Air Quality Technical Report

WOODWARD AVENUE
STREETCAR PROJECT

Detroit, Michigan

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U.S. Department of Transportation
Federal Transit Administration

MDOT
MICHIGAN DEPARTMENT OF TRANSPORTATION

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1.0 Introduction

This Air Quality Technical Report supports the Woodward Avenue Streetcar Supplemental Environmental Assessment (EA). The report evaluates the Streetcar Alternative's potential air quality impacts within the study area. This includes the following:

- The Project's impact on regional air quality levels;
- Whether this Project will cause or contribute to a new localized exceedance of carbon monoxide (CO) ambient air quality standards or increase the frequency or severity of any existing exceedance;
- Potential particulate matter (PM_{10} and $PM_{2.5}$) impacts of the Project;
- The mobile source air toxic (MSAT) impacts of the Project;
- The construction emissions of the Project.

The report updates the Existing Conditions, Future No Build Conditions, and the Streetcar Alternative conditions from the Woodward Avenue Light Rail Transit (LRT) Project Final Environmental Impact Statement (FEIS) Air Quality Technical Report. Chapter 2 of the EA provides a description of the Streetcar Alternative, while the Woodward Avenue LRT FEIS provides a description of the Existing Conditions and the No Build Conditions.

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2.0 Existing Conditions

"Air Pollution" is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, and/or reducing human or animal health. Air quality is a term used to describe the amount of air pollution the public is exposed to in the environment.

Air quality in the United States is governed by the Federal Clean Air Act (CAA) and is administered by the United States Environmental Protection Agency (USEPA).

2.1 U.S. Environmental Protection Agency

The USEPA is responsible for establishing the National Ambient Air Quality Standards (NAAQS) and enforcing the Clean Air Act, and regulates emission sources, such as aircraft, ships, and certain types of locomotives, under the exclusive authority of the Federal government. The USEPA also has jurisdiction over emission sources outside state waters (e.g., beyond the outer continental shelf) and establishes various emission standards. For additional information about the USEPA, the reader can contact its general internet address found at www.epa.gov. Additional information on the activities of USEPA's Office of Mobile Sources can be found at www.epa.gov/omswww/mshome.htm.

2.2 Clean Air Act Amendments of 1990

The Clean Air Act Amendments of 1990 (CAAA) direct the USEPA to implement environmental policies and regulations that will ensure acceptable levels of air quality. Under the CAAA, a project cannot:

- Cause or contribute to any new violation of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS in any area; or
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area.

2.3 National Ambient Air Quality Standards

As required by the Clean Air Act, NAAQS have been established for six major air pollutants. These pollutants are: carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide, and lead. These standards are summarized in Table 2-1. The "primary" standards have been established to protect the public health. The "secondary" standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation and other aspects of the general welfare.

Table 2-1. National Ambient Air Quality Standards

Pollutant [final rule cite]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead [73 FR 66964, Nov 12, 2008]		primary and secondary	Rolling 3 month average	0.15 $\mu g/m^3$ (1)	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb (2)	Annual Mean
Ozone [73 FR 16436, Mar 27, 2008]		primary and secondary	8-hour	0.075 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution Dec 14, 2012	$PM_{2.5}$	primary	Annual	12 $\mu g/m^3$	annual mean, averaged over 3 years
		secondary	Annual	15 $\mu g/m^3$	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]		primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: USEPA Office of Air and Radiation, http://www.epa.gov/air/criteria.html (updated December 14, 2012)

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone 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.

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

2.4 Ambient Air Quality Data

2.4.1 Local Meteorology

The nature of the surrounding atmosphere is an important element in assessing the ambient air quality of an area. Detroit and the immediate suburbs, including nearby urban areas in Canada, occupy an area approximately 25 miles in radius. The waterways—consisting of the Detroit River, St. Clair River, Lake St. Clair, and the west end of Lake Erie—are at an elevation of 568 – 580 feet above sea level. Nearly flat land slopes up gently from the water's edge northwestward for approximately 10 miles and then gives way to increasingly rolling terrain. The Irish Hills, parallel to and about 40 miles northwest of the waterway, have tops of 1,000 – 1,250 feet above sea level. On the Canadian side of the waterway, the land is relatively level.

The current climate of Detroit is influenced by its location with respect to major storm tracks and the influence of the Great Lakes. The normal wintertime storm track is south of the City; the storm track brings, on the average, three-inch snowfalls. Winter storms can bring combinations of rain, snow, freezing rain, and sleet with heavy snowfall accumulations possible at times. In summer, most storms pass to the north allowing for intervals of warm, humid, sunny skies with occasional thunderstorms followed by days of mild, dry, and fair weather. Temperatures of 90 degrees or higher are reached during each summer.

Northwest winds in winter bring snow flurry accumulations to all of Michigan except in the Detroit metropolitan area while summer showers moving from the northwest weaken and sometimes dissipate as they approach Detroit. Much of the heaviest precipitation in winter — especially in the City's northwest suburbs — comes from southeast winds.

Lake and land breezes are conditions induced by the Great Lakes. They occur because of a difference in the heating and cooling rates between land and water. During a clear summer day, a lake breeze might develop in which winds flow on-shore from the body of water and orient themselves perpendicular to the shoreline. The development of this phenomenon is due to the ability of the land to absorb and re-radiate the incoming solar radiation. This characteristic allows for a more efficient heating of the surface and causes a large temperature gradient between the surface of the land and water.

During the night, just the opposite occurs: The land cools faster than the lake and a land breeze develops. Here, winds blow offshore from the cooler land surface to the warmer water. Wind speed direction and its variability have a large influence on the dispersion of atmospheric pollutants.

On warm days in late spring or early summer, lake breezes often lower temperatures by 10 – 15 degrees in the eastern part of the City and the northeastern suburbs. The general result is a warming in the winter and a cooling effect in the summer. The cooler temperatures in the summer are beneficial from an air quality perspective since high ambient temperatures combined with strong insulation enhance the formation of ozone. Indirectly, extremes of temperatures have a bearing on the energy consumption required for heating and cooling; this affects emissions going into the atmosphere.

2.4.2 Local Monitored Air Quality

The monitored information for three monitoring stations near the project area is presented in Table 2-2. This table presents the last three years of available monitored at each of these stations

in order to illustrate the study area's general air quality trends. Detailed monitored data can be found in Appendix A of this report.

2.5 Pollutant Description

2.5.1 Criteria Pollutants

Pollutants that have established national standards are referred to as "criteria pollutants." The sources of these pollutants, their effects on human health and the nation's welfare, and their final deposition in the atmosphere vary considerably. A brief description of each pollutant is provided below.

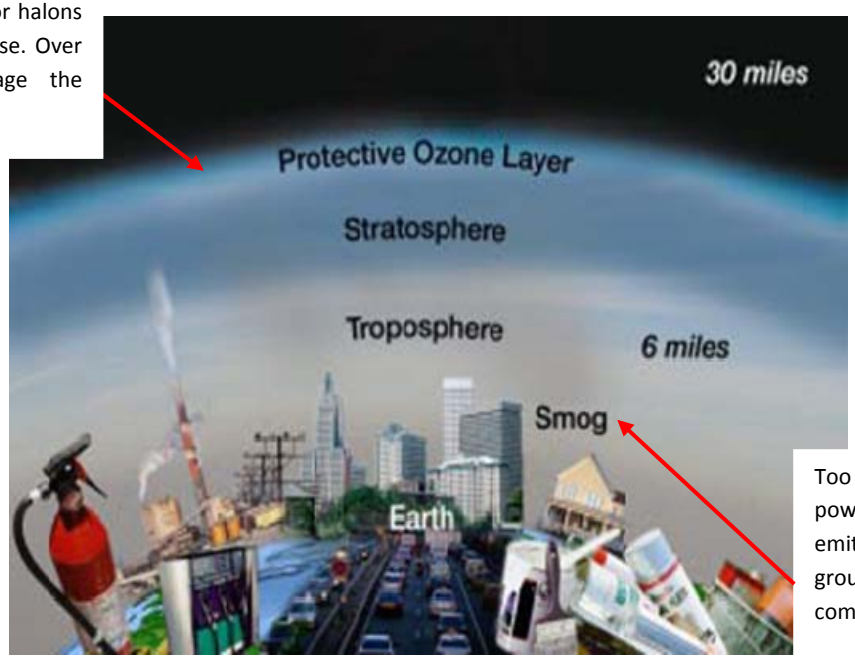
Ozone

Ozone (O_3) is a colorless toxic gas. As shown in Figure 2-1, O_3 is found in both the Earth's upper and lower atmospheric levels. In the upper atmosphere, O_3 is a naturally occurring gas that helps to prevent the sun's harmful ultraviolet rays from reaching the Earth. In the lower layer of the atmosphere, O_3 is man-made. Although O_3 is not directly emitted, it forms in the lower atmosphere through a chemical reaction between hydrocarbons (HC), also referred to as Volatile Organic Compounds (VOC), and nitrogen oxides (NOx), which are emitted from industrial sources and from automobiles. HC are compounds comprised primarily of atoms of hydrogen and carbon.

Substantial O_3 formations generally require a stable atmosphere with strong sunlight; thus high levels of O_3 are generally a concern in the summer. O_3 is the main ingredient of smog. O_3 enters the bloodstream through the respiratory system and interferes with the transfer of oxygen, depriving sensitive tissues in the heart and brain of oxygen. O_3 also damages vegetation by inhibiting its growth. The effects of changes in VOC and NOx emissions for the proposed project are examined on a regional and statewide level.

Figure 2-1. Ozone in the Atmosphere

Too little there… Many popular consumer products like air conditioners and refrigerators involve CFCs or halons during either manufacture or use. Over time, these chemicals damage the earth's protective ozone layer



Too much here... Cars, trucks, power plants and factories all emit air pollution that forms ground-level ozone, a primary component of smog.

Source: U.S. EPA - http://www.epa.gov/airquality/gooduphigh/good.html#1

Table 2-2. Summary of Air Quality Monitored Data Near Study Area

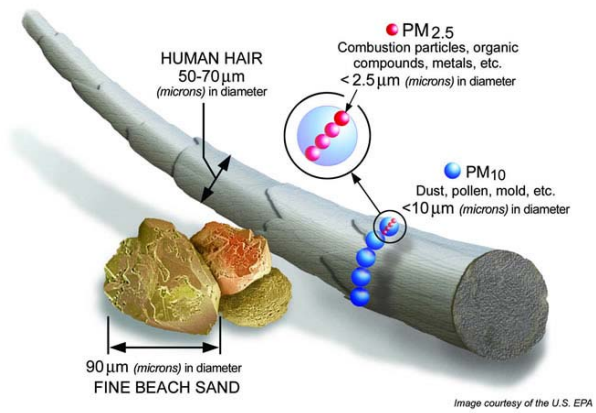
Air Pollutant	Standard/ Exceedance	11600 East 7 Mile Rd Detroit			150 Waterman St Detroit			14700 Goddard St Allen Park		
		2009	2010	2011	2009	2010	2011	2009	2010	2011
Carbon Monoxide (CO)	Max. 1-hour Concentration (ppm)	NM	NM	NM	NM	NM	NM	2.0	2.2	2.0
	Max. 8-hour Concentration (ppm)	NM	NM	NM	NM	NM	NM	1.3	1.4	1.6
	# Days>Federal 1-hour Std. of >35 ppm	NM	NM	NM	NM	NM	NM	0	0	0
	# Days>Federal 8-hour Std. of >9 ppm	NM	NM	NM	NM	NM	NM	0	0	0
Ozone (O_3)	Max. 1-hour Concentration (ppm)	0.095	0.096	0.104	NM	NM	NM	0.083	0.087	0.104
	Max. 8-hour Concentration (ppm)	0.086	0.082	0.087	NM	NM	NM	0.073	0.071	0.084
	# Days>Federal 8-hour Std. Of >0.075 ppm	1	7	10	NM	NM	NM	0	0	4
Nitrogen Dioxide (NO_2)	Max. 1-hour Concentration (ppb)	59	74	67	NM	NM	NM	NM	NM	NM
	# Days>Federal 1-hour Std. Of >100 ppb	0	0	0	NM	NM	NM	NM	NM	NM
Sulfur Dioxide (SO_2)	Max. 24-hour Concentration (ppb)	NM	NM	NM	29	68	38	14	14	11
	Max. 1-hour Concentration (ppb)	NM	NM	NM	104	160	112	70	67	58
	# Days>Federal 1-hour Std. of >75 ppb	NM	NM	NM	7	0	0	0	0	0
	# Days>Federal 24-hour Std. of >140 ppb	NM	NM	NM	0	41	13	0	0	0
Suspended Particulates (PM_{10})	Max. 24-hour Concentration ($\mu g/m^3$)	NM	NM	NM	50	52	77	36	38	53
	#Days>Fed. 24-hour Std. of>150 $\mu g/m^3$	NM	NM	NM	0	0	0	0	0	0
Suspended Particulates ($PM_{2.5}$)	Max. 24-hour Concentration ($\mu g/m^3$)	33.2	32.5	25.7	32.3	34.6	36.7	32.1	34.8	31.2
	#Days>Fed. 24-hour Std. of>35 $\mu g/m^3$	0	0	0	0	0	0	0	0	0
	National Annual Average ($\mu g/m^3$)	10.5	9.9	9.4	11.1	10.7	10.9	11	10.2	10.5
	#Days>Fed. Annual Std. of>15.0 $\mu g/m^3$	0	0	0	0	0	0	0	0	0
Lead	Maximum 24-Hour Concentration ($\mu g/m^3$)	NM	NM	NM	NM	0.018	NM	NM	0.013	0.015

Source: Parsons Brinckerhoff, 2013
NM = Not measured

Particulate Matter

Particulate pollution is composed of solid particles or liquid droplets that are small enough to remain suspended in the air. In general, particulate pollution can include dust, soot, and smoke; these can be irritating but usually are not poisonous. Particulate pollution also can include bits of solid or liquid substances that can be highly toxic. Of particular concern are those particles that are smaller than, or equal to, 10 microns (PM_{10}) or 2.5 microns ($PM_{2.5}$) in size.

Figure 2-2. Relative Particulate Matter Size



Source: EPA Office of Air and Radiation

PM_{10} refers to particulate matter less than 10 microns in diameter, about one-seventh the thickness of a human hair (Figure 2-2). Particulate matter pollution consists of very small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals. Particulate matter also forms when gases emitted from motor vehicles undergo chemical reactions in the atmosphere.

Major sources of PM_{10} include motor vehicles; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions. Suspended particulates produce haze and reduce visibility.

Data collected through numerous nationwide studies indicate that most of the PM_{10} comes from the following:

- Fugitive dust
- Wind erosion
- Agricultural and forestry sources

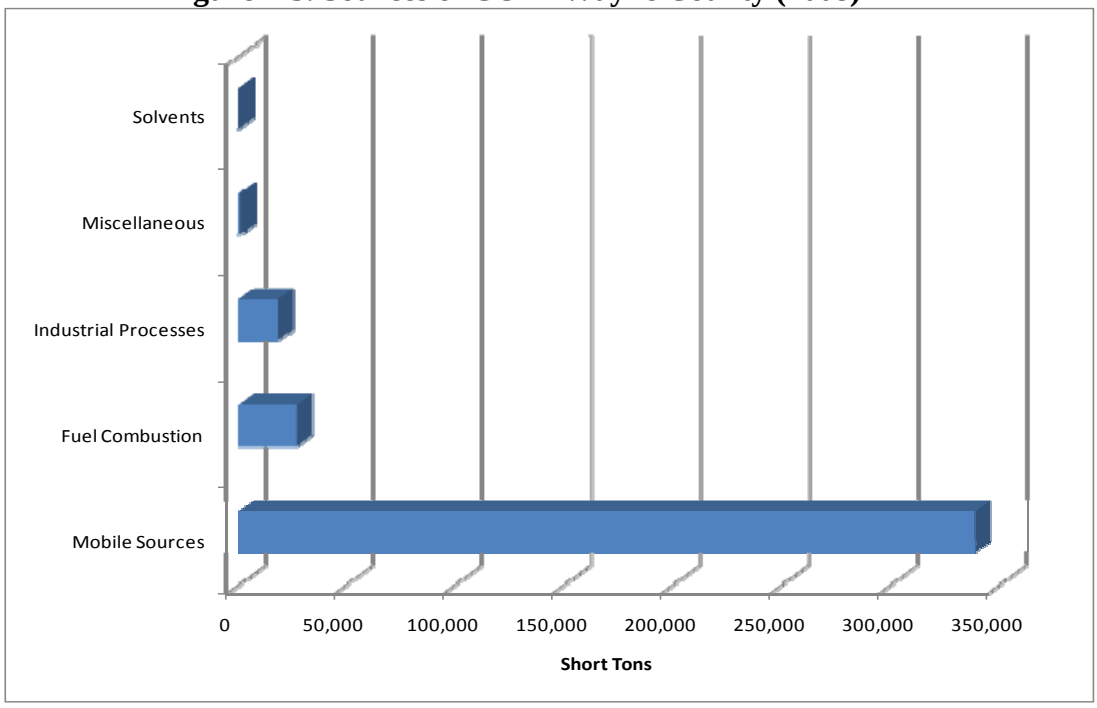
A small portion of particulate matter is the product of fuel combustion processes. In the case of $PM_{2.5}$, the combustion of fossil fuels accounts for a significant portion of this pollutant. The main health effect of airborne particulate matter is on the respiratory system. $PM_{2.5}$ refers to particulates that are 2.5 microns or less in diameter, roughly 1/28th the diameter of a human hair. $PM_{2.5}$ results from fuel combustion (from motor vehicles, power generation, and industrial facilities), residential fireplaces, and wood stoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. Like PM_{10}, $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Whereas particles 2.5 to 10 microns in diameter tend to collect in the upper portion of the respiratory system, particles 2.5 microns or less are so tiny that they can penetrate deeper into the lungs and damage lung tissues. The effects of PM_{10} and $PM_{2.5}$ emissions for the project are examined on a localized, or microscale, basis, a regional basis and a statewide basis.

Carbon Monoxide

Carbon monoxide (CO) is a colorless gas that interferes with the transfer of oxygen to the brain. CO is emitted almost exclusively from the incomplete combustion of fossil fuels. As shown in Figure 2-3, mobile sources (on-road motor vehicle exhaust) are the primary source of CO in Wayne County. In cities, 85 to 95 percent of all CO emissions may come from motor vehicle exhaust. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, or heart disease. CO levels are generally highest in the colder months of the year when inversion conditions (when warmer air traps colder air near the ground) are more frequent.

CO concentrations can vary greatly over relatively short distances. Relatively high concentrations of CO are typically found near congested intersections, along heavily used roadways carrying slow-moving traffic, and in areas where atmospheric dispersion is inhibited by urban "street canyon" conditions. Consequently, CO concentrations must be predicted on a microscale basis.

Figure 2-3. Sources of CO in Wayne County (2008)



Source: USEPA
http://www.epa.gov/cgi-bin/broker?polchoice=CO&_debug=0&_service=data&_program=dataprog.national_1.sas

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a brownish gas that irritates the lungs. It can cause breathing difficulties at high concentrations. As with O_3, NO_2 is not directly emitted but is formed through a reaction between nitric oxide (NO) and atmospheric oxygen. NO and NO_2 are collectively referred to as nitrogen oxides (NOx) and are major contributors to ozone formation. NO_2 also contributes to the formation of PM_{10}. At atmospheric concentrations, NO_2 is only potentially irritating. In high concentrations, the result is a brownish-red cast to the atmosphere and reduced visibility. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis. An increase in bronchitis in children (two and three years old) has also been observed at concentrations below 0.3 parts per million (ppm).

Lead

Lead (Pb) is a stable element that persists and accumulates both in the environment and in animals. Its principal effects in humans are on the blood-forming, nervous, and renal systems. Lead levels from mobile sources in the urban environment have decreased significantly due to the federally-mandated switch to lead-free gasoline, and they are expected to continually decrease. An analysis of lead emissions from transportation projects is therefore not warranted.

Sulfur Dioxide

Sulfur Dioxide (SO_2) is a product of high-sulfur fuel combustion. The main sources of SO_2 are coal and oil used in power stations, industry, and domestic heating. Industrial chemical manufacturing is another source of SO_2. SO_2 is an irritant gas that attacks the throat and lungs. It can cause acute respiratory symptoms and diminished ventilator function in children. SO_2 can also yellow plant leaves and corrode iron and steel. Although diesel-fueled heavy duty vehicles emit SO_2, transportation sources are not considered by EPA (and other regulatory agencies) to be significant sources of this pollutant.

2.5.2 Mobile Source Air Toxics

Air Toxics

In addition to the criteria pollutants for which there are NAAQS, the EPA also regulates air toxics. Toxic air pollutants are those pollutants known or suspected to cause cancer or other serious health effects. Most air toxics originate from man-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/ncea/iris/index.html). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOVES2010b model, even if vehicle activity (vehicle-miles traveled, VMT) increases by 102 percent as assumed from 2012 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same period.

A brief description of the seven priority MSATs is given below.

Acrolein is a water-white or yellow liquid that burns easily, is readily volatilized, and has a disagreeable odor. It is present as a product of incomplete combustion in the exhausts of stationary equipment (e.g., boilers and heaters) and mobile sources. It is also a secondary

pollutant, formed through the photochemical reaction of VOC and NO_X in the atmosphere. Acrolein is considered to have high acute toxicity, and it causes upper respiratory tract irritation and congestion in humans. The major effects from chronic (long-term) inhalation exposure to acrolein in humans consist of general respiratory congestion and eye, nose, and throat irritation. No information is available on the reproductive, developmental, or carcinogenic effects of acrolein in humans. EPA considers acrolein data to be inadequate for an assessment of human carcinogenic potential.

Benzene is a volatile, colorless, highly flammable liquid with a sweet odor. Most of the benzene in ambient air is from incomplete combustion of fossil fuels and evaporation from gasoline service stations. Acute inhalation exposure to benzene causes neurological symptoms, such as drowsiness, dizziness, headaches, and unconsciousness in humans. Chronic inhalation of certain levels of benzene causes disorders in the blood in humans. Benzene specifically affects bone marrow (the tissues that produce blood cells). Aplastic anemia, excessive bleeding, and damage to the immune system (by changes in blood levels of antibodies and loss of white blood cells) may develop. Available human data on the developmental effects of benzene are inconclusive due to concomitant exposure to other chemicals, inadequate sample size, and lack of quantitative exposure data. EPA has classified benzene as a known human carcinogen by inhalation.

1,3-Butadiene is a colorless gas with a mild gasoline-like odor. Sources of 1,3-butadiene released into the air include motor vehicle exhaust, manufacturing and processing facilities, forest fires or other combustion, and cigarette smoke. Acute exposure to 1,3-butadiene by inhalation in humans results in irritation of the eyes, nasal passages, throat, and lungs. Neurological effects, such as blurred vision, fatigue, headache, and vertigo, have also been reported at very high exposure levels. One epidemiological study reported that chronic exposure to 1,3-butadiene via inhalation resulted in an increase in cardiovascular diseases, such as rheumatic and arteriosclerotic heart diseases, while other human studies have reported effects on the blood. No information is available on reproductive or developmental effects of 1,3-butadiene in humans. EPA has classified 1,3-butadiene as a probable human carcinogen by inhalation.

Diesel Particulate Matter/Diesel Exhaust Organic Gases are a complex mixture of hundreds of constituents in either a gaseous or particle form. Gaseous components of diesel exhaust (DE) include CO_2, oxygen, nitrogen, water vapor, CO, nitrogen compounds, sulfur compounds, and numerous low-molecular-weight hydrocarbons. Among the gaseous hydrocarbon components of DE that are individually known to be of toxicological relevance are several carbonyls (e.g., formaldehyde, acetaldehyde, acrolein), benzene, 1,3-butadiene, and polycyclic aromatic hydrocarbons (PAHs) and nitro-PAHs. DPM is composed of a center core of elemental carbon and adsorbed organic compounds, as well as small amounts of sulfate, nitrate, metals, and other trace elements. DPM consists primarily of $PM_{2.5}$, including a subgroup with a large number of particles having a diameter <0.1 μm. Collectively, these particles have a large surface area, which makes them an excellent medium for adsorbing organics. Also, their small size makes them highly respirable and able to reach the deep lung. A number of potentially toxicologically-relevant organic compounds, including PAHs, nitro-PAHs, and oxidized PAH derivatives, are on the particles. Diesel exhaust is emitted from on-road mobile sources, such as automobiles and trucks, and from off-road mobile sources (e.g., diesel locomotives, marine vessels, and construction equipment). DPM is directly emitted from diesel-powered engines (primary particulate matter) and can be formed from the gaseous compounds emitted by diesel engines (secondary particulate matter).

Acute or short-term (e.g., episodic) exposure to DE can cause acute irritation (e.g., eye, throat, bronchial), neurophysiological symptoms (e.g., lightheadedness, nausea), and respiratory symptoms (cough, phlegm). Evidence also exists for an exacerbation of allergenic responses to known allergens and asthma-like symptoms. Information from the available human studies is inadequate for a definitive evaluation of possible non-cancer health effects from chronic exposure to DE. However, on the basis of extensive animal evidence, DE is judged to pose a chronic respiratory hazard to humans. EPA has determined that DE is "likely to be carcinogenic to humans by inhalation" and that this hazard applies to environmental exposures.

Formaldehyde is a colorless gas with a pungent, suffocating odor at room temperature. The major emission sources of formaldehyde appear to be power plants, manufacturing facilities, incinerators, and automobile exhaust. However, most of the formaldehyde in ambient air is a result of secondary formation through photochemical reaction of VOC and NO_X. The major toxic effects caused by acute formaldehyde exposure via inhalation are eye, nose, and throat irritation and effects on the nasal cavity. Other effects seen from exposure to high levels of formaldehyde in humans are coughing, wheezing, chest pains, and bronchitis. Chronic exposure to formaldehyde by inhalation in humans has been associated with respiratory symptoms and eye, nose, and throat irritation. EPA considers formaldehyde to be a probable human carcinogen.

Naphthalene is used in the production of phthalic anhydride; it is also used in mothballs. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and neurological damage. Cataracts have also been reported in workers acutely exposed to naphthalene by inhalation and ingestion. Chronic (long-term) exposure of workers and rodents to naphthalene has been reported to cause cataracts and damage to the retina. Hemolytic anemia has been reported in infants born to mothers who "sniffed" and ingested naphthalene (as mothballs) during pregnancy. Available data are inadequate to establish a causal relationship between exposure to naphthalene and cancer in humans. EPA has classified naphthalene as a Group C, possible human carcinogen.

The term **Polycyclic Organic Matter** (POM) defines a broad class of compounds that includes the polycyclic aromatic hydrocarbon compounds (PAH), of which benzo[a]pyrene is a member. POM compounds are formed primarily from combustion and are present in the atmosphere in particulate form. Sources of air emissions are diverse and include cigarette smoke, vehicle exhaust, home heating, laying tar, and grilling meat. Cancer is the major concern from exposure to POM. Epidemiologic studies have reported an increase in lung cancer in humans exposed to coke oven emissions, roofing tar emissions, and cigarette smoke; all of these mixtures contain POM compounds. Animal studies have reported respiratory tract tumors from inhalation exposure to benzo[a]pyrene and forestomach tumors, leukemia, and lung tumors from oral exposure to benzo[a]pyrene. EPA has classified seven PAHs (benzo[a]pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) as Group B2, probable human carcinogens.

2.6 Attainment Status

Section 107 of the 1977 Clean Air Act Amendment requires that the USEPA publish a list of all geographic areas in compliance with the NAAQS, plus those not attaining the NAAQS. Areas not in NAAQS compliance are deemed non-attainment areas. Areas that have insufficient data to make a determination are deemed unclassified, and are treated as being attainment areas until proven otherwise. Maintenance areas are areas that were previously designated as nonattainment for a particular pollutant, but have since demonstrated compliance with the NAAQS for that

pollutant. An area's designation is based on the data collected by the state monitoring network on a pollutant-by-pollutant basis.

The Project is located in Wayne County, Michigan. As shown Table 2-3, the USEPA has classified the county as a nonattainment area for $PM_{2.5}$. The monitors in the region are currently measuring $PM_{2.5}$ at attainment levels. SEMCOG is working with the State on a request to EPA for redesignation to "attainment/maintenance" for both the $PM_{2.5}$ annual and 24-hour standard.

Table 2-3. Project Area Attainment Status

Pollutant	Federal Attainment Status Wayne County, MI
Ozone (O_3)	Attainment / Maintenance
Nitrogen Dioxide (NO_2)	Attainment
Carbon Monoxide (CO)	Attainment / Maintenance
Particulate Matter (PM_{10})	Attainment(1)
Particulate Matter ($PM_{2.5}$) – Annual and 24-Hour	Nonattainment
Lead (Pb)	Attainment

Source: Environmental Protection Agency (EPA), 2012

(1) A portion of Wayne County, in southwest Detroit, is designated as a maintenance area. The project, however, is not located in this area.

2.7 State Implementation Plan and Transportation Improvement Program Status

Under the Clean Air Act Amendments of 1990 (CAAA), the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), and the Transportation Equity Act for the 21st Century (TEA-21), proposed transportation projects must be derived from a long-range transportation plan (LRP) or RTP that conforms with the state air quality plans as outlined in the state implementation plan (SIP). The SIP sets forth the state's strategies for achieving air quality standards. Projects must also be included in a Transportation Improvement Program (TIP) that conforms with the SIP, and localized impacts from proposed projects must conform to state air quality plans in non-attainment and maintenance areas.

The Southeast Michigan Council of Governments (SEMCOG) is the Metropolitan Planning Organization for the greater Detroit area. *Direction2035* is the region's long-range vision for transportation, also known as the Regional Transportation Plan (RTP). Adopted in October 2009 by SEMCOG's General Assembly, the RTP demonstrates how the transportation system can lend itself to improving the region overall by contributing to transportation goals, economic recovery, environmental health, community revitalization and stability, and quality of life. It consists of transportation projects anticipated over the next 26 years, as well as policies and initiatives to be carried out by both SEMCOG and its partner agencies to keep moving the region in the right direction. Projects to be completed in the near term are included in the region's Transportation Improvement Program (TIP). The TIP is a list of roadway and transit projects selected as priorities for funding by cities, county road commissions, transit agencies, and the Michigan Department of Transportation. The current TIP covers the period from fiscal year (FY) 2011 through FY 2014. The Woodward Avenue Streetcar is included in the December 14, 2012 amendment to the RTP, *Direction2035*, as project I.D. #4430[1]. The project is also included in the December 14, 2012 amendment to the 2011-2014 TIP as project I.D. #2010353[2].

[1] RTP amendment can be found at http://www.semcog.org/direction2035_Amendment_20121108.aspx

[2] TIP amendment can be found at http://www.semcog.org/uploadedFiles/Programs_and_Projects/Planning/Short_Range_Transportation_Plan/December_2012_TIP.pdf

3.0 Environmental Impact/Environmental Consequences

Pollutants that can be traced principally to motor vehicles are relevant to the evaluation of the project's impacts; these pollutants include CO, HC, NO_x, O_3, PM_{10}, $PM_{2.5}$, and MSAT. Transportation sources account for a small percentage of regional emissions of SO_x and Pb; thus, a detailed analysis is not required.

HC (VOC) and NO_x emissions from automotive sources are a concern primarily because they are precursors in the formation of ozone and particulate matter. Ozone is formed through a series of reactions that occur in the atmosphere in the presence of sunlight. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels often are found many miles from the sources of the precursor pollutants. Therefore, the effects of HC and NO_x emissions generally are examined on a regional or "mesoscale" basis.

PM_{10} and $PM_{2.5}$ impacts are both regional and local. A significant portion of particulate matter, especially PM_{10}, comes from disturbed vacant land, construction activity, and paved road dust. $PM_{2.5}$ also comes from these sources. Motor vehicle exhaust, particularly from diesel vehicles, is also a source of PM_{10} and $PM_{2.5}$. PM_{10}, and especially $PM_{2.5}$, can also be created by secondary formation from precursor elements such as sulfur dioxide (SO_2), nitrogen oxides (NO_X), volatile organic compounds (VOCs), and ammonia (NH_3). Secondary formation occurs due to chemical reaction in the atmosphere generally downwind some distance from the original emission source. Thus it is appropriate to predict concentrations of PM_{10} and $PM_{2.5}$ on both a regional and a localized basis.

CO impacts are generally localized. Even under the worst meteorological conditions and most congested traffic conditions, high concentrations are limited to a relatively short distance (300 to 600 feet) of heavily traveled roadways. Vehicle emissions are the major sources of CO. The Project could change traffic patterns within the project area. Consequently, it is appropriate to predict concentrations of CO on both a regional and a localized or "microscale" basis.

MSAT impacts are both regional and local. On February 3, 2006, the FHWA released *Interim Guidance on Air Toxic Analysis in NEPA Documents.* This guidance was superseded on September 30, 2009 by FHWA's *Interim Guidance Update on Air Toxic Analysis in NEPA Documents.* On December 6, 2012, the interim guidance was updated. According to these documents, regardless of the alternative chosen, MSAT emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by 83 percent between 1999 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle miles traveled (VMT) growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

3.1 Regional Emissions Analysis

The regional (or mesoscale) analysis of a project determines a project's overall impact on regional air quality levels. A transportation project is analyzed as part of a regional transportation network developed by the County or State. Projects included in this network are found in the area's Transportation Improvement Plan (TIP). The TIP is the basis for the regional analysis which utilizes vehicle miles traveled (VMT) and vehicle hours traveled (VHT) within the region

to estimate daily "pollutant burden" levels. The results of this analysis determine if an area is in conformity with regulations set forth in the Final Conformity Rule.

The Woodward Avenue Streetcar is included in the December 14, 2012 amendment to the RTP, *Direction2035*, as project I.D. #4430. The project is also included in the December 14, 2012 amendment to the 2011-2014 TIP as project I.D. #2010353. This analysis found that the plan and, therefore, the individual projects contained in the plan, are conforming projects, and will have air quality impacts consistent with those identified in the state implementation plans (SIPs) for achieving the National Ambient Air Quality Standards (NAAQS).

The project is expected to reduce regional VMT, and therefore is not expected to have a negative impact on regional air quality. Furthermore, since the project is included in both the TIP and RTP, the conformity analysis conducted by the Southeast Michigan Council of Governments (SEMCOG) for those documents has determined that the Project conforms to the air quality goals of the region. As such, an analysis of the regional air quality impacts of the project was not deemed necessary and therefore was not conducted.

3.2 Carbon Monoxide (CO)

Sites are chosen for a detailed microscale CO analysis using a screening analysis based on overall intersection volume, changes in intersection volume, and changes in traffic level of service (LOS). Intersections that demonstrate a LOS of A, B, or C pass the screening test. That is, they are not expected to cause a violation of the NAAQS. An intersection that the project causes to operate at or below LOS D, increase delay of an intersection with a LOS of worse than D, or increase overall volumes, has the potential to cause a violation of the NAAQS, and thus fail the screening analysis.

As shown in Table 3-1, all intersections pass the screening analysis under the Streetcar Alternative conditions – that is, no intersections are predicted to operate below LOS C. As such, a detailed microscale analysis is not required.

Furthermore, based on the results of the microscale air quality analysis conducted for the *Woodward Avenue LRT Air Quality Final Technical Report (June 2011),* the three intersections which previously failed the screening analysis (Woodward and Euclid, Woodward and Bethune, and Woodward and MLK Jr. / Mack) did not show any violations of the NAAQS for 1-hour or 8-hour CO under existing (2005) or future (2030) conditions.

As such, no violations of the NAAQS are predicted for this project.

Table 3-1. CO Intersection Screening Analysis

Intersection with Woodward Avenue	Streetcar Alternative 2030 AM Peak Hour		Streetcar Alternative 2030 PM Peak Hour	
	LOS	Delay	LOS	Delay
Bethune	A	7.4	A	7.6
Lothrop	A	1.1	A	1.7
Grand Blvd	C	25.4	C	21.4
Milwaukee	B	15.1	B	19.7
Baltimore	A	2.6	C	23.9
Piquette/Amsterdam	A	9.8	B	11.8
Antoinette	B	10.7	B	13.0
Palmer	A	6.7	A	9.6
Ferry St	A	4.5	A	7.0
Kirby	A	7.6	A	8.4
Putnam	A	1.9	A	7.2
Warren	B	18.4	C	20.4
Forest	B	12.8	B	10.1
Canfield	A	8.4	B	14.9
Alexandrine	A	6.0	B	11.1
Parsons	A	2.2	B	12.2
Mack/MLK Blvd	C	22.8	C	23.4
Peterboro	A	5.1	A	4.2
Charlotte	A	3.9	A	7.2
Sibley/Adelaide	B	10.8	B	13.9
Woodward south of Cadillac	B	11.7	B	14.8
Cadillac Square	A	4.4	B	13.6
Monroe	A	8.4	A	8.9
SBI75service Dr	B	16.0	B	15.6
NBI75Service Dr	A	5.1	A	9.7
Montcalm	A	5.2	A	8.1
Elizabeth	A	4.6	A	4.2
Adams	B	14.7	B	17.7
Park	B	13.2	B	14.8
John R	A	9.3	A	8.3
Grand River	B	15.8	B	13.2
State	A	9.8	A	9.1
Larned	C	21.6	B	19.5
Congress	B	19.3	C	23.5
Woodward north of Michigan	B	10.3	B	10.9
Michigan	A	5.1	A	5.8

Source: Woodward Avenue Streetcar Project Team, 2013

3.3 Particulate Matter (PM_{10} and $PM_{2.5}$)

Because the project area is classified as a nonattainment area for $PM_{2.5}$, a qualitative hotspot analysis following EPA's March 29, 2006 guidance "*Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (EPA420-B-06-902) was conducted, as recommended in EPA's Final Rule regarding the localized or "hot-spot" analysis of $PM_{2.5}$ and PM_{10} (40 CFR Part 93 – issued on March 10, 2006).

Following these guidelines a $PM_{2.5}$ hot-spot analysis should be conducted according to qualitative guidance only if the project is a project of air quality concern, defined in 40 CFR 93.123(b)(1) as:

- New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.
- Projects affecting intersections that are at Level of Service D, E, or F with a significant number of diesel vehicles, or those that will change to Level of Service D, E or F because of increased traffic volumes from a significant number of diesel vehicles.
- New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location.
- Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location.
- Projects in or affecting locations, areas, or categories of sites which are identified in the $PM_{2.5}$ or PM_{10} applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

Examples of projects of air quality concern that would be covered by 40 CFR 93.123(b)(1)(i) and (ii) include:

- A project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as facilities with greater than 125,000 annual average daily traffic (AADT) where 8 percent or more of such AADT is diesel truck traffic.
- New exit ramps and other highway facility improvements to connect a highway or expressway to a major freight, bus, or intermodal terminal.
- Expansion of an existing highway or other facility that affects a congested intersection (operated at Level of Service D, E, or F) that has a significant increase in the number of diesel trucks.
- Similar highway projects that involve a significant increase in the number of diesel transit buses and/or diesel trucks.

Examples of projects of air quality concern that would be covered by 40 CFR 93.123(b)(1)(iii) and (iv) include:

- A major new bus or intermodal terminal that is considered to be a "regionally significant project" under 40 CFR 93.101.
- An existing bus or intermodal terminal that has a large vehicle fleet where the number of diesel buses increases by 50 percent or more, as measured by bus arrivals.

An interagency consultation between the concerned agencies, determines if a project is one of air quality concern. In this case, the agencies included the Michigan Department of Transportation (MDOT), Michigan Department of Environmental Quality (MDEQ), SEMCOG, and the appropriate Federal agencies, including the United States Environmental Protection Agency (USEPA), the Federal Transit Administration (FTA) and the Federal Highway Authority (FHWA). ,. In general, the interagency consultation includes a review of the project's impact on roadways in the study area along with representative monitored data. The project is not proposing to expand or create new bus or rail terminals. The project is not expected to increase diesel truck traffic in the project area, nor will it significantly affect regional VMT. As such, the Southeast Michigan Inter-Agency Working Group's confirmed the determination that the Woodward Avenue Streetcar is not one of air quality concern with regard to PM hotspot analysis. A letter of their confirmation can be found in Appendix A of this report.

3.4 Mobile Source Air Toxics (MSAT)

The USEPA is the lead Federal agency for administering the CAA and has certain responsibilities regarding the health effects of MSATs. The USEPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (66 Federal Register 17229, March 29, 2001). This rule was issued under the authority in Section 202 of the CAA. In its rule, USEPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline program, its national low emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel requirements. Future emissions likely would be lower than present levels as result of the USEPA's national control programs that are projected to reduce MSAT emissions by 83 percent from 2010 to 2050, even if VMT increases by 102 percent, as shown in Figure 3-1.

On February 9, 2007 and under authority of CAA Section 202(l), USEPA signed a Final Rule, Control of Hazardous Air Pollutants from Mobile Sources, which sets standards to control MSATs from motor vehicles. Under this rule, USEPA is setting standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. The new standards are estimated to reduce total emissions of MSATs by 330,000 tons in 2030, including 61,000 tons of benzene. Concurrently, total emissions of volatile organic compounds (VOC) will be reduced by over 1 .1 million tons in 2030 as a result of adopting these standards.

On February 3, 2006, the FHWA released "Interim Guidance on Air Toxic Analysis in NEPA Documents." This guidance was superseded on December 6, 2012 by FHWA's "Interim Guidance Update on Air Toxic Analysis in NEPA." The purpose of FHWA's guidance is to advise on when and how to analyze Mobile Source Air Toxics (MSATs) in the NEPA process for highways. This guidance is interim, because MSAT science is still evolving. As the science progresses, FHWA will update the guidance.

A qualitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives, found at:

http://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/methodology/methodology00.cfm.

FHWA's Interim Guidance groups projects into the following tier categories:

- No analysis for projects with no potential for meaningful MSAT Effects;
- Qualitative analysis for projects with low potential MSAT effects; or
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

Based on the recommended tiering approach, this Project falls within the Tier 2 approach. Tier 2 is appropriate for this Project because it does not fall under the Tier 1 category, which includes:

- Projects qualifying as a categorical exclusion under 23 CFR, Part 771.117(c);
- Projects exempt under the Clean Air Act conformity rule under 40 CFR, Part 93.126; or
- Other projects with no meaningful impacts on traffic volumes or vehicle mix.

The Project also does not fall under the Tier 3 category. Tier 3 includes projects that:

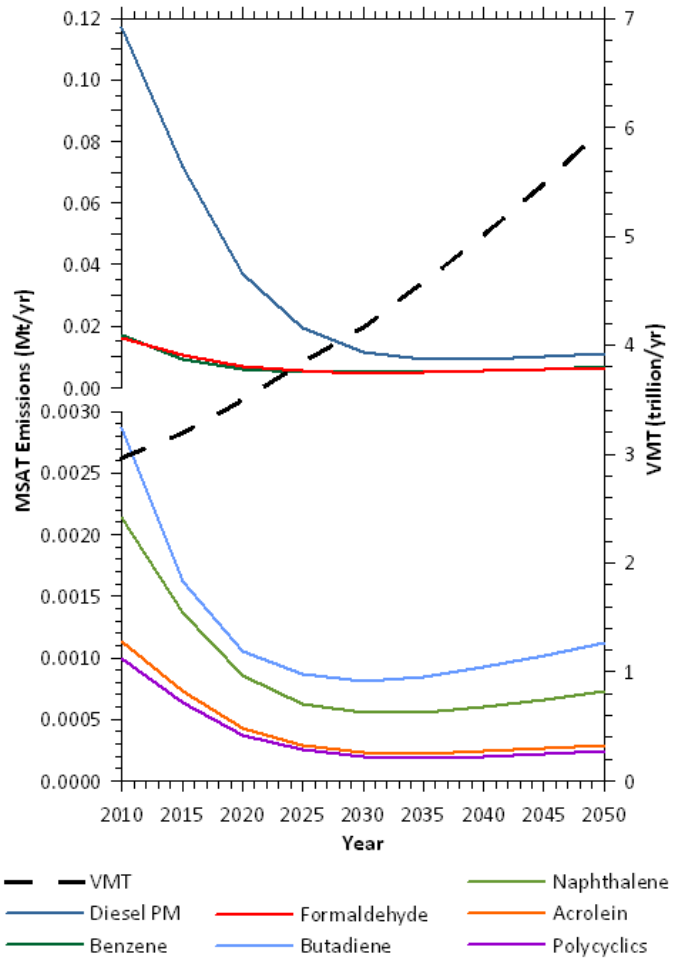
- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location; or
- Create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the Average Annual Daily Traffic (AADT) is projected to be in the range of 140,000 to 150,000 vehicles per day (vpd), or greater, by the design year.

And also:

- Proposed to be located in proximity to populated areas.

As stated in FHWA's guidance, Tier 2 includes projects that "serve to improve operations of highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. This category covers a broad range of projects." Based on this guidance, the Project was analyzed using the Tier 2 approach.

Figure 3-1. National MSAT Emission Trends 2010-2050 for Vehicles Operating on Roadways Using USEPA's MOVES2010b Model



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors

Source: EPA MOVES2010b model runs conducted during May - June 2012 by FHWA.

When comparing the Streetcar Alternative to the No-Build Alternative, the variation in the amount of MSATs emitted would be proportional to the change in vehicle-miles traveled (VMT) between the No-Build and Streetcar Alternative(s), assuming that other variables such as fleet mix are the same under No-Build and Streetcar conditions. This Project is not expected to measurably affect regional VMT. Since the Project is not expected to measurably affect VMT, it is not expected to affect MSAT levels in the project area in comparison to the No-Build Alternative. In comparing the Streetcar Alternative to the No-Build Alternative, MSAT levels could be higher in some locations than others, such station locations, but current tools and science are not adequate to quantify them. Regardless, emissions likely would be lower than present levels in the design year as a result of USEPA's national control programs that are projected to reduce annual MSAT emissions by 83 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the USEPA-projected

reductions is so great (even after accounting for VMT growth) that MSAT emissions in the project area likely would be lower in the future in nearly all cases.

This document has provided a qualitative analysis of MSAT emissions and has acknowledged that the Streetcar Alternative could increase exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain. However, available technical tools do not enable prediction of the project-specific health impacts of the emission changes associated with the detailed study alternatives. Because of these limitations, the following discussion is included in accordance with the President's Council on Environmental Quality (CEQ) regulations (40 CFR, Section 1502.22[b]) regarding incomplete or unavailable information.

3.4.1 Incomplete or Unavailable Information for Project-Specific MSAT Health Impacts Analysis

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The U.S. Environmental Protection Agency (EPA) is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, http://www.epa.gov/iris/). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are; cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts - each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have

to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA (http://www.epa.gov/risk/basicinformation.htm#g) and the HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

3.5 Construction Assessment

Construction-related effects of the project would be limited to short-term increased fugitive dust and mobile-source emissions during construction. State and local regulations regarding dust control and other air quality emission reduction controls should be followed.

Once a detailed construction schedule is developed, a more refined construction analysis will be conducted to determine the air quality impacts of construction.

3.5.1 Fugitive Dust Emissions

Fugitive dust is airborne particulate matter, generally of a relatively large particulate size. Construction-related fugitive dust would be generated by haul trucks, concrete trucks, delivery trucks, and earth-moving vehicles operating around the construction sites. This fugitive dust would be due primarily to particulate matter re-suspended ("kicked up") by vehicle movement over paved and unpaved roads, dirt tracked onto paved surfaces from unpaved areas at access points, and material blown from uncovered haul trucks.

Generally, the distance that particles drift from their source depends on their size, the emission height, and the wind speed. Small particles (30 – 100 micron range) can travel several hundred feet before settling to the ground. Most fugitive dust, however, is comprised of relatively large particles (that is, particles greater than 100 microns in diameter). These particles are responsible for the reduced visibility often associated with this type of construction. Given their relatively large size, these particles tend to settle within 20 to 30 feet of their source.

In order to minimize the amount of construction dust generated, the guidelines below should be followed. The following preventive and mitigative measures should be taken to minimize the potential particulate pollution problem:

- Site Preparation
  - Minimize land disturbance.
  - Use watering trucks to minimize dust.
  - Cover trucks when hauling dirt.
  - Stabilize the surface of dirt piles if they are not removed immediately.
  - Use windbreaks to prevent accidental dust pollution.
  - Limit vehicular paths and stabilize these temporary roads.
  - Pave all unpaved construction roads and parking areas to road grade for a length no less than 50 feet from where such roads and parking areas exit the construction site. This prevents dirt from washing onto paved roadways.
- Construction
  - Cover trucks when transferring materials.
  - Use dust suppressants on unpaved traveled paths.
  - Minimize unnecessary vehicular and machinery activities.
  - Minimize dirt track-out by washing or cleaning trucks before leaving the construction site. An alternative to this strategy is to pave a few hundred feet of the exit road just before entering the public road.
- Post-Construction
  - Re-vegetate any disturbed land not used.
  - Remove unused material.
  - Remove dirt piles.
  - Re-vegetate all vehicular paths created during construction to avoid future off-road vehicular activities.

3.5.2 CO Construction Emissions

Since CO emissions from motor vehicles generally increase with decreasing vehicle speed, disruption of traffic during construction (such as the temporary reduction of roadway capacity and the increased queue lengths) could result in short-term, elevated concentrations of CO. In order to minimize the amount of emissions generated, every effort should be made during the construction phase to limit disruption to traffic, especially during peak travel hours.

4.0 Conclusion

The Woodward Avenue Streetcar is included in the December 14, 2012 amendment to the RTP, *Direction2035*, as project I.D. #4430. The project is also included in the December 14, 2012 amendment to the 2011-2014 TIP as project I.D. #2010353. The Southeast Michigan Inter-Agency Working Group's confirmed the determination that the Woodward Avenue Streetcar is not one of air quality concern with regard to PM hotspot analysis. A letter of their confirmation can be found in Appendix A of this report. This analysis found that the plan and, therefore, the individual projects contained in the plan, are conforming projects, and will have air quality impacts consistent with those identified in the state implementation plans (SIPs) for achieving the National Ambient Air Quality Standards (NAAQS). In as much as the project is predicted to reduce VMT in the study area, it is predicted to have a beneficial impact on regional air quality levels. In addition, the result of the air quality analyses conducted for the proposed project, indicates that it would not cause or exacerbate an exceedance of the CO NAAQS. Furthermore, the project is not expected to measurably affect MSAT or $PM_{2.5}$ levels in the project area.

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APPENDIX A

Southeast Michigan Inter-Agency Working Groups (IAWG) Letter of Determination

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SEMCOG . . . *Creating Success in Southeast Michigan*

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January 30, 2013

Terrance Plaskon
Federal Transit Administration Headquarters
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Dear Mr. Plaskon:

The purpose of this letter is to confirm the Southeast Michigan Inter-Agency Working Group's determination that the Woodward Avenue (M-1) Streetcar project is not one of air quality concern with regard to PM hotspot analysis. The group had previously determined that a PM hotspot analysis was not needed for the original Woodward light rail project, which was to run from the Detroit CBD to 8 Mile Road. On January 16, 2013, members of the group were contacted via email and asked to confirm that this determination also applied to the scaled-back version of the project, which now involves a 3.3 mile streetcar line on Woodward, between the Detroit CBD to the City's New Center area. All members have concurred with this determination. The members include:

- Pam Boyd, Michigan Department of Transportation (Lansing office)
- Julie Edwards, Michigan Department of Transportation (Metro region)
- Michael Leslie, U.S. Environmental Protection Agency, Region 5
- Andy Pickard, Federal Highway Administration, Michigan Division
- Bob Rusch, Michigan Department of Environmental Quality
- Joan Weidner, SEMCOG

According to the IAWG's guidelines for determining which projects require PM2.5 hotspot analysis, only those projects that are expected to generate significant additional diesel emissions would be deemed projects of air quality concern that warrant a hotspot analysis. No such increase in diesel emissions is expected from the Woodward Streetcar project.

If you have any questions regarding this air quality determination, please contact me at (313) 234-3343.

Sincerely,

Joan Weidner

Joan Weidner
Plan & Policy Development

Michael Sedlak Chairperson Clerk, Green Oak Township | **Joan Gebhardt** First Vice Chair Treasurer, Schoolcraft College | **Jeffrey Jenks** Vice Chairperson Commissioner, Huntington Woods | **Phil LaJoy** Vice Chairperson Supervisor, Canton Township | **Charles Pugh** Vice Chairperson Council President, City of Detroit | **Kathy D. Vosburg** Vice Chairperson Commissioner, Macomb County | **John A. Scott** Immediate Past Chair Commissioner, Oakland County | **Paul E. Tait** Executive Director