

DANBURY BRANCH IMPROVEMENT PROGRAM TASK 5

ENVIRONMENTAL TECHNICAL MEMORANDUM

STATE PROJECT 302-008



SECTION 3: AIR QUALITY

MAY 2009

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INTRODUCTION

This section discusses air quality in the study corridor. Air quality in the context of this DEIS is associated with emissions into the air by all transportation-related vehicles, including trains, passenger vehicles, and freight-carrying vehicles. Existing air quality conditions are the result of human activities combined with natural processes, and generally reflect activities over a broad area. The existing conditions analysis for the DEIS therefore examines background conditions. The impact analysis will examine potential changes in background conditions and potential local pollutant “hot-spots” caused by project activities.

EXISTING CONDITIONS

Primary Transportation-Related Air Pollutants

There are a number of pollutants produced by transportation sources that affect the quality of the ambient air. Ambient air is a general term for outdoor air which the public is exposed to. 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. How these pollutants form and how they affect human health are described below.

Carbon Monoxide (CO): Carbon monoxide (CO) is a colorless, odorless gas formed from incomplete combustion of carbon-containing fuels and from oxidation of VOC in the atmosphere. CO typically converts by natural processes to carbon dioxide quickly enough to prevent buildup. However, CO can reach dangerously high levels in local areas, such as city street “canyons” with heavy auto traffic and little wind. These high levels are often referred to as CO hotspots. Exposure to high levels of CO can affect mental alertness and vision in healthy persons and may cause severe chest pains and other cardiovascular symptoms in people with cardiovascular diseases.

Ozone: Ozone is a gas with a slightly bluish color. Ozone is formed when NO₂ reacts with VOC and sunlight. Ozone is the principal component of smog. At high levels, ozone irritates the mucous membranes of the respiratory system and can cause impaired lung function.

Particulate Matter (PM): Particulate matter (PM) is a mixture of particles – solid, liquid or both – that are suspended in the air. PM is the main cause of visibility impairment in the nation’s cities and national parks. Sources of PM include diesel and petroleum engine combustion, erosion of the pavement by road traffic, and abrasion of brakes and tires. The finest particles, called PM_{2.5} because the particles are less than 2.5 microns in size, are the most dangerous, as they can penetrate furthest into the lungs. PM is linked to a variety of significant health problems, particularly respiratory ones.

Nitrogen Dioxide (NO₂): Nitrogen dioxide (NO₂) is a byproduct of nitric oxide, a colorless gas formed during combustion of fuels at high temperatures and pressures. Motor vehicle exhaust is

the primary source of NO₂. NO₂ is one of the substances that react to form ozone. NO₂ reduces the oxygen carrying capacity of blood.

Volatile Organic Compounds (VOCs): Volatile organic compounds (VOCs) are emitted from fuel through evaporation and combustion. VOCs are another category of substances that react to form ozone. Some VOCs cause cancer, while others are harmful to plants.

Mobile Source Air Toxics (MSATs): Mobile Source Air Toxics (MSATs) are compounds emitted from fuel-powered vehicles and equipment of many types. A variety of toxic compounds are present in fuel. Some are emitted to the air when the fuel evaporates or passes through the engine unburned. Others are emitted during the incomplete combustion of fuels or as secondary combustion products. Air toxics associated with diesel engines are mainly present in the PM exhausted by such engines.

Federal Air Quality Regulations

Under the auspices of the Clean Air Act and 1990 Clean Air Act Amendments, federal standards have been established to define acceptable levels of certain air pollutants. Several regulatory programs have been established to monitor, estimate, and control air pollution. The federal ambient air standards and the regulatory programs pertinent to transportation projects are described below.

National Ambient Air Quality Standards

The U.S. Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) for six commonly found air pollutants, also called “criteria pollutants”. Criteria air pollutants are called such because EPA has set standards for them based on human health-based and/or environmentally-based criteria. Primary standards set maximum limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards are set to protect public welfare and the environment, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings. With the exception of sulfur dioxide, all criteria pollutants have secondary standards that are equal to the primary standards. The six criteria pollutants and their standards are shown in Table 1.

The Clean Air Act Amendments require each state to monitor air quality to determine whether the NAAQS are being met and, further, to take actions to maintain acceptable air quality. Like other states, Connecticut has established a system of air sampling stations across the state to continuously monitor the criteria pollutants. Results are evaluated by county in order to identify regions which may have air pollution problems. If air pollutant levels do not exceed the standard for any pollutant, a region is considered in attainment of the NAAQS. However, if even one sampling location (monitor) in a region shows a pollutant level higher than the standard (called an “exceedance” of the standard), the region, or a portion of, is classified as nonattainment for that pollutant. Once a region is classified as nonattainment for an air pollutant, the state must develop a State Implementation Plan (SIP) to bring the region back to attainment status.

Table 1: National Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide	9 ppm (10 mg/m ³)	8-hour ¹	None
	35 ppm (40 mg/m ³)	1-hour ¹	None
Lead	1.5 µg/m ³	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 µg/m ³)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM ₁₀)	150 µg/m ³	24-hour ¹	
	15 µg/m ³	Annual ² (Arithmetic Mean)	Same as Primary
Particulate Matter (PM _{2.5})	35 µg/m ³	24-hour ³	
Ozone	0.075 ppm	8-hour ⁴	Same as Primary
Sulfur Oxides	0.03 ppm	Annual (Arithmetic Mean)	-----
	0.14 ppm	24-hour ¹	-----
	-----	3-hour ¹	0.5 ppm (1300 µg/m ³)

¹ Not to be exceeded more than once per year.

² To attain this standard, the 3-year average of the annual arithmetic mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15 µg/m³.

³ To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m³.

⁴ To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. This is a new standard adopted in 2008.

⁵ (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

State Implementation Plan

In order to comply with federal regulations, the State of Connecticut is required to prepare State Implementation Plans (SIPs) for ozone and PM_{2.5} because the entire state is designated nonattainment for ozone and various regions are nonattainment for PM_{2.5}. The Connecticut Department of Environmental Protection (DEP) prepares and submits SIPs to the EPA for approval. SIPs are prepared for individual pollutants and are updated periodically to reflect new attainment goals and measures to be taken.

Connecticut's PM_{2.5} SIP was last revised July 2008, at which time it incorporated a PM_{2.5} NAAQS attainment demonstration, explaining that Connecticut will reach attainment for PM_{2.5} by the 2010 deadline established by the EPA. The most recent revision to the 8-hour ozone SIP occurred in February 2008, when the SIP was revised to incorporate an 8-hour ozone NAAQS attainment demonstration, explaining that Connecticut will reach attainment for ozone by the 2010 deadline set by the EPA.

Non-attainment regions remain so until they meet all future-year air quality goals and achieve the transportation measures outlined in the approved SIP, while reporting no further exceedances. Based on these improvements, the DEP would demonstrate that the region is in attainment and EPA would need to rule in agreement.

General Conformity Rule

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. The General Conformity Rule contains details regarding the conformity of transportation projects and plans developed, funded, or approved by the U.S. Department of Transportation (USDOT) and metropolitan planning organizations. Conforming transportation projects and plans are those that meet the requirements of a State Implementation Plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards.

Specific criteria and procedures, outlined in 40 CFR 93.114-116, determine whether or not a project is in conformity. These criteria are listed below, followed by the status of each in relation to the Danbury Branch project:

Currently Conforming Regional Transportation Plan and Transportation Improvement Program

There must be a currently conforming Regional Transportation Plan and currently conforming Transportation Improvement Program in the project area at the time of project approval. In Connecticut, the regional planning agencies (RPAs) prepare the Regional Transportation Plans and Transportation Improvement Programs for their region. The Regional Transportation Plan identifies long-range (20+ years) transportation needs in the region. The Transportation Improvement Program lays out the priority projects to be funded within the next five years and the allocated budget amount.

Status: Both the 2007-2035 Regional Transportation Plan and the 2007-2011 Transportation Improvement Program completed for the South Western Regional Planning Agency region, which includes Norwalk and Wilton, currently conforms to the State Implementation Plan. Both the 2007-2035 Regional Transportation Plan and the 2007-2011 Transportation Improvement Program completed for 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.

Project Included in a Conforming Regional Transportation Plan and Transportation Improvement Program

The project must be identified in a currently conforming Regional Transportation Plan and Transportation Improvement Program.

Status: 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. The project is not identified in either region's 2007 - 2011 Transportation Improvement Program. It is assumed that the project will

be identified in both regions' Transportation Improvement Programs during subsequent planning stages and before improvements occur.

CO, PM₁₀, and PM_{2.5} Hot Spots

The project must not cause or contribute to any new localized CO, PM₁₀ and/or PM_{2.5} violations or increase the frequency or severity of any existing CO, PM₁₀ and/or PM_{2.5} violations in CO, PM₁₀ and/or PM_{2.5} nonattainment and maintenance areas.

Status: The project is not in a CO or PM₁₀ nonattainment area. Although the Fairfield County portions of the project are in a PM_{2.5} nonattainment area, Connecticut's SIP includes the 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.

PM₁₀ Control measures

The project must comply with PM₁₀ control measures in the applicable implementation plan.

Status: There are no PM₁₀ control measures in the current SIP.

Mobile Source Air Toxics

In addition to the NAAQS pollutants, EPA also regulates 21 MSATs, identified in an EPA Final Rule, *Control of Emissions of Hazardous Air Pollutants from Mobile Sources* (66 FR 17235). The EPA subsequently designated six of these pollutants as priority MSATs. These are benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene. While these MSATs are considered the priority transportation toxics, the EPA notes that the list of priority MSATs may change or be adjusted in future rules.

The analysis of air toxics is an emerging field. Technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and health effects from any one project. In addition, EPA has not established regulatory concentration targets for the six priority MSATs appropriate for use in the project development progress. However, national trend data illustrates that overall emissions are decreasing as a result of EPA implementation of control measures, such as fuel composition programs.

The U.S. Department of Transportation, Federal Highway Administration (FHWA) has outlined a tiered approach for analyzing MSATs in NEPA documents, with three tiers representing the levels of potential impacts from projects (Memorandum, *Interim Guidance on Air Toxic Analysis in NEPA Documents*, dated February 3, 2006). The three tiers are the following:

1. No analysis for projects with no potential for meaningful effects on MSATs (such as categorical exclusions)

2. Qualitative analysis for projects with low potential MSAT effects (including projects that would improve transit or freight operations)
3. Quantitative analysis to differentiate between alternatives for projects with higher potential MSAT effects (such as creating or substantially altering a major intermodal freight facility with the potential to concentrate diesel particulate matter in a single location)

Based on this guidance, the Danbury Branch Line improvements would fall under the middle tier and thus will require qualitative analysis of potential MSAT effects.

State Air Quality Designations and Monitoring Overview

For the purpose of monitoring NAAQS, the DEP maintains air quality monitoring stations statewide. The study corridor extends into two of Connecticut's air quality sampling regions, Fairfield and Litchfield Counties. Most of the towns in the corridor are located in Fairfield County, including Norwalk, Wilton, Redding, Ridgefield, Bethel, Danbury, and Brookfield. New Milford is the only corridor town located in Litchfield County. For PM_{2.5} and ozone, attainment designations are made by counties. Thus, the Fairfield County designations apply to all of the towns in the study corridor except New Milford, to which the Litchfield County designations apply. Table 2 displays air quality monitoring information and NAAQS attainment status for the counties in the corridor.

Anticipated Air Analyses for the Danbury Branch Improvement Program

Based on the regulatory framework and the air quality conditions in the Danbury Branch study corridor, the following air quality analyses will be conducted for the project during the impact analysis phase of the EIS:

- CO hot-spot analyses at signalized roadway intersections near station sites with the highest anticipated level of station-related traffic and/or traffic congestion (up to six intersections corridor-wide). These analyses will look at CO concentrations at the selected intersections with and without the proposed project, based on modeling of conditions in current and future years. Because the hot-spot analyses are focused on small intersection areas, rather than large regions, they are often called microscale analyses. The purpose of the analyses is to ensure that additional traffic and/or traffic congestion from the proposed project does not cause localized adverse air quality impacts. These analyses will be conducted using the EPA MOBILE6.2 emissions factor model and the CALQVIEW2 (Windows version of CAL3QHC Version 2) model.
- Qualitative analysis of potential PM_{2.5} effects (Fairfield County)
- Qualitative analysis of potential MSAT effects (corridor-wide)

Table 2: Danbury Branch Corridor Air Quality Status in Fairfield and Litchfield Counties

Pollutant	Number of Monitors	Monitor Locations in Fairfield (F) and Litchfield (L) Counties	Exceedances (2006)	Attainment Status
CO	2	96 Broad Street, Stamford (F) 258 Old Waterbury Road, Thomaston (L)	None	Attainment
Ozone	5	Greenwich Point Park, Greenwich (F) Sherwood Island State Park, Westport (F) UCG Lighthouse, Stratford (F) WCSU, Danbury (F) Mohawk Mountain, Cornwall (L)	At all monitors in project counties	Nonattainment (in both the Greater CT and the NY-NJ-CT nonattainment areas)
PM ₁₀	3	137 East Avenue, Norwalk (F) Sherwood Island State Park, Westport (F) Roosevelt School, Bridgeport (F)	None	Attainment
PM _{2.5}	6	137 East Avenue, Norwalk (F) Sherwood Island State Park, Westport (F) Roosevelt School, Bridgeport (F) WCSU, Danbury (F) Mohawk Mountain, Cornwall (L) 258 Old Waterbury Road, Thomaston (L)	At Norwalk and Bridgeport monitors	Fairfield County – nonattainment (in the NY-NJ-CT nonattainment area) Litchfield County - attainment.
NO ₂	1	Sherwood Island State Park, Westport (F)	None	Attainment
SO ₂	4	Greenwich Point Park, Greenwich (F) Sherwood Island State Park, Westport (F) 115 Boston Terrace, Bridgeport (F) WCSU, Danbury (F)	None	Attainment
Lead	0 ¹	-	-	Attainment

¹ As a result of extremely low ambient levels, lead monitoring ceased in 2002.
 Source: EPA Region 1, 2006 Annual Report on Air Quality in New England, July 2007