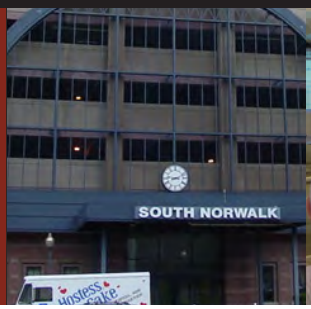
CONNECTICUT DEPARTMENT OF TRANSPORTATION

In Cooperation with
SWRPA
South Western Regional Planning Agency

U.S. Department of Transportation
Federal Transit Administration





FTA ENVIRONMENTAL ASSESSMENT

DANBURY BRANCH IMPROVEMENT PROGRAM

TECHNICAL SUMMARY REPORT

STATE PROJECT 302-008

MAY 2013

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Chapter 1: Introduction

1.1 Document Purpose

The Connecticut Department of Transportation (CTDOT) undertook the Danbury Branch Improvement Program to examine the needs of and identify potential improvements to the New Haven Line's commuter rail branch line service between Norwalk and Danbury. The original intent of this study was to develop an Environmental Impact Statement (EIS). As the study has progressed, however, it was determined that the appropriate final document would be an Environmental Assessment (EA).

This *Technical Summary Report* is a summary of the technical work completed in order to produce an EIS. This report includes information from the following documents, all of which can be found on the study website (www.danburybranchstudy.com):

- Final Scoping Report (2008)
- Rail Infrastructure Report: Existing Conditions (2009)
- Existing Conditions Report (2009)
- Train Simulation Report for Alternatives (2010)
- Environmental Technical Memorandum: Existing Conditions (2009 – 2011)
- Engineering Feasibility Report (2011)
- Environmental Technical Memorandum: Impact Report (2010 – 2012)

Where appropriate, sections have been added to address additional coordination and/or data collection that has occurred since the publishing of the original documents. This report also includes information about alternatives development and evaluation, including a benefit-cost analysis. This *Technical Summary Report* will be the reference document for the EA associated with this study.

Figure 1: Study Area Map

1.2 Study Area

The study corridor consists of nearly 38 miles of existing rail between Norwalk and New Milford in western Connecticut. Both passenger service, provided by Metro-North Railroad (MNR), and freight service, provided on a limited basis by the Providence & Worcester Railroad, operate between Norwalk and Danbury. This portion of the corridor is owned by the State of Connecticut. North of Danbury, the existing track structure can only accommodate freight service. This portion of the line is owned and operated by the Housatonic Railroad Company. The following towns are included in the study area: Norwalk, Wilton, Ridgefield, Redding, Bethel, Danbury, Brookfield, and New Milford.

During Phase II, the study was expanded to be considered in the context of extending rail passenger service to Massachusetts in the future. This extension would run north from New Milford through the towns of Kent, Cornwall, Canaan, Salisbury, and North Canaan, Connecticut. It would then continue through the towns of Sheffield, Great Barrington, Stockbridge, Lee, Lenox, and Pittsfield, Massachusetts. The tracks that would be used for this extension are owned by the State of Connecticut between New Milford and the State border. Freight service is already operated along this corridor by the Housatonic Railroad Company.

1.3 Project Purpose

Currently, there are limited transportation options available to the traveling public in western Connecticut. While there is existing bus and commuter rail service operating in this region, they do so with limited frequency and connectivity. The purpose of the Danbury Branch Improvement Program is to improve mobility and increase transportation options for the traveling public in the Southwestern and Housatonic Valley regions of Connecticut, specifically in the corridor between South Norwalk and Danbury.

1.4 Transportation Needs

The Danbury Branch Improvement Program preferred alternative documentation addresses several transportation-related concerns in the study corridor that were identified through technical analysis, public scoping and agency involvement. The Project would help meet the following needs:

- Need to maintain and improve existing commuter rail service on the Danbury Branch
- Need to improve the Danbury Branch modal and intermodal connections
- Need to reduce vehicular congestion in the Route 7 corridor
- Need to improve transit mobility along the corridor
- Need to enhance economic development and increase Transit-Oriented Development (TOD) opportunities in conjunction with municipal land use plans

Chapter 2: Background Information

The following is a summary of background information on the Danbury Branch Improvement Program. This section highlights previous studies and projects, rail rider surveys, and a train performance model. More detailed information can be found in the Existing Conditions Report (October 2009), which can be found on the study website.

2.1 Previous Studies and Projects

As part of the review of Existing Conditions, previous documentation pertaining to the study corridor and relating to current efforts were researched. The following studies and projects were reviewed for their applicability to Phase II of the Danbury Branch Improvement Program:

- **Studies:**
  - Route 7 Corridor Travel Options Implementation Plan
  - Danbury Branch Line Shuttle Feasibility Study
  - Rail Transit Development Program
  - U.S. Census Journey-to-Work
  - Danbury Branch Line Service Study
  - The Untapped Marked for Rail Passenger Service
  - Action Plan for Restoring Passenger Rail Service to New Milford
  - Congestion Mitigation Systems Plan "Vision 2020"
  - Danbury Branch Electrification Feasibility Study
  - Connecticut Department of Transportation Rail Governance Study
- **Projects:**
  - Danbury Branch CTC
  - Danbury Branch Tie Replacements
  - Rt. 7 & 33 Reconstruction in Wilton
  - Rt. 7 Bypass in Brookfield
  - Rt. 15 & Rt. 7 Interchange Reconstruction
  - Wilton Station Parking

2.2 Rail Rider Survey

As part of the analysis of the existing transportation, rail, bus, highway conditions, and intermodal opportunities in the Danbury Branch/Route 7 corridor between South Norwalk and New Milford, the URS Project Team developed and conducted two types of surveys for the Danbury Branch Improvement Program. An on-board survey of existing passengers was conducted on the Danbury Branch to collect current information and opinions. In addition, a telephone survey was performed of the corridor population to assist in identifying potential passengers who do not currently use the available train service.

The following are some highlights from the on-board survey of existing passengers:

- **Trip Origin and Destination**
  - Survey results support the observation that the New York bound trains and intra-state shuttles support different travel markets with the following origin and destination characteristics:
- **Trip Purpose**
  - More than 90% of all respondents said that their trip purpose was going to work.
- **Trip Frequency**
  - Approximately 73% of respondents reported riding the train five or more times per week.
  - An additional 18.7% of respondents reported riding the train 3-4 times per week.
- **Anticipated Mode Changes**
  - Approximately 72% of respondents reported driving to their boarding station alone; 15.4% reported being dropped off (Kiss and Ride); and 7.2% walked.
  - Approximately 56% of respondents reported walking to their final destination; 14% reported using the subway; and 12% reported taking a company shuttle.
- **Service Preferences**
  - Nearly 86% of respondents would increase their use of the train if there were more frequent service.
  - 87.9% of respondents would increase their use of the train if the travel time were reduced by about 20 percent.
  - Better shuttle bus service to and from stations and extending the Danbury Branch to New Milford would cause approximately 35% of respondents to increase their use of the train.
- **Demographics of Survey Respondents**
  - 872 passengers responded to this survey.
  - The majority of respondents held a valid driver's license (97.1%) and had access to a private vehicle (93.1%).
  - The largest percentage of respondents (31.0%) was between the ages 51 and 65. An additional 29.6% of respondents were between the ages of 41 and 50.
  - Most respondents (66.7%) were male.

2.3 Baseline Train Performance Model

The following is a summary of a baseline condition train simulation on the existing track between South Norwalk and New Milford. The complete findings and details of this simulation can be found in the Train Simulation Report for the Baseline Train Performance Model (April 2009). This report can be found as an appendix to the Existing Conditions Report (October 2009), which is available on the study website.

The objective of the simulation, which was conducted using the Train Performance Calculator (TPC) within Railsim Version 7 software, was to compare a model of the train and track alignment runtimes against the existing MNR schedule. The MNR public schedule showed trip times between Danbury and South Norwalk of 53 minutes for the inbound trip and 55 minutes for the outbound.

The simulated runtime for the initial baseline including dwells for the outbound direction between South Norwalk and Danbury was approximately 65 minutes. For the inbound direction, the simulated runtime between Danbury to South Norwalk was about 59 minutes. The analysis suggests that the simulated runtimes are longer than the existing schedule, and the deviation may be attributed to the assumed dwell times and/or the wheel to rail adhesion coefficient rate, which was assumed to be 6% instead of normal adhesion of 15%.

At the instruction of MNR, a revised baseline was run with a 15% adhesion coefficient that reflects normal rail conditions. Under this simulation, the simulated outbound runtime including dwells between South Norwalk and Danbury was 58 minutes 35 seconds. The simulated inbound runtime from Danbury to South Norwalk was 57 minutes 31 seconds. The analysis suggests that the revised simulated runtimes are about 6% longer than the schedule. This deviation may be attributed to the assumed dwell times. Additionally, the runtime utilizing a wheel to rail adhesion coefficient rate of 15% is about 10% shorter than that using 6% adhesion coefficient in the same direction.

Chapter 3: Public Involvement

Public involvement is a critical part in the planning of any transportation initiative. This chapter explains how public involvement has been handled in the process of developing the Danbury Branch Improvement Program. This section discusses the study's scoping process, the creation and role of the study advisory committee, the study's public outreach plan, and public outreach activities, both past and future.

3.1 Project Scoping Process

The scoping phase of the Danbury Branch Improvement Program provided a formal mechanism to inform the public as well as the regulatory and governmental agencies that an Alternatives Analysis (AA)/Environmental Impact Statement (EIS) was in preparation and to solicit input on the project's scope of work from these groups. Detailed information regarding the scoping process can be found in the Final Scoping Report (October 2008), which can be found on the study website.

An initial agency scoping meeting was held on July 11, 2006 at the New Haven Railroad Station to discuss the scope of work with the Federal and State resource agencies, including the environmental resources to be investigated, the level of detail required for each resource, and further refinement of alternatives.

The FTA published a Notice of Intent (NOI) in the Federal Register on May 30, 2008. The purpose of the NOI was to notify the public that an EIS is being prepared by CTDOT in accordance with the National Environmental Policy Act (NEPA), with respect to potential improvements to the Danbury Branch commuter rail line. Information describing the proposed action, the possible improvement alternatives, and details on the scoping process as well as contact information was included in the Notice.

The CEQ published a Scoping Notice on their web site on May 6, 2008. The purpose of the Scoping Notice was to notify the public that an Environmental Impact Evaluation (EIE) is being prepared by CTDOT for the Danbury Branch, in accordance with the Connecticut Environmental Policy Act (CEPA). A brief description of the study along with contact information was included in the notice.

A second agency scoping meeting was held on June 17, 2008 at Danbury City Hall to discuss the scope of work with Federal, State, local, and tribal governmental agencies that may have an interest in the proposed initiative. No significant changes to the scope were proposed as a result of this meeting.

A series of Public Scoping Meetings were held on June 17, 2008 at the New Milford Town Hall; June 18, 2008 at the Wilton Town Hall Annex Building; and June 19, 2008 at the Ridgefield Town Hall. The meetings were attended by the chief elected official from each Town and members of various Town Boards and Commissions. Also present at the meeting were state

representatives from the districts. Members of the general public, including residents of various towns in the corridor, as well as current commuters on the Branch line, also attended.

Each of the Public Scoping Meetings ran from 6:00pm to 8:30pm. A presentation to discuss the project's purpose and need and the alternatives being evaluated to improve rail service on the Danbury Branch was given twice at each session. Representatives from the Study Team were present to discuss the study and address questions from the public.

The primary purpose of the Scoping Meetings and overall process was to allow the participating agencies and the public the opportunity to provide review and comment on the study's scope of work and public involvement process. In addition, the study sought confirmation of the initial Purpose and Need statement for this initiative.

3.2 Study Advisory Committee

A Study Advisory Committee (SAC) was established during Phase I. This committee consists of the first elected official or his/her representative from each of the communities in the study corridor, as follows: Norwalk, Wilton, Ridgefield, Redding, Bethel, Danbury, Brookfield, and New Milford. In addition, the SAC includes representatives from the Connecticut Transportation Strategy Board, HVCEO, SWRPA, HRRC, MNR, New Milford Rail Restoration Society, Housatonic Area Regional Transit, Metro-Pool, Providence & Worcester Railroad, Connecticut Rail Commuter Council, state legislators, congressional representatives, and other interested parties.

In Phase I, five SAC meetings were held:

- June 26, 2003
- September 23, 2003
- March 10, 2004
- November 30, 2004
- October 18, 2005

In Phase II, three SAC meetings have been held:

- June 23, 2009
- March 17, 2010
- June 3, 2010

Additional coordination with the SAC will occur throughout the remainder of this study.

3.3 Public Outreach Plan

The following is a summary of the Public Outreach Plan, which can be found in the Final Scoping Report (October 2008), which can be found on the study web site.

Section 6002 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act-A Legacy for Users (SAFETEA-LU) requires that lead agencies establish a plan for coordinating public

and agency participation and comment during the environmental review process. The Coordination Plan documents the process by which CTDOT was to communicate with the Federal Transit Administration (FTA), additional cooperating and participating agencies, regional and local interested parties, and the general public regarding the Environmental Impact Statement (EIS).

Under NEPA and CEPA, the public must be given an opportunity for input during the EIS/EIE environmental review process. The public is encouraged to be involved early and often during the study process and project development. Public meetings will be held and the DEIS will be made available for public comment as well. A notice will be published in area newspapers in order to notify the public of the availability of the DEIS. The notice will indicate where the document can be obtained for review and it will also indicate where additional information can be obtained regarding this study. The public must be allowed an opportunity to provide input on the Purpose and Need of this transportation initiative and the range of alternatives considered for the study as well.

The Danbury Branch Improvements EIS process will involve a public outreach program intended to inform the public and receive any input the public may have regarding this initiative. The public participation process contains the following elements:

- Meeting with town boards
- Meeting with the SWRPA and HVCEO
- Advisory committee meetings
- Public information meetings
- Newsletters
- Public hearings on the DEIS
- A study website.

3.4 Summary of Public Outreach Activities

A study website was launched on August 22, 2003 (http://www.danburybranchstudy.com). The website is updated periodically to provide current study information and to provide users with an opportunity to submit comments. Content on the website includes reports of past meetings, information regarding future meetings, photographs of the study area, current status, a video of the EIS process, and links to relevant websites.

In addition to the use of the study website, the public has had an opportunity to learn about the study and submit their comments at open house meetings and public informational meetings.

In Phase I, four public open house meetings were held:

- September 30, 2003: Ridgefield Community Center
- October 2, 2003: Norwalk Community Center
- November 29, 2005: Wilton Town Hall Annex
- December 1, 2005: New Milford Railroad Station

In Phase II, three public informational meetings were held:

- June 15, 2010: Wilton Library
- June 16, 2010: Brookfield Town Hall
- June 17, 2010: Bethel Municipal Center

Notification of Public Information and Open House Meetings was accomplished through notices distributed on-board rail passenger trains, postings at stations and municipal buildings, newspaper advertisements, and the study web site.

As noted in Section 2.2 of this report, public opinion was also sought through surveys.

3.5 Public Hearings on the Environmental Assessment

Upon its completion, the EA for the Danbury Branch Improvement Program will be filed with EPA, after which a 45-day comment period will begin. A public hearing on the EA will be held, and prior to the hearing, the public will be notified of the date, time, and place of the hearing in accordance with NEPA and CEPA requirements.

Chapter 4: Analysis Framework

The analysis of alternatives within the Danbury Branch Improvement Program occurred within a framework that ensued that evaluation occurred in a way that involved the applicable agencies, considered the appropriate time frames, and evaluated alternatives based on relevant criteria. This chapter explains the study's agency coordination plan, analysis years, and alternatives evaluation.

4.1 Agency Coordination

The study team for the Danbury Branch Improvement Program consists of URS Corporation (URS), the Connecticut Department of Transportation (CTDOT), the Federal Transit Administration (FTA), the South Western Regional Planning Agency (SWRPA), Metro-North Railroad (MNR), the Housatonic Railroad Company (HRRC), the Housatonic Valley Council of Elected Officials (HVCEO), and subconsultants to URS. Coordination with the team has been maintained through regular meetings, e-mail, and telephone communications.

FTA is the lead Federal agency for this initiative. As lead Federal agency, FTA is responsible for facilitating the expeditious completion of the environmental review process, reviewing and accepting the EIS, and ensuring that CTDOT complies with all regulatory requirements. CTDOT will act as Joint Lead Agency for this study and coordinates with the Connecticut Office of Policy and Management (OPM) regarding Connecticut Environmental Protection Act (CEPA) compliance.

Cooperating Agencies are those Federal, State, or local government agencies that have jurisdiction by law or special expertise regarding the environmental impacts involved in the proposed transportation project. Cooperating Agencies are asked to review technical reports and draft chapters of the EIS in their respective fields of expertise. The agencies requested to be Cooperating Agencies for this study include the following: the State Historic Preservation Office (SHPO), the CT Department of Environmental Protection (DEP), OPM, the CT Council on Environmental Quality (CEQ), the CT Department of Economic and Community Development (DECD), the Environmental Protection Agency (EPA), FTA, the Federal Railroad administration (FRA), the Army Corps of Engineers (ACOE), and United States Fish and Wildlife Service.

4.2 Analysis Years

Each alternative is analyzed for its impacts in years 2015 and 2030. These analysis years represent mid-range (five-year) and long-range (20-year) planning horizons.

4.3 Alternatives Evaluation

During Phase I, a set of initial criteria was developed for evaluating alternatives. These criteria were further refined in Phase II, and additional criteria were added. These evaluation criteria, explained in Section 4.3.1, represent impacts and characteristics of the alternatives that are important to CTDOT, study advisory committee members, and the public.

4.3.1 Evaluation Criteria

Operational Impact – How would the alternative impact trip speed, service type (bi-directional, etc.), and frequency?

Fleet Impact – In what ways would the alternative impact the fleet? Are there service improvements that could result from various types of equipment? This includes passenger capacity, equipment performance, fleet maintenance, and compatibility with existing fleets.

Travel Demand – What impact would the alternative have on ridership for the current year, and future analysis years (2015 and 2030)? How would the alternative affect ridership (percent increase) or total ridership?

Environmental Impact – What potential impacts would the alternative have on the environment? These impacts are discussed in Chapter 8: Impact Analysis.

Roadway Conditions – What potential impacts would the alternative have on traffic and congestion?

Time Savings – What travel time savings in minutes would result from the alternative?

Capital Cost – What is the overall estimated capital cost for the alternative?

Operational Cost – What is the estimated annual operating cost for the alternative?

Constructability – Are there technical challenges associated with the implementation of the alternative?

Local Acceptance – Are local officials and residents supportive of the alternative?

Cost/Benefit Ratio – What does the alternative cost relative to its benefits? This ratio is discussed in Chapter 9: Benefit-Cost Analysis.

Chapter 5: Description of Alternatives

Before determining which alternative (or selected modifications/improvements) will be implemented for a project, numerous preliminary and preferred alternatives must first be considered and eliminated. This chapter explains the preliminary alternatives that were analyzed in Phase I of the Danbury Branch Improvement Program and the preferred alternatives that are analyzed in the DEIS as part of Phase II.

5.1 Preliminary Alternatives

In Phase I of the Danbury Branch Improvement Program, more than 20 preliminary alternatives were identified. This section summarizes these alternatives and briefly explains how they were analyzed. More details regarding the initial alternatives assessment can be found in the "Phase I Alternatives Summary Evaluation Report" (October 2005), which is available on the study website.

The preliminary alternatives that were considered for improving the Danbury Branch were:

- **1a) South Norwalk to Danbury Existing Track Alignment –** This would essentially retain the existing Branch Line, which is single-tracked and has a maximum 50 mph track speed. The total trip time would be unchanged from the current 53 minutes.
- **1b) Red Alignment South Norwalk to Danbury –** This would continue single track service with minor horizontal track geometry upgrades. Maximum track speed increases to 60 mph for approximately 9 miles.
- **1c) Blue Alignment South Norwalk to Danbury –** This would require construction of 10.2 miles of new single-track alignment to replace the existing track, achieving 60 mph track speed for the route, with the exception of the South Norwalk and Danbury approaches.
- **1d) Green Alignment South Norwalk to Danbury –** This would require the construction of 14 miles of new track construction along a new single-track alignment to increase speeds in this section to 70 mph.
- **2) Double Tracking South Norwalk to Danbury –** This would add a second track parallel to any of the single track alignments between South Norwalk and Danbury, enabling unrestricted operation of bi-directional service.
- **3 and 4) Combined Improvements of Short and Long Passing Sidings South Norwalk to Danbury –** This is an alternative to double track the entire length of the corridor, where the use of passing sidings allow two trains to pass each other on a single-track main line. Passing siding options include both long and short sidings.
- **5 and 6d) Electrify from South Norwalk to Danbury Using Electric Multiple Unit (EMU) Equipment –** This option consists of installing overhead electrification, catenary and electrical substations. This option would also implement self-powered electric vehicles, known as electric multiple units (EMUs) on the Danbury Branch.
- **6a and 6b) Diesel Locomotive with coaches South Norwalk to Danbury –** This option includes both the Danbury Branch midday shuttle service (47 minutes) and through train service (54-55 minutes) between Danbury and South Norwalk.

- **6c) Diesel Multiple Units South Norwalk to Danbury –** This option would implement a shuttle service between Danbury and South Norwalk utilizing Diesel Multiple Unit (DMU) equipment.
- **7a) Existing Alignment Danbury to New Milford –** This option suggests using the existing right-of-way, which is currently used only for freight operations between Danbury and New Milford, for extended passenger service.
- **7b) Red Alignment Danbury to New Milford –** This option would upgrade the existing 30 mph track speed to 40 mph for passenger service. New high level passenger platforms and parking facilities would be constructed at Danbury North, Brookfield and New Milford.
- **7c) Blue Alignment Danbury to New Milford –** This option would realign and upgrade the track speed to 50 mph for passenger service. New high level passenger platforms and parking facilities would be constructed at Danbury North, Brookfield and New Milford.
- **7d) Green Alignment Danbury to New Milford –** This option would realign the track and increase passenger service speeds to 60 mph between Danbury and New Milford. New high level passenger platforms and parking facilities would be constructed at Danbury North, Brookfield and New Milford.
- **8) Double Tracking Danbury to New Milford –** This option would include construction of a second track parallel to the existing single track railroad from Danbury to New Milford. New high level passenger platforms, pedestrian overpasses, and parking facilities would be constructed at Danbury North, Brookfield and New Milford.
- **9 and 10) Short and Long Passing Sidings between Danbury and New Milford –** This is in lieu of double tracking, where the use of passing sidings would allow two trains to pass each other on a single-track main line.
- **11 and 12d) Electrification Danbury to New Milford Using EMU Equipment –** Similar to Option 5, this option would consist of a number of catenary design possibilities along a single track. This option would also implement self-propelled EMU service on the Danbury Branch.
- **12a and 12b) Locomotive with Coaches Danbury to New Milford –** This option would extend service from Danbury to New Milford using a diesel locomotive and two coaches. New high level passenger platforms and parking facilities would be constructed at Danbury North, Brookfield and New Milford.
- **12c) DMU –** This option would implement a shuttle service between South Norwalk and New Milford utilizing Diesel Multiple Unit (DMU) equipment.

These preliminary alternatives were initially screened against six assessment factors to determine whether or not they should be given further consideration. These assessment criteria were as follows:

- Operational Impact
- Fleet Equipment Impact
- Ridership Forecast
- Environmental
- Time
- Capital Costs

After an initial assessment based upon these six factors, the following preliminary alternatives were dropped from further consideration: 1b, 1c, 6c, 7b, and 12c. The remaining preliminary alternatives were then combined to create eight viable upgrade alternatives. These alternatives were:

1. **No Build/TSM**
    - This Alternative assumes no major changes in service and no major new investments other than what has already been approved or required for regular maintenance into the Danbury Branch line. The existing route and stations would remain the same, with the possible exception of an additional station at the Georgetown development near the existing Branchville station.
2. **Extend Diesel Service to New Milford Using Existing Track and Equipment**
    - This alternative would extend existing rail service an additional 14.3 miles along the Housatonic Railroad's freight line from Danbury to New Milford and would include station stops at Danbury North, Brookfield and New Milford.
3. **Electrify Danbury Branch From South Norwalk to Danbury**
    - This alternative would install a new electrification system between South Norwalk and Danbury on the existing single track alignment. This option would also implement EMU service on the Danbury Branch. Four substations would also be required, at Norwalk, Wilton, Branchville and Danbury.
4. **Enhance Passing Sidings From South Norwalk to Danbury**
    - This alternative would install passing sidings from between 2000 feet to two miles in length on the Danbury Branch between South Norwalk and Danbury. This is a means of improving service flexibility and allowing bi-directional service without requiring complete double tracking the length of the branch line. The sidings allow trains in opposing directions to move under differing operating conditions, depending on the length of the siding. The short siding of 2000 feet allows trains in opposing directions to meet but with one train in a stopped condition. The longer siding of up to two miles allows the train in the siding to keep moving (up to 30 mph) while it is passed by the train on the main line.
5. **Electrify and Enhance Passing Sidings From South Norwalk to Danbury**
    - This alternative would combine electrifying the branch from South Norwalk to Danbury with the flexibility of bi-directional service afforded by the addition of passing sidings. It basically is comprised of Alternatives Three and Four and brings both travel time improvements through the electrification and also bi-directional service flexibility through the use of sidings.
6. **Extend Diesel Service to New Milford With Alignment Improvements between Danbury and New Milford**
    - This alternative would extend the existing Branch service between South Norwalk and Danbury to New Milford, similar to Alternative Two. However improvements to the Housatonic Railroad alignment between New Milford and Danbury improve service along this segment to 50 mph.
7. **Transportation Strategy Board (TSB) Option to Electrify the South End of the Branch and Establish Feeder Bus/Rail Service.**
    - This alternative would construct an electrification of the existing branch up to Wilton in the vicinity of the Merritt Parkway. Consideration would be given to

developing feeder bus service for the corridor north of Wilton – either bus feeder service, DMU shuttles, or a combination of existing rail diesel service with bus service. This alternative was presented by the Transportation Strategy Board in its 2003 report, "Connecticut's Transportation Strategy: 2003 through 2023." Impacts of this alternative have not yet been considered as this was not part of the Phase I study.

8. **Full Build**
    - This would combine virtually all of the preliminary alternative improvements (except sidings due to double track) and applies them along the entire route – electrification, double tracking, new EMUs and new alignment. Highest cost of all alternatives due to improved travel time. Produces greatest ridership increase (In the year 2020, there would be a 120% increase over current year ridership if the Full Build is implemented).

5.2 Alternatives for Detailed Analysis

Further screening of the eight alternatives discussed in Section 5.1 was undertaken by Study Advisory Committee members, representatives of the Connecticut Department of Transportation, and the Study Team. The consensus was that five alternatives would be further evaluated during Phase II. These alternatives are as follows:

5.2.1 Alternative A: No Build

The No Build alternative is required as part of the National Environmental Policy Act (NEPA) process. This alternative would leave the existing railroad as it is, and doing routine maintenance as required. This means continuing with the existing rail service levels between South Norwalk and Danbury as they are today, with 11 weekday trains and six trains each weekend day. This alternative assumes the completion of the Centralized Traffic Control (CTC) System on the Branch and the development of a Georgetown Station. Alternative A also assumes the presence of transit shuttles from South Norwalk to Merritt 7 and from Danbury to Brewster Station on the Harlem Line.

5.2.2 Alternative B: Transportation System Management (TSM)

The Federal Transit Administration defines Transportation System Management (TSM) as "everything that can be done without new construction or vehicle procurement." For the Danbury Branch, this alternative would add two rail shuttle trains in the morning and evening between South Norwalk and Wilton. Service during the midday from South Norwalk to Danbury would be provided hourly. Each station would have enhanced bus and transit service options, and more frequent rail service would be provided on weekends.

5.2.3 Alternative C: South Norwalk to Danbury Improvements

Alternative C is the first of three "Build" alternatives. Alternative C would provide improvements between South Norwalk and Danbury on the existing Branch. Improvements

include track realignments that would allow for increased speeds of up to 60mph; expanding parking and improving access at stations; upgrading 15 bridges from an older open deck structure to modern ballast deck bridges with retaining walls; upgrading the rail yard and providing a new maintenance facility at Danbury Yard; and electrifying the rail line.[1] New rolling stock would be added to allow for expanded service or for the electric trains.

5.2.4 Alternative D: Extension from Danbury to New Milford (Diesel and Electric)

Alternative D would extend the existing Branch passenger service approximately 14 miles from Danbury to New Milford using either diesel or electric vehicles. Both versions of this alternative would include constructing new track to accommodate speeds up to 60mph, adding new stations and parking facilities at Danbury North, Brookfield, and New Milford, and adding new rolling stock. A new maintenance facility and storage yard would also be built in the vicinity of New Milford. The electric version of this alternative would also include a new traction power system between Danbury and New Milford, new EMU rolling stock, and the raising of seven highway overpasses to accommodate the catenary.

5.2.5 Alternative E: Improvement from South Norwalk to Merritt 7/Wilton

Alternative E was recommended by the State of Connecticut's Transportation Strategy Board (TSB). It would provide partial electrification of the Branch, from South Norwalk to Wilton, a distance of 7.5 miles. This would require a new traction power system and new rolling stock. Parking and access improvements would be made at the Merritt 7 Station, and there would be minor modifications to track and structures along this section.

[1] A diesel version of this alternative was considered in Phase I. Due to its high costs and limited time-savings benefits, however, the diesel alternative was cut from further consideration.

Chapter 6: Construction Methodology

This section describes construction methods for work that would be associated with each of the Build Alternatives being evaluated in this study. These activities include: Track, Structures, Stations, Traction Power, Communications and Signals, Storage Yards and Utility Relocation.

6.1 Introduction

6.1.1 Disruption to Rail Service

On the Danbury Branch, track outages are allowed for construction and maintenance activities except for the periods when the weekday thru trains are operating. Track outages for construction are anticipated between 9:00 AM and 4:00 PM and 9:00 PM and 5:00 AM Monday thru Friday and all day Saturday and Sunday. During the track outages, service is provided using busses.

North of Danbury on the freight lines, track outages for construction are anticipated to be available during nighttime and on weekends.

6.1.2 Access to Work Sites

Most of the work is anticipated to be undertaken within existing railroad rights-of-ways with access along or on the tracks. Track mounted "hi-rail" vehicles enter the rails at existing at-grade road crossings or special access pads where railroad and roadway properties abut. For major work such as structures, construction easements maybe required. Such easements are noted on the conceptual engineering plans.

6.1.3 Types of Construction and Construction Methods

This section is presented by the System or feature being constructed; Track, Structures, etc. Generally, construction activities will require material storage and handling, the use of both light and heavy equipment within and adjacent to the project site, and managing rail, roadway and pedestrian traffic. The methods described are standard methods taken from sources such as the State of Connecticut, Department of Transportation's (CTDOT) Standard Specifications for Roadways, Bridges and Incidental Construction and the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.

Any construction activity is expected to follow CTDOT's Standard Specifications and Construction Manual, as well as Best Management Practices and regulatory protocol for the protection of the environment.

6.2 Track Construction, Replacement, or Realignment

The railroad track system includes the two rails and ties, referred to as the track structure, and ballast, sub-ballast, and subgrade, the track foundation. For passenger and heavy freight lines, continuously welded rail (CWR) on wood or concrete ties is used. Ballast is crushed stone, six to

12 inches below the ties that supports and restrains the track structure. Subgrade is the natural ground, cleared of vegetation, or it is fill material that establishes the track foundation at the desired line and grade. Generally, track construction takes place in a linear fashion along the alignment and uses specialized track mounted equipment.

New Track and track realignments between South Norwalk and Danbury would include:

- Clearing – removal of vegetation as appropriate.
- Earth & rock excavation – removal of rock or soil to provide area to install the track. Excavation machines are used to remove the material and load trucks for transporting off site. Blasting may be required in hard rock areas.
- Fill – installing subgrade type material to the bottom elevation of the ballast. The material is delivered by truck, spread by bulldozer or grader and compacted by a roller.
- Ballast – delivered by truck and spread longitudinally with a bulldozer or grader.
- Ties – placed on the ballast perpendicular to the rail. Wood ties are 18" on center and concrete ties are 24".
- Rail – the two rails are placed on the ties and attached to the ties with spikes, clips or other devices.
- Lining the track – additional ballast is deposited around and between the ties, and the rails are brought to finish grade using track machines that distribute and tamp the ballast around and under the ties.

If passenger service is extended to New Milford, the entire existing track structure (rails, ties and ballast) must be replaced. The existing ballast would not be excavated but would be graded to form a new subgrade. Rail mounted machinery known as a track laying machine (TLM) would be utilized. In one pass along the railroad, the TLM installs new ties, removes the old rail and installs new rail. The new rail is previously delivered to the work site in long, up to one-quarter mile lengths using a specialized rail train.

6.3 Construction of Structures: Bridges and Retaining Walls

Structures will be constructed in accordance with the CTDOT Standard Specifications for Roads, Bridges and Incidental Construction (Form 816), and the AREMA Manual for Railway Engineering. Structures would need to be constructed with minimal disruptions to railroad operations, with only weekend and night closures for railroad traffic. General reconstruction would be necessitated for nearly all affected bridges, requiring superstructure replacement and substructure modifications. Varying degrees of reconstruction are anticipated for several reasons: the existing superstructures and substructures are not strong enough to support the additional ballast load (for the undergrade bridges), the existing substructure is not wide enough to accommodate a ballasted-deck superstructure (for the undergrade bridges), the existing foundation and wing walls/retaining walls cannot accommodate the additional height required for the necessary vertical clearances (for the overhead structures), and many of the existing superstructures and substructures are not in good overall condition.

6.3.1 Undergrade Structures

A top-down construction is expected to minimize impacts to railroad operations. The proposed foundation is anticipated to consist of stub abutments on micro-piles. Micro-piles are proposed since the equipment required for their installation can be easily mobilized in locations that may be more difficult to access, like the remote streams and river crossings found within the project limits. In most cases (where the bridge will be constructed on the existing alignment with the existing span configuration), the micro-piles will be drilled through the existing abutments and the pile caps constructed above the existing abutments. The existing abutments will be left in place to support the existing embankment and will be partially demolished to accommodate the new superstructure. Many of the proposed structures will be wider than the existing structures (to accommodate the ballasted deck) allowing for some of the foundation to be more easily constructed outside of the existing structural footprint.

In order to attempt to keep railroad closures to just on weekend, it is recommended that the proposed superstructure be pre-fabricated and assembled separately from and independent of the foundation construction. After the foundation is complete, the existing superstructure can be demolished and the new superstructure can then be erected or rolled into place. The bridges with shorter spans could be assembled at an off-site facility, transported by rail to the site and erected by crane. Bridges with medium spans could be assembled adjacent to the site and erected by crane. Bridges with long spans could be assembled adjacent to the existing structure on a roll-in frame and rolled into place.

6.3.2 Overhead Structures

The overhead structures can be constructed in a more traditional manner. For overhead structures, the construction staging will need to accommodate not only the railroad traffic, but also the roadway traffic. In some cases, the intersected road is a local road that can be completely closed during construction, and in other cases, such as the Interstate 84 crossing, the roadway traffic would have to be maintained. A portion of the associated overhead roadway may also need to be reconstructed, as the height of the superstructure will be raised approximately three to five feet in many cases. Also, an increase in the vertical profile of the roadway may require additional retaining walls in order to minimize right-of-way impacts and/or impacts to surrounding roads and intersections.

6.4 Station Construction and Enhancements

Enhancements are planned for existing stations between Merritt 7 and Danbury. Also three new stations in North Danbury, Brookfield and New Milford are being considered. Work items include:

- Excavation, grading, drainage, & paving for drives and parking
- Lighting
- Passenger rest rooms
- Elevators and stairs to pedestrian overpasses
- Parking garage

- High level platform, foundations & canopy
- Water, sewer, & electrical services
- Landscaping & sidewalks

Construction activities would be within existing public rights-of-way (ROW) or on property acquired for the project.

6.5 Construction of Traction Power System

The traction power system is comprised of two major components; overhead wires that provide electric power to the trains (catenary) and their support structures, and electrical substations that distribute and control the electric power.

6.5.1 Installation of Overhead Wires (Catenary) and Support Structures

The track on which the catenary was being replaced would be out of service while catenary installation work is being performed.

Sequencing of the work generally follows the order of: relocation or replacement of the existing AT&T overhead fiber optic cable into underground conduit (the conduit is presently being installed under the Danbury Branch CTC project), foundation installations, catenary support structure erections, and catenary cantilever arm or truss installations, followed by the installation of the new catenary over the track. Also, after the relocation of the existing AT&T fiber optic cable the old "H" poles would be cut off at ground level and removed.

Installations of foundations for new structures are normally during scheduled track outages. The outages are required since access to most new foundation locations is not available within the existing railroad ROW. Special high-rail equipped vehicles are used to transport the auger type excavation equipment to the new foundation locations. The equipment operates from the track, reaching over to the excavation area, generally 10 to 12 feet off of the track centerline. The augured foundation is about 5 feet in diameter. A circular from is inserted and filled with concrete. A hi-rail concrete truck(s) delivers the concrete.
When foundations have cured adequately, the new catenary structure columns are erected. High-rail bucket trucks and cranes operating from the track and/or the adjacent ROW are used for pole/column setting, stringing of the new overhead wires, and removal of the old H poles.

6.5.2 Traction Power Substation Installation

The substations are fenced facilities that include an outdoor ground mounted transformer and various circuit breakers, switches and controls in a prefabricated metal enclosure.

The construction activities include:

- Clearing and grading the site.
- Excavating for and installing prefabricated concrete foundation walls or columns.

- Installing a ground grid.
- Installing crushed stone to a finish grade.
- Installing the Transformer and metal enclosure. These items are delivered by truck(s) and placed by a crane.
- Electrical connections are made and tested.
- Fence with access gates is installed.

6.6 Construction/Relocation of Communication and Signal (C&S) Systems

Like the traction power system, the C&S systems include two components; houses/huts where information is monitored, controlled, and distributed and cables that carry information and power. The cables can be installed aerially, buried or in trays that are flush to the ground.

The existing (now under construction) Danbury Branch signal system will require modifications and relocations including:

- Relocate C&S cables at track realignments/additions.
- Relocate at-grade crossing warning devices.
- Install insulated joints in track.
- Modifications to hardware and software at dispatch center.

If service is extended to New Milford, C&S systems will be required. The type of installation/construction will depend on whether the extension is electrified or not. If electrified, the cables would be hung on the catenary support poles. If not electrified, the cables would be installed underground using a plowing method. The plow places cables about 4’ off the end of the ties and 3’ – 5’ deep. Where plowing is impractical due to physical conditions, the cable tray is used. The tray is approximately 12” deep and is installed flush with the ground.

Access to the work sites and use of hi-rail mounted equipment to install cables and houses follows the methods described for the traction power system.

6.7 Construction of Storage Yards

Upgrading the existing facility at Danbury for storage, cleaning and minor maintenance of trains is desirable. Enhancements would include additional storage tracks, fueling facility, and employee welfare and supply storage.

If rail passenger service is extended to New Milford, a new facility in New Milford would replace the Danbury facility. At either location, Danbury or New Milford, property must be acquired for the facility, including permanent and temporary accesses.

Types of construction anticipated include:

- Hazardous/contaminated materials cleanup
- Site clearing
- Earth excavation

- Subbase preparation
- Track construction
- Roadway & Driveway
- Drainage
- 1 story building
- Fuel tank and dispensing system
- Water, sewer, and electrical systems

6.8 Utility Relocations

The one significant utility relocation expected is of the AT&T aerial fiber optic cable, which is described in the previous section with traction power.

Chapter 7: Existing Conditions

This chapter discusses the existing conditions within the Study Corridor relating to demographics; traffic and transportation; and 18 environmental topics: Topography, Geology, and Soils; Noise and Vibration; Air Quality; Energy; Biological Diversity; Threatened and Endangered Species; Wetlands; Floodplains and Floodways; Surface and Groundwater Resources; Historic Resources; Archaeological Resources; Prime Farmland and Active Farmland; Land Use; Hazardous Contamination; Public Recreational/4(f)/6(f) Lands; Socioeconomics and Environmental Justice; Scenic Roads; and Visual Resources.

7.1 Demographics[2]

The study corridor includes eight municipalities, which, from south to north, are Norwalk, Wilton, Ridgefield, Redding, Bethel, Danbury, Brookfield, and New Milford.

Overall, the population density of the study corridor is higher than that of the State (Table 1).

Table 1: Population and Population Density, Study Corridor

TOWN	POPULATION	LAND AREA (SQ. MI.)	POPULATION DENSITY
Norwalk	84,877	22.8	3,723
Wilton	17,924	26.9	666
Ridgefield	24,031	34.4	699
Redding	9,365	31.5	297
Bethel	18,481	16.8	1,100
Danbury	78,939	42.1	1,875
Brookfield	16,269	19.8	822
New Milford	28,967	61.6	470
Study Corridor	**278,853**	**256**	**1,090**
Connecticut	**3,540,846**	**5,009**	**707**

The municipalities in the study corridor also generally have higher educational attainment levels (Table 2) and higher household incomes (Table 3) than are found in Connecticut.

[2] The *Existing Conditions Report* for this study was completed in October 2009. As such, the demographic information is based on the 2000 Census.

Table 2: Educational Attainment Levels, Study Corridor

Town	Residents 25-years or older	Less than High School		High School		Some College		Bachelors or Higher	
		#	%	#	%	#	%	#	%
Norwalk	58,768	7,069	*12.0%*	15,729	*26.8%*	13,811	*23.5%*	22,159	*37.7%*
Wilton	11,967	427	*3.6%*	1,055	*8.8%*	1,871	*15.6%*	8,614	*72.0%*
Ridgefield	16,083	466	*2.9%*	1,883	*11.7%*	2,885	*17.9%*	10,849	*67.5%*
Redding	6,411	147	*2.3%*	898	*14.0%*	1,235	*19.3%*	4,131	*64.4%*
Bethel	12,236	941	*7.7%*	3585	*29.3%*	2,856	*23.3%*	4,854	*39.7%*
Danbury	52,651	8,490	*16.1%*	16,045	*30.5%*	11,220	*21.3%*	16,896	*32.1%*
Brookfield	11,010	511	*4.6%*	2,646	*24.0%*	2,804	*25.5%*	5,029	*45.9%*
New Milford	19,662	1,162	*5.9%*	5,981	*30.4%*	5,466	*27.8%*	7,053	*35.9%*
Study Corridor	**188,788**	**19,213**	***10.2%***	**47,822**	***25.3%***	**42,148**	***22.3%***	**79,605**	***42.2%***
Connecticut	**2,401,464**	**261,863**	***10.9%***	**723,175**	***30.1%***	**592,297**	***24.7%***	**824,309**	***34.3%***

Table 3: Median Household Income, Study Corridor

Town	Median Household Income
Norwalk	$74,475
Wilton	$181,187
Ridgefield	$138,006
Redding	$131,814
Bethel	$86,273
Danbury	$66,997
Brookfield	$102,299
New Milford	$83,564
Study Corridor	**$108,077**
Connecticut	**$67,236**

When considering a future extension to Pittsfield, Massachusetts, the study corridor grows to include Kent, Cornwall, Canaan, Salisbury, and North Canaan, Connecticut and Sheffield, Great Barrington, Stockbridge, Lee, Lenox, and Pittsfield, Massachusetts. These additional municipalities are located in Litchfield County, Connecticut and Berkshire County, Massachusetts. Both of these counties have lower population densities than the study corridor (Table 4).

Table 4: Population and Population Density, Extension to Massachusetts

Area	Population	Land Area (Sq. Mi.)	Population Density
Study Corridor	278,853	256	1,090
Litchfield County	192,262	920	209
Berkshire County	134,953	931	145
Connecticut	**3,540,846**	**5,009**	**707**
Massachusetts	**6,349,097**	**7,840**	**810**

The study corridor also has higher levels of educational attainment (Table 5) and a higher median household income (Table 6) than do the counties involved in the extension to Pittsfield.

Table 5: Educational Attainment Levels, Extension to Massachusetts

AREA	RESIDENTS 25-YEARS OR OLDER	LESS THAN HIGH SCHOOL		HIGH SCHOOL		SOME COLLEGE		BACHELORS OR HIGHER	
		#	%	#	%	#	%	#	%
Study Corridor	188,788	19,213	*10.2%*	47,822	*25.3%*	42,148	*22.3%*	79,605	*42.2%*
Litchfield County	136,271	11,632	*8.5%*	42,527	*31.2%*	36,804	*27.0%*	45,308	*33.2%*
Berkshire County	93,339	13,951	*14.9%*	31,855	*34.1%*	23,307	*25.0%*	24,226	*26.0%*
CT	**2,401,464**	**261,863**	***10.9%***	**723,175**	***30.1%***	**592,297**	***24.7%***	**824,309**	***34.3%***
MA	**4,273,275**	**651,093**	***15.2%***	**1,165,489**	***27.3%***	**1,038,398**	***24.3%***	**1,418,295**	***33.2%***

Table 6: Median Household Income, Extension to Massachusetts

AREA	MEDIAN HOUSEHOLD INCOME
Study Corridor	$108,077
Litchfield County	$70,291
Berkshire County	$39,047
Connecticut	**$67,236**
Massachusetts	**$50,502**

7.2 Traffic and Transportation

This section discusses the traffic and transportation within the study corridor. Topics covered include traffic, parking, rail service, transit service, and bicycle and pedestrian facilities.

7.2.1 Traffic

The predominate road in the study corridor is Route 7. Route 7 traverses north-south (essentially parallel with the Danbury Branch rail line) as a two-lane surface road for most of its length from Norwalk to New Milford, but it has two expressway sections where it runs concurrently with I-84, U.S. 6, and U.S. 202 in Danbury. There are also sections of the Route 7 corridor in Brookfield and southern New Milford that have been widened to four lanes. Major roadways that intersect Route 7 include I-95 and the Merritt Parkway (Route 15) in Norwalk, Route 106 in Wilton, Routes 57, 107, and 53 in Branchville/Georgetown, Routes 102, 33 and 35 in Ridgefield, and I-84 and Routes 6 and 202 in Danbury.

Route 7 serves as a major commuting corridor in southwest Connecticut and experiences peak period congestion at several points. The South Western Regional Planning Agency (SWRPA) conducted travel time monitoring along the Route 7 corridor from Danbury to South Norwalk in 2009. From this data collection effort, average travel speeds for segments of the roadway were calculated. Table 7 and Table 8 show travel speeds by segment in the southbound morning peak and the northbound afternoon peak periods.

Table 7: Travel Time and Speed, Route 7, Danbury to Norwalk (Southbound AM)

TRAVEL TIME (MINUTES.SECONDS)			SPEED (MPH)		
Mean	Minimum	Maximum	Mean	Minimum	Maximum
43.48	31.27	55.32	28	22	39

Table 8: Travel Time and Speed, Route 7, Norwalk to Danbury (Northbound PM)

TRAVEL TIME (MINUTES.SECONDS)			SPEED (MPH)		
Mean	Minimum	Maximum	Mean	Minimum	Maximum
42.18	32.32	63.41	29	19	38

In general, speeds less than 40 MPH are more frequent than speeds over 50 MPH. For southbound morning peak trips, observed travel speeds more closely matched posted speed limits along the segments between the southern end of the expressway alignment in Danbury and north of Branchville in Ridgefield, as well as from the expressway alignment in Norwalk to the I-95 interchange. For northbound afternoon peak trips, observed travel speeds more closely matched posted speed limits along the segments from the I-95 interchange to the Route 15 interchange in Norwalk, the segment between Scribner Hill Road and the Route 107 intersection in the Georgetown section of Wilton, and between the Branchville section of Ridgefield and the southern end of the expressway alignment in Danbury.

In the morning peak period in the southbound direction, the congested areas are more severe in central Danbury, central Wilton, and at the Wilton and Norwalk border. There are other smaller pockets of slower travel speeds at the border of Ridgefield and Wilton and in downtown Norwalk. In the northbound direction during the afternoon peak period, the slowest travel speeds are found at the north end of Norwalk and in central Wilton. Other slow pockets are experienced at the border of Wilton and Ridgefield and in central Danbury. When looking at both peak periods together, the section of Route 7 with the greatest amount and longest stretch of the slowest travel speeds is located within Wilton.

Several attempts are underway to ease congestion along Route 7, and additional efforts are planned for the future. Route 7 has been widened in Wilton, Ridgefield, and Danbury. Also, a Route 7 Bypass has been completed in Brookfield, which extends this expressway section to the New Milford line. Historically, plans for an expressway to replace Route 7 from Danbury to Norwalk have circulated at the state and local level, but such plans are currently on hold.

Access at each rail station along the Danbury Branch is also influenced by the local network of roads. The following is a summary of the existing traffic conditions on these roads. A detailed discussion of traffic conditions and accident data at each of the stations is found in the Existing Conditions Report (October 2009), which is located on the study website.

Two ways to analyze traffic around stations is through average daily traffic (ADT) counts and accident data. Table 9 shows the most recent ADT data available from CTDOT (2008). The ADT number in the table represents the ADT count at the busiest intersection in the vicinity of the station. Accident data was collected at intersections surrounding the Branch stations over the period of September 30, 2003 to October 1, 2007. Based on this information, the average number of annual accidents was calculated for each station. The highest traffic volume is located

in the vicinity of Merritt 7 and Branchville Stations, and the most accidents occur on the roads surrounding Danbury and Merritt 7 Stations.

Table 9: Danbury Branch Stations Traffic Summary

STATION	2008 ADT	ACCIDENTS/YEAR
South Norwalk	13,100	20
Merritt 7	21,800	46
Wilton	15,600	15
Cannondale	14,100	8
Branchville	20,200	8
West Redding	2,300	3
Bethel	n/a[3]	1
Danbury	18,800	57

7.2.2 Passenger Rail Service

Passenger rail service on the Danbury Branch is operated by MNR between South Norwalk and Danbury. The following is a summary of this rail service. More detailed information regarding current rail service in the study corridor can be found in the Existing Conditions Report (October 2009), which is located on the study website.

The Danbury Branch is one of MNR's three branches served by the New Haven Rail Line in Connecticut. The Branch's southerly terminal is in South Norwalk, with stops at Merritt 7 (Norwalk), Wilton, Cannondale (Wilton), Branchville (Ridgefield), Redding, Bethel, and Danbury. All of the stations on the Branch are owned by CTDOT and leased by the town/city. The exception is Merritt 7, which is leased by Merritt 7 Station, Inc. Indoor passenger waiting areas are provided at Bethel, Wilton, and Danbury Stations; coffee houses are located in the Cannondale and Branchville Stations.

The Danbury Branch is a 23-mile single track railroad with passing sidings at Norwalk, Wilton, Branchville, and Danbury. Trains currently operate in what is referred to as "dark territory." Trains are operated from section to section by radio communicated orders, with manually operated switches at Norwalk, Wilton, and Branchville. Also, there is no control or data links with MNR's automated control center. A new automated Centralized Traffic Control (CTC) and Signalization initiative is being constructed and is scheduled to be completed in Winter 2013.

The Danbury Branch passenger train schedule consists of 22 daily weekday trains and 12 Saturday/Sunday/Holiday trains. In addition to all trains connecting to main line service at South Norwalk, direct service beyond the Branch to Stamford and New York City is an especially attractive feature for commuting.

Travel times for thru trains to Grand Central Terminal (GCT) from the Danbury Branch are nearly uniform at two hours including shuttle connection times. Danbury Branch shuttle trains have average travel times between Danbury and South Norwalk of 51 minutes for inbound and 52 minutes for outbound runs. These travel times are detailed in Table 10.

[3] Traffic counts were not conducted in the vicinity of Bethel Station. Therefore, ADT volumes are not available.

Table 10: Danbury Branch Travel Times

Trains From Danbury (Inbound)	1811	1819	1833	1837	1841	1851	1863	1873	1881	1895	1897	***Average Danbury Transit Time***
South Norwalk Ar.	0:54	0:54	0:54	0:48	0:48	0:48	0:48	0:48	1:00	0:54	0:48	0:51
Stamford	1:15	1:04	1:14	1:01	1:00	1:04	1:12	1:01	1:16	1:08	1:05	1:07
GCT (NYC)	2:05	1:52	2:04	1:57	1:54	1:53	1:59	2:01	2:06	2:15	2:11	2:01
Trains To Danbury (Outbound)	1810	1818	1830	1838	1844	1848	1860	1868	1874	1882	1890	
GCT (NYC)	2:07	1:52	1:52	1:52	2:08	2:02	1:51	1:58	1:49	2:03	1:54	1:57
Stamford	1:17	1:08	1:08	0:59	1:04	1:15	1:06	1:13	1:01	1:17	1:10	1:08
South Norwalk Lv.	0:51	0:48	0:48	0:48	0:53	0:56	0:56	0:55	0:51	0:57	0:50	0:52

Weekday ridership on the Danbury Branch was approximately 1,300 passengers in 2007. This represents a 23.4% increase over ridership in 2001. Origin and destination information was gathered via a 2008 Rail Passenger Survey that was conducted as part of the Danbury Branch Improvement Program. The destination stations for respondents traveling on the commuter shuttle trains differed from those for respondents travelling on the NYC-bound trains. Passengers on the commuter shuttles were mostly traveling to Stamford (43.7%), Merritt 7 (19.0%), or South Norwalk (14.7%). Not surprisingly, the vast majority (70.0%) of passengers on the thru trains were going to GCT.

7.2.3 Freight Rail Service

Freight rail service is operated in the study area by the Housatonic Railroad Company and the Providence and Worcester Railroad. The following is a summary of the rail service offered by these operators. More detailed information regarding current rail service in the study corridor can be found in the Existing Conditions Report (October 2009), which is located on the study website.

The Housatonic Railroad Company (HRRC), based in Canaan, CT, is a local railroad that operates over approximately 160 miles of track in western Massachusetts and Connecticut. HRRC provides local freight service in the Housatonic Valley, operating north-south between Danbury and Pittsfield, MA on the Berkshire Line, and easterly between Danbury and Derby on the Maybrook Line. Through an interchange with CSX in Pittsfield, MA, HRRC connects to the national rail system.

The Providence and Worcester Railroad (P&W) is a regional railroad that operates over approximately 545 miles of track in southern New England and New York State. The P&W is a major freight provider in Connecticut and has key interchanges with other major rail freight providers in the region. Within Connecticut, P&W provides service to customers along the entire coast, the Danbury Branch Line, the Maybrook Line, the Waterbury Branch Line to Derby Junction, from New Haven to Middletown, and in the eastern portion of the state between the cities of Groton, Norwich, Plainfield, Willimantic and north to Worcester, MA.

7.2.4 Bus Service

The Danbury Branch Study corridor features bus service that is operated by the Housatonic Area Regional Transit District (HART), the Norwalk Transit District (NTD) and the Merritt 7 Corporate Park shuttle service. The following is a summary of the bus services offered by these two operators. More detailed information regarding current bus service in the study corridor can be found in the Existing Conditions Report (October 2009), which is located on the study website.

HART operates seven base fixed-routes, supplemented by evening and Sunday loop routes, commuter shuttles, and one interagency regional route. HART base fixed-routes all serve the HART Pulse Point in downtown Danbury, which is less than ½ mile from the Danbury Railroad station. Other routes serve Bethel Railroad Station, Brewster Railroad Station, and the areas where the Brookfield and New Milford Railroad Stations are being considered in Alternatives 2 and 6. HART weekday service generally operates half-hourly during peak periods and hourly during off-peak periods. HART also offers three Sunday and evening loop routes and two commuter shuttle services.

NTD operates 12 base weekday service fixed routes (WHEELS), evening and Sunday routes, commuter rail shuttles, and regional routes. NTD weekday fixed routes serve the WHEELS Hub in downtown Norwalk. Multiple routes serve the South Norwalk and Merritt 7 Railroad Stations. WHEELS also offers two evening and Sunday routes as well as four commuter shuttles. In addition, NTD operates two regional bus routes, one of which – The 7 Link – is run in conjunction with HART.

In addition to the bus service operated by HART and NTD, the Merritt 7 Corporate Park provides shuttle service from the Merritt 7 Railroad Station to places of employment in and around the Merritt 7 Corporate Park. The shuttle meets the four morning trains arriving from Danbury and one morning train arriving from South Norwalk and New York. In the evening, the shuttle meets the three Danbury-bound trains and one southbound train to South Norwalk.

7.2.5 Biking and Pedestrian Facilities

CTDOT's *2009 Connecticut Statewide Bicycle and Pedestrian Transportation Plan* provides an inventory of existing and proposed bicycle and pedestrian facilities across the state. In Norwalk, an off-road bicycle and pedestrian trail exists within the Route 7 corridor between I-95 and the Merritt Parkway (Norwalk River Valley Multipurpose Trail). In Wilton, the Olmstead Hill Road to Wolfpit Road Trail is located within the Route 7 corridor. Throughout the rest of the corridor, HVCEO and SWRPA have proposed on-road, multi-use trail improvements along Route 7 from Norwalk to Georgetown and from Danbury to New Milford.

7.3 Topography, Geology, and Soils

The following is a summary of the existing topographical, geological, and soil conditions of the study corridor. This information is provided as a general background description of the existing conditions within the study corridor. More detailed information can be found in *Section 1:*

Topography, Geology, and Soils (May 2009) of the Environmental Technical Memorandum, which can be found on the study website.

Existing topography is generally documented by the United States Geological Survey (USGS) in published topographic contour maps. Topography includes the identification of existing landforms, both natural and man-made, especially in relation to one another in terms of latitude, longitude and elevation. The discussion of the existing geology of the study corridor includes a description of the underlying bedrock formation and a general description of the overlying surficial strata. This information is generally specifically collected in academic geological resources, prepared by the USGS, specific to the state of Connecticut. The discussion of existing soil classifications is a summary of specific findings from soil surveys conducted within the study corridor. The surveying of soils on a national level is maintained by the United States Department of Agriculture (USDA). The surveys are generally conducted for the classification and management of certain land use areas, based on soil types, which would be supportive of certain human and natural processes, such as prime farmlands, rangelands, floodplains, wetlands, and timberlands.

7.3.1 Topography

Based on data provided by the Connecticut Department of Energy and Environmental Protection (CTDEEP), the Danbury Branch study corridor has a minimum elevation of six feet above mean sea level in Norwalk and a maximum elevation of 475 feet above mean sea level in Redding.

7.3.2 Geology

Based on geological surficial material mapping for the State of Connecticut, the majority of the State is underlain by till and thick till, with a mosaic of connecting patches of other types of surficial materials. The greater part of the study corridor is aligned along linking patches of varying types of surficial material deposits (including sand, gravel, alluvium, and fines) and till of varying thicknesses.

Bedrock geology in the corridor consists of a combination of Trap Falls Formation (a gray to silvery, partly rusty-weathering, medium-grained schist), Ordovician (a light colored, foliated granitic gneiss, Ratlum Mountain Schist (a gray, medium-grained schist), granofels, Harrison Gneiss (an inter-layered dark and light gray, medium-grained, foliated gneiss), Stockbridge Marble (a white to gray dolomitic marble), Gneiss of Highlands Massifs (granitic gneiss and schist), Dalton Formation (a gray, tan-weathering feldspathic quartzite, gneiss, and schist), Walloomsac Schist (a dark, fine-grained schist), Brookfield Gneiss (a dark and light, medium to coarse grained dioritic gneiss), and pink granitic gneiss (a light-pink to gray granitic gneiss).

7.3.3 Soils

Using readily-available web-based mapping software, existing characteristics and relative composition of soils within the study corridor were assessed. Soil composition varies throughout the study corridor. In Norwalk and Danbury, the soil is classified as predominantly urban land, which is indicative of areas that are developed and/or paved for any purpose and that are not

necessarily consisting of the native surface soil conditions found in the area prior to development. Drainage in these areas is usually accomplished through artificial stormwater management.

In other areas of the study corridor, there is a smaller percentage of land that is classified as urban. In these areas, soils are classified as varieties of Haven, Enfield, Canton, Charlton, Chatfield, Catden, Fretown, Timakwa, and Natchaug soils. The soil also includes areas of Rippowam fine sandy loam, Hinckley gravelly sand loam, Paxton and Montauk fine sandy loams, Saco silt loam, and Woodbridge fine sandy loam.

7.4 Noise and Vibration

Analysis of the existing noise and vibration environment along the study corridor included the study of commuter rail noise, commuter rail vibration, and construction noise. Criteria for analysis are based on Federal Transit Administration (FTA) guidelines. The following is a summary of existing noise and vibration conditions in the study corridor. More detailed information can be found in *Section 2: Noise and Vibration* (July 2009) of the Environmental Technical Memorandum, which can be found on the study website.

A noise measurement program was conducted in Spring 2009. Specific measurement sites were selected that were representative of the existing ambient (typically experienced background) noise levels at nearby noise sensitive locations along the corridor. Considerations taken into account in the selection of sites included land use, and the proximity to the existing railway line, major roadways, and other noise sources.

Long-term (24-hour) measurements were conducted where feasible and used to calculate the Day-Night Sound Level (Ldn). Estimates of the Ldn at these locations were made using the methods described in the FTA guidance manual. Additional short-term (one-hour) measurements ("equivalent" sound level / Leq) were conducted to supplement the long-term sites.

Table 11 summarizes the existing ambient noise exposure measurements. Because the dominant noise sources along most of the corridor are the existing commuter rail and freight rail operations and the sounding of locomotive-mounted warning horns sounded near at-grade crossings, the existing noise levels at these measurement locations will be used to determine the existing noise conditions at all noise-sensitive receptors along the study corridor.

Table 11: Summary of Existing Ambient Noise Exposure Measurements

Site	Measurement Location	Start of Measurement		Measurement Time (hrs)	Ambient Noise Exposure (dBA)	
		Date	Time		Ldn[1]	Leq
N-1	77 North Water Street, Norwalk	4/29/09	16:17	1	59	57
N-2	Matthew's Park, Norwalk	4/29/09	16:27	1	72	70
N-3	28 Wilton Ave., Norwalk	4/27/09	15:00	24	62	59
N-4	Merritt Station, Norwalk	4/28/09	15:08	1	72	69
N-5	51 Wolfpit Road, Wilton	4/27/09	16:00	24	57	53
N-6	Schenck's Island Park, Wilton	4/30/09	15:46	1	60	57
N-7	186 Mather Street, Wilton	4/27/09	17:00	24	63	58
N-8	96 Portland Avenue, Wilton	4/28/09	19:00	24	63	59
N-9	131 Simpaug Turnpike, Redding	4/28/09	18:00	24	56	54
N-10	5 Taylor Avenue, Bethel	4/28/09	13:00	24	67	59
N-11	63 Wildman Street, Danbury	4/30/09	11:54	1	66	67
N-12	51 Beaver Brook Road, Danbury	4/28/09	10:00	24	61	58
N-13	151 Pocono Road, Brookfield	4/29/09	11:00	24	51	48
N-14	16 Prospect Drive, Brookfield	4/29/09	13:00	24	57	47
N-15	30 Erickson Road, New Milford	4/30/09	10:00	24	62	49
N-16	42 S. Main Street, New Milford	4/30/09	11:00	24	74	49

(1) The Leq measurements at the one-hour measurement sites were used to estimate the Ldn using FTA methodology. This approach tends to be conservative and underestimate the existing noise levels, which can result in higher levels of noise impact for a project.

Existing sources of vibration along the study corridor include MNR commuter trains on the branch from Norwalk to Danbury and freight trains on the railway line from Danbury to New Milford. Vibration measurements may be conducted during subsequent phases of the selected project to characterize the soil conditions along the corridor in order to refine the vibration projections at specific locations, as required.

7.5 Air Quality

The following is a summary of existing air quality conditions in the study corridor. More detailed information can be found in *Section 3: Air Quality* (May 2009) of the Environmental Technical Memorandum, which can be found on the study website.

There are a number of pollutants produced by transportation sources that affect air quality. The primary transportation-related pollutants of concern to human health include carbon monoxide, ozone, particulate matter, nitrogen dioxide, volatile organic compounds, and Mobile Source Air Toxics. Under the auspices of the Clean Air Act and 1990 Clean Air Act Amendments, federal standards have been established to define acceptable levels of some of these air pollutants.

The Clean Air Act Amendments require each state to monitor air quality to determine whether the National Ambient Air Quality Standards (NAAQS) are being met and, further, to take actions to maintain acceptable air quality. Connecticut has established a system of air sampling stations

across the state to continuously monitor air quality and pollutants. The air quality sampling stations in Fairfield and Litchfield counties, within which the study corridor lies, monitor carbon monoxide, ozone, particulate matter, nitrogen dioxide, and sulfur dioxide. If a sampling location (monitor) in a region records a pollutant level higher than the standard (called an "exceedance" of the standard), then the region or a portion thereof is classified as nonattainment for that pollutant.

Based on the U.S. Environmental Protection Agency (EPA) annual reports for air quality, monitors in the study corridor (Fairfield and Litchfield counties) had exceedences for ozone and particulate matter ($PM_{2.5}$) in 2006. Fairfield County is listed as nonattainment for both ozone and $PM_{2.5}$, while Litchfield County is listed as nonattainment for ozone and attainment for $PM_{2.5}$.

Federal regulations were established to ensure that emissions from transportation plans and projects will not exceed levels set in a state's State Implementation Plan and will not interfere with the state's ability to meet the NAAQS. These regulations are defined in 40 CFR 6, 51, and 93, *Determining Conformity of General Federal Activities to State or Federal Implementation Plans, Final Rule*, also called the General Conformity Rule. Conforming transportation projects and plans are those that meet the requirements of a State Implementation Plan (SIP), the purpose of which is eliminating or reducing the severity and number of violations of the NAAQS and achieving attainment status.

Several criteria and procedures determine whether or not a project is in conformity. These criteria and their status relative to the Danbury Branch improvements are the following:

- Currently conforming Regional Transportation Plan and Transportation Improvement Program – the current Regional Transportation Plans and the Transportation Improvement Programs for the South Western Regional Planning Agency region, which includes Norwalk and Wilton, and the Housatonic Valley Council of Elected Officials region, which includes Redding, Ridgefield, Bethel, Danbury, Brookfield and New Milford, currently conform to the State Implementation Plan.
- Projects included in a conforming Regional Transportation Plan and Transportation Improvement Program (TIP) – The Danbury Branch Commuter Rail project is currently identified in the 2007-2035 Regional Transportation Plans for the Southwestern Regional Planning Agency region and the Housatonic Valley Council of Elected Officials region. This project is not identified in either region's 2007 - 2011 TIP. It is assumed that the selected project will be identified in both regions' TIP during subsequent planning stages and before improvements occur.
- CO, PM_{10} and $PM_{2.5}$ hot spots – The project corridor is not in a CO or PM_{10} nonattainment area. Although the Fairfield County portions of the project are in a $PM_{2.5}$ nonattainment area, Connecticut's SIP includes this project in its attainment demonstration. At this time there is not an approved methodology to assess $PM_{2.5}$ impacts quantitatively; however, potential project impacts in Fairfield County will be qualitatively reviewed for the DEIS.
- PM_{10} control measures – There are no PM_{10} control measures in the current SIP.

7.6 Energy

The following is a summary of existing rail service energy requirements within the study corridor. More detailed information can be found in *Section 4: Energy* (May 2009) of the Environmental Technical Memorandum, which can be found on the study website.

The energy used by the Danbury Branch is primarily the fuel consumed by diesel train operations. Unlike the New Haven mainline and the New Canaan Branch, the Danbury Branch is not electrified. Diesel-electric push-pull locomotives capable of operating on electrified and non-electrified rail lines are used for the service. Typically, the locomotives push the train sets toward South Norwalk Station and pull them toward Danbury Station. Based on existing train service, the approximate weekly diesel fuel consumption by all trains is 9,372 gallons. On an annual basis, this corresponds to 487,344 gallons.

In addition, a small amount of consumed energy is associated with electricity used at the eight existing passenger stations and for signal, communications, and radio systems. Electricity is used at the stations to illuminate rail platforms, commuter parking lots, and pedestrian walkways and to operate systems such as variable message signs on the platforms, audible train approach messaging, and ticketing machines. The signal, communication, and radio systems include highway grade-crossing warning devices, communication node houses, and radio repeaters.

7.7 Biological Diversity

Biological diversity encapsulates the variety of different living organisms (species) occurring in a place or region and the number of individuals of the species. It considers all manner of life forms, including plants and animals. It is often used as a measure of environmental health. Given the variety of life forms in the environment, the biological diversity in the Danbury Branch study corridor is described in terms of vegetation, wildlife, and fish resources (fisheries). The following is a summary of the existing biological diversity of the study corridor. More detailed information can be found in *Section 5: Biological Diversity* (November 2010) of the Environmental Technical Memorandum, which can be found on the study website.

The Federal laws that will govern the project's effects on biodiversity include the Fish and Wildlife Coordination Act (16 USC 661-667), the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), the Migratory Bird Treaty Act (MBTA) (16 USC 703-712), the Bald Eagle Protection Act (16 USC 668-668d), and the Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265). At the state level, the following legislation is relevant to biological resources: the Connecticut Endangered Species Act (CGS 26-303) and Sections 25-108-1 and Section 26-112-21 through 48 inclusive of the Connecticut General Statutes (CGS).

The Danbury Branch lies along a series of river valleys, reflecting the historic construction of the rail line on lands with gentle slopes. Rivers and their adjacent lands are particularly rich in biological diversity, due to the availability of fresh water, fertile soils, and mix of uplands and wetlands. The spread of human communities has eliminated and reduced substantial acreages of habitat in the corridor, while some undeveloped areas contain an assortment of habitat features signifying high biological diversity.

7.7.1 Ecological Backdrop

As shown in the *Connecticut Comprehensive Wildlife Conservation Strategy* (CTDEEP 2005), the study corridor lies within two ecoregions. Norwalk and the southern end of Wilton lie within the Connecticut Coast ecoregion, located on the gently sloping coastal plain. The rest of the corridor lies within the Western Connecticut ecoregion, characterized by rolling to steep hills, north-trending ridges, broad uplands, and localized deposits of sand and gravel.

With the long history of settlement and diversity of commercial and industrial activities along the study corridor, including rail transportation, there are limited large blocks of natural habitat remaining directly in the study corridor. Today, the corridor is a mosaic of urban settlement, outlying industrial (and large retail) assemblages, and wooded suburban (residential) developments, with only an occasional undeveloped parcel or farm. There are also fingers and swathes of undeveloped acreage, much of which have wetlands and some of which has upland forests. Very few fields or farms, which would have dominated the landscape a century ago, remain in the corridor today.

7.7.2 Vegetation

On lands in the study corridor that are free of development or open water, forest is the most common vegetation. The dominant upland forest trees throughout the corridor consists of oak species (*Quercus spp.*) and hickories (*Carya spp.*), with lesser components of maples (*Acer spp.*) black birch, white ash, tulip poplar, hemlock, and others. Table 12 provides a list of the most commonly encountered tree species in the study corridor, which is similar throughout Connecticut. The trees are categorized by the type of site (e.g. successional stage / disturbance conditions) they usually grow on. Where large forest blocks and wooded swathes between developed parcels occur in the study corridor, these tree species are characteristically observed. Most of these species are found in uplands, whereas some occur on both uplands and wetlands.

Table 12: Common Tree Species in the Study Corridor

COMMON NAME	SCIENTIFIC NAME
PIONEER SPECIES - INTOLERANT OF SHADE	
Quaking aspen	*Populus tremuloides*
Bigtooth aspen	*Populus grandidentata*
Eastern red cedar	*Juniperus virginiana*
Pin or Fire cherry	*Prunus pensylvanica*
Sassafras	*Sassafras albidum*
Black locust*	*Robinia pseudoacacia*
Yellow poplar	*Liriodendron tulipifera*
Black willow	*Salix nigra*
Grey birch	*Betula populifolia*
INTERMEDIATE SPECIES - SOME TOLERANCE OF SHADE, NEED MOSTLY SUN TO PARTIAL SUN	
Northern red oak	*Quercus rubra*
Scarlet oak	*Quercus coccinea*
White oak	*Quercus alba*
Black oak	*Quercus velutina*
Swampwhite oak	*Quercus bicolor*
Chestnut oak	*Quercus prinus*
Shagbark hickory	*Carya ovata*
Pignut hickory	*Carya glabra*
Mockernut hickory	*Carya tomentosa*
Bitternut hickory	*Carya cordiformis*
Red maple	*Acer rubrum*
Yellow birch	*Betula alleghaniensis*
Black or Sweet birch	*Betula lenta*
Eastern white pine	*Pinus strobus*
American elm	*Ulmus americana*
Slippery elm	*Ulmus rubra*
White ash	*Fraxinus americana*
Black cherry	*Prunus serotina*
Hophornbeam	*Ostrya virginiana*
Butternut	*Juglans cinerea*
Basswood	*Tilia americana*
CLIMAX SPECIES - TOLERANT OF SHADE	
Sugar maple	*Acer saccarum*
American beech	*Fagus grandifolia*
Eastern hemlock	*Tsuga canadensis*
American hornbeam	*Carpinus caroliniana*

* Invasive Species

Shrubs and herbaceous plants (herbs) are often present under the tree canopy. Shrubs and families of shrubs that are common throughout Connecticut and the study corridor are presented in Table 13. The list contains a mix of wetland and upland species. The presence of a native shrub understory greatly increases the biodiversity of a forest area because they offer such a wealth of food, cover, and nesting opportunities for wildlife, as well as fish where shrubs grow along a stream bank or lake shore.

Table 13: Common Shrub Species in the Study Corridor

COMMON NAME	SCIENTIFIC NAME
Autumn olive*	*Eleagnus umbellata*
Staghorm sumac	*Rhus typhina*
Multiflora Rose*	*Rosa multiflora*
Common juniper	*Juniperus communis*
Speckled alder	*Alnus rugosa*
Viburnums	*Viburnum spp*
Witchhazel	*Hamamelis virginiana*
Winterberry	*Ilex verticillata*
Mountain laurel	*Kalmia latifolia*
Highbush blueberry	*Vaccinium corymbosum*
Huckleberry	*Gaylussacia baccata*
Hazelnut	*Corylus spp*
Elder	*Sambucus spp*
Spicebush	*Lindera benzoin*
Sweet pepperbush	*Clethra alnifolia*

* Invasive Species

Key plant communities in the study corridor include Shrub Inland Wetlands, Freshwater Marsh, Non-Riparian Forested Wetlands, Riparian Zones along Large Rivers, Forest Blocks Greater than 100 Acres, and (other) Forest. Areas that do not fall into these categories are urban and suburban environments where plant diversity is low and natural plant communities supporting native wildlife are less common.

7.7.3 Wildlife

Wildlife resources include all the many types of animals to be found in the environment. Major groups include mammals, birds, amphibians (such as frogs, newts and salamanders), reptiles (such as snakes and turtles), and invertebrates (such as butterflies, mussels, insects). Wildlife occur where they can find food, cover (places where they find shelter and protection against predators), water, and reproductive needs. These basic needs come in various shapes, forms, and sizes from resources in the environment. An area where the resources are combined just right to support a species or a population (of a species) is called habitat. Some wildlife find their needs in only one habitat, so they are strongly associated with (usually occur in) that habitat. Other species are generalists and are associated with a variety of habitats.

Connecticut's Comprehensive Wildlife Conservation Strategy (Strategy) compiled by the CTDEEP (2005) identifies 12 key habitats that are the most important in the state for supporting and sustaining wildlife and fish. These habitats include various types of forests, wetlands, grasslands, water resources, and others. Each of the 12 key habitat types recognized by CTDEEP has one or more sub-habitats. A sub-habitat is a variation of the larger habitat type. The key habitats and sub-habitats in the study area include the following: forests, non-riparian forested wetlands, riparian zones along a large river, coastal rivers, forested blocks greater than 100 acres, wet meadows, cold water habitats, freshwater marshes, and shrub inland wetlands.

7.7.4 Fisheries

Fish are often described in terms of fisheries resources, a term which encompasses fish populations (individuals of the same species) in combination with the environments (habitats) they live in. Fisheries resources occur in many of the rivers, streams, lakes, and ponds within the study corridor. Fisheries resources contribute to the food supply, economy, and health of the human community and fishing is an important recreational opportunity.

Within the study area, cold-water fisheries (trout) are found in several upstream waterways. Trout are among the most sought-after game fish in Connecticut. Natural trout reproduction is not adequate to support the current levels of trout harvesting (fishing) in most of Connecticut's rivers and streams, so CTDEEP sustains trout populations through fish stocking in suitable habitat. These efforts are described in more detail by town below. Warm-water fisheries are the most common fish habitats in the study corridor. Two anadromous species, alewife and blueback herring (collectively called river herring), are known to utilize the Norwalk River for spawning habitat.

7.8 Threatened and Endangered Species

Threatened and endangered species include plants and animals. Threatened and endangered (T&E) species are identified at the national level by the federal government, resulting in a group of federally-listed species. T&E species are also identified at the state level by the Connecticut Department of Environmental Protection (CTDEEP). The state list of T&E species includes federally-listed species which previously occurred in Connecticut or could still exist in Connecticut, plus additional species of rare or declining occurrence in the state. These species and their essential (or critical) habitats are protected at their relative federal and state levels.

For projects in Connecticut, the Natural Diversity Data Base (NDDB) is the primary resource for identifying T&E species. The NDDB maps were reviewed for the Danbury Branch study corridor and showed numerous records. As such, direct coordination with CTDEEP and USFWS was warranted and initiated. The following is a summary of the threatened and endangered species located within the study corridor. More detailed information can be found in *Section 6: Threatened and Endangered Species* (March 2009) of the Environmental Technical Memorandum, which can be found on the study website.

Coordination from the U.S. Fish and Wildlife Service (USFWS) indicated that no federally-listed or proposed threatened or endangered species or critical habitats are located in the study corridor, based on their current information. The USFWS noted that there were two historic records of the federally-threatened bog turtle (*Glyptemys muhlenbergii*) within the study corridor, but that recent surveys indicated that bog turtles are no longer present at those locations. In addition, the New England cottontail (*Sylvilagus transitionalis*) is known to occur in Brookfield and New Milford. This species is a candidate for listing under the ESA. The USFWS encourages attempts to avoid adverse project effects on the habitat of this species.

Based on the CTDEEP correspondence, the NDDB records in the study corridor include 3 state-listed plants and 19 state-listed animals, none of which are fish species (Table 14). State-listed

species have been recorded from Ridgefield and Redding and northward in the study corridor; none were from Norwalk and Wilton. The species are associated with a wide range of habitats, including ponds, wetlands, upland grasslands, coniferous forest, dry sandy areas, open woods, rocky slopes, cliffs, roadsides, and rail lines.

Table 14: NDDB State-Listed Species in the Study Corridor

COMMON NAME	DESCRIPTION	SCIENTIFIC NAME	LISTING STATUS*
Water marigold	Aquatic plant	*Bidens beckii*	T
Tuckerman's sedge	Perennial sedge	*Carex tuckermanii*	SC
Bush's sedge	Perennial sedge	*Carex bushii*	SC
Northern Metalmark	Butterfly	*Calephelis borealis*	E
Harris' checkerspot	Butterfly	*Chlosyne harrisii*	SC
Appalachian blue	Butterfly	*Celastrina neglectamajor*	T
Sedge skipper	Butterfly	*Euphyes dion*	T
Bronze Copper	Butterfly	*Lycaena hyllus*	SC
Newman's brocade	Moth	*Meropleon ambifuscum*	SC
Unnamed ground beetle	Insect	*Badister transverse*	SC
Unnamed ground beetle	Insect	*Bembidion pseudocautum*	SC
Unnamed ground beetle	Insect	*Bembidion semicinctum*	SC
Unnamed ground beetle	Insect	*Bembidion lacunarium*	SC
Unnamed lymnaeid snail	Pond snail	*Fossaria rustica*	SC
Whiteriver crayfish	Aquatic invertebrate	*Procambarus acutus*	SC
Northern slimy salamander	Amphibian	*Plethodon glutinosis*	T
Eastern box turtle	Turtle	*Terrapene carolina*	SC
Wood turtle	Turtle	*Glyptemys insculpta*	SC
Eastern hognose snake	Upland snake	*Heterodon platirhinos*	SC
Sharp-shinned hawk	Raptor	*Accipiter striatus*	E
Peregrine falcon	Raptor	*Falco peregrines*	T
Purple martin	Swallow	*Progne subis*	T

*E = Endangered; T = Threatened; SC = Special Concern

7.8.1 Additional Coordination

Additional coordination with USFWS and CTDEEP occurred in January 2013. The purpose of this follow-up was to inform the agencies of the change in scope for the Danbury Branch Improvement Program and to verify that the information gathered during the first round of coordination was still accurate.

In March 2013, USFWS noted that the federally-threatened bog turtle (*Glyptemys muhlenbergii*) has been known to exist within the vicinity of the study corridor. Wetlands in Danbury, Bethel, Ridgefield, and Redding could potentially be supportive habitats for bog turtles. As such, a bog turtle habitat ("Phase I") survey would need to be conducted before any construction occurred within these areas.

As of May 2013, response from the CTDEEP was still pending. Any changes to the state-listed species located in the study corridor will be considered in the EA as they pertain to the preferred alternative.

7.9 Wetlands

The following is a summary of wetlands within the study corridor. Both federal wetlands, as defined by the U.S. Army Corps of Engineers (USACE), and state wetlands, as defined by the Connecticut General Assembly, were identified within the study corridor. More detailed information can be found in *Section 7: Wetlands* (January 2011) of the Environmental Technical Memorandum, which can be found on the study website.

The Danbury Branch rail corridor parallels and crosses a series of rivers and streams. The study corridor is located in lowland areas in close proximity to streams, and as a result wetlands are common. The level floodplain areas along the Norwalk River represent the greatest proportion of wetlands from Norwalk into Redding. Many of the other wetlands in the study corridor are associated with the Saugatuck River, Sympaug Brook, the Still River, and the Housatonic River.

Norwalk: The Norwalk Harbor is designated as a regularly flooded, estuarine, intertidal system with an unconsolidated shoreline, and it is the only corridor section within Connecticut's designated coastal boundary. No tidal wetlands are indicated by the mapped data. In areas of Norwalk other than the harbor, numerous wetlands fall within the study corridor. These wetlands are associated with the Norwalk River and other water features. Linear wetlands adjacent to the track occur regularly in portions of Norwalk.

Wilton: Wetlands in the Wilton study corridor are primarily state and federal wetlands along the floodplain of the Norwalk River, varying in width and location as the river weaves in and out of the corridor. Unless noted, these are forested wetlands. Prevalent tree species on steep slopes are red maple trees. More level, less rocky areas include cottonwoods, and some areas have abundant hanging vines, such as grape and bittersweet. Linear wetlands adjacent to the track occur periodically throughout the length of the study corridor in Wilton, on both sides of the line.

Redding: There are numerous wetlands in Redding. These wetlands are associated with the Norwalk River, Umpawaug Pond, Umpawaug Pond Brook, the Saugatuck River, West Redding Brook, Bogus Mountain Brook, and other smaller water features. Linear wetlands adjacent to the track occur periodically throughout the length of the study corridor in Redding.

Ridgefield: The one mapped wetland in Ridgefield is a state and federal palustrine forested wetland associated with the Norwalk River. There are also several linear wetlands adjacent to the track along the western side of the rail bed.

Bethel: There are numerous wetlands in Bethel. These wetlands are associated with Sympaug Pond, Sympaug Brook, Chestnut Brook, and other smaller water features. Much of Bethel has linear wetlands adjacent to the track on one or both sides of the tracks. Where there are no linear wetlands adjacent to the track, there are often ponds or large wetlands along the tracks.

Danbury: There are numerous wetlands in Danbury. These wetlands are associated with Sympaug Brook, the Still River, and other smaller water features. In some areas of Danbury, where development is very dense, there are no wetlands located within the corridor, even at these

river crossings. There are also many linear wetlands adjacent to the track located within the Danbury segment of the study corridor.

Brookfield: There are numerous wetlands in Brookfield. These wetlands are associated with the Still River, former river oxbows, and other smaller water features. There is a combination of very short linear wetlands adjacent to the track and very long ones, as well as some long stretches with none.

New Milford: There are numerous wetlands in New Milford. These wetlands are mostly associated with the Sill River and the Housatonic River. Linear wetlands adjacent to the track in New Milford are relatively short and sporadic.

7.10 Floodplains and Floodways

The following is a summary of floodplains and floodways within the study corridor. More detailed information can be found in *Section 8: Floodplains and Floodways* (April 2009) of the Environmental Technical Memorandum, which can be found on the study website.

The Danbury Branch lies along a series of river valleys, reflecting the historic construction of the rail line on lands with gentle slopes. From south to north, the rail line parallels the Norwalk River (crossing back and forth a number of times), the Umpawaug Pond Brook, and crosses the Saugatuck River. It also follows the general course of Sympaug Brook to the brook's junction with the Still River. The rail runs through the Still River valley primarily on the east side of the river, crosses the Still River where it joins the Housatonic River, and then follows the Housatonic River northerly for the rest of its path in the study corridor. Throughout this course, the rail line crosses many tributary streams making their way to these rivers.

Floodplains are flat or nearly flat areas adjacent to rivers or streams that are inundated occasionally or periodically by flood waters. Floodways are located within floodplains and consist of the river or stream channel plus any portion of the floodplain which carries stream flows during flood events. Floodplains and floodways are important nation-wide for handling and holding floodwaters, so that adjacent properties and downstream areas are not damaged by floods. Stream channel encroachment lines (SCELS) are jurisdictional boundaries established by the State of Connecticut.

Within the 38-mile study corridor, about 31 miles of track lie within or adjacent to floodplains as mapped by the Federal Emergency Management Administration (FEMA). There are designated floodways along most of the waterways within the study corridor. In many places, the tracks are elevated above the flood elevations and cross over the floodways and floodplains on bridges, so that flooding does not interrupt rail service. SCELS are associated with the larger rivers in the study area, including the Norwalk River, Still River, and Housatonic River.

7.10.1 Updated Information

At the outset of this study, the most recent FEMA GIS mapping available for the study corridor was from either 2002 or 2008, depending on county. This data was used to describe existing

floodplain and floodway resources within the project corridor for the Existing Conditions discussion. Subsequently, in May 2011, FEMA released new Flood Insurance Rate Map (FIRM) GIS data for Fairfield County, which includes the southern portion of the project corridor. To date, a new FEMA GIS data coverage has not been issued for Litchfield County, which encompasses the northern portion of the project study corridor.

The new FEMA data for Fairfield County reflects changes in mapped floodplain and floodway boundaries that have been authorized by FEMA after consideration of Letters of Map Change (LOMCs) that have been submitted by individuals, towns, and other entities. The most current available new FEMA GIS mapping was compared to the earlier FEMA mapping that was used to document existing conditions. This comparison revealed that there have been no substantive changes to floodplain or floodway boundaries within the immediate study corridor in Fairfield County. Thus, the data used to document existing floodplain resources still remains applicable and reflects accurate data for this corridor.

7.11 Surface and Groundwater Resources

Surface water is defined as water that is present above the substrate or soil surface. Surface waters thus include resources such as rivers, lakes, reservoirs, ponds, perennial streams, estuaries, and oceans. Groundwater is defined as water that collects or flows beneath the earth's surface, filling the porous spaces in soil, sediment, and rocks. The following is a summary of water resources in the study corridor. More detailed information can be found in *Section 14: Surface and Groundwater Resources* (April 2009) of the Environmental Technical Memorandum, which can be found on the study website.

The Danbury Branch corridor lies within two of Connecticut's seven major drainage basins: the southern portion is in the Southwest Coast major drainage basin and the northern half is in the Housatonic River major drainage basin. The major rivers and brooks in the study corridor include the following:

- Norwalk River in Norwalk, Wilton, Weston, Redding, and Ridgefield
- Umpawaug Pond Brook in Redding
- Saugatuck River in Redding
- Bogus Mountain Brook in Redding
- Sympaug Brook in Bethel and Danbury
- Still River in Danbury, Brookfield and New Milford
- Housatonic River in New Milford
- West Aspetuck River in New Milford

The Norwalk River and a portion of the Still River within the study corridor have DEP-designated water quality classifications of B, indicating water of the minimum acceptable quality based on water parameters and criteria established by the Connecticut Water Quality Standards (WQS). The Housatonic River is classified as C, indicating water of unacceptable quality due to point or non-point sources of pollution. The smaller rivers and brooks in the study corridor are

mostly classified as water quality A and AA. There are no surface water reservoirs used for drinking water supply located within the study corridor.

Much the Danbury Branch study corridor is underlain by Class GA groundwater. However, the more urbanized portions of the corridor are underlain by GB groundwater, including portions of Norwalk, Bethel, Brookfield and New Milford, and most of Danbury. There are several Aquifer Protection Areas (APAs) and GAA-Wells in or adjacent to the study corridor where groundwater may be used for community wells or public water supplies. These are listed below:

- In Norwalk, the Kellogg-Deering Wellfield Level "A" APA overlaps the study corridor just south of the Merritt Parkway. Associated with this APA are four active community wells located approximately 1,000 feet west of the study corridor (near milepost 2.5) and west of the Norwalk River, around Kellogg Pond.
- In Wilton, a Class GAA-Impaired well is located just south of the Cannondale Station. The well itself is located outside of the study corridor, while the eastern side of the protective radius around the well falls within the corridor.
- In Danbury, there is an existing Level "B" APA in the vicinity of the Danbury Station associated with the inactive Osborne Well. This well is located northwest of the intersection of Tamarack Avenue and Fifth Avenue, approximately 1,000 feet beyond (north of) the limits of the study corridor.
- Also in Danbury is a GAA well near the Shelter Rock Road-South Street intersection. The well lies just outside of the study corridor, while a portion of the radius around the well lies within the corridor.
- In Brookfield are two GAA wells located within the study corridor. One is located east of the tracks, off the south side of Silvermine Road (near milepost 30.1). The second is less than ½-mile north of the first, on the west side of the tracks along Pocono Road and north of Silvermine Road (near milepost 30.5).
- In New Milford, the rail corridor passes through two Level "B" APAs that join to form a continuous coverage of the northern end of the study corridor. All of the associated wells are located west of the Housatonic River and outside of the study corridor.

7.12 Historic Resources

The following is a summary of historic resources in the study corridor. Historic resources are an important part of the character of a community, and may include features such as buildings, structures, entire properties, objects, and districts. More detailed information can be found in *Section 9: Historic Resources* (May 2009) of the Environmental Technical Memorandum, which can be found on the study website.

Potential historic, architectural, and archaeological resources located within the study corridor were identified through research and review of the following sources: National Register of Historic Places (National Register) data; the Connecticut Statewide Historic Resource Inventory (SHRI), which is maintained by the Connecticut State Historic Preservation Office (SHPO); local histories of the towns crossed by the study corridor; information from local historical societies; field reconnaissance; review of aerial and oblique aerial photography; and published railroad histories.

7.12.1 Historic Rail Lines

During field reconnaissance of the rail line, numerous culverts and bridges along the line were observed. Most of these were built of stone and follow engineering standards established in the 1840s and standardized through manuals such as the *Manual for Railroad Engineer,* and the *Hand book of Railroad Construction,* which were published by George Vose in 1878 and 1881 respectively. Given that very few changes have been made to the rail alignments since 1874, and that many intact historic structures such as culverts, bridges, stations, elevated alignments and embankments remain, the rail line in its entirety, from Norwalk to New Milford, appears to be eligible for the National Register. It would be eligible under criterion C as state-level significant example of a transportation corridor that was an example of standard engineering practices during the time of its construction. It would also be significant for its impact on improving trade and commerce in the state, and connecting manufacturing and agricultural areas in western Connecticut with markets in New York City and further abroad via the main line railroad and the port of Norwalk. Further coordination with SHPO will need to be conducted to confirm the line's eligibility.

7.12.2 Other Historic Resources

The long interrelationship between the eight study corridor communities and the railroad is reflected in the dense and varied assortment of historic resources located throughout the corridor. Review of the SHRI, the National Register, and additional data sources revealed over 300 historic resources on or eligible for the National Register in the study corridor. These resources include residential structures, churches, cemeteries, commercial buildings, factories, train stations, fire houses, banks, and municipal buildings. The densest concentrations are in Norwalk, Wilton, and Danbury, largely due to the proximity of the rail line to the historic central business areas of these communities.

Table 15 provides a summary of the number of historic resources listed on or believed eligible for listing on the National Register for each municipality in the study corridor.

Table 15: Summary of Historic Structures

TOWN	NUMBER OF RESOURCES
Norwalk	89
Wilton	63
Redding	52
Ridgefield	22
Bethel	24
Danbury	12
Brookfield	18
New Milford	78

7.12.3 Additional Coordination

An additional coordination letter was sent to SHPO in January 2013. The purpose of this coordination was to update the office on the change in scope of the Danbury Branch

Improvement Program from an EIS to an EA. The coordination was also intended to determine whether the SHPO has any new concerns related to historic properties within the study area.

As of May 2013, response from the SHPO was still pending. Any changes to concerns regarding historic properties in the study corridor will be considered in the EA as they pertain to the preferred alternative.

7.13 Archaeological Resources

In mid to late 2008, a survey of Archaeological resources within the study corridor was conducted. The following is a summary of the finding of this survey. More detailed information can be found in *Section 10: Archaeological Resources* (March 2009) of the Environmental Technical Memorandum, which can be found on the study website.

There are 35 previously recorded prehistoric sites documented within the study corridor. As a whole, the sites represent a variety of functions and chronological settings, extending from the Paleo-Indian to Late Woodland periods. Most of the site areas remain as originally recorded, with the exception of one site that appears to have been impacted by modern house construction. There were no new prehistoric sites recorded during the current survey, likely due to soil development and vegetation cover. The high density of sensitive areas within the study corridor can be attributed to the placement of the rail line in the heart of the Still River valley, a substantial drainage basin containing a sizeable river and thick glacial and alluvial sedimentary deposits that would have afforded well drained, habitable surfaces for settlement. The high sensitivity of much of the alignment is mitigated in Danbury and southern Brookfield where there are high densities of industrial properties.

Important standing structures located within the study corridor include a variety of commercial, civic, residential, industrial, and railroad-related buildings. In Danbury, Union Station and the locomotive turntable are early 20th Century features, both listed with the National Register of Historic Places (NRHP). There is also a late 19th Century Victorian home at 160 White Street in Danbury, with more historic residential structures located along Stony Hill Road and Pocono Road in southern Brookfield. The historic structures become tightly clustered in Brookfield Village, including two stores, a hotel, a mill, and residential houses. The New Milford Center historic district has been listed with the NRHP and contains 154 contributing structures. A number of individual tobacco warehouses and commercial structures in New Milford have also been listed with the NRHP, as has the New Milford train station. There are many other residential structures outside the center historic district within the study corridor that are a century old or more, including those concentrated on West Street, South Avenue, High Street, and Nicholas Square.

Other historic resources relate directly to the railroad itself. The Housatonic Railroad Bridge in New Milford and the Still River arch bridge in Brookfield are recorded with the Historic American Engineering Record. Other bridges are plain girder/deck-style features built around the turn of the 20th century. The railroad tracks date to the early 1920s when last replaced, and there were also 117 specific railroad-related features or locations recorded during the surface survey. Many of these were culverts made from a variety of materials and representing different

times, including original stone culverts, culverts made from a combination of stone and other material such as iron pipe or concrete, and the more recent concrete culverts. There were also manual switching devices, many dating to the time of track replacement. Less common railroad-related features along the alignment include several whistle posts, a lubricator, and a flanger signal. There were also a variety of reflective signs and mile post markers recorded.

7.14 Prime Farmland and Active Farmland

Two types of farmland have been identified in the study corridor. The first type is prime farmland, which is protected by the Farmland Protection Policy Act and the second is active farmland, which is currently being used for agricultural purposes. The following is a summary of these properties. More detailed information regarding farmland in the study corridor can be found in *Section 11: Prime Farmland and Active Farmland* (May 2009) of the Environmental Technical Memorandum, which can be found on the study website.

The following prime farmlands were identified within the study corridor:

- *Wilton*: There are 10 parcels of prime farmland, ranging in size from 0.4 to 9.9 acres.
- *Redding*: There are three prime farmland parcels, which are 1.0, 5.7, and 7.0 acres in size.
- *Bethel*: There are two prime farmland parcels, which are 4.7 and 6.8 acres in size.
- *Brookfield*: There are two prime farmland parcels, which are 2.0 and 23 acres in size.
- *New Milford*: There are 20 prime farmland parcels, ranging in size from 1.0 to 7.0 acres.

The following active farmlands were identified within the study corridor:

- *Bethel*: There is one small active Christmas tree farm.
- *Brookfield*: There are two active Christmas tree farms and a small active fruit orchard.
- *New Milford*: There are six active hay fields.

7.15 Land Use

The following is a summary of land use within the study corridor. More detailed information can be found in *Section 12: Land Use* (May 2009) of the Environmental Technical Memorandum, which can be found on the study website.

Existing land uses within the study corridor were determined based on the information within each municipality's Plan of Conservation and Development. Table 16 summarizes the existing land uses within each study corridor municipality.

Table 16: Study Corridor Land Use Summary

LAND USE	NORWALK	WILTON	REDDING	RIDGEFIELD	BETHEL	DANBURY	BROOKFIELD	NEW MILFORD	TOTAL
Residential	59.2%	59.6%	39.1%	75.1%	45.2%	35.1%	45.0%	16.9%	40.1%
Commercial	12.9%	3.1%	0.2%	2.7%	6.3%	8.0%	4.8%	1.9%	4.2%
Industrial	5.7%	---	---	---	---	---	---	---	0.4%
Open Space	16.0%	22.1%	35.9%	---	18.7%	27.7%	13.6%	6.4%	15.6%
Institutional	4.5%	---	4.0%	---	2.4%	5.0%	2.8%	1.0%	2.2%
Utilities / Transportation	1.7%	6.6%	4.3%	---	7.2%	8.1%	9.4%	2.6%	4.4%
Agriculture	---	---	---	---	---	---	---	9.9%	3.1%
Vacant / Undeveloped	---	8.6%	16.5%	22.2%	20.2%	16.2%	24.4%	61.3%	30.0%

7.16 Hazardous Contamination

Environmental database references were used to identify and evaluate hazardous/contaminated locations that may pose potential risks to site development within the Danbury Branch Study corridor. The study corridor is defined as 1,000 feet in width as measured 500 feet on each side of the existing rail right-of-way centerline. The objective of this analysis was to determine the relative environmental risk associated with land uses in the vicinity of the alternatives being considered in the study corridor in order to estimate the likelihood for each study alternative to encounter discharge, spillage, uncontrolled loss, seepage, or filtration of hazardous wastes, contaminated materials, or other regulated substances. The following is a summary of hazardous/contaminated locations within the study corridor. More detailed information (including mapping) can be found in *Section 13: Hazardous Contamination* (August 2009) of the Environmental Technical Memorandum, which can be found on the study website

The database search of the study corridor initially identified 590 locations. These listed sites/incidents were further evaluated and classified based on probable level of site complexity and proximity to the rail centerline as posing a potential "*Low*", "*Moderate,*" or "*High*" risk of contamination. Based on the risk evaluation criteria, 204 *"Moderate*" or "*High*" risk sites were identified as having documented environmental conditions that pose potential impacts to construction activities.

"*Moderate*" or "*High*" risk site locations are generally grouped in areas of the study corridor with historical, industrial, and commercial land uses in urban centers. The areas with the largest number of identified "risk of contamination" sites exist in Norwalk, Bethel, Danbury, and New Milford. The lowest areas of identified "risk of contamination" sites exist in Ridgefield, Redding, and Brookfield. Table 17 summarizes these findings by mapping area. The reference maps can be found in *Section 13: Hazardous Contamination* (August 2009) of the Environmental Technical Memorandum.

Table 17: Summary of Contaminated Sites

SHEET NO.	ORTHOPHOTO BASE MAP	DATABASE SITES	MODERATE OR HIGH RISK SITES
1	Norwalk	106	44
2	Norwalk/Wilton	105	36
3	Wilton	22	5
4	Wilton/Weston	26	7
5	Wilton/Weston/Ridgefield/Redding	26	8
6	Ridgefield/Redding	9	2
7	Redding/Bethel/Danbury	3	1
8	Bethel/Danbury	42	12
9	Danbury/Bethel	132	52
10	Danbury/Bethel/Brookfield	23	7
11	Brookfield	28	7
12	Brookfield/New Milford	5	0
13	New Milford	3	0
14	New Milford	60	23
Total		**590**	**204**

7.17 Public Recreational/4(f)/6(f) Lands

The following is a summary of public recreational lands within the study corridor. Public recreational lands consist of local, state, and national parks, open spaces, greenways and trails, and recreational facilities. More detailed information about these lands can be found in *Section 15: Public Recreational/4(f)/6(f) Lands* (March 2009) of the Environmental Technical Memorandum, which can be found on the study website.

In accordance with Section 4(f) of the 1966 Federal Aid and Highway Act, special efforts must be made to protect any public park, recreation area, or wildlife/waterfowl refuge from any disturbance or adverse impact as the result of a Department of Transportation project. Furthermore, approval for use of the affected properties is contingent on a determination that avoidance is neither reasonable nor prudent and that all possible planning has been undertaken to minimize any detrimental effect to the land as a result of the project. Section 4(f) sites are considered "potential" until they are impacted and confirmed to be eligible by the lead federal agency.

Numerous municipally and state owned public recreational lands lie within the study corridor. Table 18 summarizes the size and location of these properties.

Table 18: Potential 4(f) Lands in the Study Corridor

MUNICIPALITY	POTENTIAL 4(F) LAND (ACRES)	NUMBER OF PROPERTIES	LARGEST PROPERTY
Norwalk	42.1	8	Mathew's Park (19.7 acres)
Wilton	132.7	4	Mather Street Open Space (72 acres)
Ridgefield	13.1	2	Old Branchville School Site (11.6 acres)
Redding	308.2	3	Topstone Park (267.4 acres)
Bethel	0	0	n/a
Danbury	0	0	n/a
Brookfield	44.4	1	Brookfield Municipal Center Park (44.4 acres)
New Milford	278.7	6	Lover's Leap State Park (170.4 acres)
TOTAL	**774.8**	**24**	

According to Section 6(f) of the Land and Water Conservation Fund Act (LWCFA), "any lands purchased or developed with LWCFA funds cannot be „converted' to another use for purposes inconsistent with the Act without being replaced with other land that is of equal value to the land proposed for conversion."

The following properties are Section 6(f) lands, portions of which lie within the study corridor:

1) Oyster Shell Park, 10.0 acres (Norwalk)
2) Mathew's Park, 19.7 acres (Norwalk)
3) Bogus Brook Preserve, 36.4 acres (Redding)

7.18 Socioeconomics and Environmental Justice

Socioeconomic resources include residents, workers, employers, and neighborhoods within the study corridor. Consequently, the analysis of existing conditions for the Danbury Branch Improvement Program considered the following aspects: socioeconomics, environmental justice, community cohesion, businesses, and municipal services and finances. The following is a summary of these resources within the study corridor. More detailed information can be found in *Section 16: Socioeconomics and Environmental Justice* (June 2009) of the Environmental Technical Memorandum, which can be found on the study website.

7.18.1 Socioeconomics

The first aspect of socioeconomics is demographics. Norwalk and Danbury are urban centers, each with populations of over 70,000. The other six communities are distinctly smaller, ranging from approximately 8,000 residents in Bethel to approximately 27,000 residents in New Milford. Each of the municipalities is projected to grow over the next 30 years, except for Redding. The majority of the population in the corridor, 58 to 67 percent within each community, is of employment age, suggesting an associated demand for transportation options for travel to work.

Median household incomes in the corridor are higher than the state average ($65,859), except in Danbury, which is slightly lower at $65,161. Unemployment is generally low in the corridor communities, 2.8 to 3.6 percent, below the state average of 4.3 percent. Poverty levels (the percent of the population below poverty) are close to the state average of 7.9 percent in Norwalk

(7.2 percent) and Danbury (8.0 percent) but far below the state average in the six other communities, ranging from a low of 1.8 percent in Redding to 3.3 percent in New Milford.

The second aspect of socioeconomics is school enrollment. Trends for Connecticut anticipate a decline in public school enrollment from 567,138 in 2007 to 458,900 in 2030 (-19.1 percent). Trends in these projections of student-age population (4 to 19 years old) for the period 2007 to 2030 are as follows:

- Slight decline in student-age populations in Bethel and Danbury.
- Student-age populations will stay essentially the same in Norwalk, Wilton, Redding, and Ridgefield.
- Slight growth (10 percent or less) in student-age population in Brookfield and New Milford.

The final aspect of socioeconomics is real estate trends and values. Overall, the total number of housing units in the study corridor communities grew collectively during 2000-2007 by 5.7 percent. The study corridor predominantly has owner-occupied and single-family housing. The highest rates of renter-occupied housing are in Norwalk (36.9 percent) and Danbury (39.8 percent), exceeding the state average of 31.2 percent. The percent of housing units that are vacant in each of the study area communities is low compared to the statewide average of 6.1 percent, except for in New Milford (6.5 percent). The 2006 median house prices were well above the state median of $275,000 in all of the corridor communities.

7.18.2 Environmental Justice

Almost all of the communities in the study corridor have a substantially lower percentage of below-poverty residents than the state average of 7.9 percent. Danbury is the sole community with a higher percentage, 8.0 percent. Both Norwalk and Danbury have higher percentages of minority residents, 27 and 25 percent respectively, than the state average of 19 percent.

7.18.3 Community Cohesion

Community cohesion is characterized by residents' expression of common belonging or unity within a specified geographic area, and it is typically related to common experiences such as similar lifestyles, similar family structure, common values, and shared goals for their community. Key elements of community cohesion include neighborhoods within (as defined by municipal government, residences or established associations) and shared community resources (such as community centers, government centers, and schools).

Table 19 summarizes the neighborhoods and community resources within the study corridor.

Table 19: Study Corridor Neighborhoods and Community Resources

MUNICIPALITY	NEIGHBORHOODS	COMMUNITY RESOURCES
Norwalk	South Norwalk (SoNo) Norwalk Center Cranbury	South Norwalk Police Station Norwalk Maritime Museum South Norwalk Post Office
Wilton	Wilton Center	Wilton Public Library Wilton Post Office Wilton Community Nursery School
Redding	West Redding	West Redding Post Office
Ridgefield	Branchville	Branchville Elementary School
Danbury	Downtown Danbury	
Bethel	Bethel Center	Bethel Public Library Bethel Post Office Bethel Town Hall
Brookfield	Brookfield Center	
New Milford	Downtown New Milford	New Milford Town Hall & Community Center New Milford Library

7.18.4 Businesses

Services represent the highest percentage of any job sector in each of the study corridor communities (30 to 51 percent of jobs), with government-related employment the lowest percentage of jobs (from 1 to 8 percent). Services include legal services, accounting services, and schools, as well as restaurants and repair and maintenance services. Major employers in the study corridor include ASML Lithography in Wilton, Easton Corporation and Duracell, Inc./Gillette Co. in Bethel, Western Connecticut State University in Danbury, and Kimberly Clark Manufacturing in new Milford.

Business climate is based on the non-residential grand list data, which reflects the value of taxable business properties and the larger planned or programmed development sites anticipated within the study corridor. In general, the commercial and industrial properties in the study corridor communities represent less than 25 percent of the taxable property value in each community. Among the study corridor communities, the two urban centers of Norwalk and Danbury have the highest percentage of their grand list values in non-residential properties, at 18.6 percent and 24.7 percent respectively. Redding and Ridgefield have the lowest percentage of their grand list value in non-residential properties among study corridor communities with 5.2 and 8.8 percent respectively.

7.18.5 Municipal Services and Finances

All of the study corridor communities provide the traditional municipal services including government, schools, roadway system maintenance, libraries, and some sewer service. However, municipal water and sewer service are not universally available in all communities. Water and sewer service are community-wide in Norwalk and Danbury. In Wilton, Redding, Ridgefield, Bethel and New Milford, water and sewer are located only through the cores of each community with some extension areas. Brookfield provides only a limited sewer service area and no water service. Water lines from Danbury extend north into Brookfield to serve new development along

Route 7 and this is the only area with public water service in Brookfield. In each community there are some sewer lines and/or water lines that cross into or through the study corridor.

7.18.6 Limited English Proficiency (LEP)

On August 11, 2000, Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency" was signed into law. This requires Federal agencies to ensure that those with limited English proficiency (LEP) can have meaningful access to Federal services and programs. The website www.LEP.gov states that "individuals who do not speak English as their primary language and who have a limited ability to read, speak, write, or understand English can be limited English proficient or "LEP." These individuals may be entitled to language assistance with respect to a particular type or service, benefit, or encounter." In recent years, federal guidance has directed that the presence of LEP populations be considered in the implementation of federally funded programs such as this proposed project.

The presence of LEP populations in the study corridor was not analyzed in the original *Socioeconomics and Environmental Justice* existing conditions memorandum. Recognizing the importance of this measure as a factor in environmental justice, however, the Study Team undertook a subsequent evaluation of LEP populations.

The location of concentrations of LEP populations was determined using currently available Census data via the American Community Survey. The analysis regarding Linguistically Isolated Households, which the South Western Regional Planning Agency (SWRPA) conducted as part of its transportation planning program in 2010, was also used. A concentration of LEP populations is considered to exist where the number of LEP households by Census Tract is 15 percent or greater.

Figure 2 shows the locations of concentrations of LEP populations within the study area. They occur in similar areas to the location of Environmental Justice populations: in downtown Norwalk, in the vicinity of the South Norwalk rail station, and in downtown Danbury and adjacent neighborhoods.

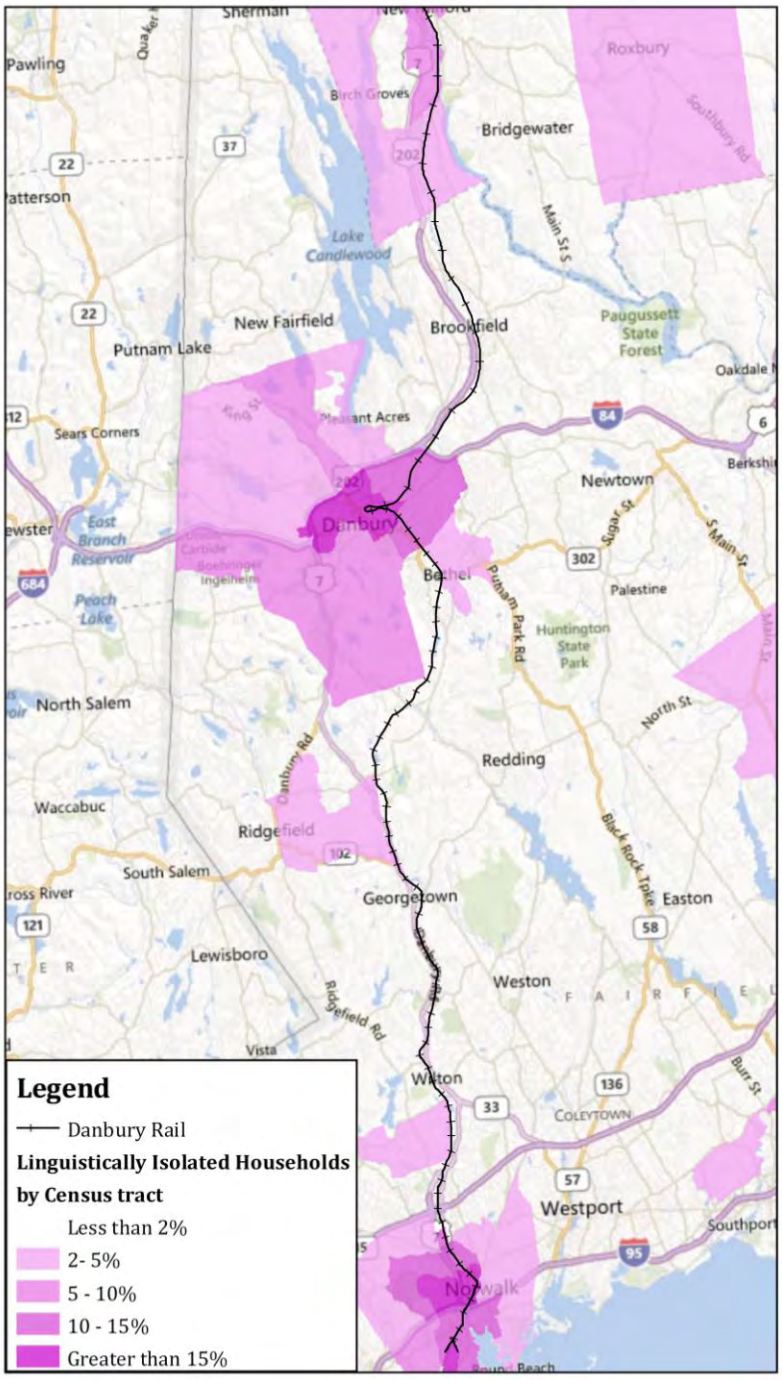

Figure 2: Concentrations of LEP Populations

7.19 Scenic Roads

The following is a summary of scenic roads within the study corridor. More detailed information can be found in *Section 17: Scenic Roads* (June 2009) of the Environmental Technical Memorandum, which can be found on the study website.

In Connecticut, there are two categories of scenic roads: State Scenic Highways, which are determined for eligibility and managed by CTDOT, and Local Scenic Roads, which are selected by municipalities and protected by municipal ordinances. Both of these categories are recognized for Archaeological, cultural, historic, natural, recreational, or scenic qualities. The study corridor includes one State Scenic Highway and two Town Scenic Roads.

The State Scenic Highway within the study corridor is the Merritt Parkway (Route 15), which crosses over the Danbury Branch in Norwalk, between exit 39 (US 7 Expressway) and exit 40 (Old US 7/Main Street). The Merritt Parkway is designated a scenic road easterly from the New York state line to the Housatonic River in Stratford. Relative to the railroad, the Parkway is an overhead structure at Milepost 3.41 and is about 0.2 miles south of the Merritt 7 Station.

There are two Town Scenic Roads in the study corridor. Seeley Road in Wilton traverses the study corridor north of Cannondale Station. It begins at Route 7 and runs easterly, crossing the Norwalk River. Further east is an at-grade crossing of the Danbury Branch. The area within the study corridor is generally wooded. In Redding, Marchant Road, from Simpaug Turnpike to Umpawaug Road, features gentle terrain, meadows, stone walls, and mature trees. Side Cut Road, from Station Road to Redding Road (Route 53) is in a broad valley with a stream and mature trees. Although not in the study corridor, it begins just to the east.

7.20 Visual Resources

Visual resources include natural landscape elements as well as features of the built environment. The quality of the visual experience depends on many factors, including the physical attributes of objects, the combination of objects and features in view, the location of visual elements in relation to the viewer, the condition of the elements, their uniqueness, viewer perceptions, and cultural connotations. The following is a summary of visual resources in the study corridor. More detailed information can be found in *Section 18: Visual Resources* (May 2009) of the Environmental Technical Memorandum, which can be found on the study website.

The southern end of the study corridor in Norwalk is a relatively flat urban setting, where views from the rail line are dominated by buildings, streets, signage, houses, and backyards, with closer objects blocking views of the background. Hundreds of properties with frontage along the railroad right-of-way have direct views of the tracks and passing trains, as do drivers and pedestrians on local roadways.

Hills and forests begin to encroach on the rail corridor farther north along the Norwalk River valley in Wilton and Ridgefield and the Umpawaug Pond Brook valley in Redding. There are long stretches where views from one or both sides of the rail corridor are entirely or partially obscured by rock cuts, hilly topography, or dense vegetation. Scattered homes in the adjacent woods are sometimes visible from the tracks and these have seasonal intermittent views of the tracks and trains. Ponds and water features regularly lie alongside and/or cross the tracks, creating small clearings at track level with snapshots of rural forest scenery.

In Bethel, trackside views include taller forested hills in the background with variable foreground views of trees, industrial and commercial buildings from various eras. Farther north, the level broad terrain through much of the Danbury corridor has been developed, so views from the tracks are dominated by buildings, houses, roadways, parking lots, cars, and localized patchy vegetation.

The rail line through Brookfield and the southern portion of New Milford lies along the narrow Still River valley floor and views are constricted by forested ridges on both sides. Occasional openings allow two-way views between the tracks and adjacent residences, industrial sites, and commercial development. Occasionally, views over long stretches of tracks or water features include the high ridges surrounding the valley.

The most open and far-reaching views occur north of where the rail corridor meets the Housatonic River valley in New Milford. This broad valley floor with large cleared acreages allows panoramic views from the tracks of the meandering Housatonic River and forested ridges to the east and west. Elsewhere in New Milford the landscape is very diverse, with some rail sections being cloaked by trees and others framed by downtown residential and commercial buildings. In downtown New Milford, dozens of properties and drivers along local roads have visual exposure to the rail line.

Chapter 8: Impact Analysis

This chapter analyzes the potential impacts that the alternatives being considered for the Danbury Branch could have on to Traffic and Transportation as well as numerous environmental topics: Topography, Geology, and Soils; Noise and Vibration; Air Quality; Energy; Biological Diversity; Threatened and Endangered Species; Wetlands; Floodplains and Floodways; Surface and Groundwater Resources; Historic and Archaeological Resources; Prime Farmland and Active Farmland; Land Use; Hazardous Contamination; Public Recreational/4(f)/6(f) Lands; Socioeconomics and Environmental Justice; Scenic Roads; and Visual Resources.

8.1 Traffic and Transportation

This section summarizes potential traffic and transportation impacts that would result from each of the alternatives being considered for the Danbury Branch study corridor. Specifically, the impacts to traffic volumes and operations, passenger rail service, rail station parking capacity, freight rail service, transit service (bus) as well as bicycle and pedestrian facilities and access are reviewed.

8.1.1 Alternative A: No Build

Under Alternative A there would be no new capital or operational improvements and no associated costs. When looking at potential impacts, only recent and already planned improvements within the corridor are considered as having been completed.

The primary planned roadway improvements associated with this alternative are the CTDOT Route 7 Bypass in Brookfield project and signalization and roadway safety improvements along Route 7 in Wilton. Regarding passenger rail, Alternative A assumes that the Danbury Centralized Traffic Control (CTC) and Signalization project has been completed and is in operation. It also assumes that a new passenger rail station has been built in Georgetown.

8.1.1.1 Traffic

Under Alternative A, traffic congestion is expected to continue to worsen along key sections of the Route 7 corridor. An example of this expected congestion is in the vicinity of the Merritt 7 station, where daily traffic volumes are expected to grow approximately 25% in the 2010-2030 timeframe, from a total of 20,000 vehicles to more 25,000 per day. Similarly, 35% increases in traffic volume are expected by 2030 along Route 7 in the vicinity of the Wilton station and in New Milford in the vicinity of the intersection of Bridge Street/Route 202.

Overall, traffic demands on local and residential roads in the Route 7 corridor are expected to increase and result in operational issues and safety concerns. Based on traffic volume information provided by CTDOT, Levels of Service (LOS) E and/or F during peak hours occur at a number of intersections in Norwalk and Wilton, including the following:

- South Norwalk (vicinity of Merritt 7 station):
  - Grist Mill Road(Route 7)/Glover Avenue
  - Grist Mill Road (Route 7)/Main Avenue
  - Main Avenue/Glover Avenue/Creeping Hemlock Drive
- Ridgefield (vicinity of Branchville station):
  - Route 7/Danbury Road (Route 35)
  - Route 7/Cains Hill Road-Topstone Road
  - Route 7/Mountain Road-School Street

8.1.1.2 Passenger Rail Service

Based on CTDOT's Travel Forecast Model, which applies the MNR 2030 service plan and primary planned improvements, there will be a 16% increase in rail passenger ridership between 2010 and 2030. This plan shows 14 trains per day in each direction from Danbury to South Norwalk, with up to seven thru trains to Grand Central Terminal. This is an increase over existing service, which offers 11 trains per day in each direction with three thru trains to Grand Central. No need for additional equipment is anticipated to meet this service plan.

Parking demand at rail stations, as shown in Table 20, already exceeds the supply at several stations along the Danbury Branch. Current estimates by CTDOT indicate there is a need for 73 additional spaces. Table 21 shows that – based on existing parking capacity and current ridership projections – this demand is expected to exceed capacity at the majority of rail stations along the Branch by 2030 under Alternative A. It is anticipated that up to 508 new spaces would be needed along the Branch. Given lack of capacity at main line stations, this scenario could lead to more persons choosing to drive to their destination.

Table 20: Existing Parking Demand

STATION	EXISTING SPACES	BOARDINGS	PARKING DEMAND	DESIRABLE NO. OF SPACES	ADDITIONAL SPACES NEEDED
Danbury	146	216	162	178	32
Bethel	190	259	194	214	24
Redding	82	58	44	48	Surplus of 34 Spaces
Branchville	142	150	113	124	Surplus of 18 Spaces
Cannondale	140	155	116	128	Surplus of 12 Spaces
Wilton	220	170	128	140	Surplus of 80 Spaces
Merritt 7	88	128	96	106	18
Total	**1,008**	**1,136**	**852**	**937**	**73**

** Table 20, Table 21, Table 23, Table 25, Table 26, and Table 28 assume that boardings are equal to the sum of projected inbound and outbound boardings during the AM and Midday for 2030. They also assume that not every rider will need a parking space. The study's Ridership Survey showed that about 25% of the respondents did not drive to their boarding station, so the parking demand is equal to the total boardings less 25%. The desirable number of spaces is the demand plus 10%. The additional number of spaces needed is equal to the desirable number of spaces minus the existing number of spaces.*

Table 21: Parking Requirements to Meet Demand in 2030 (Alternatives A and B)

STATION	EXISTING SPACES	BOARDINGS	PARKING DEMAND	DESIRABLE NO. OF SPACES	ADDITIONAL SPACES NEEDED
New Milford	0	0	0	0	0
Brookfield	0	0	0	0	0
Danbury	146	147	110	121	Surplus of 25 Spaces
Bethel	190	353	265	291	101
Redding	82	160	120	132	50
Branchville	142	320	240	264	122
Georgetown	0	0	0	0	0
Cannondale	140	237	178	196	56
Wilton	220	309	232	255	35
Merritt 7	88	282	212	233	145
Total	**1,008**	**1,808**	**1,356**	**1,492**	**508**

8.1.1.3 Freight Rail Service

The limited changes to passenger operations associated with Alternative A would be consistent with existing operations along the Branch. Therefore, Alternative A would have no impact on rail freight operations.

8.1.1.4 Bus Service

There would be no new impacts to existing bus service associated with Alternative A as there would be no planned changes in bus operations on the corridor associated with this alternative. However, it should be noted that modifications to bus service could occur, given available budget and equipment, to address future changes in passenger demand.

8.1.1.5 Bicycling and Pedestrian Facilities

There would be no direct improvements to existing bicycle and pedestrian facilities associated with Alternative A. It is anticipated with this alternative that access to passenger stations by walking and bicycling would become more difficult due to the need to comingle with additional traffic volumes.

8.1.2 Alternative B: Transportation System Management

Similar to Alternative A, there would be no changes to roadway or rail transportation infrastructure as part of Alternative B, other than what is already planned. This alternative would primarily consist of modifications to bus service along the corridor and the addition of midday rail shuttle service on the Branch. There are no capital costs associated with this alternative. Operating costs would increase moderately pending on amount of bus service or additional rail service added.

8.1.2.1 Traffic

Traffic impacts that would result from the TSM alternative would be similar to those discussed under Alternative A. Although there would be no direct impact to traffic, demands on local and residential roads in the Route 7 corridor are expected to increase and result in operational issues and safety concerns.

8.1.2.2 Passenger Rail Service

There would be no capital improvements to the rail passenger system in Alternative B. This alternative, however, does assume additional service as outlined in the MNR 2030 service plan, as discussed in Alternative A. Additionally, operational changes in the form of additional service in the off-peak could be implemented to provide passenger rail service on the Branch every two hours during the midday. Up to two additional shuttle trains from Danbury to Stamford could also be added. This proposed additional service would be reviewed with MNR and CTDOT operations and service planning staff prior to implementation. There would be minor operational cost increases with this additional. A ridership increase of 29% is anticipated under this alternative.

As with Alternative A, parking demand is expected to exceed capacity at the majority of rail stations along the Danbury Branch by 2030, based on existing parking capacity and current ridership projections. Given lack of capacity at main line stations, this could lead to more persons choosing to drive to the destination. Existing and projected parking needs are shown in Table 20 and Table 21, respectively.

8.1.2.3 Freight Rail Service

The limited changes to passenger operations associated with Alternative B would be consistent with existing operations along the Branch. Therefore, Alternative B would have no impact on rail freight operations.

8.1.2.4 Bus Service

A number of bus service options are included in Alternative B. The following is a list of planned bus service improvements:

- New Milford-Danbury Rail Connector Bus
    - This route would connect with the existing passenger rail service in Danbury, with stops in Brookfield and New Milford. It would operate as an extension of the existing rail service. CTDOT has forecasted this service would generate up to 75 daily riders each way.
- Increased service on the existing commuter bus shuttle 10/20 Westport Road in Wilton
- New commuter shuttle service to Danbury Station, with a connection to Commerce Park
- New commuter shuttle service to West Redding Station, with connections to office parks in proximity to the Danbury Municipal Airport

The number of buses operating would adjust with the increasing demand as needed. Additional express bus service between Danbury and New Milford could lead to an overall increase in transit ridership. These bus service options would require approximately $2.9 million (2010 dollars) in annual operating costs. While no capital costs for buses are anticipated other than what is already planned as part of normal fleet replacement, further analysis would be required if this alternative is pursued to better determine capital and operating costs and potential ridership.

8.1.2.5 Bicycling and Pedestrian Facilities

There would be no direct improvements to existing bicycle and pedestrian facilities associated with Alternative B. It is anticipated with this alternative that access to passenger stations by walking and bicycling would become more difficult due to the need to comingle with additional traffic volumes.

8.1.3 Alternative C: South Norwalk to Danbury Improvements

In addition to the improvements already planned or recently implemented as noted in Alternatives A and B, a number of transportation infrastructure improvements would be implemented as part of the Alternative C. Regarding passenger rail, this alternative includes track reconfiguration at South Norwalk to provide a second parallel route between the Branch and the New Haven Mainline; track realignments at selected curves to allow increased operating speeds; installation of new Traction Power System (electrification) from South Norwalk to Danbury; modifications to at-grade crossing warning systems to allow increased operating speeds; bridge improvements; station improvements; and enhancements to Danbury Yard to facilitate vehicle storage and maintenance.

Total anticipated capital costs associated with Alternative C are approximately $403.9 million. The total annual operating cost for this alternative is projected to be approximately $279.9 million.

8.1.3.1 Traffic

Traffic impacts resulting from Alternative C on the Danbury Branch would include a small reduction in traffic volume growth due to improved passenger rail ridership. However, this could be offset by very minor increases in traffic volumes during peak hours at intersections in the vicinity of the rail station at Merritt 7.

8.1.3.2 Passenger Rail Service

Passenger rail service would be significantly improved in Alternative C due to improved acceleration and deceleration afforded by electrification of the rail line. This would lead to a travel time reduction of approximately 25 minutes from Danbury to Grand Central Terminal and approximately 21 minutes from Danbury to South Norwalk. Table 22 shows a comparison between trip times for Alternative A and Alternative C.

Table 22: Trip Time Savings (Alternative C)

STATION	ALTERNATIVE A	ALTERNATIVE C	TIME SAVINGS
Danbury	0:00:00	0:00:00	*0:00:00*
Bethel	0:08:37	0:04:36	*0:04:01*
Redding	0:16:50	0:10:18	*0:06:32*
Branchville	0:28:03	0:16:14	*0:11:49*
Georgetown	0:31:39	0:18:30	*0:13:09*
Cannondale	0:37:56	0:22:57	*0:14:59*
Wilton	0:43:40	0:26:14	*0:17:26*
Merritt 7	0:50:41	0:31:26	*0:19:15*
South Norwalk	1:03:41	0:42:24	*0:21:17*
Stamford	1:17:51	0:53:47	*0:24:04*
Grand Central Terminal (Arrival)	**1:57:21**	**1:32:03**	***0:25:18***

Service frequency could also be significantly improved. A number of options, including providing increased shuttle service from Danbury to Stamford, and potentially more frequent service to Grand Central Terminal, were considered as part of the overall Danbury Branch Improvement Program. A preliminary plan was developed to provide half-hour service in the AM peak (6AM – 9AM) and PM peak (4PM – 7PM), with hourly service during off-peak hours. This would lead to an additional 10 trains in each direction in the 2030 plan. A final schedules and operating plan would require additional coordination with MNR service planning and operations group when/if this alternative moves forward.

As shown in Table 23, an estimated 1,007 additional parking spaces would be needed along the Branch to accommodate year 2030 demand under Alternative C. Additional parking spaces are planned for Merritt 7, Branchville, Redding, and Bethel as part of this alternative.

Table 23: Parking Requirements to Meet Demand in 2030 (Alternative C)

STATION	EXISTING SPACES	BOARDINGS	PARKING DEMAND	DESIRABLE NO. OF SPACES	ADDITIONAL SPACES NEEDED
Danbury	146	416	312	343	197
Bethel	190	490	368	404	214
Redding	82	207	155	171	89
Branchville	142	362	272	299	157
Georgetown	0	141	106	116	116
Cannondale	140	92	69	76	Surplus of 64 Spaces
Wilton	220	308	231	254	34
Merritt 7	88	349	262	288	200
Total	**1,008**	**2,365**	**1,774**	**1,951**	**1,007**

8.1.3.3 Freight Rail Service

Considering existing and known planned rail freight service in the Study Corridor, Alternative C would have no impact on rail freight operations. Freight service would continue to operate outside of the passenger service hours and would not be affected.

8.1.3.4 Bus Service

There would be no impacts related to bus service as part of improvements planned under the Alternative C.

8.1.3.5 Bicycling and Pedestrian Facilities

Alternative C includes improvements to pedestrian access at the Merritt 7 Station, including a new pedestrian overpass over the tracks to provide access to commercial development. This would be a significant improvement over the existing Merritt 7 station. In addition, the existing low-level platform at the station will be replaced with a 500' high-level platform with canopy, waiting shelter, access stairs, and ramp. Bicycle lockers are planned at Merritt 7, Branchville, Redding, and Bethel Stations. In addition, proposed improvements to Redding, Bethel, and Branchville Stations would also include additional bicycle lockers and upgrades to pedestrian access with crosswalks and sidewalks.

8.1.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Alternative D would extend existing passenger service on the Danbury Branch over existing Housatonic Railroad Company (HRRC) rail from Danbury to New Milford, approximately 14 miles. Two options are considered: a diesel rail service and an electrified rail service. This alternative includes track replacement; bridge improvements; new station construction; installation of signal systems; replacement of at-grade crossing warning signal systems and crossing surface; and construction of a new rail yard in New Milford. The electric version of Alternative D would also include installation of a new Traction Power System.

8.1.4.1 Traffic

It is anticipated that intersections in New Milford will experience modest increases in traffic volumes with a new rail station in the downtown area. These intersections include:

- Route 7/Bridge Street (Route 202)
- Railroad Street-Middle Street/Bridge Street (Route 202)
- Youngfield Road/Bridge Street (Route 202)

Despite these modest traffic increases at intersections, it is anticipated that the new ridership along the extension would have a positive benefit in terms of reducing the number of vehicles along Route 7. The overall traffic impact of Alternative D, therefore, is assessed to be neutral.

8.1.4.2 Passenger Rail Service

Alternative D would introduce passenger rail service between Danbury and New Milford, with an intermediate stop in Brookfield, resulting in a 19-22% increase in ridership by 2030. The same number of trips per day as in Alternative C would be extended from Danbury to New Milford. A final schedules and operating plan would require additional coordination with MNR service planning and operations group if this alternative moves forward. The capital cost

associated with Alternative D is approximately $352.3 million for the diesel version and $501.4 million for the electric version. Annual operating costs are estimated to be $164.9 million and $175 million for the diesel and electric version, respectively.

When comparing the two versions of Alternative D, there is a travel time savings associated with electrification. Table 24 compares the trip times of these two alternatives. The electric option would offer more than 25 minutes in time savings on a trip between New Milford and Grand Central Terminal and more than 21 minutes in time savings on a trip between New Milford and South Norwalk.

Table 24: Trip Time Comparison (Alternative D – Diesel and Electric)

STATION	ALTERNATIVE D – DIESEL	ALTERNATIVE D – ELECTRIC	TIME SAVINGS
New Milford	0:00:00	0:00:00	*0:00:00*
Brookfield	0:15:15	0:13:45	*0:01:30*
Danbury	0:34:35	0:29:18	*0:05:17*
Bethel	0:41:35	0:33:54	*0:07:41*
Redding	0:49:03	0:39:36	*0:09:27*
Branchville	0:59:09	0:45:32	*0:13:37*
Georgetown	1:02:45	0:47:48	*0:14:57*
Cannondale	1:08:41	0:52:15	*0:16:26*
Wilton	1:14:22	0:55:32	*0:18:50*
Merritt 7	1:21:01	1:00:44	*0:20:17*
South Norwalk	1:33:09	1:11:42	*0:21:27*
Stamford	1:47:19	1:23:05	*0:24:14*
Grand Central Terminal (Arrival)	**2:26:49**	**2:01:21**	***0:25:28***

Parking demand would be created at the Brookfield and New Milford stations. New parking facilities would be constructed to meet the future additional parking spaces needed at each station along the entire rail corridor where demand is expected to exceed existing supply. Table 25 and Table 26 indicate the expected impacts of each version of Alternative D on parking supply. Because the electric version of the alternative is expected to attract more riders, this version would also require a larger number of parking spaces.

Table 25: Parking Requirements to Meet Demand in 2030 (Alternative D – Diesel)

STATION	EXISTING SPACES	BOARDINGS	PARKING DEMAND	DESIRABLE NO. OF SPACES	ADDITIONAL SPACES NEEDED
New Milford	0	131	98	108	108
Brookfield	0	117	88	97	97
Danbury	146	248	186	205	59
Bethel	190	423	317	349	159
Redding	82	152	114	125	43
Branchville	142	258	194	213	71
Georgetown	0	124	93	102	102
Cannondale	140	199	149	164	24
Wilton	220	309	232	255	35
Merritt 7	88	343	257	283	195
Total	**1,008**	**2,304**	**1,728**	**1,901**	**893**

Table 26: Parking Requirements to Meet Demand in 2030 (Alternative D – Electric)

STATION	EXISTING SPACES	BOARDINGS	PARKING DEMAND	DESIRABLE NO. OF SPACES	ADDITIONAL SPACES NEEDED
New Milford	0	162	122	134	134
Brookfield	0	123	92	101	101
Danbury	146	358	269	295	149
Bethel	190	491	368	405	215
Redding	82	207	155	171	89
Branchville	142	362	272	299	157
Georgetown	0	141	106	116	116
Cannondale	140	92	69	76	Surplus of 64 Spaces
Wilton	220	308	231	254	34
Merritt 7	88	349	262	288	200
Total	**1,008**	**2,593**	**1,945**	**2,139**	**1,195**

8.1.4.3 Freight Rail Service

Alternative D directly impacts approximately 14.3 miles of two Housatonic Rail Road Company (HRRC) lines: the Maybrook Line, a two-track section which includes the Main and the Tilcon Runner tracks; and the Berkshire Line, a single-track running up through New Milford. To provide a clear route for oversize freight moves (wide loads), passing sidings would be built at the planned Brookfield and New Milford stations. The passing sidings would be constructed a distance of 1,800-feet to allow wide load freight cars to avoid the high level boarding platforms at the passenger stations. The sidings would also allow space for trains to pass each other along the single-track lines.

A vertical clearance of 21 feet 6 inches would be required to allow for double stack freight service to operate. Under the electric version of Alternative D, the necessary catenary system would necessitate bridge improvements or track undercutting to achieve these clearances.

With the above mitigation measures, Alternative D would have no impacts to freight service.

8.1.4.4 Bus Service

There would be no anticipated impacts to existing bus service along the Danbury to New Milford corridor resulting from Alternative D.

8.1.4.5 Bicycling and Pedestrian Facilities

Under alternative D, both the New Milford and Brookfield rail stations would include construction of high level platforms with canopies, waiting shelter, access stairs and ramps, bicycle lockers, and bus/car drop offs. A sidewalk at Brookfield station, from the station site westerly to Route 202 along the north side of Route 25 would be constructed to improve pedestrian access. Additionally, a new pedestrian bridge over the Still River would also be constructed.

These new rail station amenities would have a positive impact on overall pedestrian and bicycle access and facilities and would support a reduction in overall automobile usage in the corridor.

8.1.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

Alternative E would involve partial electrification of the southerly section of the Danbury Branch (approximately 7.5 miles) between South Norwalk and Wilton. The passenger rail improvements associated with this alternative include a track reconfiguration at South Norwalk to provide a second parallel route between the Branch and the New Haven Line; modest track realignments at selected curves to allow higher operating speeds; modifications to at-grade crossing warning systems to allow higher operating speeds; bride improvements; and station improvements.

8.1.5.1 Traffic

Traffic impacts resulting from Alternative E would be similar to those under Alternative B, with the exception of a small reduction in traffic volume due to improved passenger rail ridership at Merritt 7 Station. However, this could be offset by minor increases in traffic volumes during peak hours at intersections in the vicinity of the rail station.

8.1.5.2 Passenger Rail Service

Under Alternative E, the Danbury Branch would be electrified to Wilton. The rail service improvements closely resemble those described in Alternative B. The same existing diesel service schedule would remain north of Wilton, while south of Wilton there could be more frequent service. A preliminary plan would be to provide half-hour service in the AM peak (6AM – 9AM) and PM peak (4PM – 7PM). Consideration would be given to the improved service speed/reliability of the electrified portion of track to Wilton. Schedule improvements could occur between Wilton and Stamford, and additional service could be added from Wilton to New York City. A final schedules and operating plan would require additional coordination with MNR service planning and operations group if this alternative moves forward. The capital cost

of Alternative E is approximately $240.6 million. The annual operating costs associated with this alternative would be approximately $216.2 million

Alternative E is expected to result in limited travel time reductions. Time savings would be approximately 7 minutes from Danbury to Grand Central Terminal and approximately 4 minutes from Danbury to South Norwalk. Table 27 shows a comparison between trip times for Alternative A and Alternative E.

Table 27: Trip Time Savings (Alternative E)

STATION	ALTERNATIVE A	ALTERNATIVE C	TIME SAVINGS
Danbury	0:00:00	0:00:00	*0:00:00*
Bethel	0:08:37	0:08:37	*0:00:00*
Redding	0:16:50	0:16:50	*0:00:00*
Branchville	0:28:03	0:28:03	*0:00:00*
Georgetown	0:31:39	0:31:39	*0:00:00*
Cannondale	0:37:56	0:37:56	*0:00:00*
Wilton	0:43:40	0:44:10	*0:00:30*
Merritt 7	0:50:41	0:49:22	*0:01:19*
South Norwalk	1:03:41	1:00:20	*0:03:21*
Stamford	1:17:51	1:11:43	*0:06:08*
Grand Central Terminal (Arrival)	**1:57:21**	**1:49:59**	***0:07:22***

As shown in Table 28, an estimated 734 additional parking spaces would be needed along the Branch to accommodate year 2030 demand under Alternative E. Additional parking spaces are planned for Merritt 7 as part of this alternative.

Table 28: Parking Requirements to Meet Demand in 2030 (Alternative E)

STATION	EXISTING SPACES	BOARDINGS	PARKING DEMAND	DESIRABLE NO. OF SPACES	ADDITIONAL SPACES NEEDED
Danbury	146	279	209	230	84
Bethel	190	419	314	346	156
Redding	82	155	116	128	46
Branchville	142	269	202	222	80
Georgetown	0	131	98	108	108
Cannondale	140	200	150	165	25
Wilton	220	314	236	259	39
Merritt 7	88	344	258	284	196
Total	**1,008**	**2,111**	**1,583**	**1,742**	**734**

8.1.5.3 Freight Rail Service

Considering existing and known planned rail freight service on this line, Alternative E would have no impact on rail freight operations. Freight service would continue to operate outside of passenger service hours and would not be affected.

8.1.5.4 Bus Service

Alternative E would incorporate improved bus shuttle service for Merritt 7 and Wilton Stations. These improvements would need to be coordinated with the rail service planning efforts that would take place with MNR and CTDOT Office of Rails.

8.1.5.5 Bicycling and Pedestrian Facilities

The same improvements as with Alternative C would occur at Merritt 7 station for Alternative E. This includes general improvements to pedestrian access and a new pedestrian overpass over the tracks to provide access to commercial development. This is a significant improvement over existing conditions. Also, the existing low-level platform at the station would be replaced with a 500' long high-level platform with canopy, waiting shelter, access stairs, and ramp. Bicycle lockers would also be added at Merritt 7 Station.

8.1.6 Comparison of Transportation Impacts for Build Alternatives

A comparison of costs for the three build alternatives, including contingency, is presented in Table 29 in 2010 dollars.

Table 29: Comparison of Estimated Infrastructure Capital Costs (Alternatives C, D, and E)

COST	ALTERNATIVE C	ALTERNATIVE D – DIESEL	ALTERNATIVE D –ELECTRIC	ALTERNATIVE E
Construction Cost	$185,278,587	$161,582,725	$230,018,519	$110,373,541
Design & Permits – 25%	$46,319,647	$40,395,681	$57,504,630	$27,593,385
Incidentals – 23%	$42,614,075	$37,164,027	$52,904,259	$25,385,914
Railroad Protection – 30%	$55,583,576	$48,474,818	$69,005,556	$33,112,062
Contingency – 40%	$74,111,435	$64,633,090	$92,007,408	$44,149,416
Total	**$403,907,320**	**$352,250,341**	**$501,440,371**	**$240,614,319**

Table 30 shows costs of implementing specific work elements. This demonstrates the potential costs of phased construction. Contingency, design and permitting costs, insurance, and incidentals – at the percentages shown in Table 29 – are built into these costs.

Table 30: Comparison of Costs for Major Work Elements (Alternatives C, D, and E)

WORK TYPE	ALTERNATIVE C	ALTERNATIVE D – DIESEL	ALTERNATIVE D – ELECTRIC	ALTERNATIVE E
Electrification	$112,805,669	$0	$71,524,479	$36,113,269
Track	$56,025,581	$57,961,677	$57,961,677	$34,190,948
Structures	$145,521,889	$135,399,800	$198,208,652	$118,980,040
Communications & Signals	$20,290,350	$92,497,400	$92,497,400	$11,973,650
Stations	$49,552,272	$52,286,864	$52,286,864	$27,926,672
Other	$19,711,560	$14,104,600	$28,961,300	$11,429,740
Total	**$403,907,320**	**$352,250,341**	**$501,440,371**	**$240,614,319**

***Costs include construction, design and permitting, incidentals, insurance, and contingency*

Table 31 shows the travel times associated with each alternative. The most travel time savings are realized with Alternative C. Under this alternative, a trip time savings of approximately 21

minutes is realized between Danbury and South Norwalk, and a trip time savings of approximately 25 minutes is realized between Danbury and Grand Central Terminal. Although Alternative D includes a longer total travel time, it also includes service to two new stations.

Table 31: Comparison of Travel Times to Grand Central Terminal

STATION	ALTERNATIVES A&B	ALTERNATIVE C	ALTERNATIVE D – DIESEL	ALTERNATIVE D – ELECTRIC	ALTERNATIVE E
New Milford	n/a	n/a	0:00:00	0:00:00	n/a
Brookfield	n/a	n/a	0:15:15	0:13:45	n/a
Danbury	0:00:00	0:00:00	0:34:35	0:29:18	0:00:00
Bethel	0:08:37	0:04:36	0:41:35	0:33:54	0:08:37
Redding	0:16:50	0:10:18	0:49:03	0:39:36	0:16:50
Branchville	0:28:03	0:16:14	0:59:09	0:45:32	0:28:03
Georgetown	0:31:39	0:18:30	1:02:45	0:47:48	0:31:39
Cannondale	0:37:56	0:22:57	1:08:41	0:52:15	0:37:56
Wilton	0:43:40	0:26:14	1:14:22	0:55:32	0:44:10
Merritt 7	0:50:41	0:31:26	1:21:01	1:00:44	0:49:22
South Norwalk	1:03:41	0:42:24	1:33:09	1:11:42	1:00:20
Stamford	1:17:51	0:53:47	1:47:19	1:23:05	1:11:43
GCT (Arrival)	**1:57:21**	**1:32:03**	**2:26:49**	**2:01:21**	**1:49:59**

Table 32 compares the estimated number of parking spaces that would be needed along the Branch to accommodate year 2030 demand under each of the alternatives. Even under Alternatives A and B, the demand for parking along the Danbury Branch is expected to exceed the supply. The electric version of Alternative D is expected to require the most additional parking spaces.

Table 32: Comparison of Parking Requirements to Meet Demand in 2030

STATION	ALTERNATIVES A&B	ALTERNATIVE C	ALTERNATIVE D – DIESEL	ALTERNATIVE D – ELECTRIC	ALTERNATIVE E
New Milford	n/a	n/a	108	134	n/a
Brookfield	n/a	n/a	97	101	n/a
Danbury	Surplus of 25 Spaces	197	59	149	84
Bethel	101	214	159	215	156
Redding	50	89	43	89	46
Branchville	122	157	71	157	80
Georgetown	0	116	102	116	108
Cannondale	56	Surplus of 64 Spaces	24	Surplus of 64 Spaces	25
Wilton	35	34	35	34	39
Merritt 7	145	200	195	200	196
Total	**508**	**1,007**	**893**	**1,195**	**734**

8.2 Topography, Geology, and Soils

The following is a summary of constraints to project implementation due to the existing topography, geology and soils in the study corridor. More detailed information can be found in

Section 1: Topography, Geology, and Soils (February 2012) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

The corridor topography varies from urban developed to rural river valley. Features such as rivers, streets, and buildings were carefully considered as the conceptual engineering was developed for all alternatives. Given the extensive presence of rock within the study corridor, the construction cost estimate has been prepared assuming that all excavation will be classified as "rock." Also, in view of the rocky terrain, soils are not expected to be of concern except as described in other environmental technical memoranda.

8.2.1 Alternative A: No Build

There are no constrains to Alternative A due to topography, geology, or soils as no new construction would take place as part of this alternative.

8.2.2 Alternative B: Transportation System Management

There are no constrains to Alternative B due to topography, geology, or soils as no new construction would take place as part of this alternative.

8.2.3 Alternative C: South Norwalk to Danbury Improvements

The area associated with Alternative C is predominated by rock outcrops and boulders. The topography has influenced the conceptual designs by limiting planned track realignments. As mentioned previously, where excavations are anticipated, the presence of rock has been assumed in preparing the cost estimate.

Nineteen different soil types are present in planned improvement areas, but soils are not expected to place constraints on project implementation except as described in other environmental technical memoranda.

8.2.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

The area associated with Alternative D is predominated by rock outcrops and boulders. The topography has influenced the conceptual designs by limiting planned track realignments. As mentioned previously, where excavations are anticipated, the presence of rock has been assumed in preparing the cost estimate.

Thirteen different soil types are present in planned improvement areas, but soils are not expected to place constraints on project implementation except as described in other environmental technical memoranda.

8.2.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

The area associated with Alternative E is predominated by rock outcrops and boulders. The topography has influenced the conceptual designs by limiting planned track realignments. As

mentioned previously, where excavations are anticipated, the presence of rock has been assumed in preparing the cost estimate.

Six different soil types are present in planned improvement areas, but soils are not expected to place constraints on project implementation except as described in other environmental technical memoranda.

8.3 Noise and Vibration

The following is a summary of potential noise and vibration impacts as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 2: Noise and Vibration* (August 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Without mitigation, the total number of locations projected to experience new long-term noise impacts from train operations is expected to be 4,636 moderate impacts and 919 severe impacts. Figure 3 graphically shows how moderate and severe impacts are defined. The total number of locations projected to experience vibration impacts, without mitigation, is expected to be greatest for the alternatives that include diesel-powered trains. These alternatives would impact residences, museums, and schools.

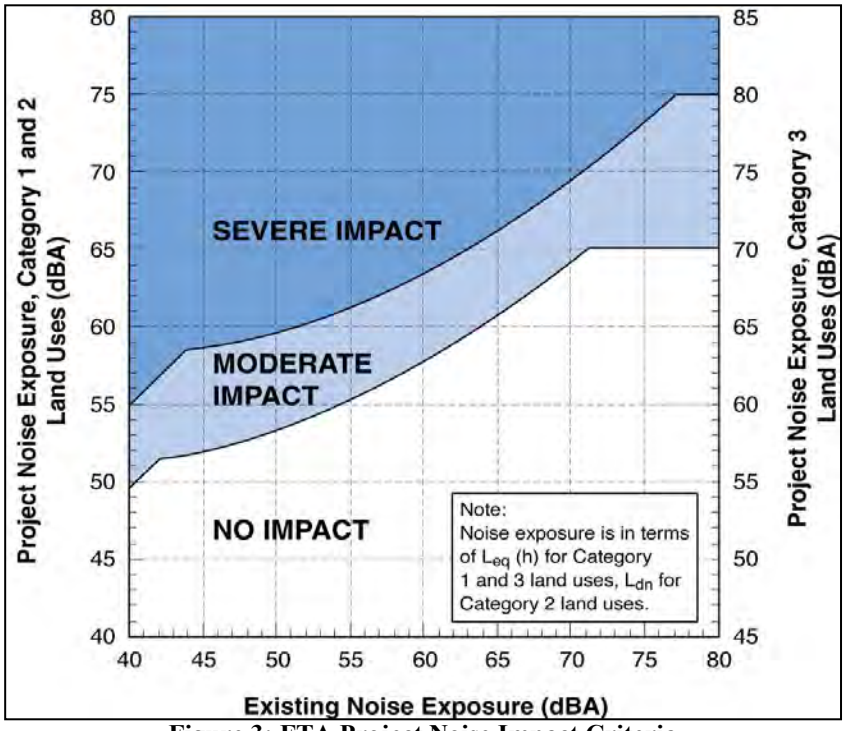

Figure 3: FTA Project Noise Impact Criteria

8.3.1 Alternative A: No Build

No noise or vibration impacts would be associated with Alternative A as there would be no change in rail operations along the corridor for this alternative.

8.3.2 Alternative B: Transportation System Management

It is anticipated that there would be 14 moderate noise impacts caused by the changes in bus and rail operations associated with Alternative B, assuming no mitigation. Vibration impacts to 456 residential properties, one museum, and one school are also predicted.

8.3.3 Alternative C: South Norwalk to Danbury Improvements

It is anticipated that there would be 1,026 moderate and 70 severe noise impacts caused by the changes in rail operations associated with Alternative C, assuming no mitigation. It is projected that this alternative would have no vibration impacts.

8.3.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

It is anticipated that there would be 1,735 moderate and 486 severe noise impacts caused by the changes in rail operations associated with Alternative D-Diesel, assuming no mitigation. Vibration impacts to 1,122 residential properties, one museum, and two schools are also predicted.

It is anticipated that there would be 1,303 moderate and 311 severe noise impacts caused by the changes in rail operations associated with Alternative D-Electric, assuming no mitigation. Vibration impacts to 218 residential properties are also predicted.

8.3.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

It is anticipated that there would be 558 moderate and 52 severe noise impacts caused by the changes in rail operations associated with Alternative E, assuming no mitigation. It is projected that this alternative would have no vibration impacts.

8.3.6 Mitigation

One effective mitigation approach would be to establish quiet zones to eliminate train horn noise at all at-grade crossings near affected noise-sensitive areas. This measure would eliminate all noise impacts for Alternative B and to reduce the number of noise impacts by 60 to 90 percent for Alternatives C, D, and E. To mitigate the residual noise impacts, a combination of noise barriers and building sound insulation could be considered. The noise analysis will be refined during project design to determine the details of the final mitigation measures for the preferred alternative that is ultimately selected.

Vibration impacts that exceed FTA criteria are considered to be significant and to warrant mitigation, if reasonable and feasible. A detailed vibration analysis would need to be carried out during project design to refine the impact projections for the preferred alternative that is ultimately selected. Depending on identified needs for vibration mitigation, potential approaches include: ballast mats: tire derived aggregate (TDA), floating slabs, special track work, and/or property acquisitions or easements.

8.4 Air Quality

The following is a summary of potential air quality impacts as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 3: Air Quality* (April 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website. The below results include station improvements (with their associated traffic changes) included with each of the build alternatives (Alternatives C, D, and E).

8.4.1 Alternative A: No Build

Alternative A would not directly or indirectly impact local or regional air quality as no new construction would take place.

8.4.2 Alternative B: Transportation System Management

Alternative B, with diesel-powered buses would likely have little effect on reducing regional mobile source air toxics (MSAT) emissions. It has the potential to result in a neutral, slightly positive or slightly negative effect on emissions.

8.4.3 Alternative C: South Norwalk to Danbury Improvements

Alternative C is expected to result in the greatest reductions in MSAT emissions of the three build alternatives, since it would replace existing diesel service by electric trains and increase the frequency of rail service which would remove vehicles from the region's highways.

8.4.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

The electric version of Alternative D is anticipated to have a slight positive effect (decrease in regional emissions) due to the anticipated mode shift and resultant decrease in roadway vehicle miles traveled (VMTs). The diesel version of Alternative D is expected to introduce a new source of diesel fuel-related MSAT emissions and would likely result in higher levels of MSAT emissions in certain local areas.

8.4.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

Alternative E is expected to be the next most effective alternative (after Alternative C) in reducing emissions by replacing existing diesel service with electric trains and increasing the frequency of rail service, which would remove vehicles from the region's highways. However, it would be less effective because these improvements would only occur over approximately one-third the distance as they would occur under Alternative C.

8.4.6 Mitigation

It is not anticipated that any short-term or long-term adverse air quality impacts will occur as a result of this project. Therefore, no specific air quality mitigation measures are proposed.

8.5 Energy

The following is a summary of potential energy impacts as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 4: Noise and Vibration* (February 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Existing energy usage associated with Danbury Branch operations primarily includes diesel fuel to power trains and electricity to operate stations (lighting, heating, cooling, etc.). Future energy usage may include diesel fuel and/or electricity to power trains and/or buses as well as electrical usage for passenger stations. Overall, the analysis of energy consumption demonstrates that electrification is a less energy-consumptive choice compared to diesel locomotives.

8.5.1 Alternative A: No Build

Alternative A represents a baseline of energy usage against which the other alternatives can be prepared. The estimated energy consumed by vehicles under Alternative A would be 46.2 billion BTUs per year. The energy consumed by the existing Danbury Branch railroad stations would be approximately 81.9 million BTUs per year.

8.5.2 Alternative B: Transportation System Management

The estimated energy consumed by vehicles under Alternative B would be 58.6 billion BTUs per year. This represents a 30% increase over Alternative A. Because Alternative B does not include station improvements, the energy consumed by stations would remain 81.9 million BTUs per year.

8.5.3 Alternative C: South Norwalk to Danbury Improvements

The estimated energy consumed by vehicles under Alternative C would be 26.8 billion BTUs per year. This represents a 42% decrease over Alternative A. Due to improvements, the energy consumed by stations would be 92.1 million BTUs per year, which is 12% more than would be used for Alternative A.

8.5.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

The estimated energy consumed by vehicles under Alternative D-Diesel would be 101.2 billion BTUs per year. This represents a 119% increase over Alternative A. The estimated energy consumed by vehicles under Alternative D-Electric would be 60.4 billion BTUs per year. This represents a 31% increase over Alternative A.

Both versions of Alternative D would create two new rail stations. These stations would consume 20.5 million BTUs per year, which would increase station energy consumption across the Branch by 25%.

8.5.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

The estimated energy consumed by vehicles under Alternative C would be 47.5 billion BTUs per year. This represents a 3% decrease over Alternative A. Due to improvements, the energy consumed by stations would be 83.9 million BTUs per year, which is 2% more than would be used for Alternative A.

8.6 Biological Diversity

The following is a summary of potential impacts to biological diversity as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 5: Biological Diversity* (January 2012) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Biological diversity (biodiversity) – or the number of different life forms – stems from the availability of life-supporting resources which allow plants and animals to live, reproduce, and proliferate. Life-supporting resources occur within areas defined as habitat. Project impacts on biological diversity were evaluated based on impacts to the key habitats in the Danbury Branch corridor. A relative rating scheme was developed for the qualitative assessment of biodiversity impacts. Potential impacts from the improvements within ecologically sensitive habitats were rated Low, Moderate, or High:

- **Low**: the anticipated impacts on habitat are very small and are not estimated to effectively (or functionally) diminish the availability of ecologically sensitive habitat.

- **Moderate**: the effects on habitat would likely diminish the availability of ecologically sensitive habitat for one or more species.

- **High**: the effects on habitat would almost certainly diminish the availability of ecologically sensitive habitat for one or more species.

Overall, Alternatives A and B would have no impacts. Alternatives C and D would both cause direct loss of key habitats which provide for biodiversity as well as indirect cumulative effects on biodiversity. Alternative E has a much smaller potential for impacts to biodiversity, with less potential for indirect cumulative effects.

8.6.1 Alternative A: No Build

This alternative would not directly or indirectly impact biological diversity as no new construction would take place.

8.6.2 Alternative B: Transportation System Management

This alternative would not directly or indirectly impact biological diversity as no new construction would take place.

8.6.3 Alternative C: South Norwalk to Danbury Improvements

Some of the included improvements relating to existing stations, bridges, the traction power system, and track reconfigurations have the potential to have low to moderate impacts on biodiversity. Four track reconfiguration improvements, however, have the potential for high impacts. These high-impact track reconfiguration improvements would result in the direct loss of key habitats, including 0.76 acres of upland deciduous forest, 0.08 acres of open water, 0.3 acres of shrub inland wetlands, and approximately five acres of deciduous forest, including 0.25 acres of forested wetlands.

8.6.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Some of the included improvements relating to bridges and the traction power system have the potential to have low to moderate impacts on biodiversity. It is anticipated that the construction of two new rail stations, however, has the potential for high impacts. These high-impact station improvements would result in the direct loss of key habitats, including 1.2 acres of deciduous forest along river and approximately two acres of deciduous forest surrounded by development.

8.6.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

Some of the included improvements relating to bridges, the traction power system, and track reconfigurations have the potential to have low to moderate impacts on biodiversity.

8.6.6 Mitigation

Given the presence of undeveloped lands combined with previously disturbed areas in the study corridor, there appear to be ample opportunities for habitat mitigation in the study corridor. Potential mitigation measures include (but are not limited to) the following:

- Restoration or enhancement of habitat
- Restoration or enhancement of habitat connectivity in locations of at-risk populations
- Preservation of high quality existing habitats at risk of development
- Monitoring studies of wildlife or plant populations
- Additional measures (to be determined) as developed in coordination with DEEP relative to the protection of state-listed species

If preservation is pursued, priorities for the preservation strategy will include the acquisition and/or protection of land exhibiting one or more of the following characteristics:

- Contiguous with existing preserved areas
- Adjacent to areas with low potential for development
- Probability for sustained ecological and biological diversity value
- Connects two or more preserved areas
- Habitat blocks under imminent threat from development
- Contains important wetlands
- Contains habitat, or has the potential for creation of habitat, for any endangered species
- Combination of the above to promote the creation of an ecological preserve

8.7 Threatened and Endangered Species

The following is a summary of potential impacts to threatened and endangered (T&E) species as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 6: Threatened and Endangered Species* (December 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Impacts to T&E species were deemed possible if a planned improvement was located in an area noted as a concern by the Connecticut Department of Energy and Environmental Protection (DEEP) and if the improvement would alter habitats associated with the subject species. For each alternative, the potential for direct and indirect impacts to T&E species and their habitats can be attributed to the construction of the following major project elements: new or improved (existing) passenger stations; rail reconstruction; structures and bridges; traction power systems (electrification); track reconfigurations, sidings, and connections; and maintenance yards.

8.7.1 Alternative A: No Build

Impacts to T&E species are not expected from Alternative A, as no new construction would take place as part of this alternative.

8.7.2 Alternative B: Transportation System Management

Impacts to T&E species are not expected from Alternative B, as no new construction would take place as part of this alternative.

8.7.3 Alternative C: South Norwalk to Danbury Improvements

Overall, Alternative C has the potential to impact two threatened species, one endangered species, and eight species of special concern. Some of these species could be impacted by more than one improvement type.

Some of the included improvements relating to bridges under Alternative C have the potential to impact one threatened species, one endangered species, and one species of special concern. Some of the included improvements relating to track reconfigurations have the potential to impact two threatened species, one endangered species, and eight species of special concern.

8.7.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Overall, Alternative D has the potential to impact two threatened species, one endangered species, and five species of special concern. Some of these species could be impacted by more than one improvement type.

The construction of a new rail station in Brookfield under Alternative D has the potential to impact one threatened species and four species of special concern. Some of the included improvements relating to bridges have the potential to impact two threatened species. Some of

the included improvements relating to the traction power system have the potential to impact two threatened species and one endangered species. Some of the included improvements relating to track reconfigurations have the potential to impact two threatened species and one species of special concern.

8.7.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

The only potential impacts to T&E species under Alternative E relate to the installation of catenary. While the potential impacts to T&E species habitat from the catenary installation are anticipated to be negligible because catenary would be placed either within railroad ballast or disturbed urban lands at the edge of existing rail right-of-way, further coordination with DEEP would need to be conducted during the layout of pole locations in order to avoid and/or minimize impacts.

8.7.6 Mitigation

Where impacts cannot be avoided, mitigation for T&E species impacts may be required. Mitigation may be formulated as a condition for obtaining environmental permits from DEEP for project impacts to wetlands and watercourses and/or floodplains, or may be determined through separate approval processes with DEEP and the Connecticut Office of Policy and Management (OPM). Mitigation may be fulfilled simultaneously with wetland mitigation (if required) or may consist of additional stand-alone measures. Given the presence of undeveloped lands of many types, as well as the occurrence of previously disturbed areas in the study corridor, there appear to be ample opportunities for T&E species habitat mitigation in the study corridor. Potential mitigation measures include (but are not limited to) the following:

- Monitoring of wildlife or plant populations
- Restoration or enhancement of habitat
- Restoration or enhancement of habitat connectivity
- Preservation of high quality existing habitats at risk of development

8.8 Wetlands

The following is a summary of potential impacts to wetlands as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 7: Wetlands* (October 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Direct permanent impacts to wetlands could result from excavation and/or placement of structures and fill material within wetlands. Direct temporary impacts beyond the permanent impact zones could result from vegetation clearing, construction vehicle access, temporary water handling, material laydown areas, and equipment staging areas. Indirect impacts were assessed by considering the potential for off-site or delayed effects such as increases in water temperature and turbidity as a result of construction-related soil erosion and sedimentation of wetlands.

8.8.1 Alternative A: No Build

Impacts to wetlands are not expected from Alternative A, as no new construction would take place as part of this alternative.

8.8.2 Alternative B: Transportation System Management

Impacts to wetlands are not expected from Alternative B, as no new construction would take place as part of this alternative.

8.8.3 Alternative C: South Norwalk to Danbury Improvements

Potential permanent impacts from Alternative C would include 0.9 acres of state and federal palustrine forested (PFO) and palustrine scrub-shrub (PSS) wetlands, 0.04 acres of state-only forested wetlands, and 0.06 ac of linear trackside wetlands, for a total of approximately 1.0 acres. Additional potential temporary impacts during the construction period could amount to 0.3 acres within state and federal PFO wetlands, state-only forested wetlands, and linear trackside wetlands.

In terms of wetland functions and values, the sediment/toxicant retention and transformation, wildlife habitat, and floodflow alteration functions of the directly impacted wetlands has the potential to be affected by Alternative C. Visual/aesthetic values as well as fish/shellfish habitat, shoreline stabilization, and groundwater recharge/discharge functions could be affected to a lesser degree.

8.8.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Just over 0.05 acres of potential permanent wetland impacts are associated with Alternative D. These are comprised of 0.03 acres of state and federal wetlands, 0.006 acres of state-only wetlands, and 0.015 acres of linear trackside wetlands. Additional temporary impacts could amount to 5,640 SF (0.1 ac) of state and federal PFO and state-only forested wetlands.

In terms of wetland functions and values, the sediment/toxicant retention and transformation, wildlife habitat, and floodflow alteration functions of directly impacted wetlands could be affected by Alternative D. There is also potential for endangered species habitat within two impacted wetlands. Those impacted wetlands with potential endangered species habitat include a forested wetland in New Milford (0.023 acres of impact associated with raising the Erickson Road Bridge) and a trackside ditch at the Brookfield Station that would be impacted by the construction of a rail siding.

8.8.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

A total of just over 0.02 acres of potential permanent wetland impacts, all from track reconfigurations, are associated with Alternative E. Impacts would include 0.02 acres of state-only forested wetlands and 0.003 acres of linear trackside wetlands.

In terms of wetland functions and values, the sediment/toxicant retention and transformation, wildlife habitat, floodflow alteration, fish and shellfish habitat, groundwater recharge/discharge, and sediment/shoreline stabilization functions of the directly impacted wetlands would be affected by Alternative E. There are additional potential temporary impacts of approximately 5,000 SF (0.1 ac) within the state wetlands.

8.8.6 Mitigation

A comprehensive mitigation program would be necessary to mitigate for loss and impairment of wetlands. The program would take into account the permanent and temporary impacts, as well as direct acreage and functional impacts. The mitigation program would be tailored to compensate for the specific types of wetlands affected and the specific functions and values affected and would adhere to the U.S Army Corps of Engineers (USACE) mitigation guidelines. Acceptable forms of mitigation include wetland creation, restoration, enhancement, and preservation.

8.9 Floodplains and Floodways

The following is a summary of potential impacts to floodplains, floodways, and Stream Channel Encroachment Lines (SCELs) as a result of each of the potential alternatives being considered for the Danbury Branch corridor. More detailed information can be found in Section 8: Floodplains and Floodways (October 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

To assess project impacts, improvement concept plans were overlaid with the mapping to estimate direct impacts for construction activities located within the boundaries of 100-year floodplains and floodways. Direct permanent impacts could result from excavation and/or placement of structures and fill within these resources and alteration of land/soil conditions or stream channels. Temporary impacts during the construction period could result from vegetation clearing, construction vehicle access roads, and preparation of material laydown areas and equipment staging areas. Indirect impacts, which are off-site or delayed effects, could include hydrologic changes in water flows or patterns which cause flooding effects or scour of channels.

8.9.1 Alternative A: No Build

Alternative A would not directly or indirectly impact floodplains, floodways, or SCELs, as no new construction would take place as part of this alternative.

8.9.2 Alternative B: Transportation System Management

Alternative B would not directly or indirectly impact floodplains, floodways, or SCELs, as no new construction would take place as part of this alternative.

8.9.3 Alternative C: South Norwalk to Danbury Improvements

Potential direct permanent impacts associated with Alternative C are estimated to affect approximately 1.8 acres of 100-year floodplains and 2.2 acres of floodway. Based on conceptual design plans for the improvements included in Alternative C, the associated net fill volumes are estimated to be approximately 7,000 CY in the 100-year floodplain and 6,600 CY in floodways.

8.9.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Total potential permanent surface area impacts from Alternative D improvements are 0.15 acres of 100-year floodplains and 0.01 acres of floodway. Fill volume impacts are estimated to be approximately 650 CY in floodplains and less than one CY in floodways.

8.9.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

Total potential surface area impacts from Alternative E improvements are estimated to be approximately 0.5 acres of 100-year floodplains with 830 CY of associated fill and approximately 0.08 acres of floodway with 350 CY of associated fill.

8.9.6 Mitigation

Application for Flood Management Certification from the Connecticut DEEP would be required for any of the planned work in the floodway or 100-year floodplains. Work affecting SCELs would additionally require a SCEL permit from DEEP. During the permitting process, mitigation requirements would be determined based on the results of detailed hydrologic and/or hydraulic studies.

If adverse effects cannot be avoided through layout, design and/or construction methodology modifications, mitigation options would be evaluated. Mitigation measures for adverse effects would likely include creating compensatory flood storage and preparing (FEMA) map revisions. If for some reason mitigation is not feasible at a given location, an exemption may be sought. The public would be afforded the opportunity to comment on the proposed exemption during the permit application process.

8.10 Surface and Groundwater Resources

The following is a summary of potential impacts to surface and groundwater resources as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 14: Surface and Groundwater Resources* (February 2012) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Direct permanent impacts to surface and groundwater resources were considered possible from activities such as: excavation and/or placement of structures and fill material within water resources; spillage or leakage of contaminants into water resources; and alteration of land/soil conditions and stream channels. Direct temporary impacts beyond the permanent impact zones

could result from vegetation clearing, construction vehicle access, temporary water handling, material laydown areas, and equipment staging areas. Indirect impacts, which are off-site or delayed effects, may include things like: increased water temperature and turbidity as a result of soil erosion and sedimentation of water bodies; hydrologic changes in water flows or patterns; and gradual intrusion of contaminants into ground water.

8.10.1 Alternative A: No Build

There would be no project-related changes to water quality under Alternative A since no improvements would be made to stations, tracks, or other rail infrastructure. Stormwater runoff from the existing rail corridor and station areas will continue to be collected and conveyed through existing drainage system features and discharged to receiving waters at current outfall locations.

8.10.2 Alternative B: Transportation System Management

Alternative B would have no effect on the quality of existing surface or groundwater resources within the study corridor as this alternative does not include improvements to stations, tracks, or other rail infrastructure. Stormwater runoff from existing stations and along the corridor will continue to be collected and conveyed through existing drainage system features and discharged to receiving waters at current outfall locations.

8.10.3 Alternative C: South Norwalk to Danbury Improvements

There is one potential permanent direct impact to water resources as a result of Alternative C. This impact of approximately 3,500 square feet would result from the filling of Umpawaug Pond for a track reconfiguration in Redding. In addition, potential temporary and indirect impacts to surface water quality from project construction would be associated with upgrades to existing passenger stations, installation of the traction power system (electrification), and bridge improvements. Impacts as a result of these improvements, however, are expected to be minimal and will be greatly reduced with the proper implementation and maintenance of erosion and sedimentation (E&S) controls, construction phasing, and effective site stabilization measures. Overall, the planned improvements under this alternative are not expected to directly or indirectly affect groundwater resources.

8.10.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

There is one potential permanent direct impact to water resources as a result of Alternative D. This impact of approximately 300 square feet would result from installing a pier in the Still River for a bridge replacement in Danbury. Potential temporary and indirect impacts to water quality from project construction would be associated with construction of new passenger stations, installation of the traction power system (electrification), bridge improvements, and rail yard improvements. Impacts as a result of these improvements, however, are expected to be minimal and will be greatly reduced with the proper implementation and maintenance of E&S controls, construction phasing, and effective site stabilization measures. The planned improvements under this alternative are not expected to directly or indirectly affect groundwater resources.

8.10.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

There are no potential permanent direct impacts to water resources as a result of Alternative E. Potential temporary and indirect impacts to water quality from project construction would be associated with upgrades to existing passenger stations, installation of the traction power system (electrification), and bridge improvements. Impacts as a result of these improvements, however, are expected to be minimal and will be greatly reduced with the proper implementation and maintenance of E&S controls, construction phasing, and effective site stabilization measures. Overall, the planned improvements under this alternative are not expected to directly or indirectly affect groundwater resources.

8.10.6 Mitigation

Best Management Practices (BMPs) for groundwater and surface water protection will be applied to all construction activities associated with the recommended projects within the Danbury Branch Improvement Program. For instance, practices to prevent and minimize sedimentation, siltation, and/or other pollution during construction will be implemented in accordance with the DEP's *2002 Connecticut Guidelines for Soil Erosion and Sediment Control*. Use of flotation dams at the perimeter of in-water work areas and other appropriate water handling measures will be implemented to minimize turbidity and other temporary water quality impacts during construction. Stormwater management designs at stations will adhere to the Connecticut Department of Energy and Environmental Protection (DEEP or CTDEEP) *Connecticut Stormwater Quality Manual* (2004) and will apply to the construction period (temporary) as well as to finished construction (permanent).

Any improvements with work in water (river, stream, lake, or pond) would require (at minimum) an Inland Wetlands and Watercourses Permit from the CTDEEP. Depending on the location and size of the construction site and fill area, projects with work in water may also require a Section 404 permit from the U.S. Army Corps of Engineers (USACE) and a Section 401 Water Quality Certificate from the CTDEEP.

Mitigation for adverse impacts due to increased impervious surfaces would primarily take the form of stormwater management improvements. According to federal statutes, any improvements to existing transportation facilities require improvements to the drainage systems of these facilities. The types of drainage improvements will vary, depending on the size of the facility expansion or upgrade, the quality of the receiving water, and other factors. Primary stormwater treatment measures will be provided wherever possible. Potential drainage improvements could include, but not be limited to: new or additional deep-sump catch basins; vegetated water quality swales or ditches; stormwater detention or retention basin; improved erosion control measures at discharge points; and buffer strips or infiltration strips. Innovative low-impact development (LID) measures such as pervious pavements, rain gardens, and other measures will also be considered for implementation on a site-by-site basis as the design of the project advances. Stormwater management design will be consistent with the CTDOT Drainage Manual and the 2004 *Connecticut Stormwater Quality Manual*.

For the improvements within mapped aquifer protection areas (APAs), or within several hundred feet of groundwater wells with no mapped APA, coordination with water companies will be conducted to address concerns. For improvements within an APA, review of the proposed construction by the CTDEEP Aquifer Protection Area Program would be required, and there may be a need to coordinate with the Department of Public Health (DPH).

For construction of any individual or collective improvements that will disturb more than one acre of land and those involving dewatering, submission of a General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities (Stormwater General Permit for Construction Activities) to CTDEEP will be required. A Stormwater Pollution Prevention Plan (SWPPP) will be implemented on the active construction sites at all times. If cumulative ground disturbance will be a total of 10 acres or greater, the SWPPP will need to be submitted to CTDEEP for review and approval.

8.11 Historic and Archaeological Resources

The following is a summary of potential impacts to historic and archaeological resources as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 9/10: Historic and Archaeological Resources* (October 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Historic resources include features such as buildings, structures, properties, objects, and districts. The historic resources examined in this section are those eligible or potentially eligible for listing on the National Register of Historic Places (National Register or NR), based on the standards established by the National Historic Preservation Act (NHPA) of 1966. Archaeological resources as defined by the U.S. Department of Interior are material remains of human life or activities which are at least 100 years old and which may provide understandings of past human behavior and cultural adaptations and related topics. Archaeological resources are categorized as prehistoric (prior to European contact) and historic (post-European contact), and may also be listed on the National Register.

The NHPA requires that the geographic area be identified within which a project may cause changes in the character or use of historic resources. This area is known as the Area of Potential Effect (APE). The APE for the Danbury Branch Improvement Program alternatives was determined to coincide with the limits of the study corridor, which extends 500 feet from the rail center line on both sides of the existing track. The APE for station sites was variable for each station to include all areas from which such construction activities would be visible.

Each study alternative was assessed to determine whether its associated improvements could potentially cause visual, physical, or historic contextual impacts to historic properties. Visual impacts were considered possible in instances where an improvement's physical infrastructure or landform changes would be visible from historic resources and these changes were inconsistent with the historic character and/or setting of the historic resource. Physical impacts were considered possible when the construction of improvements would result in the removal, deterioration, or alteration of a historic resource. Contextual impacts were considered to be

possible when an improvement being considered would enhance or detract from a historic property's connection with its historic context.

The compatibility of increasing train service along the rail corridor and at the historic train stations (Branchville, Cannondale, Bethel, Danbury, and Brookfield) was evaluated. Increasing the train service was assessed to be consistent with the context of the rail line and the stations since historically passenger train service along the Danbury Branch corridor was considerably more intense than the current level of service. Thus, the increased service levels planned under Alternatives B, C, D, and E were assessed as having no effect on historic resources.

8.11.1 Alternative A: No Build

Alternative A does not include any improvements of track or adjacent properties or changes to rail service. Therefore, this alternative would result in no visual, physical, or contextual impacts to historic resources. No prehistoric or historic archeological resources would be affected.

8.11.2 Alternative B: Transportation System Management

Historically, passenger train service along the Danbury Branch corridor was considerably more intense than the current level of service. Increasing the train service at historic stations as suggested under Alternative B is consistent with the stations' historic context and could potentially result in increased visibility and public awareness of these historic resources. No adverse effects on other historic resources are anticipated. As such, Alternative B would likely have a positive contextual impact and no visual or physical impacts on historic resources. No prehistoric or historic archeological resources would be affected.

8.11.3 Alternative C: South Norwalk to Danbury Improvements

8.11.3.1 Historic Resource Impacts

There is a potential for adverse impacts to historic resources as a result of Alternative C improvements. A combination of potential visual, physical, and contextual effects is anticipated as a result of two sets of station improvements, one track reconfiguration, catenary structures, one substation, one bridge improvement, and one set of rail yard improvements.

While they may result in visual impacts, catenary structures were assessed as having little risk of causing physical impacts to historic resources along the corridor. However, as these facilities enter the design phase, their locations should be compared against detailed railway system plans to ensure that NR-eligible rail features are not impacted.

8.11.3.2 Archaeological Resource Impacts

Physical impacts to both prehistoric and historic archaeological resources may occur as a result of excavations for activities planned under Alternative C. Potentially harmful improvements include three sets of station improvements, one substation, 19 track reconfigurations, 12 bridge replacements, and one set of rail yard improvements.

8.11.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

8.11.4.1 Historic Resource Impacts

There is a potential for adverse impacts to historic resources as a result of Alternative D improvements. A combination of potential visual, physical, and contextual effects is anticipated as a result of two sets of station improvements (including demolitions) and catenary structures. The installation of catenary poles along this portion of the line would require the raising of seven roadway bridges. Photographic review of these bridges reveals no evidence that these bridges have historic significance. However, additional analysis of individual structures would be needed to confirm this preliminary evaluation.

8.11.4.2 Archaeological Resource Impacts

Physical impacts to both prehistoric and historic archaeological resources may occur as a result of excavations for activities planned under Alternative D. Potentially harmful improvements include two sets of station improvements, two substations, four bridge improvements, three track reconfigurations, six bridge replacements, and one set of rail yard improvements.

8.11.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

8.11.5.1 Historic Resource Impacts

There is a potential for adverse impacts to historic resources as a result of Alternative E improvements. A combination of potential visual, physical, and contextual effects is anticipated as a result of one track reconfiguration and the construction of one new bridge.

Catenary structures were assessed as having little risk of causing physical impacts to historic resources along the corridor. However, as these facilities enter the design phase, their locations should be compared against detailed railway system plans to ensure that NR-eligible rail features are not impacted.

8.11.5.2 Archaeological Resource Impacts

Physical impacts to both prehistoric and historic archaeological resources may occur as a result of excavations for activities planned under Alternative E. Potentially harmful improvements include five track reconfigurations and three bridge replacements.

8.11.6 Mitigation

As design plans are further developed for the various elements of the Danbury Branch Improvement Program that have been assessed to affect or potentially affect historic and archaeological resources, efforts will be made to avoid and minimize impacts to the extent possible. Plans will be further evaluated relative to their effects on cultural resources, in coordination with the Connecticut State Historic Preservation Office (SHPO). Where project improvements may disrupt areas with prehistoric and/or historic archaeological resources, further

archaeological surveys may be necessary to identify the presence and significance of archaeological resources, to be determined in coordination with the SHPO. Where historic property takings are required, in addition to triggering Section 106 consultation, they would constitute potential Section 4(f) impacts.

If adverse effects on historic (including archaeological) properties are confirmed, additional review by agencies, consulting parties, and the public will be conducted. Potential impacts and the project's attempts to avoid them, as well as the historic importance of the affected resources, will be compiled into Section 106 documentation. Adversely affected historic and archaeological resources may also qualify as Section 4(f) resources, so Section 4(f) evaluations and documentation may be required. Both the Section 106 and Section 4(f) processes will lead to the development of mitigation measures.

Agency consultations will ensue to outline appropriate mitigation measures for the individual and cumulative loss of historic resources. The goal of consultations is a Memorandum of Agreement (MOA) to be formulated and agreed upon by FTA, CTDOT, the Connecticut State Historic Preservation Office (SHPO), and other participating agencies. The MOA documents the mitigation measures to be implemented by the recommended project to minimize the project's overall impacts on historic and archaeological resources. The types of mitigation measures that may be expected include the following:

- Historic documentation of affected resources and/or historic themes represented by them.
- Publication of an article about a property and its surrounding historic resources.
- Compilation of archival images or documentation about the property.
- Consideration of historic context in the design of newly constructed elements.
- Salvage and/or relocation of historic elements that would be damaged or removed.
- Preservation of historic railroad equipment removed by the project.
- Archaeological investigation of impacted areas bearing prehistoric or historic sensitivity.

8.12 Prime Farmland and Active Farmland

The following is a summary of potential impacts to farmland resources as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 11: Prime Farmland and Active Farmland* (April 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Direct impacts to prime and/or active farmland were considered to potentially occur where project activities are anticipated to be located within the boundaries of prime or active farmland. Results provide an understanding of possible scale-of-magnitude impacts and point to locations of particular potential concern. Site-specific plans, surveys and mapping have not been produced for potential improvements at this planning stage. More defined impacts at any one site can be determined during the project design stage.

8.12.1 Alternative A: No Build

Alternative A would not impact farmland resources as no new construction would take place as part of this alternative.

8.12.2 Alternative B: Transportation System Management

Alternative B would not impact farmland resources as no new construction would take place as part of this alternative.

8.12.3 Alternative C: South Norwalk to Danbury Improvements

There is no identified active farmland in the Alternative C section of the study corridor, so there would be no impacts to this resource. Total potential surface area impacts of prime farmlands are estimated at 0.3 acres. These estimates include permanent impacts plus temporary construction-period impacts related to track reconfiguration in Wilton.

8.12.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Although there is prime and active farmland adjacent to the railroad tracks in the Alternative D section of the study corridor, none are potentially impacted because planned work in those areas is limited to the existing railroad right-of-way.

8.12.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

Although there is prime and active farmland adjacent to the railroad tracks in the Alternative E section of the study corridor, none are potentially impacted because planned work in those areas is limited to the existing railroad right-of-way.

8.13 Land Use

The following is a summary of potential impacts to land use as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 12: Land Use* (December 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Impacts on Land Use were evaluated by comparing the locations of improvement concepts associated with each of the Build Alternatives with the existing land use conditions. Due to a lack of GIS data, however, the quantitative analysis has limitations. It is assumed that impacts to land use will only occur where the taking of land is necessary for an improvement concept. Areas where takings may occur were tentatively identified on the land use map and the Locational Guide Map for each community.

8.13.1 Alternative A: No Build

Alternative A would not impact Land Use as no new construction would take place as part of this alternative.

8.13.2 Alternative B: Transportation System Management

Alternative B would not impact Land Use as no new construction would take place as part of this alternative.

8.13.3 Alternative C: South Norwalk to Danbury Improvements

Improvements under Alternative C would require the taking of 13.76 acres of land across Danbury (1.92), Norwalk (5.9 acres), Redding (3.06 acres), Ridgefield (1.68 acres), and Wilton (1.21 acres). Existing land uses impacted by these potential takings include Centennial Watershed State Forest, commercial/primarily commercial, dedicated open space, high density, institutional, regional center, residential, and vacant. According to the Location Guide Maps for the affected municipalities, this land falls under the categories of aquifer protection area, conservation area, existing preserved open space, neighborhood conservation area, preservation area, regional center, and rural lands.

8.13.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Improvements under Alternative D would require the taking of 12.74 acres of land across Brookfield (2.14 acres), and New Milford (10.6 acres). Existing land uses impacted by these potential takings include commercial, industrial, mixed use, public utility/railroad, and residential. According to the Location Guide Maps for the affected municipalities, this land falls under the categories of aquifer protection area, conservation area, growth area, neighborhood conservation area, and rural lands.

8.13.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

Improvements under Alternative E would require the taking of 5.32 acres of land in Norwalk. Existing land uses impacted by these potential takings include primarily commercial, primarily industrial, and regional center. According to the Location Guide Map for Norwalk, this land falls under the categories of aquifer protection area, neighborhood conservation area, preservation area, and regional center.

8.14 Hazardous Contamination

The following is a summary of the likelihood of the presence and potential impact associated with hazardous and/or contaminated material within or proximate to the rail corridor's anticipated areas of possible construction. More detailed information can be found in *Section 13: Hazardous Contamination* (January 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Most (97.4%) locations where hazardous/contaminated material has been identified were rated as low or moderate risk. Approximately one-half (50.6%) of these were categorized as low risk, The location and specific types of activities present or release that has occurred at these sites would not likely affect material within the rail corridor or be affected by construction activities. A substantial number of these hazardous/contaminated locations (46.8%) were categorized as moderate risk, primarily due to their proximity to the rail corridor. A high risk rating was assigned to those few hazardous/contaminated locations (2.6%) proximate to or within the rail corridor, some with documented releases that could likely impact or be affected by the rail corridor activities.

8.14.1 Alternative A: No Build

Alternative A does not include any construction and would have no impacts relating to hazardous/contaminated sites.

8.14.2 Alternative B: Transportation System Management

Alternative B does not include any construction and would have no impacts relating to hazardous/contaminated sites.

8.14.3 Alternative C: South Norwalk to Danbury Improvements

For Alternative C, 143 low risk sites, 23 moderate risk sites, and 10 high risk sites were identified.

8.14.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

For Alternative D, 42 low risk sites, 10 moderate risk sites, and one high risk site were identified.

8.14.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

For Alternative E, 96 low risk sites, four moderate risk sites, and eight high risk sites were identified.

8.14.6 Mitigation

Performance of a CTDOT Task 210: Subsurface Site Investigation Report (Task 210) of the rail corridor proposed construction area for the selected project is recommended before construction of this project begins. The purpose of the Task 210 would be to ascertain the presence of contamination through the collection and review of soil data (and other data as applicable) from within the proposed rail corridor.

Controlled material (media impacted with concentrations of regulated substances) encountered within proposed construction areas may require remediation and/or special handling. Abatement and disposal plans will be developed as construction progresses and needs are more clearly identified. Excavated or removed controlled material will be managed in accordance with State

and Federal regulations and established protocols. Furthermore, if impacted material is, there may be a requirement to address worker health and safety in accordance with Occupational Safety and Health Administration (OSHA) requirements, as presented in 29 CFR 1910.120.

8.15 Public Recreational/4(f)/6(f) Lands

The following is a summary of potential impacts to recreational lands as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 15: Public Recreational/4(f)/6(f) Lands* (May 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Impacts on Public Recreational Lands were evaluated by comparing the locations of improvement concept plans for each alternative. Improvement concept plans were visually compared with the resource mapping to derive quantitative estimates of direct impacts. Direct impacts were considered to potentially occur where project activities are anticipated to be located within the boundaries of present 4(f) or 6(f) designated lands. The results of this assessment provide an understanding of possible scale-of-magnitude impacts and point to locations of particular potential concern.

8.15.1 Alternative A: No Build

Alternative A would not impact public recreational lands as no new construction would take place as part of this alternative.

8.15.2 Alternative B: Transportation System Management

Alternative B would not impact public recreational lands as no new construction would take place as part of this alternative.

8.15.3 Alternative C: South Norwalk to Danbury Improvements

One track reconfiguration improvement associated with Alternative C would potentially eliminate 0.7 acres of public recreational land at Madison Street Park in Norwalk. There are additional public recreational lands adjacent to the railroad right-of-way in this alternative, but none are potentially impacted.

8.15.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Although there are potential 4(f) lands adjacent to the railroad right-of-way in the Alternative D section of the study corridor, none are potentially impacted.

8.15.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

One track reconfiguration improvement associated with Alternative E would potentially eliminate 0.7 acres of public recreational land at Madison Street Park in Norwalk. There are

additional public recreational lands adjacent to the railroad right-of-way in this alternative, but none are potentially impacted.

8.15.6 Mitigation

In accordance with Section 4(f) of the 1966 Federal Aid and Highway Act, special efforts must be made to protect any public park, recreation area, or wildlife/waterfowl refuge from any disturbance or adverse impact as the result of a Department of Transportation project. Furthermore, approval for use of said properties is contingent on a determination that there are no possible alternatives to using the land for the project and that all possible planning has been undertaken to minimize any detrimental effect to the land as the result of the project. Section 4(f) sites are considered "potential" until they are impacted and confirmed to be eligible by the lead federal agency.

At this stage of the project, it appears that there is no other viable alignment for the track reconfiguration involved in the taking of land associated with Madison Street Park. Mitigation for this loss of could be the creation of a new park on excess acquired land about 0.3 miles to the east of its current location. As the project and plans progress, alternatives may be further considered.

8.16 Socioeconomics and Environmental Justice

The following is a summary of potential impacts relating to socioeconomics and environmental justice (EJ) as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 16: Socioeconomics and Environmental Justice* (February 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

The alternatives being evaluated for the Danbury Branch Improvement Program were assessed for socioeconomic and environmental justice effects considering the following four parameters: Community Cohesion, Environmental Justice, Economic Vitality, and Municipal Services and Finances. Impacts to these parameters were assessed qualitatively based on the modifications associated with each alternative. New and/or modified infrastructure and the effects of increased frequency of train service were considered.

8.16.1 Alternative A: No Build

8.16.1.1 Community Cohesion

No adverse impacts to existing community cohesion are anticipated. Some beneficial change from current conditions could be realized under the No-Build scenario as a result of other community initiatives. Each of the Danbury Branch communities is exploring transit-oriented development (TOD) opportunities, and if these TOD plans come to fruition, there is potential for neighborhood cohesion to improve in terms of vitality, access, and travel patterns.

8.16.1.2 Environmental Justice

Conditions for EJ populations would likely remain similar to present conditions under Alternative A, so no effects on EJ populations are anticipated.

8.16.1.3 Economic Vitality

Adverse economic effects may occur over time under Alternative A. Adverse effects of highway congestion include time lost to delay, greater fuel consumption, higher labor costs, difficulty recruiting employees, and increases in freight costs and the cost of consumer products. If Connecticut does not find ways to reduce the number of single-occupancy vehicles on the highways and improve opportunities for commuters to travel by other modes, business growth will be constrained.

8.16.1.4 Municipal Services and Finances

No adverse or beneficial effects to municipal services or finances are anticipated under no-build conditions.

8.16.2 Alternative B: Transportation System Management

8.16.2.1 Community Cohesion

Potential adverse effects from increased service under Alternative B may include increased noise. In addition, more frequent vehicular stops at at-grade crossings can aggravate a perception of trains being neighborhood barriers and disruptions. Beneficially, residents would have increased commuting options. This generally translates to increased economic stability due to a greater access to jobs. When residents are economically stable, neighborhood conditions tend to remain more stable as well.

8.16.2.2 Environmental Justice

The increase in frequency of service under Alternative B can be expected to increase noise in the vicinity of the South Norwalk neighborhood, in particular in the area of low-income/subsidized housing north of the South Norwalk rail station. A beneficial impact would result from the enhanced transportation options for travel and commuting. This could benefit the economically disadvantaged living in close proximity to the stations.

8.16.2.3 Economic Vitality

Alternative B can be expected to have a beneficial effect on the local economies due to increased travel options. Potential for successful TOD could also be strengthened with added transit service via rail and bus.

8.16.2.4 Municipal Services and Finances

No direct adverse or beneficial effects to municipal services or finances are anticipated under Alternative B.

8.16.3 Alternative C: South Norwalk to Danbury Improvements

8.16.3.1 Community Cohesion

Potential adverse effects from increased service under Alternative C may include increased noise. In addition, more frequent vehicular stops at at-grade crossings can aggravate a perception of trains being neighborhood barriers and disruptions. Some adverse effects are also anticipated from the expansion of the existing surface parking and the relocation of existing businesses. Beneficially, residents would have increased commuting options. This generally translates to increased economic stability due to a greater access to jobs. When residents are economically stable, neighborhood conditions tend to remain more stable as well.

8.16.3.2 Environmental Justice

No substantive changes to the rail stations in Norwalk and Danbury, where EJ populations are located, are planned as part of Alternative C. Consequently, no impacts to EJ populations from station upgrades are anticipated.

8.16.3.3 Economic Vitality

Alternative C is expected to have an indirect beneficial effect on economic vitality in the vicinity of improved stations. At Merritt 7, the construction of a parking garage with pedestrian overpass and connections would bring more commuters to the largely retail surrounding neighborhood. The addition of parking in Cannondale, Branchville, and Redding would bring more commuters to the diverse and mostly small businesses and restaurants in these villages.

8.16.3.4 Municipal Services and Finances

The increase of passengers and vehicular traffic at the upgraded station sites would likely trigger the need for increased municipal services such as public safety and roadway maintenance on the more heavily used local roads near stations. The addition of parking at the Merritt 7 station may necessitate improvements to the local sidewalk system, which would have an indirect effect on municipal services in Norwalk. The added parking in Cannondale, Branchville, and Redding may also create an indirect demand for more infrastructure in these villages.

8.16.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

8.16.4.1 Community Cohesion

The extension of rail passenger service would introduce rail noise along the line where it does not occur today with horn and engine noise, and train braking occurring. This could adversely

affect the quality of life in the neighborhoods in proximity to the rail line, particularly in Brookfield Center and in Downtown New Milford. In addition, more frequent vehicular stops for trains at at-grade crossings could aggravate a perception of trains being neighborhood barriers and disruptions. Beneficially, access to rail service is expected to enhance access to Brookfield Center and Downtown New Milford and increase commuting for residents. This can increase the stability of the neighborhood residential areas, making them more cohesive.

8.16.4.2 Environmental Justice

Some minor adverse effects to the EJ populations in Danbury along with some beneficial effects are anticipated under Alternative D. An increase in frequency of service can be expected to increase noise in the vicinity of ethnic and lower income neighborhoods south and east of the rail station in Danbury. However, this alternative would also enhance travel options along the corridor for access to jobs for the economically disadvantaged.

8.16.4.3 Economic Vitality

Alternative D has the potential to have a beneficial effect on the local economies of Brookfield and New Milford due to increased human activity in the community cores, increased commute options, and enhanced access to businesses. Given the pedestrian and vehicular barriers in the close vicinity of the new station in Brookfield, however, economic synergy with the commercial area on Route 7 is not anticipated.

8.16.4.4 Municipal Services and Finances

Impacts to municipal services and finances are expected to be mixed. The increase of passengers and vehicular traffic at the new station sites would likely trigger the need for increased municipal services such as public safety and roadway maintenance on the more heavily used local roads near stations. This could be an adverse effect on municipal services/finances. Beneficially, however, the availability of commuter rail may indirectly strengthen the housing markets in Brookfield and New Milford as increased options for an easier and faster commute to work can make longer-distance commutes more feasible and in turn, make living in these more rural areas more feasible and attractive.

8.16.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

8.16.5.1 Community Cohesion

Potential adverse effects from increased service under Alternative E may include increased noise. In addition, more frequent vehicular stops at at-grade crossings can aggravate a perception of trains being neighborhood barriers and disruptions. Some adverse effects are also anticipated from the relocation of existing businesses. Beneficially, residents would have increased commuting options. This generally translates to increased economic stability due to a greater access to jobs. When residents are economically stable, neighborhood conditions tend to remain more stable as well.

8.16.5.2 Environmental Justice

No EJ populations are located in the vicinity of the Merritt 7 station, so no impacts to EJ populations are anticipated under Alternative E.

8.16.5.3 Economic Vitality

Alternative E is expected to have an indirect beneficial effect on economic vitality in the vicinity of Merritt 7. The construction of a parking garage with pedestrian overpass and connections would bring more commuters to the largely retail surrounding neighborhood.

8.16.5.4 Municipal Services and Finances

The increase of passengers and vehicular traffic at the upgraded station sites would likely trigger the need for increased municipal services such as public safety and roadway maintenance on the more heavily used local roads near stations. The addition of parking at the Merritt 7 station may necessitate improvements to the local sidewalk system, which would have an indirect effect on municipal services in Norwalk.

8.17 Scenic Roads

The following is a summary of potential impacts to scenic roads as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information can be found in *Section 17: Scenic Roads* (December 2010) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

In Connecticut, there are two categories of scenic roads: State Scenic Highways, which are determined for eligibility and managed by the CTDOT, and Local Scenic Roads, which are selected by municipalities and protected by municipal ordinances. Both of classifications of scenic roads are recognized for archeological, cultural, historic, natural, recreational, and/or scenic qualities. The State Scenic Highway within the study corridor is the Merritt Parkway (Route 15). There are two Town Scenic Roads in the study corridor: Seeley Road in Wilton and Marchant Road in Redding.

8.17.1 Alternative A: No Build

Alternative A would not impact scenic roads as no new construction would take place as part of this alternative.

8.17.2 Alternative B: Transportation System Management

Alternative B would not impact scenic roads as no new construction would take place as part of this alternative.

8.17.3 Alternative C: South Norwalk to Danbury Improvements

Under Alternative C, new galvanized steel catenary support poles would be approximately 200 feet apart and replace the poles that remain from the original electrification of the line. The old poles, which have deteriorated and become rusted over time, would be removed. These new poles could impact the visual elements along the Seely Road in Wilton and Marchant Road in Redding. Where the Merritt Parkway crosses over the railroad, the catenary poles would be below the viewing plane.

8.17.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

None of the improvements planned as a part of Alternative D are located within the vicinity of scenic roads, so this Alternative would not have any impact on scenic roads.

8.17.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

Under Alternative E, new galvanized steel catenary support poles would be approximately 200 feet apart and replace the poles that remain from the original electrification of the line. The old poles, which have deteriorated and become rusted over time, would be removed. These new poles could impact the visual elements along the Seely Road in Wilton and Marchant Road in Redding. Where the Merritt Parkway crosses over the railroad, the catenary poles would be below the viewing plane.

8.18 Visual Resources

The following is a summary of potential impacts to visual resources as a result of each of the alternatives being considered for the Danbury Branch corridor. More detailed information, including visual simulations of some proposed improvements, can be found in *Section 18: Visual Resources* (July 2011) of the Environmental Technical Memorandum: Impacts Analysis, which can be found on the study website.

Visual impacts are assessed by identifying the project-related changes in the visual landscape and the viewer responses to those changes. Where changes are assessed as unfavorable for viewers, adverse visual impacts are predicted. Where visual changes blend into the existing landscape or are located such that no viewers see them, no impacts would occur. Positive impacts are also possible, where changes may be looked upon favorably by viewers.

8.18.1 Alternative A: No Build

Alternative A would not result in changes to the visual setting of the study corridor. Therefore it would not cause direct or indirect visual impacts.

8.18.2 Alternative B: Transportation System Management

Alternative B would not result in changes to the visual setting of the study corridor. Therefore it would not cause direct or indirect visual impacts.

8.18.3 Alternative C: South Norwalk to Danbury Improvements

Moderate negative visual impacts could potentially occur as a result of improvements included with Alternative C. These potentially disruptive items include expanded parking lots and tree removal at stations; rehabilitation of historic bridges; construction of a new bridge; placement of a substation; installation of modern catenary equipment; and tree clearing along the track.

8.18.4 Alternative D: Extension from Danbury to New Milford (Diesel/Electric)

Moderate negative visual impacts could potentially occur as a result of improvements included with Alternative D. These potentially disruptive items include construction of platforms, expansion of parking lots, and tree removal at stations; installation of modern catenary equipment; and tree clearing along the track.

8.18.5 Alternative E: Improvements from South Norwalk to Merritt 7/Wilton

Moderate negative visual impacts could potentially occur as a result of improvements included with Alternative E. These potentially disruptive items include rehabilitation of historic bridges and the construction of a new bridge.

8.18.6 Mitigation

Mitigation for sites where physical changes could adversely affect the visual experience would be implemented during design and construction. The most effective mitigation measures include establishing ground cover and landscaping in such a way to soften or mask the views of new facilities from adjacent residences and other sensitive viewers and using building construction materials, colors, and architectural styles consistent with the impacted site's surroundings, to the extent possible.

Adverse visual impacts affecting the integrity of historic properties would be mitigated through consultation and coordination with the Connecticut State Historic Preservation Office (SHPO) and would comply with Section 106 of the National Historic Preservation Act.

8.19 Summary of Impacts

The alternatives are anticipated to have various levels of impact of transportation and environmental issues within the study corridor. Overall, Alternative A and Alternative B are projected to have relatively limited impacts across all categories, as shown in Table 33. The Build Alternatives – C, D, and E – however, are anticipated to result in a more significant number of impacts. Table 34 summarizes the impacts of these three alternatives as outlined in the previous sections of this chapter.

Table 33: Summary of Impacts – Alternatives A and B

ISSUE	ALTERNATIVE A: NO BUILD	ALTERNATIVE B: TRANSPORTATION SYSTEM MANAGEMENT
Traffic & Transportation		
Traffic	Negative Impact	Negative Impact
Passenger Rail	16% Ridership Increase Up to 4 New Trains Need for 508 Parking Spaces	29% Ridership Increase Up to 6 New Trains Need for 508 Parking Spaces
Freight Rail	No Impact	No Impact
Bus	No Impact	Danbury-New Milford Connector 2 New Shuttle Routes Enhanced Existing Shuttle Service
Bicycle & Pedestrian	Negative Impact	Negative Impact
Topography, Geology, & Soils	No Impact	No Impact
Noise and Vibration	No Impact	0 Noise Impacts 458 Vibration Impacts
Air Quality	No Impact	Minimal Impact
Energy	Vehicles: 46.2 million BTUs Stations: 81.9 million BTUs	Vehicles: 30% Increase Stations: 81.9 million BTUs
Biological Diversity	No Impact	No Impact
Threatened & Endangered Species	No Impact	No Impact
Wetlands	No Impact	No Impact
Floodplains & Floodways	No Impact	No Impact
Surface & Groundwater Resources	No Impact	No Impact
Historic & Archaeological Resources	No Impact	No/Neutral Impact
Prime Farmland & Active Farmland	No Impact	No Impact
Land Use	No Impact	No Impact
Hazardous Contamination	No Impact	No Impact
Public Recreational/4(f)/6(f) Lands	No Impact	No Impact
Socioeconomics & Environmental Justice	No/Neutral Impact	No/Neutral Impact
Scenic Roads	No Impact	No Impact
Visual Resources	No Impact	No Impact

Table 34: Summary of Impacts – Alternatives C, D, and E

Issue	Alternative C: South Norwalk to Danbury Improvements	Alternative D: Extension from Danbury to New Milford		Alternative E: Improvements from South Norwalk to Merritt 7/Wilton
		Diesel	Electric	
Traffic & Transportation				
Traffic	No Impact	No Impact		No Impact
Passenger Rail	46% Ridership Increase Up to 10 New Trains Up to 25min Time Savings Need for 1,007 Parking Spaces	19% Ridership Increase Up to 10 New Trains Need for 893 Parking Spaces	22% Ridership Increase Up to 10 New Trains Up to 25min Time Savings vs. Diesel Need for 1,194 Parking Spaces	33% Ridership Increase Potential for More Service S. of Wilton Up to 7min Time Savings Need for 734 Parking Spaces
Freight Rail	No Impact	No Impacts with Mitigation		No Impact
Bus	No Impact	No Impact		Enhanced shuttle service
Bicycle & Pedestrian	Positive Impact	Positive Impact		Positive Impact
Topography, Geology, & Soils	9 soil types Significant Rock	13 soil types Significant Rock		6 soil types Significant Rock
Noise and Vibration	108 Moderate Noise Impacts 34 Severe Noise Impacts 0 Vibration Impacts	731 Moderate Noise Impacts 147 Severe Noise Impacts 1,125 Vibration Impacts	223 Moderate Noise Impacts 60 Severe Noise Impacts 218 Vibration Impacts	108 Moderate Noise Impacts 34 Severe Noise Impacts 0 Vibration Impacts
Air Quality	Positive Impact	Negative Impact	Slight Positive Impact	Positive Impact
Energy	Vehicles: 42% Decrease Stations: 12% Increase	Vehicles: 119% Increase Stations: 25% Increase	Vehicles: 31% Increase Stations:25% Increase	Vehicles: 3% Decrease Stations: 2% Increase
Biological Diversity	Low & Moderate Impacts 6.14 Acres – High Impacts	Low & Moderate Impacts 3.2 Acres – High Impacts		Low & Moderate Impacts
Threatened & Endangered Species	2 Threatened Species 1 Endangered Species 8 Species of Special Concern	2 Threatened Species 1 Endangered Species 5 Species of Special Concern		No Impact
Wetlands	1 Acres – Permanent 0.3 Acres – Temporary	0.05 Acres – Permanent 0.1 Acres – Temporary		0.02 Acres – Permanent 0.1 Acres – Temporary
Floodplains & Floodways	1.8 acres – Floodplain 2.2 acres – Floodway	0.15 acres – Floodplain 0.01 acres – Floodway		0.5 acres – Floodplain 0.08 acres – Floodway
Surface & Groundwater Resources	Direct Impacts: 3,500 square feet Minimal Indirect/Temporary Impacts	Direct Impacts: 300 square feet Minimal Indirect/Temporary Impacts		No Direct Impacts Minimal Indirect/Temporary Impacts
Historic & Archaeological Resources	7 Historic Impacts 36 Archaeological Impacts	3 Historic Impacts 18 Archaeological Impacts		2 Historic Impacts 8 Archaeological Impacts
Prime Farmland & Active Farmland	0 Acres – Active Farmland 0.3 Acres – Prime Farmland	No Impact		No Impact
Land Use	13.76 Acres of Takings	12.74 Acres of Takings		5.32 Acres of Takings

ISSUE	ALTERNATIVE C: SOUTH NORWALK TO DANBURY IMPROVEMENTS	ALTERNATIVE D: EXTENSION FROM DANBURY TO NEW MILFORD	ALTERNATIVE E: IMPROVEMENTS FROM SOUTH NORWALK TO MERRITT 7/WILTON
Hazardous Contamination	143 Low Risk Sites 23 Moderate Risk Sites 10 High Risk Sites	42 Low Risk Sites 10 Moderate Risk Sites 1 High Risk Sites	96 Low Risk Sites 4 Moderate Risk Sites 8 High Risk Sites
Public Recreational/4(f)/6(f) Lands	0.7 Acres of Takings	No Impact	0.7 Acres of Takings
Socioeconomics & Environmental Justice	No/Neutral Impact	No/Neutral Impact	No/Neutral Impact
Scenic Roads	Impacts to 2 Scenic Roads	No Impact	Impacts to 2 Scenic Roads
Visual Resources	Negative Impacts	Negative Impacts	Negative Impacts

Chapter 9: Benefit-Cost Analysis

The purpose of this section is to prepare a qualitative analysis documenting the benefits and costs of each of the alternatives being considered as a part of the Danbury Branch Improvement Program. The FTA's *Procedures and Technical Methods for Transit Project Planning, Part II: Conduct of the Analysis, Chapter 9: Evaluation of Alternatives (Draft*) was used as a guide. Measures have been estimated as near as possible with all references and assumptions clearly listed to determine quantitative benefits and costs. In the instance data was not available to calculate a benefit or cost, a qualitative analysis has been performed.

The timeframe for the analysis is 20 years. This period is representative of a long-range transportation planning period. This period does not cover the full life of system components; therefore, capital recovery is captured at the end of the 20-year period as a benefit. The shortest design life is for rails cars at 25 years and the longest is 50 years for electrification, structures, stations, utilities, and roadway improvements. The base year for the analysis is 2010. All costs and benefits were estimated in 2010 dollars. Costs and benefits have been valued in the year they take place and discounted to 2010 using a discount rate of 2.1% in real terms and based on guidelines from the FTA. The time system is assumed to have begun operation in 2010 and therefore the 20-year analysis period considers full operation for the duration of this time period.

9.1 Assumptions

This analysis uses capital data from Volumes I and II of the *Engineering Feasibility Report* (May 2011, December 2011), which can be found on the study website and are summarized in Chapter 6: Construction Methodology. Cost data was gathered and reported in 18 environmental technical memos, which can be found on the study website and are summarized in Chapter 8: Impact Analysis. These memos provide descriptions of the direct and indirect impacts of each alternative on the community, its members, and the surrounding environment.

Ridership numbers have been determined by the CTDOT using their standard model and a growth rate of 1.3%. The method, to determine travel time savings and avoided auto operating costs, considers two types of new riders: Mode Choice Riders – riders that switch from another mode of transportation to the rail line because of the improvements to the system – and Growth Riders – riders that are acquired as the population around the branch increases. It was assumed that all new riders would experience the same travel time savings as existing riders sharing the same origin-destination pairs. This assumption is further explained in Section 9.2: Benefits.

The benefit-cost analysis compares the baseline (No-Build) to several "build" alternatives and a Transportation System Management (TSM) plan. A TSM plan utilizes existing resources to improve service or, as described by the Federal Transit Administration, "everything that can be done without new construction or vehicle procurement." The following are some general assumptions applicable to the baseline (No-Build) as well as each alternative:

- Identical highway and transit networks outside and within the corridor for all alternatives.
- Ridership forecasts for each alternative are based on the same set of growth forecasts and

land use assumptions as the baseline.

- Population and employment growth rates are allocated based on local land use plans.
- The new Georgetown Station has been built and is operational.
- The Danbury Centralized Traffic Control (CTC) and Signalization Project has been completed and is in operation.
- Travel not associated with the rail stations remains the same.

Table 35 contains a complete list of assumptions used in this Benefit-Cost Analysis.

Table 35: Benefit-Cost Analysis Assumptions

LOCAL ECONOMY (FAIRFIELD COUNTY)	VALUE USED	2010 USD	SOURCE
Real Discount Rate for Future Savings	2.1%		OMB Circular A-94 Appendix C, Revised December 2010: http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c
Inflation Rate For future Costs	1.8%		=3.9% - 2.1% OMB Circular A-94 Appendix C, Revised December 2010: http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c
Per Capita Income (USD 2009)	$ 77,080.00	$ 78,467.44	Connecticut Department of Economic and Community Development Annual Report for Fiscal Year 2009-2010
Mean Travel Time to Work (min)	28.2		2005-2009 American Community Survey 5-year Estimates
Mean travel distance to work (miles)	14.1		assuming an average speed of 30 mph
Per Capita Wage (USD 2009 per hr)	$ 37.06	$ 37.72	=$77080/(52 weeks * 40 days/week)
Time Value (USD 2009 per hour)	$ 18.53	$ 18.86	=50% of $37.06
Auto Operating costs (USD per mile)	$ 0.566		Derived from AAA, Your Driving Costs, 2010 edition (composite average for driving annually 15,000 miles)
Auto Occupancy (pple per vehicle)	1.30		Derived from Vehicle Occupancy Ratios on CT State Roads, 1999 and 2000
Days per year	276		Used to convert daily estimates to yearly equivalents
Average Price of Gasoline 2010	$ 2.923		www.gasbuddy.com

9.2 Benefits

The primary benefits of improving the Danbury Branch include:

- travel time savings
- avoided auto operating costs
- potential for avoided auto ownership
- reduction in environmental impacts
- remaining Capital Value

Travel time savings was determined by the difference between the baseline (No-Build) trip time and the trip time for each build alternative. The total system savings was determined for year 2030 and prorated for all previous years based upon the corresponding annual ridership. The

assumption was made that new riders would experience, on average, the same travel time savings as the existing riders of the origin-destination (O-D) pairs. That travel time savings for the existing riders for each O-D pair would be the travel time savings needed to get new riders to switch their mode choice. The travel time value was determined using the Per Capita Income of Fairfield County from the Connecticut Department of Economic and Community Development Annual Report for Fiscal Year 2009-2010.

Alternative C, the all-electric option, has the largest travel time savings at more than twice the next best option, Alternative E. The electrified Alternative D has the most travel time savings for the extension options. The electric options would also incur the largest capital costs but have lower operating costs than diesel options. The bus extension paired with diesel service on the existing branch will experience the smallest travel time savings. These results are all a factor of both speed and ridership; the faster service that attracts the most riders will experience the most travel time savings. Travel Time Savings for each alternative is summarized in Table 41 and also identified in Table 37 as a percent of total travel time.

Avoided auto operating costs are seen by reducing the amount of vehicle miles traveled. Vehicle operating costs include fuel; maintenance; tires; insurance; license, registration and taxes; depreciation; and finance. The vehicle operating cost is determined on a per mile basis and published yearly by the American Automobile Association (AAA). Avoided vehicle mileage was determined based upon the mean travel distance to work from the 2005-2009 American Community Survey 5-year estimates. Again, Alternative C, which attracts the most riders, will have the greatest effect on reducing auto operating costs. Avoided auto operating costs are summarized in Table 41. With a fast, reliable public transportation system, auto owners have the option of choosing to avoid auto ownership all together. This benefit and subsequent benefits to the corridor are discussed further in Section 9.5: Supplementary Analysis.

Environmental impacts are inclusive of direct and indirect costs associated with changes to the environment including but not limited to noise pollution and the emission of pollutants from the combustion of petro-fuels. Emissions may be reduced by electrifying the Branch and/or reducing automobile vehicle miles traveled (VMT). For each alternative, air emissions is proportional to the amount of rail activity and VMT. Emissions along the rail line caused by rail activity from the build alternatives could be higher or lower than Alternative A, depending upon the level of service and the fuel source selected. Alternative C or Alternative C with and electric Alternative D, the all-electric options, would decrease air emissions along the branch when compared to Alternative A. There are combinations of diesel/electric build scenarios that will have higher emission than the all-electric "build" options but potentially less than Alternative A. Alternative E will likely be the next best option after the all-electric "build" options, as it electrifies one-third of the existing branch, but still better than the existing diesel service.

Regardless of rail activity, a reduction in annual vehicle miles traveled, as a result of a mode shift from vehicles to rail, may reduce emissions associated with vehicular traffic by potentially decreasing traffic volumes and increasing vehicle operating speed on area highways due to a decrease in traffic volume. Traffic volumes only have the potential to decrease when drivers choose to take public transportation. There are other factors that affect future traffic volumes including population growth, same as it affects rail ridership; the local economy; and induced

demand. Latent demand may arise when traffic volumes decrease, improving the road's level of service, other people will then find driving to be the more attractive option and choose to drive; for example, instead of taking the bus. For these reasons, quantifying future traffic volumes is difficult and may not in fact be a benefit, but a cost.

Emissions impacts were not quantified in this analysis as it is assumed that no matter what alternative is chosen, year 2030 emissions will likely be lower than present levels due to nationally mandated cleaner vehicles and fuels. It is currently difficult to project out to year 2030 as the EPA control programs set levels that will maintain, if not reduce, the National Ambient Air Quality Standards for pollutants, but also programs are set in place to reduce Annual Mobile Source Air Toxics (MSATs)[4] by 72% between 1999 and 2050. These reductions are so significant that future MSAT emissions in this study are anticipated to be lower as a result.

Additional benefits include the remaining capital value after the 20-year analysis timeframe. The life of the system components is longer than the analysis period of 20 years and will therefore have capital value. The remaining capital value is summarized in Table 39.

For additional benefits, refer to the Section 9.5: Supplementary Analysis.

9.3 Costs

The primary costs associated with the "build" alternatives are:

- capital costs[5]
- operating costs
- environmental impacts

Capital costs associated with the build alternatives include track improvements, electrification, improvements to structures (e.g. bridges, retaining walls), installation of a signal system, station improvements, a new yard, utility work, and roadway improvements. The major items include electrification, if applicable to the alternative, track realignment, the development of new structures, and station improvements. Capital costs do not include property acquisitions as this is considered a transfer or a situation where one party within the community (the land owners receiving payment) benefits and the other party (the transportation authority paying for the property) has a cost. Capital Costs are summarized in Table 39.

Operating costs capture all overhead operating and maintenance costs associated with operating on the Danbury Branch of the New Haven Line. Costs include energy costs; maintenance of way, yard, equipment and facility costs; crew; claims; and administrative overhead. Annual

[4] In addition to the NAAQS pollutants, EPA regulates a number of mobile source air toxics (MSATs), identified in an EPA Rule; Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007).
[5] For the purposes of this report, capital costs are construction costs. Vehicle costs will be developed for the preferred alternative.

System Operating Costs are summarized in Table 39. These costs are also broken down in a comparative format as cost per car-mile for each of the alternatives presented.

All of the Alternative D scenarios operate at a lower cost than the baseline, Alternative A. Of the three alternatives (B, C, and E), Alternative B has the lowest operating cost and Alternative C has the largest operating cost. This is largely in part because Alternative C operates almost twice the number of car miles than Alternatives B and E. Less money is spent on energy given the all-electric option, but more money is dedicated to overhead and maintenance of rolling stock, whose total cost is quantified on a per car-mile basis. The electrified Alternative D has a larger operating cost than the diesel Alternative D, but operates 25% more car-miles. The bus extension scenario has the lowest operating costs and lowest annual VMT.

Other Costs associated with the "build" alternatives include environmental impacts associated with encroaching upon wetlands, impacts to threatened and endangered species, impacts to biological diversity, and increased train trips. Increased service has such environmental impacts as air quality and noise and vibration levels.

Costs associated to air quality may result from changes to traffic patterns and volumes over time, increased rails service, and additional station parking for the "build" alternatives. Mitigation efforts would be implemented to relieve congestion at intersections affected by the "build" alternatives as recommended by traffic studies. These mitigation efforts result in no cost to the air quality, but do appear as a capital cost. The four intersections that would be impacted the most by the "build" alternatives were evaluated given increased traffic and also considering mitigation efforts. The four signalized intersections and the alternatives they are associated with are the following:

- Grist Mill Road (Route 7)/Glover Ave (for Alternatives C and E – station improvements at existing Merritt 7 Station in Norwalk)
- Grist Mill Road (Route 7)/Main Avenue (Alternatives C and E – station improvements and existing Merritt 7 Station in Norwalk)
- Federal Road (Route 202)/Station Road-Whisconier Road (Route 25) *Alternative D – new station in Brookfield)
- Route 7/Bridge Street (Route 202) (Alternative D – new station in New Milford)

It was determined that these intersections would not be in violation of federal Carbon Monoxide (CO) standards; therefore, there is little concern regarding air quality impacts at all other signalized intersections near the stations. Benefits realized from a reduction in vehicle miles traveled may be compromised by the use of diesel buses. An increased use of diesel trains may increase emissions along the branch relative to Alternative A; conversely all-electric options would reduce emissions. It is not anticipated that any short-term or long-term adverse air quality impacts will occur as a result of this project. Therefore, no specific air quality mitigation measures are proposed. For more information on Air Quality, refer to Section 8.4.

The alternatives have low to moderate impacts on biological diversity due to construction and track realignment, whereas station improvements and the addition of new stations (particularly given the extension) have the potential for high impacts. For more information regarding the

impacts on biological diversity, refer to Section 8.6. Permanent impacts to wetlands result in track realignment where temporary impacts result from construction. Any impacts would be mitigated through a comprehensive mitigation program resulting in a status quo scenario. For more information on wetland impacts, refer to Section 8.8.

While there will be additional noise from the addition of train trips, the selected alternative could incorporate mitigation measures. This step could reduce noise impacts by 60-90 percent. Without mitigation, there are expected to be 4,636 moderate impacts and 919 severe impacts from train operations. Vibration impacts are greatest for the alternatives that include diesel-powered trains and affect residences, museums, and schools most significantly. Vibration impacts that exceed FTA criteria are considered to be significant and would warrant mitigation if reasonable and feasible. For more information on noise and vibration, refer to Section 8.3.

Additional impacts considered in Chapter 8: Impact Analysis include: Floodplains and Floodways; Surface and Groundwater Resources; Historic and Archaeological Resources; Prime Farmland and Active Farmland; Land Use; Hazardous Contamination; Public Recreational Lands; Socioeconomics and Environmental Justice; Scenic Roads; and Visual Resources. These impacts are relatively minor, if present at all, and most would include mitigation proposals to limit the permanent impacts from construction, track realignment, and station upgrades.

For a quantitative summary of major construction costs, see Table 39.

9.4 Measures of Effectiveness: Comparative Analyses

Not all of the scenarios presented are equivalent in that Alternatives B, C, and E affect the existing service from South Norwalk to Danbury while all the D Alternatives affect only an extension from Danbury to New Milford. Therefore, comparing ridership numbers, travel time savings, and vehicle miles traveled for all alternatives is not appropriate. If these numbers are made to indicate how affective each alternative is at increasing ridership, producing travel time savings, or reducing vehicle miles traveled, they become measures of effectiveness. These numbers can then be used more easily when comparing each alternative to determine which will be the most affective in achieving the goals of improving service along the Danbury Branch.

Table 36: Percent Increase in Ridership over Existing Ridership

ALTERNATIVE	OPENING DAY	BY 2030
Alternative A: No Build (Baseline)	0%	16%
Alternative B: Transportation System Management	12%	29%
Alternative C: Electrification with an increase in Service	26%	46%
Alternative D: Diesel extension given a diesel locomotive and an improved level of service on existing track	3%	19%
Alternative D: EMU Extension given electrification and improved level of service on existing track	5%	22%
Alternative D: Bus Extension given diesel locomotive and improved service on the existing track	2%	18%
Alternative D: Bus Extension given EMU and improved service on the existing track	2%	18%
Alternative E: Electrification from South Norwalk to Merritt 7	15%	33%

Table 37: Travel Time Savings as a Percent of Total Travel Time

ALTERNATIVE	PERCENT
Alternative A: No Build (Baseline)	0%
Alternative B: Transportation System Management	0%
Alternative C: Electrification with an increase in Service	19%
Alternative D: Diesel extension given a diesel locomotive and an improved level of service on existing track	5%
Alternative D: EMU Extension given electrification and improved level of service on existing track	21%
Alternative D: Bus Extension given diesel locomotive and improved service on the existing track	4%
Alternative D: Bus Extension given EMU and improved service on the existing track	20%
Alternative E: Electrification from South Norwalk to Merritt 7	9%

Table 38: Annual Reduction of Autos by 2030 (Population Growth & Mode Choice Riders)

ALTERNATIVE	DAILY NUMBER OF AUTOS OFF THE ROAD	REDUCTION IN ANNUAL VMT
Alternative A: No Build (Baseline)	*352	*1,369,535
Alternative B: Transportation System Management	658	2,555,766
Alternative C: Electrification with an increase in service	1028	3,996,560
Alternative D: Diesel extension given a diesel locomotive and an improved level of service on existing track	428	1,663,401
Alternative D: EMU Extension given electrification and improved level of service on existing track	489	1,898,495
Alternative D: Bus Extension given diesel locomotive and improved service on the existing track	408	1,587,342
Alternative D: Bus Extension given EMU and improved service on the existing track	412	1,601,171
Alternative E: Electrification from South Norwalk to Merritt 7	732	2,845,718

**Alternative A will experience an increase in ridership due to population growth*

9.5 Supplementary Analysis

There are many additional benefits that improving the Danbury Branch could bring to the region as a result of improvements made to the tracks and to the transportation system. Some benefits include but are not limited to, benefits to other users such as freight companies and increased potential for economic effects such as productivity, employment, and business activity. The Danbury Branch would have increased potential for investment opportunity and transit-oriented development (TOD). TOD would provide mixed-use space stimulating population and economic growth by attracting new residents and consumers to housing, offices, and shops built around access to public transportation.

There is the potential for avoided auto ownership going beyond just avoided automobile operating costs. Local residents may choose to not own a vehicle if they have access to fast, reliable transportation. With fewer cars on the road, a reduction in auto-vehicle miles traveled and congestion relief may result in fewer automobile accidents. Fewer automobile accidents provide an increase in safety and frees up resources that would otherwise be consumed by the automobile accident. If congestion could be reduced along local thoroughfares, capital savings would be experienced in time by reducing or eliminating the need to expand existing infrastructure.

9.6 Conclusion

The major costs associated with the TSM option or any of the build options are capital and operating costs. The major benefits are travel time savings, avoided auto operating costs, and

remaining capital value. Costs associated with environmental impacts are considered to be minimal while a switch to an all-electric system has potential benefits and may greatly reduce emissions, improving air quality along the study corridor.

Alternative C attracts the largest number of riders and has the largest trip time reductions, but requires the most capital cost and has the highest annual operating cost. The TSM option has a moderate increase in operating costs above Alternative A, requires the least amount of capital, provides savings by increasing ridership consequently reducing auto operating costs, but does not provide any travel time savings. The bus extensions have low annual operating costs and the smallest travel time savings when paired up with improved service along the existing branch, diesel service fairing the worst.

Regardless of the alternative selected, rail riders, as well as all travelers along the study corridor, can be expected to experience some benefit from improved service along the Danbury Branch. Communities along the branch could also experience increases in population and economic growth as residents and businesses are attracted to fast, reliable public transportation. If action is not taken to improve service along the Branch, congestion on local thoroughfares may continue to increase, becoming a deterrent to, existing and new, residents and businesses. Additional moneys will eventually need to be spent on improving existing roads, already restricted from growth by surrounding residences and businesses, as well as the natural environment.

There are many costs and benefits associated with improvements along the Danbury Branch. This qualitative, cost-benefit analysis presents data which has been collected throughout the Environmental Impact Statement analysis. Since this is a qualitative analysis, Benefit-Cost ratios are not provided because not all benefits and costs were quantified. Major costs and major benefits were quantified and measures of effectiveness are provided as tools to aid in determining the most effective alternative to improve service along the Danbury Branch.

Table 39: Construction Costs and Remaining Capital Value

ALTERNATIVES	CONSTRUCTION COSTS (2010 USD)	REMAINING CAPITAL VALUE IN 2030 (2010 USD)
Alternative A: No Build (Baseline)	$ -	$ -
Alternative B: Transportation System Management	$ -	$ -
Alternative C: Electrification with an increase in Service	$ (398,862,320)	$ 77,031,155
Alternative C w/ Bridges	$ (485,005,020)	$ 95,750,940
Alternative D: Diesel extension given a diesel locomotive and an improved level of service on existing track	$ (346,380,341)	$ 54,863,334
Alternative D: EMU Extension given electrification and improved level of service on existing track	$ (495,570,371)	$ 87,284,018
Alternative E: Electrification from South Norwalk to Merritt 7	$ (237,614,319)	$ 45,904,163

**Any numbers in parenthesis are negative numbers or "costs."*

Table 40: System Operating Mileage and Costs

ALTERNATIVES	TOTAL ANNUAL CAR-MILES (DIESEL TRAIN)	TOTAL ANNUAL CAR-MILES (ELECTRIC TRAIN)	TOTAL ANNUAL BUS-MILES	TOTAL SYSTEM OPERATING COSTS (2010 USD)	OPERATING COST PER CAR MILE (2010 USD)
Alternative A: No Build (Baseline)	613,444	0	0	$ (181,135,695.69)	$ (295.28)
Alternative B: Transportation System Management	745,420	0	0	$ (205,488,444.70)	$ (275.67)
Alternative C: Electrification with an increase in Service	0	1,319,760	0	$ (279,888,611.04)	$ (212.08)
Alternative C w/ Bridges	No Change	No Change	No Change	No Change	No Change
Alternative D: Diesel extension given a diesel locomotive and an improved level of service on existing track	678,600	0	0	$ (164,908,663.27)	$ (243.31)
Alternative D: EMU Extension given electrification and improved level of service on existing track	0	842,400	0	$ (175,039,850.98)	$ (207.79)
Alternative D: Bus Extension given diesel locomotive and improved service on the existing track	0	0	91800	$ (16,097,814.06)	$ (175.36)
Alternative D: Bus Extension given EMU and improved service on the existing track	0	0	91800	$ (16,097,814.06)	$ (175.36)
Alternative E: Electrification from South Norwalk to Merritt 7	499,200	249,600	0	$ (216,228,210.06)	$ (288.77)

**Any numbers in parenthesis are negative numbers or "costs."*

Table 41: Ridership Numbers and Related Savings

ALTERNATIVES	DAILY "WEEKDAY" RIDERSHIP IN 2030 (PERSONS)	DAILY TRAVEL TIME SAVINGS (HOURS/DAY)	TOTAL TRAVEL TIME SAVINGS (2010 USD)	TOTAL AVOIDED AUTO OPERATING COSTS (2010 USD)
Alternative A: No Build (Baseline)	3387	0	$ -	$ -
Alternative B: Transportation System Management	3781	0	$ -	$ 10,685,909.10
Alternative C: Electrification with an increase in Service	4263	1011.15	$ 83,659,746.72	$ 23,664,992.87
Alternative C: w/ Bridges	No Change	No Change	No Change	No Change
Alternative D: Diesel extension given a diesel locomotive and an improved level of service on existing track	3482	46.9	$ 3,811,764.17	$ 2,647,235.65
Alternative D: EMU Extension given electrification and improved level of service on existing track	3561	248.57	$ 20,565,992.43	$ 4,765,024.16
Alternative D: Bus Extension given diesel locomotive and improved service on the existing track	3457	11.8	$ 976,299.27	$ 1,962,068.77
Alternative D: Bus Extension given EMU and improved service on the existing track	3462	58.7	$ 4,856,675.20	$ 2,086,644.57
Alternative E: Electrification from South Norwalk to Merritt 7	3878	399.10	$ 33,020,427.15	$ 13,297,882.39