refer to Chapter 5. In addition, the effects of mitigation are not weighed in the discussion above. For resource-specific mitigation considerations please refer to mitigation discussions for each resource and alternative in Chapters 4 and 7.