ADVANCED RAPID TRANSIT

North/South Corridor Project

Air Quality Analysis

April 2023

VIA Advanced Rapid Transit
North/South Corridor Project

Air Quality Analysis

Prepared for:

Prepared by:

TABLE OF CONTENTS

List of Tables

List of Figures

List of Tables

ACRONYMS

Acronym/Abbreviation	Definition
AMCV	Air Monitoring Comparison Values
AQI	Air Quality Index
ART	Advanced Rapid Transit
autoGC	Automated Gas Chromatograph
CAA	Clean Air Act
CAAA	Clean Air Act Amendment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
CMAQ	Congestion Mitigation Air Quality
CO	Carbon Monoxide
CO_2e	Carbon Dioxide Equivalent
DOE	US Department of Energy
DOT	US Department of Transportation
DPM	Diesel particulate matter
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GHG	Greenhouse Gases
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MMT	Million Metric Tons
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Air Toxics
MTP	Metropolitan Transportation Plan
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NOx	Nitrogen Oxides
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
N_2O	Nitrous Oxide
O_3	Ozone
PAHs	Polycyclic Aromatic Hydrocarbon Compounds
PM	Particulate Matter
POM	Polycyclic Organic Matter

Acronym/Abbreviation	Definition
ppb	Parts per billion
ppm	Parts per million
ROG	Reactive Organic Gases
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
STIP	Statewide Transportation Improvement Program
TCEQ	Texas Commission on Environmental Quality
TCM	Transportation Control Measures
TDM	Traffic Demand Management
TERP	Texas Emission Reduction Program
TIP	Transportation Improvement Program
TSM	Traffic System Management
TxDOT	Texas Department of Transportation
USEPA	US Environmental Protection Agency
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

1. INTRODUCTION

The Federal Transit Administration (FTA) has initiated National Environmental Policy Act (NEPA) compliance for VIA Metropolitan Transit's (VIA) North/South (N/S) Advanced Rapid Transit (ART) project. FTA has determined that the project, locally known as ART, is a proposed 11.7-mile bus rapid transit line with approximately 26 new stations in San Antonio, Texas. The project comprises 75 percent dedicated transit lanes and 25 percent mixed traffic operations and would include 26 branded stations with off-board fare collection, next bus messaging, public announcement systems, bike parking, and safety features such as security cameras and lighting. The project could include the use of new low/no emission vehicles to provide frequent (10- to 15-minute headways) service. The project location map is shown in Figure 1.

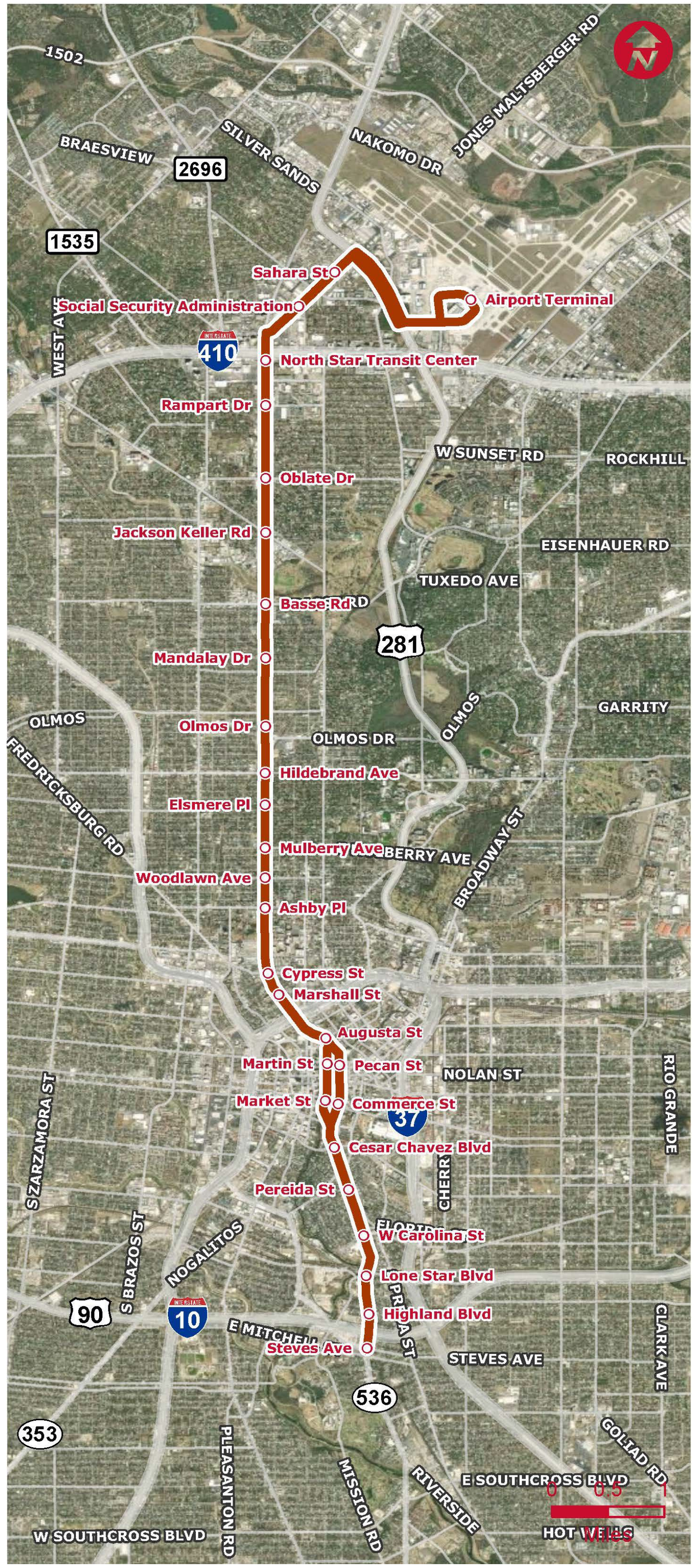
This Air Quality Report describes regulatory requirements applicable to the project, the existing air quality conditions in the project area, and the project's potential impacts to air quality.

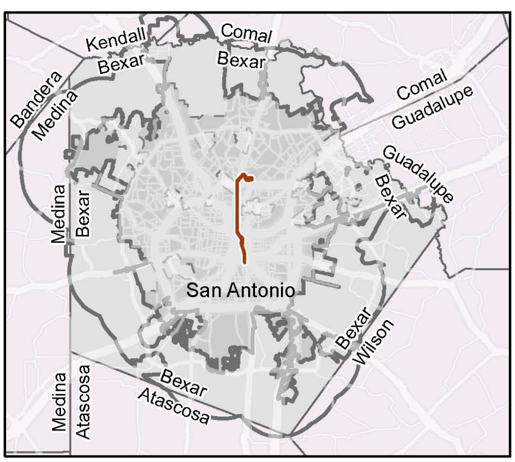
Project Aerial Map

LEGEND

ART North/South Project Alignment

N/S Stations





Sources: VIA (N/S proposed corridor and N/S Stations); TxDOT (city and county boundaries, roads, railroads); City of San Antonio (channels, central business district boundary)

Figure 1 ART North/South Corridor

2. APPLICABLE POLLUTANTS AND STANDARDS

Air quality is a term used to describe the overall degree to which the ambient air quality is polluted. 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. They are also responsible for damaging property, reducing the productivity or vigor of crops or natural vegetation, or reducing human or animal health causing injury to agricultural lands and livestock, and adversely affecting human health.

2.1. Applicable Standards and Regulations

National Ambient Air Quality Standards (NAAQS), shown in **Table 1**, are pollutants that have been identified by the US Environmental Protection Agency (USEPA) as being of concern nationwide. These air pollutants, referred to as criteria pollutants, are carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. The sources of these pollutants, their effects on human health and the nation's welfare, and their occurrence in the atmosphere vary considerably.

The CAA established two types of national air quality standards: "primary" and "secondary". 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. The Texas Commission on Environmental Quality (TCEQ) establishes plans to meet these air quality standards throughout the state.

The Clean Air Act (CAA), it's Amendments (CAAA), and the Final Conformity Rule (40 Code of Federal Regulations [CFR] Parts 51 and 93) direct the USEPA to implement environmental policies and regulations that will ensure acceptable levels of air quality. The CAA and the Final Conformity Rule apply to the Proposed Action. According to Title I, Section 176 (c) 2: "No federal agency may approve, accept, or fund any transportation plan, program, or project unless such plan, program, or project has been found to conform to any applicable State Implementation Plan (SIP) in effect under this act."

The Final Conformity Rule defines conformity as consistency with the SIP's purpose to eliminate or reduce the severity and number of violations of the NAAQS and to achieve expeditious attainment of such standards. (40 CFR Part 93) In particular, such activities shall not:

- 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.
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area.

The CAA requires that a SIP be prepared for each nonattainment area, and a maintenance plan be prepared for each former nonattainment area that subsequently demonstrated compliance with the standards (and is now known as a maintenance area). The SIP is a state's plan on ways it will meet the NAAQS under the deadlines established by the CAA. USEPA's Conformity Rule requires SIP conformity determinations on plans, programs, and projects before they are approved or adopted (i.e., plans, programs, and projects need to eliminate or reduce the severity and number of violations of the NAAQS and achieve expeditious attainment of such standards) (40 CFR Part 93).

Table 1. National Ambient Air Quality Standards

Pollutant		Primary/Secondary	Averaging Time	Level	Form
Carbon Monoxide		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead		Primary and secondary	Rolling 3-month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and secondary	Annual	53 ppb (2)	Annual Mean
Ozone		Primary and secondary	8-hour	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter	$PM_{2.5}$	Primary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m^3	Annual mean, averaged over 3 years
		Primary and secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		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:
U.S. Environmental Protection Agency, https://www.epa.gov/criteria-air-pollutants/naaqs-table

Footnotes:

(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 year, 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 October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO2 standards or is not meeting the requirements of a State Implementation Plan (SIP) call under the previous SO2 standards (40 CFR 50.4(3)), A SIP call is a USEPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

2.2. Criteria Pollutants and Effects

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. Brief descriptions of the criteria pollutants and other pollutants of concern are provided below.

2.2.1. Ozone

Ozone (O_3) is a colorless, toxic gas. 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 reactive organic gases (ROG), also referred to as volatile organic compounds (VOCs), and nitrogen oxides (NOx), which are emitted from industrial sources and from automobiles.

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 blood stream 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 their growth.

2.2.2. Carbon Monoxide

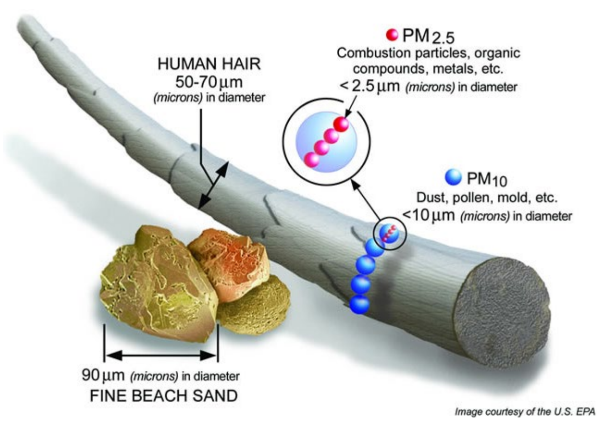
Carbon Monoxide (CO), a colorless gas, interferes with the transfer of oxygen to the brain. CO is emitted almost exclusively from the incomplete combustion of fossil fuels. In cities, 85 to 95 percent of all CO emissions may come from motor vehicle exhaust. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, or heart disease. CO levels are generally highest in the colder months of the year when inversion conditions (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 localized, or microscale, basis.

2.2.3. 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}) and 2.5 microns ($PM_{2.5}$) in size.

PM_{10} refers to particulate matter less than 10 microns in diameter, about one/seventh the thickness of a human hair (Figure 2). Particulate matter pollution

Figure 2. Relative Particulate Matter Size



Source: EPA. Particulate Matter Basics

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 industry and 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 most PM_{10} comes from fugitive dust, wind erosion, and/or 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.

2.2.4. Nitrogen Dioxide

Nitrogen Dioxide (NO_2), a brownish gas, irritates the lungs. It can cause breathing difficulties at high concentrations. Like 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 O_3 formation. NO_2 also contributes to the formation of PM_{10}, small liquid and solid particles that are less than 10 microns in diameter. 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. Some increase in bronchitis in children (two and three years old) has also been observed at concentrations below 0.3 parts per million (ppm).

2.2.5. 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 in the urban environment from mobile sources have significantly decreased due to the federally mandated switch to lead-free gasoline.

2.2.6. 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 for 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 erode iron and steel.

2.3. Mobile Source Air Toxics (MSAT)

Controlling air toxic emissions became a national priority with the passage of the CAAA, whereby Congress mandated that the USEPA regulate 188 air toxics, also known as hazardous air pollutants. The USEPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources[1] and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System[2] . In addition, the USEPA identified nine compounds with substantial contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 2011 National Air Toxics Assessment.[3] These are:

- 1,3-butadiene - characterized as carcinogenic to humans by inhalation.
- Acetaldehyde - classified as a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- Acrolein - major effects from chronic (long-term) inhalation exposure consist of general respiratory congestion and eye, nose, and throat irritation. The potential carcinogenicity of acrolein cannot be determined based on existing data.
- Benzene - characterized as a known human carcinogen.
- Diesel particulate matter (DPM) - likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases. Diesel exhaust also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.
- Ethylbenzene - classified as a Group D, not classifiable as to human carcinogenicity. Chronic exposure to ethylbenzene by inhalation in humans has shown conflicting results regarding its effects on the blood.
- Formaldehyde - classified as a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- Naphthalene - classified naphthalene as a Group C, possible human carcinogen. Acute 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.
- Polycyclic Organic Matter (POM) - defines a broad class of compounds that includes the polycyclic aromatic hydrocarbon compounds (PAHs), of which benzo[a]pyrene is a member. Cancer is the major concern from exposure to POM. USEPA has classified seven PAHs (benzo[*a*]pyrene,

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[1] Federal Register, Vol. 72, No. 37, page 8,430, February 26, 2007

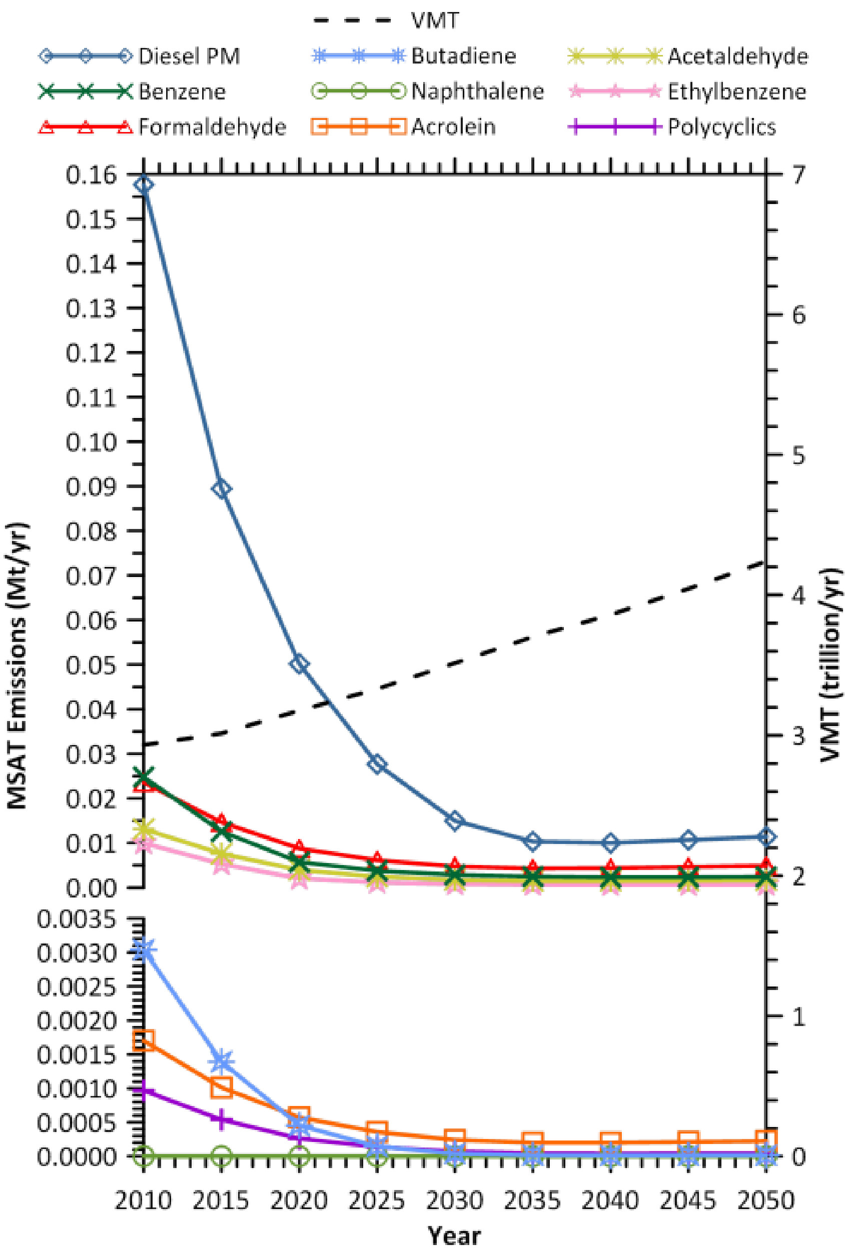
[2] http://www.epa.gov/iris

[3] https://www.epa.gov/national-air-toxics-assessment

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.

While the Federal Highway Administration (FHWA) considers these the priority MSATs, the list is subject to change and may be adjusted in consideration of future USEPA rules. The 2007 USEPA rule requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to a FHWA analysis using USEPA's Motor Vehicle Emissions Simulator (MOVES2014 version) model, even if vehicle activity (vehicle-miles traveled [VMT]) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 91 percent in the total annual emissions for the priority MSAT is projected for the same period (**Figure 3**).

Figure 3. FHWA Projected National MSAT Emission Trends 2010 - 2050 for Vehicles Operating on Roadways Using USEPA's MOVES2014b Model



Source: Federal Highway Administration's Interim Guidance Update on Air Toxic Analysis in NEPA Documents (FHWA, 2016)
Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles traveled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

2.4. Climate Change and Greenhouse Gases

Climate change is a national and global concern. While the Earth has gone through many natural climate variations in its history, there is general agreement that the Earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to this rapid change. Carbon dioxide (CO_2) makes up the largest component of these GHG emissions. Other prominent transportation GHGs include methane (CH_4) and nitrous oxide (N_2O).

The Global Warming Potential (GWP) was developed by the Intergovernmental Panel on Climate Change (IPCC) to allow comparisons of the global warming impacts of different GHGs. Specifically; it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2. The larger the GWP, the more that a given gas warms the Earth compared to CO_2 over that time period. The time period usually used for GWPs is 100 years. GWPs provide a common unit of measure, which allows analysts to add up emissions estimates of different gases (e.g., to compile a national GHG inventory), and allows policymakers to compare emissions reduction opportunities across sectors and gases.

CO_2, by definition, has a GWP of 1 regardless of the time period used, because it is the gas being used as the reference. CO_2 remains in the climate system for a very long time: CO_2 emissions cause increases in atmospheric concentrations of CO_2 that will last thousands of years.

CH_4 is estimated to have a GWP of 25 over 100 years. CH_4 emitted today lasts about a decade on average, which is much less time than CO_2. CH_4, though, also absorbs much more energy than CO_2. The net effect of the shorter lifetime and higher energy absorption is reflected in the GWP. The CH_4 GWP also accounts for some indirect effects, such as the fact that CH_4 is a precursor to ozone, and ozone is itself a GHG.

N_2O has a GWP 298 times that of CO_2 for a 100-year timescale. N_2O emitted today remains in the atmosphere for more than 100 years, on average.

GHGs are reported in CO_2 Equivalents (CO_2e), which is a combined measure of greenhouse gas emissions weighted according to the GWP of each gas, relative to CO_2. CO_2 equivalent is calculated within the MOVES model from CO_2, N_2O, and CH_4 mass emissions according to the following equation:

$$CO_2e = CO_2 \times GWP_{CO2} + CH_4 \times GWP_{CH4} + N_2O \times GWP_{N2O}$$

To date, no national standards have been established regarding GHGs, nor has USEPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO_2 under the CAA. However, the Council on Environmental Quality (CEQ) has released final guidance for Federal agencies on how to consider the impacts of their actions on global climate change in their NEPA reviews. In this guidance, the CEQ advises agencies to quantify projected GHGs of proposed federal actions in Environmental Assessments and Environmental Impact Statements whenever the necessary tools, methodologies, and data inputs are available.

3. EXISTING CONDITIONS

3.1. Attainment Status

Section 107 of the 1977 CAAA requires that the USEPA publish a list of all geographic areas in compliance with the NAAQS, as well as those that are not in attainment of the NAAQS. The designation of an area is made on a pollutant-by-pollutant basis. The USEPA's area designations are shown in **Table 2**.

Table 2. Attainment Classifications and Definitions

Classification	Definition
Attainment	Area is in compliance with the NAAQS
Unclassified	Area has insufficient data to make determination and is treated as being in attainment.
Maintenance	Area once classified as nonattainment but has since demonstrated attainment of the NAAQS.
Nonattainment	Area is not in compliance with the NAAQS

The N/S ART project is located in Bexar County, which is in attainment for all criteria pollutants except for ozone. [4] Bexar County has been classified a "marginal" nonattainment area for the 8-hour ozone 2015 standard since September 24, 2018[5].

For ozone, the CAA establishes nonattainment area classifications ranked according to the severity of the area's air pollution problem. These classifications—marginal, moderate, serious, severe, and extreme—translate to varying requirements that areas must comply to meet the ozone standard. Since the Bexar County is being in nonattainment for ozone, it is required to follow USEPA's guidance to meet ozone standard of 70 parts per billion (ppb) by September 24, 2024. This requirement is still under public review, and the comment period is anticipated to close June 13, 2022.

3.2. Transportation Conformity

3.2.1. Regional Conformity

Transportation Conformity is critical for maintaining and improving air quality. On-road mobile emission sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on public roadways. TCEQ maintains an inventory of these emissions to ensure consistency with statewide air quality improvement plans outlined in the SIP.

TCEQ has the regulatory role to enforce the USEPA's CAA regulations. These regulations are federal law that regulate air emissions from stationary and mobile sources. On July 1, 2020, TCEQ adopted the Bexar County 2015 Eight-Hour Ozone Nonattainment Area Federal CAA, §179B Demonstration SIP Revision (Non-Rule Project No. 2019-106-SIP-NR). The SIP revision demonstrates that the Bexar County marginal ozone nonattainment area would attain the 2015 8-hour ozone NAAQS by its attainment deadline "but for" anthropogenic emissions emanating from outside the United States. To meet USEPA's requirements, the City of San Antonio has created an action plan that monitors compliance and progress and each City Department Director has appointed one individual, known as the Department Sustainability Liaison, to ensure that all the City's efforts are coordinated.

[4] https://www.tceq.texas.gov/airquality/sip/san/san-status
[5] https://www3.epa.gov/airquality/greenbook/anayo_tx.html

A Transportation Improvement Program (TIP) is a short-term work program that includes transportation projects in a Metropolitan Planning Organization's (MPO) Metropolitan Transportation Plan (MTP), which is a long-range plan.. The TIP must be consistent with the adopted MTP that implements the approved SIP including any Transportation Control Measures (TCMs) that may be required. The TIP is intended to identify and implement transportation improvements that will maintain and enhance the transportation system, improve safety, improve air quality, reduce GHG emissions, and reduce VMT and congestion.

The Statewide TIP (STIP) includes all projects found in all MPO TIPs throughout the state as well as rural projects. Projects listed in STIP have been considered for regional air quality and generally have been found to meet the air quality goals of the SIP. The N/S ART project is listed in the 2021-2024 STIP as project number 10411 (Figure 4), and therefore, this project regionally conforms to the air quality goals of the SIP.[6]

Figure 4. 2021-2024 Statewide Transportation Improvement Program

2021-2024 STIP	07/2020 Revision: Approved 04/07/2021
GENERAL PROJECT INFORMATION	
PROJECT SPONSOR:	VIA Metropolitan Transit
MPO PROJECT NUMBER:	10411
MTP REFERENCE:	10411
APPORTIONMENT YEAR:	2021
PROJECT TYPE:	CAPITAL
PROJECT DESCRIPTION:	Transit: Advanced Rapid Transit Project See Appendix fo r Project Detail
AMENDMENT DATE:	07/01/2020
AMENDMENT REQUEST:	Project in FY 2021-2024 TIP
REMARKS:	

Source: https://apps3.txdot.gov/apps/estip/index.aspx?pg_vaction=reports_complete&pg_stip_id=4&pg_name=2021-2024 (pg. 878)

3.2.2. Project-Level Conformity

To demonstrate project-level conformity, a hot-spot analysis, which is an estimation of future localized pollutant concentrations and a comparison of those concentrations to the relevant NAAQS, is conducted. Hot-spot analyses assesses the air quality impacts on a scale smaller than an entire nonattainment or maintenance area for new highway and transit projects that involve significant diesel emissions. USEPA requires "hot-spot analyses" for CO and PM in nonattainment and maintenance areas. Since the San Antonio area is in attainment for CO and PM, no hotspot analyses are required for this project.

3.3. Ambient Air Quality

TCEQ has over 200 monitoring stations, which monitor air quality throughout the state for compliance with federal air quality standards[7]. The devices also measure air toxics that include hydrogen sulfide, VOCs, metals, carbonyls, and semi-volatile organic compounds. TCEQ evaluates measurements of air toxics in ambient air collected from air monitoring sites. In March 2022, TCEQ's Toxicology, Risk Assessment, and Research Division reviewed ambient air sampling data collected in 2020 at three Automated Gas Chromatograph (autoGC) sites located at Floresville Hospital Boulevard, Camp Bullis, and Karnes County, as well as one canister site located at Old Highway 90 in San Antonio. All reported hourly average and annual average concentrations of VOCs were below their respective short-term and long-

[6] https://www.transit.dot.gov/regulations-and-guidance/transportation-planning/transportation-improvement-program-tip

[7] Texas Commission on Environmental Quality: https://www.tceq.texas.gov/airquality/monops

term Air Monitoring Comparison Values (AMCVs) and would not be expected to cause acute or chronic adverse health effects, vegetation effects, or odor concerns[8].

Table 3 shows the monitored ozone data in the San Antonio area over the past three years. As shown, the three-year average of 4th highest ozone levels (the level that is compared to the NAAQS) shows an exceedance of the NAAQS for ozone.

Table 3. 2019-2021 3-year Average of 4th Highest 8-Hour Ozone level (ppm)

Monitoring Site	2019	2020	2021	3- year Average
San Antonio NW (6655 Bluebird Lane)	0.075	0.069	0.070	0.071

Source: https://www.epa.gov/outdoor-air-quality-data/monitor-values-report

3.4. Air Quality Index

The Air Quality Index (AQI) is a method for communicating daily air quality and its relationship to health effects. The AQI is calculated for major air pollutants regulated by the CAA including ozone, PM, SO_2, and CO by USEPA. The AQI illustrates how clean or unhealthy the air is and what health effects one may experience if exposed to the bad air for a few hours or days, depending on the severity. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality.

An AQI value of 100 generally corresponds to the NAAQ for the pollutant, which is the level USEPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy, at first, for certain sensitive groups of people, then for everyone as AQI values get higher. **Figure 5** demonstrates the cautionary statements associated with each AQI level for ozone, PM, and CO.

[8] https://www.tceq.texas.gov/downloads/toxicology/monitoring/air-evaluations/2020/reg13.pdf

Figure 5. Air Quality Index

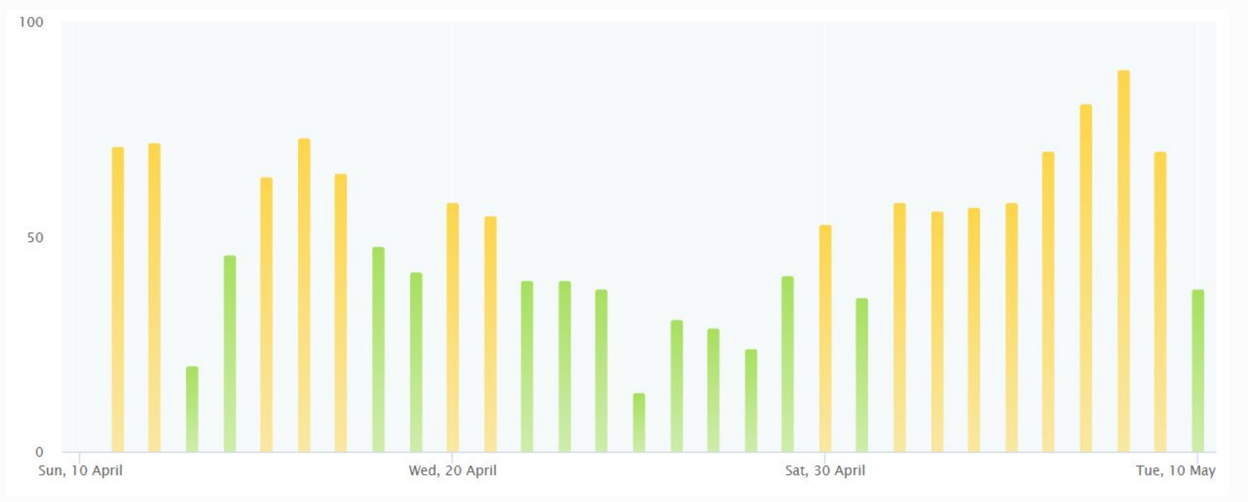
Health Categories	POLLUTANT SPECIFIC CAUTIONARY STATEMENTS			
	Ozone	PM2.5	PM10	Carbon Monoxide (CO)
VERY UNHEALTHY (201 TO 300)	Active children and adults, and people with lung disease, such as asthma, should avoid all outdoor exertion. Everyone else, especially children, should avoid prolonged or heavy exertion outdoors.	People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.	People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.	People with heart disease, such as angina, should avoid exertion and sources of CO, such as heavy traffic.
UNHEALTHY (151 TO 200)	Active children and adults, and people with lung disease, such as asthma, should avoid prolonged or heavy exertion outdoors. Everyone else, especially children, should reduce prolonged or heavy exertion outdoors.	People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.	People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.	People with heart disease, such as angina, should reduce moderate exertion and avoid sources of CO, such as heavy traffic.
UNHEALTHY FOR SENSITIVE GROUPS (101 TO 150)	Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors.	People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.	People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.	People with heart disease, such as angina, should reduce heavy exertion and avoid sources of CO, such as heavy traffic.
MODERATE (51 TO 100)	Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.	Unusually sensitive people should consider reducing prolonged or heavy exertion.	Unusually sensitive people should consider reducing prolonged or heavy exertion.	None
GOOD (0 TO 50)	None	None	None	None

Source: http://www.aqmd.gov/docs/default-source/air-quality/air-quality-index.pdf?sfvrsn=0. Note: An AQI of 100 for ozone corresponds to an ozone level of 0.075 parts per million (averaged over 8 hours)

San Antonio's annual air quality averages an AQI of "good". Spring and summer tend to be more polluted than the fall and winter due to higher temperatures. Ozone is created via chemical reactions that occur more readily at warmer seasons and may increase the photochemical reactions that create small particles in the atmosphere, creating higher $PM_{2.5}$ levels. In 2021, April, September, and October were San Antonio's most polluted months with max AQIs of 119, 101, and 101, respectively.[9] **Figure 6** portrays an example of daily AQI in San Antonio in May 2022.

[9] https://www.epa.gov/outdoor-air-quality-data/air-data-multiyear-tile-plot

Figure 6. San Antonio Daily AQI - 2022



Source: https://www.iqair.com/us/usa/texas/san-antonio

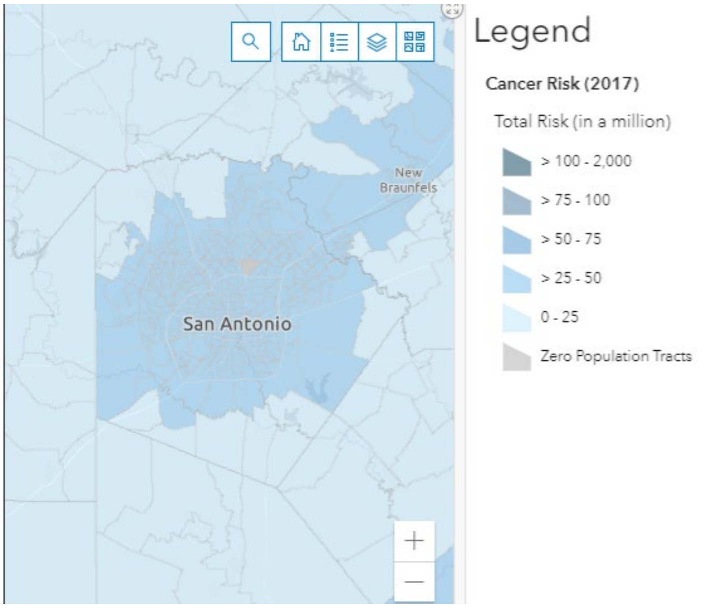
4. MOBILE SOURCE AIR TOXICS

Research has been conducted to assess the overall health risk of air toxics; however, the result of consequences due to lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA. The methodologies for forecasting health impacts include emissions modeling; dispersion modeling, exposure modeling, and the final determination of health impacts.[10]

USEPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant and is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. **Figure 7** and **Figure 8** portray current air toxic emission conditions in San Antonio and cancer risk (50-75 total risk in a million) associated with each toxic air pollutant.

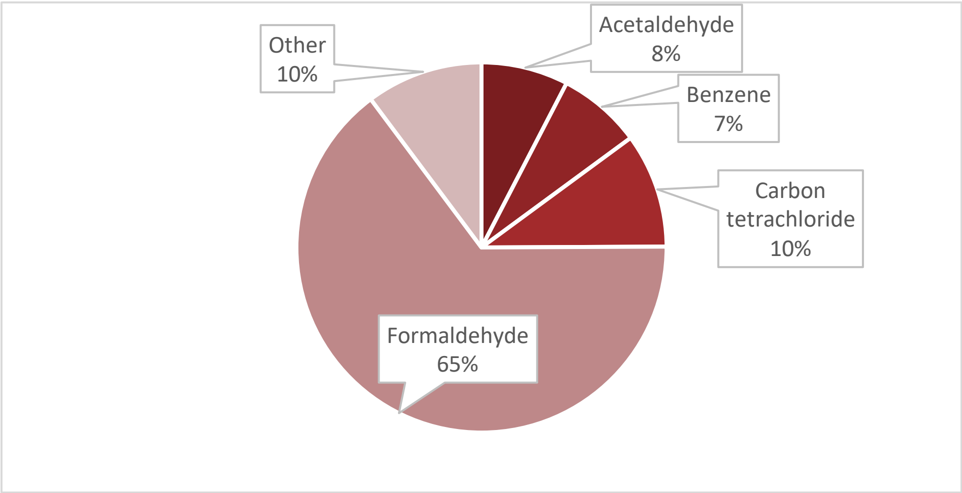
[10] https://ftp.txdot.gov/pub/txdot/get-involved/sat/loop-1604-from-sh16-i-35/091020-mobile-source.pdf

Figure 7. AirToxScreen Mapping Tool



Source: Source: https://epa.maps.arcgis.com/apps/dashboards/fb6e6b70c7e2480c8ef88cc8e9c061ac

Figure 8. San Antonio Cancer Risk by Air Toxics



Source: https://epa.maps.arcgis.com/apps/dashboards/fb6e6b70c7e2480c8ef88cc8e9c061ac

NEPA requires that all "major federal actions significantly affecting the quality of the human environment" shall include a "detailed statement" on "the environmental impact of the proposed action." In its interim MSAT guidance, FHWA stated that either a qualitative or quantitative MSAT analysis may be necessary to comply with this NEPA requirement. FHWA guidance is being referenced because FTA does not have their own specific guidance regarding MSAT in NEPA documentation.

FHWA developed a tiered approach with three categories for analyzing MSAT in NEPA documents, depending on specific project circumstances:

- Tier 1 - No analysis for projects with no potential for meaningful MSAT effects;
- Tier 2 - Qualitative analysis for projects with low potential MSAT effects; or
- Tier 3 - Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

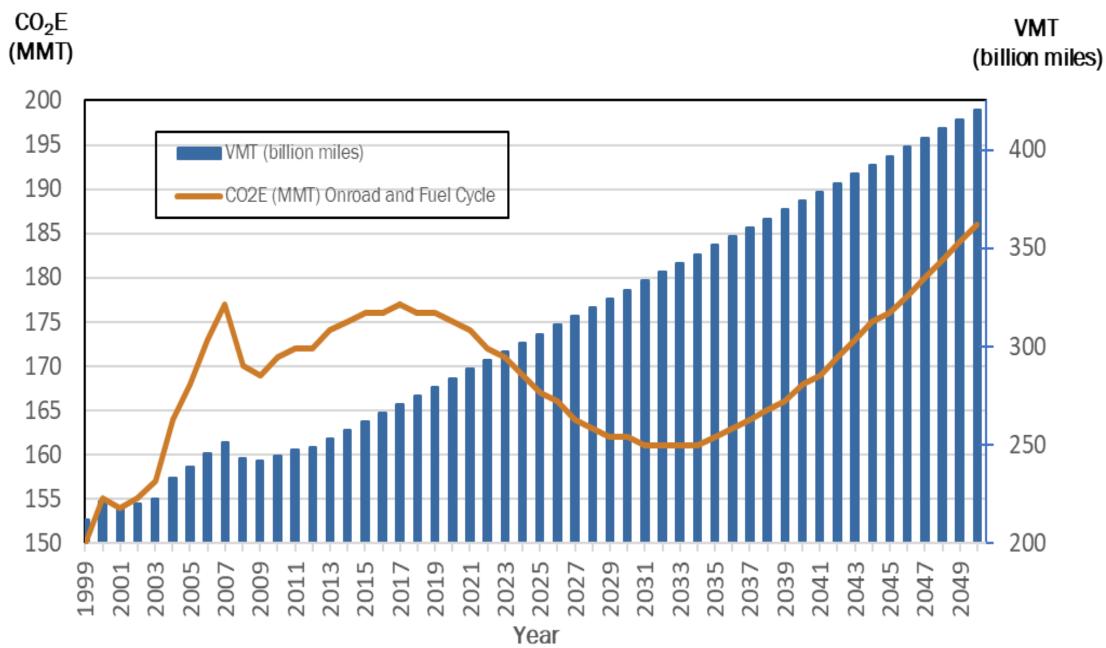
According to the Texas Department of Transportation (TxDOT) guidance, if the project is not adding capacity, it is exempt from a MSAT analysis.[11] Added capacity typically includes, but is not limited to, constructing new location roadways, adding main lanes, adding through lanes, adding auxiliary lanes longer than 1 mile, or otherwise having a meaningful impact on traffic volumes or vehicle mix. Since the N/S ART project is a Categorical Exclusion (CE) type and does not fall in the added capacity category, MSAT analysis is not required.[12] Thus, the project would fall within the Tier 1 category as a project with no potential for meaningful MSAT effects. In addition to the project not falling within a Tier 1 category, the project would also use low/no emission vehicles that would not contribute to MSAT effects and would encourage the transition from single-occupancy vehicles to transit.

[11] https://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/230-01-sop.pdf
[12] https://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/200-05-fig.pdf

5. GREENHOUSE GASES

GHG emissions, including CO_2, are typically reported in million metric tons (MMT). The historic and predicted trend between Texas on-road VMT and vehicle tailpipe/ fuel-cycle emissions (GHGs a vehicle produces while driving) in CO_2e is shown in **Figure 9** and **Table 4**. It is hard to have a mathematical model that can ever accurately predict the future, given the uncertainty in demographics, technological shifts, and social changes. However, to obtain fuel-cycle emissions, TxDOT multiplied the statewide annual emissions by 1.27 (USEPA fuel-cycle factor is 27 percent of on-road emissions). TxDOT used the following for the MMT conversion (annual tons/1.10231131092 metric tons/U.S. tons)/1,000,000 with USEPA's 2013 CO_2 to CO_2e conversion rate of CO_2/0.986 CO_2e. USEPA's MOVES model was used to estimate emissions.[13]

Figure 9. Texas Annual VMT and CO_2e On-road and Fuel-Cycle Emissions Trends (in MMT)



Source: https://ftp.txdot.gov/pub/txdot/get-involved/sat/loop-1604-from-sh16-i-35/091020-greenhouse-gas-report.pdf

In the base year (1999), Texas on-road and fuel-cycle CO_2e emissions were estimated to be 150 MMT. By 2050, the MOVES model estimates emissions to be 186 MMT. Emissions are predicted to reach a low in 2032 at 161 MMT. These low levels are anticipated due to more of the 2012 vehicles being replaced with newer model-year vehicles with less emissions. During this time, technology would reduce emissions more than VMT would increase emissions.[14] After 2032, the model shows CO_2e emissions begin increasing as VMT increases.[15]

[13] Converting global warming potentials into equivalent metric tons of CO_2 equation: A-1 in 40 CFR Part 98.
[14] The first vehicle model year to include the combined CAFE and GHG emission standards was 2012. (EPA and USDOT-NHTSA, 2010). Congress first established CAFE standards in 1975.
[15] (Forecasting, 2007), For example, page 77 states

Table 4. Texas Annual VMT and Annual CO_2e On-road

Year	Annual VMT (billion miles)	CO2 On-road (MMT)
1999	2.12	116
2015	2.62	137
2020	2.84	136
2025	3.06	130
2030	3.29	126
2050	4.20	144

Source: https://ftp.txdot.gov/pub/txdot/get-involved/sat/loop-1604-from-sh16-i-35/091020-greenhouse-gas-report.pdf

The N/S ART project would improve access and mobility for corridor residents and decrease VMT, as shown in **Table 5**, by providing an alternative means of transportation. Reduction in VMT would further contribute to reductions of GHGs. The project would also use low/no emission vehicles that would not contribute to GHGs.

Table 5. Anticipated Reduction in Emissions by Horizon Year (2045)

Annual VMT* Decrease	CO Emissions (kg) Decrease	NO_x Emissions (kg) Decrease (Increase)	VOCs Emissions (kg) Decrease	$PM_{2.5}$ Emissions (kg) Decrease	GHG Emissions (tons) Decrease
6,271,857	**48,240.22**	**(521.05)**	**396.96**	**88.64**	**3,592.54**

6. IMPROVEMENT STRATEGIES

TCEQ encourages the community to follow the following practices to help prevent ozone formation on any day, but especially during Ozone Action Days, to accelerate degrading the ozone nonattainment classification in Bexar County: [16]

- Limit driving and idling; instead, carpool, combine errands, use public transportation, bike, or walk
- Refuel your vehicle in the late afternoon or evening and do not top off the tank
- Keep your vehicle maintained, including proper tire pressure
- Maintain your yard equipment, including changing the oil and replacing air filters regularly. Also consider using tools without gasoline motors. Hand tools such as shears, edgers, and push mowers are lightweight, quiet, and easy to use, and do not generate emissions
- Do not burn yard waste
- Use paint and cleaning products with less or zero VOCs

Strategies to reduce on-road GHG operational emissions fall under three major categories:

- Technological advances, including, but not limited to, those required by federal engine and fuel controls under the CAA;
- Traffic system management (TSM) that improves the operational characteristics of the transportation network (e.g., traffic light timing, pre-staged wrecker service to clear accidents faster, traveler information systems); and
- Travel demand management (TDM) that provides reductions in VMT (e.g., telework, transit, rideshare, scooters, and bicycle and pedestrian facilities).

[16] https://www.tceq.texas.gov/airquality/monops/ozonefacts.html

7. CONCLUSIONS

The air quality impacts from N/S ART project were evaluated based on the currently available project details.

- The project is included in the 2021-2024 STIP, meaning that it regionally conforms to the goals of the SIP with regards to regional air quality conformity and eventual attainment of the 8-hour ozone standard.
- The project is located in an attainment area for carbon monoxide and particulate matter. As such, the project is exempt from localized project-level analyses.
- The project is expected to reduce VMT in the project area. As such, the project would further contribute to regional reductions in MSATs and GHGs.

TxDOT has implemented programmatic strategies that reduce GHG emissions, including TDM projects and funding to reduce VMT through TSM projects and funding to improve the operation of the transportation system. The N/S ART project is a great example of this strategy that would assist state of Texas to achieve GHG emission and air quality improvement goals.

The project would improve access and mobility for corridor residents and connect to major key destinations throughout the region, particularly for those without access to a vehicle. The project would also strengthen the interconnected multimodal network of transit, air travel, driving, cycling, and walking by providing an alternative for car travels with low/no emissions transit vehicles.

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