Appendix 6

TECHNICAL REPORT
Task 6: Evaluation Criteria and Methodology

July 2014

New Hampshire

Capitol Corridor Rail & Transit
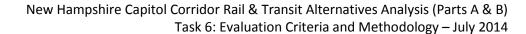## Alternatives Analysis (Parts A & B)

State Project Numbers 16317 and 68067-A

New Hampshire **DOT**
Department of Transportation

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Table of Acronyms

AA   Alternatives Analysis

O&M   Operations and Maintenance

PAR   Pan Am Railways

1 Project Purpose and Need Summary

Increasing transportation demand and growing concerns about mobility, economic development, and quality-of-life have led New Hampshire and Massachusetts citizens and officials to explore transit and/or intercity passenger rail service options in the 73-mile corridor (Capitol Corridor) between Boston, Massachusetts and Concord, New Hampshire.[1] The purpose of this Capitol Corridor Rail and Transit Alternatives Analysis (AA) Study is to evaluate a diverse set of rail and bus options to improve connectivity by leveraging existing transportation infrastructure, including Pan Am Railways (PAR), Route 3, and I-93. Investment in an improved transportation strategy is needed for several reasons:

- Projected population growth will result in increased roadway congestion
- New Hampshire's existing transportation network does not effectively connect existing modes
- The regional economy is singularly dependent on roads for movement of goods and passengers
- Improved transportation options will attract employers to New Hampshire and improve employment options for New Hampshire residents
- Young New Hampshire professionals are leaving the area to be closer to employment and cultural/social opportunities associated with larger urban centers
- New Hampshire's growing senior population needs more "car-light" mobility options
- Residential development patterns resulting from population growth may negatively impact the region's existing quality-of-life
- The existing transportation network cannot accommodate increased levels of demand without negative environmental consequences

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[1] The report "Task 2: Project Purpose and Need" (Appendix 2 to the AA Final Report) provides an in-depth evaluation of the Capitol Corridor's historical, current, and future state, and how Massachusetts and New Hampshire citizens would benefit from a transit investment strategy responsive to transportation needs and the region's economic, social, and environmental climate

2 Task Objectives

The initial set of rail and bus alternatives were defined in Task 4 and evaluated in Task 5 (Appendices 4 and 5, respectively, to the AA Final Report), an exercise that resulted in selection of seven intermediate alternatives:

1. No Build/Base Bus (Base)
2. Expanded Base
3. Bus on Shoulder
4. Expanded Bus on Shoulder
5. Nashua Minimum Commuter Rail
6. Manchester Regional Commuter Rail
7. Intercity 8

This report identifies and defines eight evaluation criteria used to further assess those seven alternatives:

1. **Ridership**. What is the average weekday ridership for each alternative?
2. **Costs: Capital and Operations & Maintenance (O&M)**. What is the cost to build and operate each alternative?
3. **Land Use Impacts**. To what degree does an alternative result in relatively compact, environmentally sensitive development patterns?
4. **Economic Development Impacts.** How does the alternative contribute to the economy of the corridor and region?
5. **Equity and Environmental Justice.** What are the relative impacts on lower-income and minority communities?
6. **Environmental Impacts.** How does the alternative affect the natural, social, and economic environments?
7. **Financial Feasibility.** What is the likelihood of developing a financial plan that will fund the construction and operation of the alternative?
8. **Public Support.** How strong is the support for the alternative, to the point of moving it into implementation, including the acceptance of a feasible financial plan?

These eight criteria were then grouped into broader categories – e.g., "financial considerations" includes costs (capital and O&M) and feasibility of a financial plan and public support of that plan.

Detailed discussion of the travel demand forecasting (ridership) and equity technical methodologies used to produce data and other non-quantitative assessments of the relative impacts of the seven alternatives are provided in Appendices A and B, respectively, to this report. Detailed discussion of the capital and O&M costs used to produce data and other assessments of the relative impacts of the seven alternatives are included as appendices to the Task 7 Technical Report, Detailed Evaluation of Alternatives, provided as Appendix 7 to the AA Final Report.

Appendix A
Rail Ridership Forecast Methodology Memorandum

TECHNICAL MEMORANDUM

This document describes the Capitol Corridor rail ridership forecasting model development and presents forecasts for the Manchester Regional Commuter Rail and Nashua Minimum Commuter Rail alternatives.

Model Development

The forecast models use the existing Massachusetts Bay Transportation Authority (MBTA) commuter rail system to estimate parameters for forecasting commuter rail boardings on the proposed New Hampshire extensions of MBTA's system.

Multiple models were estimated with parameter inputs including rail operations data (service frequency, headway, and travel time), station characteristics (parking, highway access, transit service, distance between stations, and distance to Boston), socio-economic data (population, household income, vehicle ownership, employment), the Census Transportation Planning Package (CTPP) journey-to-work (JTW) data, and available MBTA system boarding data. A recommended model was selected from the estimated models based on the following criteria:

- **Model Statistical Performance:** The model must be statistically valid.
- **Expected Relationships between Model Parameters:** The model must make sense. If an additional train is provided in the peak period, daily boards should increase more than if the additional train was provided in the off-peak period.
- **Expert Opinion:** A set of statistically valid models was developed and reviewed by the Study team. These models were presented to the Federal Transit Administration (FTA), which approved the preferred model.

The recommended model inputs and the reasons why each were used are discussed below.

- **Frequency of peak and off-peak trains** accounts for the impacts of differing levels of service on ridership. Trains in the peak direction during peak travel times are expected to attract more riders than trains during off-peak times and direction. A train is considered to be a peak train if it arrives in Boston between 6:00am and 9:30am or if it departs Boston between 4:00pm and 7:00pm. Inclusion of the peak and off-peak frequency in the model enables the model to be sensitive to the differing frequency of service in the commuter rail alternatives.
- **JTW data** provide information on the size of the work market to Boston around each station. JTW trips to downtown Boston are associated with the closest commuter rail station where

they would board if they were to use the commuter rail to go to work. Inclusion of JTW data provides a measure of the number of workers who could possibly use the proposed rail service.

- **Employment around the station** informs the potential for a station to attract trips other than those destined for Boston, such as reverse/intermediate commute trips and non-work related trips. The total employment within a half-mile of each station is calculated. A half-mile buffer is used to allow for walk access to the employment location.
- **Park-and-ride (P&R) station designation** accounts for the impacts of parking availability. A park-and-ride station is characterized as having a large parking lot that is not located in a densely developed area. MBTA P&R stations have a greater number of boardings than non-P&R stations. The inclusion of a P&R designation allows the model to be sensitive to differences in the proposed stations, with the South Nashua and Bedford/Manchester-Boston Regional Airport (Manchester Airport) stations designated as P&R lots in the alternatives.

Model Forecasts

Opening day forecasts on the Manchester Regional and Nashua Minimum Commuter Rail alternatives are presented in Tables 1.1 and 1.2. Model results are presented with a forecast value and an upper- and lower-bound that are the 95 percent confidence interval around the forecast value. It is important to note that, as with all forecasts, the predictions are not a single value but rather a range of possible values.

Table 1.1: Manchester Regional Daily Boarding Estimates

Station	Forecast	Lower Bound	Upper Bound
Manchester, NH	270	180	390
Bedford/Manchester Airport	280	230	350
Nashua	420	330	540
South Nashua	590	440	800
TOTAL	**1,560**	**1,180**	**2,090**

Table 1.2: Nashua Minimum Daily Boarding Estimates

Feeder Bus Weight	Forecast	Lower Bound	Upper Bound
South Nashua	590	450	770

The estimated model predicts daily boards for each proposed station (see Table 1.3). These boards represent one-half of a daily round trip. To convert these boarding data to daily ridership, a factor of two is applied to account for the second-half of the round trip.

Table 1.3: Daily Ridership Estimates

Alternative	Ridership	Lower Bound	Upper Bound
Manchester Regional	3,130	2,350	4,170
Nashua Minimum	1,170	890	1,540

Appendix B
Corridor and Regional Equity Analysis Methodology Memorandum

TECHNICAL MEMORANDUM

Transit investment within the Capitol Corridor will confer benefits on corridor and regional residents, and may also generate adverse impacts that will be mitigated through project design, environmental clearance, and engineering phases. Building on the Civil Rights Act of 1964 and Executive Order 12898, the United States Department of Transportation (USDOT) has directed federal agencies, including the Federal Transit Administration and Federal Railroad Administration, to "ensure that all federally funded transportation-related programs, policies, or activities having the potential to adversely affect human health or the environment involve a planning and programming process that explicitly considers the effects on minority populations and low-income populations."[2] This detailed analysis – which is commonly referred to as environmental justice analysis – will be performed through the project environmental clearance process.

The equity analysis will include a high-level assessment of each alternative's potential for disproportionally adverse impacts on households below the poverty line, minority individuals, and households living in affordable housing units, as well as mobility and access benefits conferred to these households and individuals by each alternative. The purpose of this memorandum is to describe the methodology used to perform the equity analysis.

Income and Poverty

Data regarding average median household income and the percentage of households living below the federal poverty line will come from the U.S. Census Five-Year American Community Survey (2007-2011 and 2008-2012) for Census tracts within a half-mile of any alternative under consideration.

This data will be compared at the station area, corridor, state, and national levels to analyze which alternatives under consideration are serving areas with comparatively lower-income households and comparatively higher concentrations of households living below the federal poverty line.

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[2] http://www.fta.dot.gov/12347_2238.html

Minority Population

Data regarding share of non-white (minority) population will be pulled from the U.S. Census Five-Year American Community Survey (2008-2012) for Census tracts within a half-mile of any alternative under consideration.

This data will be compared at the station area, corridor, state, and national levels to analyze which alternatives under consideration are serving areas with comparatively higher shares of a non-white population.

Affordable Housing

Data regarding the presence of affordable housing within the station areas of the alternatives under consideration were pulled from online research and conversations with municipal officials. While this list likely will not be inclusive of all affordable housing units within each station area, it will provide an order-of-magnitude estimate of affordable housing counts to support a comparison between the alternatives.

Data generated through the equity analysis will be used to support evaluation of transit investment alternatives, and may the form the basis of more detailed equity and environmental justice analyses that will be performed as the project progresses through subsequent development phases.