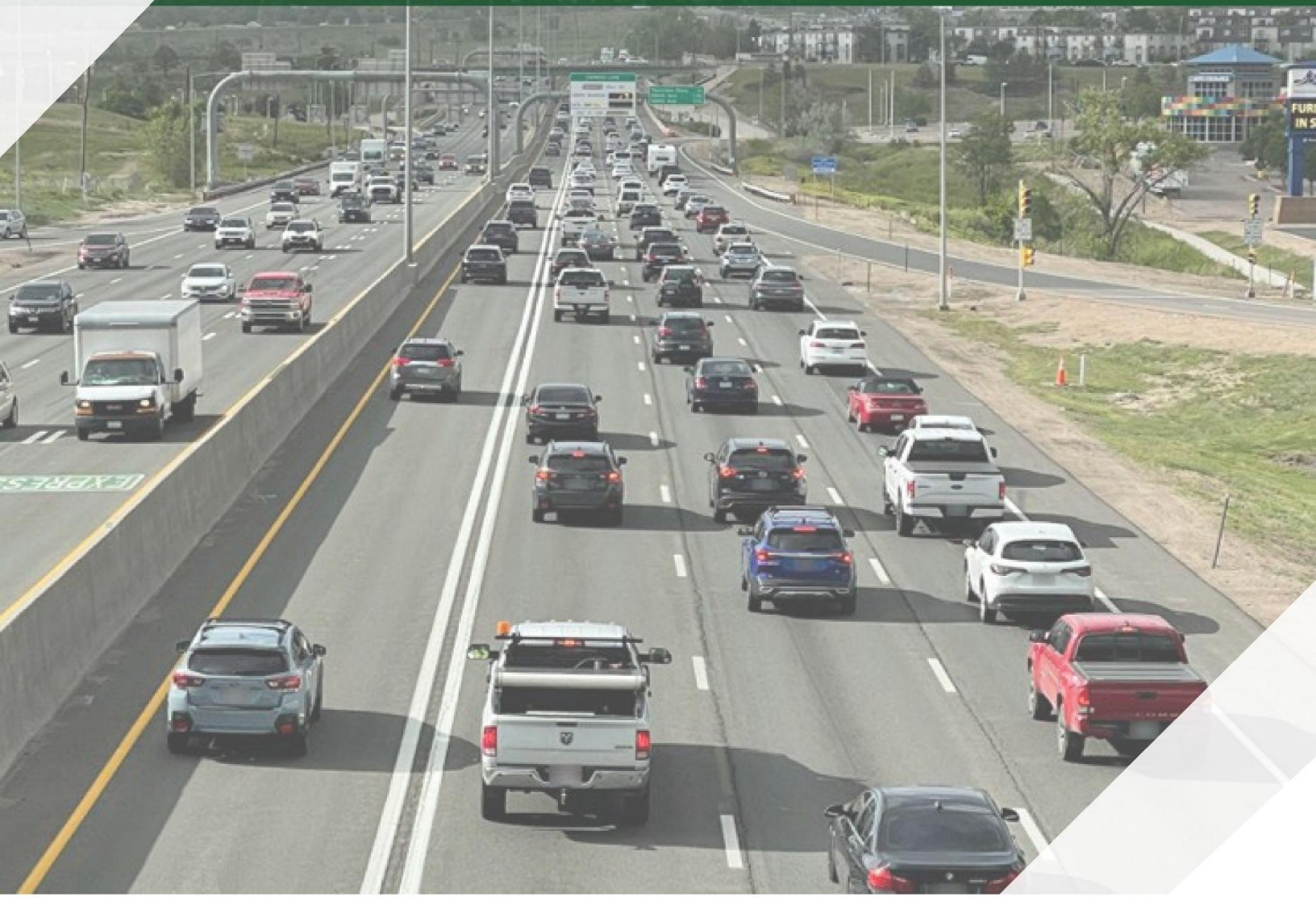
I-25 (US 36 to 104th Avenue)

Safety and Operations Improvements Project



Appendix D2: Air Quality Technical Report

October 2026

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Authorship Attribution Statement

This Air Quality Technical Report was authored by Spheros Environmental, excepting **Sections 5.4, 5.5, 5.6, and 6.0** which were authored by the CDOT Air and Climate Section and Mobility Analysis Section. Those sections of the report document a supplemental analysis conducted by CDOT to qualitatively assess relative changes in emissions rates under the Build Alternative for the Interstate 25 (I-25) from United States Highway 36 to 104th Avenue (US 36 to 104th Avenue) project (the Project) and air quality mitigation measures applicable to the Project. Spheros Environmental conducted the MOtor Vehicle Emissions Simulator (MOVES) modeling and associated air quality analyses for the Project that are required by federal and state regulations and documented in this report.

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Appendix D2. Air Quality Technical Report

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Acronyms and Abbreviations

Acronym or Abbreviation	Full Name
°F	degree(s) Fahrenheit
µg/m^3	microgram(s) per cubic meter
AADT	average annual daily traffic
APCD	Air Pollution Control Division
APEN	Air Pollutant Emission Notice
AQ-PLAG	Air Quality Project-Level Analysis Guidance
AQCC	Air Quality Control Commission
AQS	Air Quality System
C.R.S.	Colorado Revised Statutes
CAA	Clean Air Act
CCR	Code of Colorado Regulations
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CO	carbon monoxide
C.R.S.	Colorado Revised Statutes
CTIO	Colorado Transportation Investment Office
Diesel PM	Diesel Particulate Matter
DRCOG	Denver Regional Council of Governments
EF	emission factor
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
FR	Federal Register
gpm	grams per mile
GP	general-purpose
HAP	hazardous air pollutants
I-25	Interstate 25
I-270	Interstate 270
I-70	Interstate 70
I-76	Interstate 76
IRIS	Integrated Risk Information System
mph	mile(s) per hour
MOVES	MOtor Vehicle Emissions Simulator
MPO	metropolitan planning organization
MSAT	mobile source air toxic
MVRTP	Metro Vision Regional Transportation Plan
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
PAH	polycyclic aromatic hydrocarbons
Pb	lead
PM	particulate matter
PM_{10}	particulate matter 10 microns or less in aerodynamic diameter
$PM_{2.5}$	particulate matter 2.5 microns or less in aerodynamic diameter
PEL	Planning and Environmental Linkages
POM	polycyclic organic matter
ppb	part(s) per billion (by volume)
ppm	part(s) per million (by volume)
ROD	Record of Decision
RTD	Regional Transportation District
RTP	Regional Transportation Plan
SB	Senate bill
SIP	State Implementation Plan

Acronym or Abbreviation	Full Name
SO_x	sulfur oxides
SO_2	sulfur dioxide
TDM	travel demand model
TIP	Transportation Improvement Program
US 36	United States Highway 36
USC	United States Code
USDOT	United States Department of Transportation
VMT	vehicle miles traveled
VOC	volatile organic compound

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1.0 Introduction and Background

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) are proposing transportation improvements to Interstate 25 (I-25) between United States Highway 36 (US 36)/I-76/I-270 interchange and 104th Avenue (**Figure 1**). This Air Quality Technical Report was prepared to support evaluation of the I-25 from US 36 to 104th Avenue project (the Project).

CDOT has previously completed an Environmental Impact Statement (EIS) and other planning efforts that recommended improvements to this segment of I-25. The air quality study presented in this report evaluates proposed transportation improvements that reflect and build upon previous recommendations. Because the Project includes features that were not evaluated and approved in the **North I-25 Record of Decision 1** (ROD1) (FHWA and CDOT, 2011), this project is undergoing new evaluation under the National Environmental Policy Act (NEPA).

The following project information can be found in **Attachment A Project Information**:

- Project History
- Project Limits
- Purpose and Need
- Proposed Action Description

This Air Quality Technical Report documents the following federal- and state-required air quality analyses for the Project:

- The transportation project-level air quality assessment that was conducted in support of the NEPA evaluation and is prepared in accordance with the CDOT Air Quality Project-Level Analysis Guidance (AQ-PLAG) (CDOT 2019). The purpose of the air quality analysis is to analyze potential impacts associated with the Project in accordance with NEPA and applicable federal air quality requirements, including the U.S. Environmental Protection Agency (EPA) transportation conformity rule.
- A quantitative emissions inventory was developed to estimate potential air quality impacts associated with the Project in accordance with specific requirements of Colorado Senate Bill (SB) 21-260 and Colorado Revised Statutes (C.R.S.) 43-1-128.

The air quality analysis documented in this report includes three major elements:

- A quantitative emissions inventory for comparative analysis of criteria air pollutants to meet federal and state requirements.
- A Tier 3 quantitative analysis of mobile source air toxics (MSAT) to meet federal and state requirements.
- A qualitative discussion of potential emissions and air quality effects from construction activities.

The air quality analysis considered two Project alternatives, which are described in greater detail in **Attachment A**:

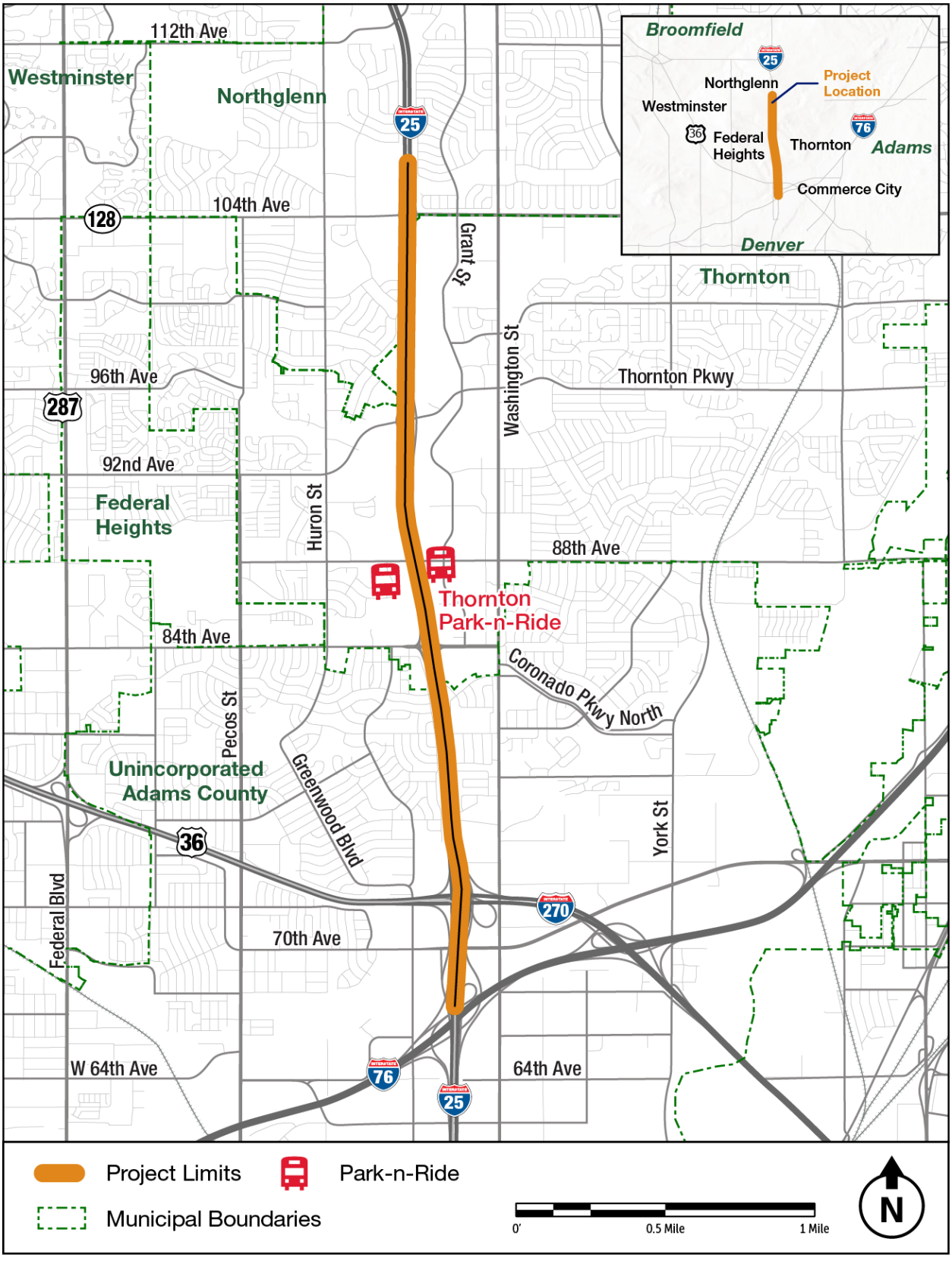
- **No Action Alternative**, which would maintain the existing I-25 highway configuration of three general-purpose (GP) and one Express Lane in each direction.
- **Build Alternative**, which would include three GP lanes in each direction with a fourth southbound GP lane from 104th Avenue to Thornton Parkway; a new northbound climbing lane from 84th Avenue to 104th Avenue; and an Express Lane in each direction, along the inside shoulder, with an expanded four-foot buffer from the adjacent GP lane.

The report is organized as follows:

- Section 2 describes the applicable federal and state regulatory context.
- Section 3 describes the resources considered in the air quality analyses, summarizes the NEPA scoping and interagency consultation activities, and provides an overview of the air quality analysis methods.
- Section 4 describes the affected environment and existing air quality conditions.
- Section 5 summarizes air quality analysis results and environmental consequences.
  - Section 5.1 presents results from federally required air quality analysis.
  - Section 5.2 presents results from state-required air quality analysis.
  - Section 5.3 presents a qualitative discussion of construction emissions.
  - Section 5.4 presents a supplemental analysis of changes in emissions intensity.
  - Section 5.5 presents corridor-level considerations.
  - Section 5.6 presents conclusions and recommendations from the analysis results.
- Section 6 provides the air quality mitigation measures that are applicable to the Project.

The NEPA scoping and interagency consultation activities described in Section 3.2 resulted in the development of the Air Quality Analysis Work Plan for this analysis. The Air Quality Analysis Work Plan is included in this report as **Attachment B**. Additional details on the air quality analysis methods are described in **Attachment C**. **Attachment D** of this report provides the MSAT discussion and the quantitative MSAT analysis for NEPA.

Figure 1. Project Limits



2.0 Regulatory Setting

2.1 Federal Regulatory Context

Described in this section are several federal laws and regulations that must be considered for air quality assessments of transportation projects.

2.1.1 NEPA

NEPA (Title 42 USC Chapter 55) was passed by Congress in 1969 and signed into law by President Richard Nixon on January 1, 1970, following a period of increased concern for human impacts on the natural and human environments. NEPA requires environmental review for any federal action that has the potential to affect the environment. Transportation projects that have a federal nexus (e.g., projects that use federal funds and/or require FHWA approval) must be evaluated for potential impacts on the natural and human environments. Air quality is one of several resources considered in a NEPA evaluation. NEPA also requires that agencies making these decisions consult with other agencies, involve the public, disclose information, investigate the environmental effects of a reasonable range of alternatives, and prepare a detailed statement of the environmental effects of the alternatives. NEPA applies to projects irrespective of the federal National Ambient Air Quality Standards (NAAQS) attainment status of the project location. The Colorado Department of Transportation's (CDOT) Policy Directive 1904.0 establishes the CDOT NEPA Manual (CDOT 2024) for maintaining compliance with NEPA standards on CDOT projects.

2.1.2 Clean Air Act and National Ambient Air Quality Standards

Air quality at the federal level is regulated under the Clean Air Act (CAA) (Title 42 USC Chapter 85 and amended in 1977 and 1990). The purpose of the CAA is to protect and enhance air quality to promote public health, welfare, and the productive capacity of the nation. Six criteria air pollutants and a group of toxic air pollutants, known as hazardous air pollutants (HAPs) are regulated under the CAA. A subset of HAPs is referred to as MSAT.

The EPA establishes primary (health) and secondary (environment and property) NAAQS for criteria pollutants (see **Table 1** in **Section 3.1.1**). Areas that violate the NAAQS are designated by the EPA as nonattainment areas based on ambient air quality monitoring data. State Implementation Plans (SIP) developed for these areas may include control requirements on emissions from the transportation sector and other sources. A nonattainment area that receives a Clean Air Determination from EPA can be redesignated as a maintenance area. Transportation planning is subject to specific requirements in NAAQS nonattainment and maintenance areas.

2.1.3 Transportation Conformity Rule

Transportation projects in federal nonattainment and maintenance areas are subject to transportation conformity requirements (CAA Section 176(c)), implemented in the Conformity Rule (40 CFR 93), to ensure that federally supported transportation activities in NAAQS nonattainment and maintenance areas are consistent with air quality goals in any applicable SIP. Transportation conformity includes both regional and project-level components.

Regional Conformity. Regional conformity for a transportation project is satisfied if the project's design concept, scope, and "open-to-traffic" schedule are consistent with those included in a currently conforming, fiscally constrained Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP) (40 CFR 93.114). Projects that are part of a region's conforming RTP and TIP meet the regional conformity requirement through a broad assessment of emissions involving the entire transportation network to ensure they are consistent with the emissions goals contained in the region's SIP. The Denver Regional Council of Governments (DRCOG) is the federally designated metropolitan planning organization (MPO) responsible for transportation planning for the Denver metropolitan region, where the Project is located. The DRCOG 2050 Metro Vision RTP (MVRTP) (DRCOG 2024) and the 2026-2029 TIP (DRCOG 2025) are the latest federally approved and fiscally constrained conforming plan and program for the DRCOG planning area. The Project is listed in the 2050 MVRTP, which was adopted by DRCOG in April 2021 and FHWA in June 2021 and amended in May 2024. FHWA issued the conformity determination for the DRCOG 2024 Amended 2050 MVRTP and the amended Fiscal Year 2026-2029 DRCOG TIP on June 18, 2025.[1] The Project is included in the fiscally constrained 2026-2029 TIP and specifically referenced by TIP number 2022-076.

Project-Level Conformity. Project-level conformity is an additional requirement that applies to criteria pollutant emissions that may cause localized air quality impacts to ensure the Project does not: (1) cause or contribute to any new violations of the NAAQS; (2) worsen existing NAAQS violations; and (3) delay timely attainment of any NAAQS or required interim milestones. Project-level conformity requirements only apply to projects of air quality concern in NAAQS nonattainment or maintenance areas.

Unless otherwise stated in a SIP, transportation conformity requirements for maintenance areas no longer apply after an area has remained in maintenance for 20 years. The Project is in an area that has completed 20 years of maintenance of applicable NAAQS for carbon monoxide (CO) and particulate matter 10 microns or less in aerodynamic diameter (PM_{10}), and it is no longer considered a maintenance area for those pollutants for the purposes of transportation conformity.[2] Therefore, project-level hot-spot analyses for CO and PM_{10} are not required under the Conformity Rule. Project-level hot-spot analysis for particulate matter 2.5 microns or less in aerodynamic diameter ($PM_{2.5}$) is not required under the Conformity Rule because the Project area is in attainment of the $PM_{2.5}$ NAAQS. Although project-level hot-spot analysis is not required for these pollutants under the Conformity Rule, emissions are still quantified for the NEPA comparison. **Section 5.1** presents the quantitative criteria pollutant emissions inventory for the NEPA comparative assessment.

2.1.4 Mobile Source Air Toxics

Toxic air pollutants, also known as HAPs, are those known to cause cancer or other serious health effects. The CAA Section 112 requires the EPA to regulate emissions of 188 HAPs. EPA assessed this expansive list in its rule on the **Control of Hazardous Air Pollutants From Mobile Sources** (72 FR, 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of EPA's Integrated Risk Information System (IRIS)

[1] The conformity determination is published in Appendix R of the DRCOG 2024 Amended 2050 MVRTP.
[2] The 20-year periods of maintenance with the CO and PM_{10} NAAQS for the Denver-Boulder area ended on January 14, 2022, and October 16, 2022, respectively.

(EPA 2021). The EPA also identified a subset of this list that is now considered the nine priority MSAT: 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel PM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter (POM) (see **Section 3.1.2**). FHWA considers these to be the priority MSAT for NEPA studies. This list is subject to change and may be adjusted in consideration of future EPA rules.

In the **Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents** (FHWA 2023a), FHWA presents a tiered approach with three categories for analyzing MSAT in NEPA documents, depending on specific project circumstances for evaluating potential MSAT effects. Potential MSAT effects from the Project were evaluated following this guidance and are discussed further in **Section 5.1.4** and **Attachment D**.

2.2 State and Local Regulatory Contexts

Several state and local laws and regulations are applicable to the consideration of a transportation project-level air quality assessment. As noted earlier, this report includes air quality analyses conducted to meet state requirements. The state and local regulations applicable to the required analyses are described in this section.

2.2.1 Criteria Pollutants

The **Colorado Air Pollution Prevention and Control Act of 1992** (C.R.S. 25-7-101, or the Act) was passed to foster the health, welfare, convenience, and comfort of citizens and visitors within the State of Colorado and to facilitate the enjoyment and use of the scenic and natural resources of the state. The Act requires the use of available practical methods to reduce, prevent, and control air pollution in the state. Colorado's Air Quality Control Commission (AQCC) oversees Colorado's air quality program.

The AQCC adopts air quality regulations to help ensure that Colorado meets clean air goals and requirements. Air quality regulations that impact Colorado transportation projects that have been adopted into the Code of Colorado Regulations (CCR) include, but are not limited to:

- Regulation Number 1 (5 CCR 1001-3): Emission Control for Particulate Matter, Smoke, Carbon Monoxide, and Sulfur Oxides - Construction Emissions Fugitive Dust Control
- Regulation Number 3 (5 CCR 1001-5): Stationary Source Permitting and Air Pollutant Emission Notice Requirements - Permitting Requirements for Land Development Projects
- Regulation No. 10 (5 CCR 1001-12): Criteria for Analysis of Transportation Conformity (Colorado's Conformity State Implementation Plan [SIP])
- Regulation No. 11 (5 CCR 1001-13): Motor Vehicle Emissions Inspection Program
- Regulation No. 12 (5 CCR 1001-15): Reduction of Diesel Vehicle Emissions
- Regulation No. 16 (5 CCR 1001-18): Street Sanding Emissions
- Regulation No. 20 (5 CCR 1001-24): Colorado Clean Cars and Trucks Regulation

2.2.2 Mobile Source Air Toxics

As described in **Section 2.1.4**, FHWA considers nine HAPs from mobile sources to be the priority MSAT for NEPA studies and provides guidance for evaluating potential MSAT effects based on a tiered approach (FHWA 2023a). CDOT has used the FHWA guidance to inform air

pollutant modeling conducted to meet state requirements in C.R.S. 43-1-128. Evaluation of potential MSAT effects from the Project to meet federal and state requirements are discussed further in **Section 5.1.3** and **Section 5.2.2**, respectively.

2.2.3 C.R.S. 43-1-128 and Transportation-Related Pollutants

SB 21-260 was signed on June 17, 2021, and requires the planning, funding, development, construction, maintenance, and supervision of a sustainable transportation system in Colorado. The State of Colorado works to create new funding to preserve, improve, and expand existing transportation infrastructure, develop modernized infrastructure to support adoption of electric motor vehicles, and mitigate environmental and health impacts related to transportation system use. SB 21-260 created C.R.S. 43-1-128, which includes additional requirements for CDOT to engage in community involvement, modeling, and monitoring when assessing potential environmental impacts of regionally significant transportation capacity (RS/TC) projects. The requirements specific to an RS/TC project, as defined in Section 4 of C.R.S. 43-1-128, include the following:

- Use EPA-approved models to determine air pollutant emission impacts for the planned project. Provide monitoring and measurement of criteria pollutants prior to construction of the project.
- Develop and implement a PM construction plan to provide continuous monitoring and transparent public reporting of concentrations, issue public alerts as soon as possible when exceedance events occur, and implement action plans to address emission levels on construction projects prior to exceedances with a particular focus on disproportionately impacted communities.
- Develop and implement a plan to mitigate air quality impacts on communities, including but not limited to disproportionately impacted communities adjacent to the project, with particular focus where feasible on mitigation of fine PM pollution.

The I-25 Safety and Operations Improvements Project is an RS/TC project, and CDOT is required to use EPA-approved models to assess air pollutant emissions impacts during the environmental study process before construction begins (C.R.S. 43-1-128(4)(a)).

3.0 Methodology

3.1 Air Pollutants Considered

The primary air quality concerns for the I-25 Safety and Operations Improvements Project focus on the exposure of local populations to:

- Criteria pollutants that are regulated at the federal level through the Clean Air Act (CAA) (Title 42 United States Code [USC] Chapter 85) to achieve and maintain National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] Part 50).
- MSAT pollutants defined by FHWA as priority MSAT pollutants of concern that arise from transportation activities.
- Fugitive dust emissions associated with project construction activities.

3.1.1 Criteria Pollutants

The CAA of 1970, as amended, identifies six criteria pollutants that are harmful to human health and the environment. Ground-level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), PM_{10}, and $PM_{2.5}$ are considered transportation-related criteria pollutants. Nitrogen oxides (NO_x) and volatile organic compounds (VOC) are important transportation-related pollutant precursors.

Ground-level ozone. O_3 is a colorless gas that is formed when NO_x chemically reacts with VOCs in the presence of sunlight. Warm temperatures, strong sunlight, and low wind speeds provide optimum conditions for O_3 formation. O_3 concentrations often peak downwind of the NO_x and VOC emission sources. As a result, O_3 is of regional concern and O_3 pollution issues are addressed through regulation of NO_x and VOC emissions. O_3 is evaluated using VOC and NO_x emission precursors in an emission inventory burden analysis. VOCs are highly reactive hydrocarbons that contribute to O_3 formation. Motor vehicles produce NO_x and VOC emissions through combustion and also produce VOC emissions through fuel evaporative processes (known as running losses). O_3 can irritate and damage the respiratory system. Health effects associated with O_3 include breathing problems, reduced lung function, asthma, and other respiratory ailments. O_3 also damages plants, trees, rubber products, fabrics, and other materials.

Particulate matter. PM is a complex mixture of small particles and liquid droplets classified as PM_{10} or $PM_{2.5}$. PM from motor vehicles is emitted directly from the tailpipe from fuel combustion (exhaust emissions) and is also produced from non-exhaust processes including brake wear, tire wear, road wear, and resuspended road dust. Construction activities also produce PM emissions through tailpipe exhaust and by disturbing dust (fugitive emissions). Diesel PM, an important MSAT of concern, is also a component of diesel vehicle exhaust. $PM_{2.5}$ penetrates deep into the lungs and can cause respiratory ailments and contribute to cardiovascular disease and increased mortality. PM_{10} does not penetrate as deep into the lungs but can irritate the nose and throat and cause respiratory distress.

Carbon monoxide. CO is a colorless, odorless gas emitted directly from vehicle tailpipes as a product of combustion. CO tends to concentrate at intersections with large traffic volumes, high vehicle delays, and poor level of service (high congestion). CO reduces the oxygen

carrying capacity of blood in the body. High concentrations of CO can cause headaches, dizziness, and confusion, and can be hazardous to those with heart and respiratory issues. At very high concentrations, CO poisoning can cause unconsciousness and death.

Nitrogen dioxide. NO_2 is a highly reactive gas that is emitted during the combustion process. NO_2 can sometimes be seen as a reddish-brown haze layer over an urban area. Health effects include lung damage and respiratory illness. NO_2 is regulated through the NAAQS, but motor vehicles produce a variety of highly reactive nitrogen oxide pollutants, known collectively as NO_x, which cause health effects and also contribute to the secondary formation of O_3 and $PM_{2.5}$ in the atmosphere.

Sulfur dioxide. Sulfur dioxide (SO_2) is a highly reactive gas emitted during the combustion process. SO_2 also contributes to the secondary formation of $PM_{2.5}$ in the atmosphere. Motor vehicles emit very small amounts of SO_2 and related pollutants (known collectively as sulfur oxides, or SO_x) because diesel fuel contains sulfur, a natural component of crude oil. The EPA implements stringent regulations on the sulfur content in diesel fuel. Therefore, SO_2 is not considered a transportation-related criteria pollutant. SO_2 causes breathing problems and lung damage.

Lead. Lead (Pb) is a metal found naturally in the environment. It is used in manufacturing and historically was added to gasoline to reduce engine knocking, boost octane ratings, and decrease wear and tear on engine components. Pb poisoning causes serious health effects, including seizures, high blood pressure, learning disabilities, behavioral disorders, and central nervous system problems. Pb has been phased out of paint and automotive fuels and is no longer considered a transportation-related criteria pollutant.

The current NAAQS are shown in **Table 1**. The NAAQS include primary standards that protect public health and secondary standards that protect public welfare. Each NAAQS has a specific concentration level, averaging time, and statistical form.

Table 1. National Ambient Air Quality Standards

Pollutant	Primary/Secondary	Averaging Time	Level[3]	Form
CO	Primary	8 hours 1 hour	9 ppm 35 ppm	Not to be exceeded more than once per year
Pb	Primary and Secondary	Rolling 3-month average	0.15 µg/m^3	Not to be exceeded
NO_2	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
NO_2	Primary and Secondary	1 year	53 ppb	Annual mean
O_3	Primary and Secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
$PM_{2.5}$	Primary	1 year	9.0 µg/m^3	Annual mean, averaged over 3 years
$PM_{2.5}$	Secondary	1 year	15.0 µg/m^3	Annual mean, averaged over 3 years
$PM_{2.5}$	Primary and Secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and Secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
SO_2	Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
SO_2	Secondary	1 year	10 ppb	Annual mean, averaged over 3 years

3.1.2 Mobile Source Air Toxics

MSAT are known or suspected to cause cancer or other serious health and environmental effects. The nine MSAT identified by the EPA to be among the key drivers of national and regional-scale cancer risk and noncancer hazards and considered by FHWA as priority MSAT pollutants for NEPA studies are described below.[4]

1,3 Butadiene. 1,3 butadiene is a component of motor vehicle exhaust that breaks down quickly in the atmosphere but nonetheless is found in the ambient air at low levels in urban and suburban areas. Acute (short-term) exposure causes irritation of the eyes, nasal passages, throat, and lungs. Chronic (long-term) exposure may result in cardiovascular diseases, leukemia, and other cancers.

Acetaldehyde. Acetaldehyde is a component of motor vehicle exhaust. Acute exposure can result in irritation of the eyes, skin, and respiratory tract. Symptoms of chronic intoxication of acetaldehyde resemble those of alcoholism. Acetaldehyde is considered a probable human carcinogen.

Acrolein. Acrolein is a component of motor vehicle exhaust. Acute and chronic exposure may result in upper respiratory tract irritation and congestion, as well as irritation to the eyes. It is unclear from the scientific evidence if acrolein poses a reproductive or cancer risk to humans.

[3] ppm: parts per million; µg/m^3: microgram(s) per cubic meter; ppb: parts per billion
[4] These descriptions are informed by EPA's Health Effects Notebook for Hazardous Air Pollutants (EPA Health Effects Notebook for Hazardous Air Pollutants).

Benzene. Benzene is a component of gasoline vapors and motor vehicle exhaust. Acute exposure can cause eye, skin, and respiratory tract irritation, while chronic exposure can cause blood disorders, reproductive effects, and cancer.

Diesel Particulate Matter (Diesel PM). Diesel PM is a component of diesel exhaust that includes soot particles made up primarily of carbon, ash, metallic abrasion particles, sulfates, and silicates. More than 90 percent of diesel PM is less than 1 micrometer in diameter. Diesel PM can increase the risk of cardiovascular, cardiopulmonary, and respiratory diseases, and lung cancer.

Ethylbenzene. Ethylbenzene is a component of gasoline vapors and motor vehicle exhaust. Acute exposure can result in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects such as dizziness. Chronic exposure has shown conflicting results regarding its effects on the blood.

Formaldehyde. Formaldehyde is a component of motor vehicle exhaust. Both acute and chronic exposure can result in respiratory symptoms, as well as eye, nose, and throat irritation. The EPA considers formaldehyde a probable human carcinogen.

Naphthalene. Naphthalene is a component of motor vehicle exhaust. Acute and chronic exposure can lead to anemia and cataracts, as well as liver and neurological damage. The EPA considers naphthalene a possible human carcinogen.

Polycyclic Organic Matter (POM). POM defines a broad class of compounds, including polycyclic aromatic hydrocarbons (PAH), which are formed by the incomplete burning of oil and gas and are present in the atmosphere in particulate form. POM compounds have various acute effects, but the principal concern is that chronic exposure can increase the risk of cancer in humans.

3.1.3 Construction Fugitive Dust

Project construction activities may result in short-term, temporary emissions of fugitive dust, including $PM_{2.5}$ and PM_{10}. The term “fugitive” refers to the widespread or open area sources of the dust as compared to a single point source, such as a smokestack. Sources of fugitive dust during project construction include disturbed surface areas at the construction site and trucks transporting soil and debris from the construction site. Fugitive dust emissions vary from day to day at a construction site, depending on the nature and magnitude of construction activity and local weather conditions. Fugitive dust emissions depend on conditions, such as soil moisture, silt content of soil, wind speed, and the number of construction vehicles operating. Track-out of dust from the construction site can increase the amount of resuspended road dust from nearby paved roads. Fugitive dust has been linked to respiratory and cardiovascular health effects. It is also a component of haze, which can reduce visibility.

3.2 Project Scoping and Interagency Consultation

An environmental scoping meeting was held for the Project on February 14, 2024. FHWA, CDOT resource specialists and project staff, and consultant team members were invited to the meeting. The meeting included the topics of project overview and status; roles,

responsibilities, and expectations; agency coordination; and a review of the environmental resources and scoping form.

Technical Working Group and FHWA coordination meetings were held monthly starting February of 2024 throughout the Project to discuss analysis needs for the Project, development of the Air Quality Work Plan (formally reviewed by FHWA in January 2025), Project schedule, and analysis results. Invitees included FHWA, CDOT, and the consultant team.

Input data for the air quality analysis (e.g., traffic information and MOtor Vehicle Emissions Simulator [MOVES] emissions factors) were sent to the Technical Working Group for review, and comments were discussed in Working Group meetings. Inputs were revised as necessary based on decisions made by the Working Group.

Once the analysis results were available and quality checked, they were presented to and discussed with the Technical Working Group participants. The analysis was updated as necessary to address questions and comments from the participants.

3.3 Overview of Analysis Methods

The air quality analysis was completed based on the requirements of NEPA, the conformity provisions of the CAA Amendments, FHWA's MSAT Guidance (FHWA 2023a, 2023b), and CDOT's AQ-PLAG, Version 1 (CDOT 2019). The quantitative emissions inventories were developed by modeling operational emissions from motor vehicles using the most recent version of EPA's MOVES model (MOVES4.0.2) when the analysis was conducted. The analysis methodology included use of a lookup table of emission factors based on the results of the MOVES runs and PM_{10} road dust emission factors provided by the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control District (APCD) in combination with traffic data[5] to calculate operational emissions for the 2024 Existing Conditions and each Project alternative in the design year (2050). **Attachment C** provides a detailed description of the MOVES model setup and input data. Additional details of the overall analysis methodology are also provided in the Air Quality Analysis Work Plan (**Attachment B**).

3.3.1 Air Quality Study Area

The air quality analysis encompasses all mainline I-25 roadway links from the US 36/I-270 interchange on the south to 104th Avenue on the north, as well as portions of US 36 and I-270 at the interchanges with I-25. The air quality analysis also encompassed nearby "non-project" links where traffic was determined to be affected by the Project:

- Connector ramps at the US 36 and I-270 interchanges with I-25
- Ramps at I-25 and CO 224
- Ramps at I-25 and 84th Avenue
- Ramps at I-25 and Thornton Parkway
- Ramps at I-25 and 104th Avenue

[5] See the Traffic and Safety Technical Report for more details on development of the traffic activity data for the Project.

The selection of non-project links to include in the air quality analysis was guided by FHWA recommendations and is discussed in Section 1.0 of **Attachment C**. The complete list of roadway links that were included in the air quality analysis are shown in Table 1 through Table 3 of **Attachment C**.

3.3.2 Description of Alternatives

The air quality analysis considered one Build Alternative for full evaluation, as well as the No Action Alternative, which is fully evaluated as a baseline for comparison. Additional information on the development of project alternatives and the evaluation process for the Build Alternative is included in the Alternatives Development Technical Report.

No Action Alternative

The No Action Alternative evaluates operations of I-25 if a build alternative would not occur along the corridor. It does not address the Project purpose and need but is carried forward as a baseline for comparison. This alternative would maintain the existing highway configuration. The current cross section of this segment is described in **Attachment A**.

Under the No Action Alternative, the corridor would require substantial ongoing maintenance and continuous repairs to bridges and pavement. These frequent maintenance activities would be necessary to keep the roadway operational and would lead to recurring lane closures, traffic disruptions, and temporary impacts on travel time and reliability. Furthermore, the underlying infrastructure deficiencies would persist, necessitating increasingly complex and potentially impactful repairs over time.

Additional description of the No Action Alternative can be found in **Attachment A**.

Build Alternative

The Build Alternative would improve approximately five miles of I-25 between US 36 and 104th Avenue. The Build Alternative would fulfill the Project purpose and need by adding a new southbound general-purpose lane from 104th Avenue to south of 84th Avenue, adding a new northbound climbing lane from the I-76 entrance ramp to 104th Avenue, and creating auxiliary lanes northbound and southbound between the 84th Avenue and Thornton Parkway interchanges and northbound between I-270 and 84th Avenue. Additional description of the Build Alternative can be found in **Attachment A**.

3.3.3 Applicable Guidance

The methodology for the air quality analysis is in accordance with all applicable federal and state regulations, and is based upon guidance from EPA, FHWA, and CDOT. The following relevant guidance was applied in the analysis methodology.

- NEPA Manual, Version 7 (CDOT 2024)
- CDOT Interim Guidance for Project Level Compliance of C.R.S. 43-1-128
- (National Environmental Policy Act [NEPA] and Construction) DRAFT (CDOT 2023a)
- Air Quality Project-Level Analysis Guidance (AQ-PLAG), Version 1 (CDOT 2019)
- Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents (FHWA 2023a)
- Frequently Asked Questions (FAQs): Conducting Quantitative Mobile Source Air Toxics (MSAT) Analysis for FHWA NEPA Documents (FHWA 2023b)
- MOVES4 Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity (EPA 2023)

4.0 Existing Conditions

This section describes the atmospheric conditions of the study area, including the climate and topography, NAAQS attainment status, and monitored ambient pollutant concentrations.

4.1 Climate and Topography

The Project is located in the Denver metropolitan area in Adams County, Colorado. The Project resides along the western edge of the High Plains (elevation 5,150 feet above mean sea level), immediately east of the Front Range of the Rocky Mountains. The region has a semi-arid, continental climate with hot summers and cold winters. The nearby mountains and surrounding hills produce microclimates that affect local wind and temperature patterns. The difference between the daily high and low temperatures in the Project area can be extreme due to the high elevation and low relative humidity in the region. Summers are hot with high temperatures frequently exceeding 90 degrees Fahrenheit (°F). Winters are relatively cold with an average low temperature in December of 17.7°F (NWS 2021). The annual average precipitation in the Denver area is 14.5 inches, with 70 percent of the precipitation occurring during the summer months. The annual average snowfall is 54.8 inches, with most snow occurring from October to April. Downslope (Chinook) winds periodically bring warm and dry conditions, and in some cases, severe windstorms, to the region. Thunderstorms can occur during spring and summer.

4.2 Existing Air Quality

As of December 2025, all areas in Colorado were in attainment of all NAAQS criteria pollutants except ground-level O_3. Eight counties in the Denver metropolitan area (Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, and Weld) and a portion of one county in the Colorado North Front Range (Larimer) are currently designated as serious nonattainment for exceeding the 2015 8-hour O_3 standard (70 ppb). Seven counties in the Denver metropolitan area (Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson) and portions of two counties in the Colorado North Front Range (Larimer and Weld) are currently designated as severe nonattainment for exceeding the 2008 8-hour O_3 standard (75 ppb). The Denver Metro/North Front Range area was originally designated as nonattainment under the 1-hour O_3 standard, which was replaced with an 8-hour O_3 standard in 2008. Annual fourth-highest daily maximum 8-hour O_3 design values have fluctuated above and below the NAAQS since 2008 (APCD 2024).

The Denver region was previously designated nonattainment for CO and PM_{10}. The region was redesignated to attainment/maintenance status for CO by the EPA on December 14, 2001 (EPA 2001), and for PM_{10} by the EPA on September 16, 2002 (EPA 2002). Denver is in attainment for the 1997, 2006, and 2012 $PM_{2.5}$ standards. EPA has not yet designated nonattainment areas for the 2024 annual $PM_{2.5}$ standard of 9.0 µg/m^3.

Ambient air quality monitoring data from nearby stations that best represent the study area are provided for the years 2021 through 2024 in **Table 2**. APCD operates several air pollutant monitoring stations that are approved by the EPA in Adams County and the City and County of Denver. The closest monitor that measures $PM_{2.5}$ concentrations is located at 7275 Birch St. in

Commerce City (Commerce, Air Quality System [AQS] 080010010)[6], approximately 2.4 miles east of the I-25/US 36 interchange. The Commerce City monitor measures only PM_{10} and $PM_{2.5}$ concentrations. Air quality data for other pollutants were obtained from a nearby station located at 3174 East 78th Avenue in Welby (Welby, AQS 080013001), approximately 1.75 miles east of the study area.

Table 2. Pollutant Concentrations Measured at Air Quality Monitoring Sites Near the Project Site 1

Site	Pollutant	Parameter	2021	2022	2023	2024
Commerce	PM_{10}	Maximum 24-hour average ($\mu g/m^3$)	104	114	98	142
Commerce	$PM_{2.5}$	98th percentile 24-hour average ($\mu g/m^3$)	29.8	16.4	23.7	21.5
Commerce	$PM_{2.5}$	Annual average ($\mu g/m^3$)	10.3	6.9	8.3	7.1
Welby	PM_{10}	Maximum 24-hour average ($\mu g/m^3$)	96	100	95	139
Welby	CO	Maximum 1-hour average (ppm)	2.0	2.0	1.8	NA[1]
Welby	CO	Maximum 8-hour average (ppm)	1.5	1.1	1.3	NA
Welby	O_3	3-year average of fourth max. 8-hour (ppm)	0.072	0.077	0.074	0.076
Welby	NO_2	3-year average of 98th percentile 1-hour (ppb)	58	56	56	55
Welby	NO_2	Annual average	15.4	16.7	15.9	14.4

[1] Monitored CO concentrations are not available (NA) at the Welby site for the year 2024; CO monitoring at this site was discontinued in October 2023.

Data sources: Obtained from APCD Network Monitoring Plans (APCD 2022, 2023, 2024, and 2025).

[6] The Commerce City monitor was located at 4201 72nd Avenue through 2020, and was then switched to the current location on Birch Street. During the switch, no data were collected between November 2020 and the first half of March 2021. Therefore, calendar years 2020 and 2021 do not have complete data at the Commerce City monitor.

5.0 Environmental Consequences

This section documents how the Project meets federal conformity and state regulatory requirements. **Section 5.1** focuses on federal requirements and presents results of the comparative analysis of criteria pollutant emissions inventories as required by NEPA and the Tier 3 quantitative MSAT analysis results. **Section 5.2** provides discussion of the results for two state-level requirements: the analysis of criteria pollutant emissions inventories and the quantitative MSAT analysis. Finally, **Section 5.3** summarizes the qualitative analysis of construction emissions.

5.1 Federal Conformity and NEPA Comparative Analysis

The Project is in the Denver Metro/North Front Range O_3 nonattainment area for the 2008 and 2015 8-hour O_3 NAAQS. Because the Project is located within at least one nonattainment or maintenance area, transportation conformity requirements apply per 40 CFR 93. This section demonstrates how the Project meets applicable transportation conformity requirements for CO, $PM_{2.5}$, PM_{10}, and O_3 under 40 CFR 93. It also presents the quantitative criteria pollutant emissions inventory for the NEPA comparative assessment and a summary of the quantitative MSAT emissions analysis.

5.1.1 Project-Level Conformity Determination

The Project is in an area that has completed 20 years of maintenance of applicable CO and PM_{10} NAAQS. As a result, the study area is no longer considered a maintenance area for those pollutants for the purposes of transportation conformity (see Section 4.2). The study area is in attainment of the $PM_{2.5}$ NAAQS. Therefore, project-level hot-spot analyses for CO, PM_{10}, and $PM_{2.5}$ are not required to demonstrate conformity with the CAA.

Under 40 CFR 93, hot-spot analyses are not applicable to O_3 because it is not directly emitted from sources. Rather, it forms through complex atmospheric reactions involving the precursor pollutants, VOCs and NO_X, which can result in O_3 exceedances at locations far away from the emission sources. Consequently, O_3 conformity is determined at the regional level using a regional emissions analysis based on models with the latest planning assumptions.

5.1.2 Regional Conformity Determination

Regional conformity for transportation projects is satisfied through the federally approved DRCOG 2050 MVRTP (DRCOG 2024) and the 2026-2029 TIP (DRCOG 2025). DRCOG is the federally designated transportation planning agency for the Denver region, where the Project is located. The Project is listed in the 2050 MVRTP. Pre-construction activities for the Project are included in the fiscally constrained 2026-2029 TIP and specifically referenced by TIP number 2022-076. The MVRTP and TIP are being amended to reflect the project's revised scope, cost, and staging. Regional conformity requirements will be satisfied upon approval of the RTP update (anticipated November 2026) and the TIP amendment.

O_3 is modeled on a regional basis for the RTP and TIP. The design concept and scope of the Project is consistent with the anticipated updates to the RTP and TIP and the "open-to-traffic" assumptions in DRCOG's regional emissions analysis. Inclusion in the conforming RTP

and TIP, once they are updated to include the project's revised scope, cost, and staging, will demonstrate that the Project was evaluated for regional impacts, meets the planning and regional requirements for demonstration of federal conformity, and is consistent with local air quality planning efforts.

5.1.3 NEPA-Required Criteria Pollutant Emissions Inventories Analysis

The emissions inventories for the criteria pollutants were developed in accordance with NEPA requirements, applicable guidance, and methods (see **Section 3.3**, **Attachment B**, and **Attachment C**). The emissions inventories are based on vehicle traffic for roadway segments included in DRCOG's Focus 2.3.3 travel demand model (TDM) and within the air quality study area for the Project (see **Section 3.3.1**).

The reported emissions in this section represent motor vehicle emissions for the 2024 Existing Conditions and for the No Action and Build alternatives in 2050; the differences in emissions between the No Action and Build alternatives are attributed solely to the Project.

O_3 emissions are not explicitly quantified in the emissions inventories because this pollutant is a secondary pollutant. Instead, the primary precursor pollutants for O_3 formation, NO_x and VOCs, are quantified.

Table 3 lists estimated daily vehicle miles traveled (VMT) for the existing conditions year and the design year Project alternatives. VMT increases from 975,336 in 2024 to 1,168,718 in 2050 under the No Action Alternative due to traffic volume growth. The 2050 Build Alternative is projected to have higher traffic volumes and increased daily VMT (i.e., 1,281,050) due to added lanes compared with the No Action alternative. The difference in VMT between the Build and No Action alternatives is 9.6%.

Table 3. Daily Vehicle Miles Traveled (VMT)

2024 Existing	2050 No Action	2050 Build
975,336	1,168,718	1,281,050

Data source: Traffic data described in the Traffic and Safety Technical Report for the Project.

Table 4 summarizes the modeled criteria pollutant emissions on an annual basis (in tons per year) for the existing conditions year (2024) and design year (2050). The annual emissions were calculated as the total of typical weekday emissions in winter and summer months, each summed over half of the days in a year.[7] Except for PM_{10}, emissions of the remaining criteria pollutants decrease from existing conditions to the design year for both Project alternatives due to the implementation of stringent emission standards, improved fuel efficiency, and vehicle fleet turnover. PM_{10} emissions increase from 96.837 tons/year (existing conditions) in 2024 to 115.258 tons/year for the No Action Alternative and 117.117 tons/year for the Build Alternative in 2050, with approximately 77—89% of total PM_{10} emissions attributed to re-entrained road dust. Road dust emissions are driven by VMT and are not affected by emission standards or travel speeds.

[7] Based on methods in the travel demand model (TDM) used to develop the AADT in this analysis, 338 days in a year is used in the calculation of annual emissions. The value implies that daily weekend AADT is approximately three fourths of the AADT on weekdays.

Emissions of $PM_{2.5}$, NO_2, and NO_x are lower in the 2050 Build Alternative compared with the No Action Alternative, despite the increase in VMT, largely because of the increased travel speeds that are expected due to operational improvements that will reduce congestion and delay on the I-25 corridor. PM_{10}, CO, and VOC emissions increase slightly in the Build Alternative compared with the No Action Alternative, as the emissions for these pollutants are less sensitive to changes in travel speed compared to the other criteria pollutants.

Table 4. NEPA Comparative Analysis of Criteria Air Pollutant and Ozone Precursor Emissions (in U.S. tons per year)

Pollutant	2024 Existing	2050 No Action	2050 Build
PM_{10}	96.8	115.3	117.1
$PM_{2.5}$	8.8	2.7	2.2
CO	1260.6	230.5	231.7
NO_2	19.4	5.4	4.2
NO_x	245.2	29.4	23.7
VOCs	71.7	22.3	22.6

5.1.4 Quantitative MSAT Analysis

MSAT emissions were analyzed in accordance with FHWA guidance (FHWA 2023a), which provides a tiered approach with three categories for analyzing MSAT in NEPA documents, depending on specific project circumstances: (1) no analysis for projects without potential for meaningful MSAT effects; (2) qualitative analysis for projects with low potential MSAT effects; or (3) quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects. The Project is expected to add capacity to a high-traffic urban interstate in a populated area. The projected design-year traffic for the Build Alternative is greater than 150,000 AADT[8] and the total AADT for the Build Alternative is projected to increase by 10.6% compared with the No Action Alternative within the study area. Based on a review of the Project and consultation between CDOT and FHWA, it was concluded that the Project meets the criteria for a project with higher potential MSAT effects. Therefore, a Tier 3 (quantitative) MSAT analysis was completed to meet federal NEPA requirements. The quantitative MSAT emissions analysis results are described below. Additional MSAT discussion for NEPA can be found in **Attachment D**.

A quantitative emissions inventory for the nine FHWA priority MSAT pollutants was developed following the applicable guidance listed in **Section 3.3.3**. **Table 5** summarizes the modeled MSAT emissions on an annual basis (in tons per year) for the existing conditions year (2024) and the design year (2050). The annual emissions were calculated as the total of typical weekday emissions in winter and summer months each summed over half of the days in a year.[9]

[8] 140,000 to 150,000 AADT is an FHWA threshold for considering whether capacity expansion projects in urban areas should be considered for a Tier 3 MSAT analysis. It is one of several considerations that are examined to determine the appropriate level of MSAT analysis that is needed for NEPA.
[9] Based on methods in the TDM used to develop the AADT in this analysis, 338 days in a year is used in the calculation of annual emissions. The value implies that daily weekend AADT is approximately three fourths of the AADT on weekdays.

Table 5. Annual MSAT Air Pollutant Emissions (tons per year)

Pollutant	2024 Existing	2050 No Action	2050 Build
1,3-butadiene	0.078	0.000	0.000
Acetaldehyde	0.481	0.053	0.044
Acrolein	0.064	0.003	0.003
Benzene	0.955	0.164	0.165
Diesel PM	6.714	0.106	0.093
Ethylbenzene	0.909	0.361	0.367
Formaldehyde	0.895	0.067	0.058
Naphthalene	0.103	0.004	0.004
Polycyclic Organic Matter	0.056	0.002	0.002

For both Project alternatives, modeled MSAT emissions are predicted to decrease between 2024 and 2050, consistent with EPA's national emissions control programs, which are expected to reduce annual MSAT emissions by roughly 90% between 2010 and 2050 (FHWA 2023a). Notably, the diesel PM emissions in the design year are more than 98 percent less than in the existing conditions year. The substantially greater decrease in estimated diesel PM emissions between 2024 and 2050 compared with the other MSAT is consistent with EPA's national emission control programs, and is also influenced by Colorado's adoption of the Advanced Clean Trucks rule and the corresponding increase in the fraction of electric vehicles in the medium- and heavy-duty truck fleets by 2050.

The emissions in the 2050 Build Alternative are less than in the 2050 No Action Alternative for most MSAT pollutants. Although emissions for most MSAT are lower in the Build Alternative, ethylbenzene and benzene are estimated to have slightly higher emissions than in the No Action Alternative in 2050.

For a given analysis year, the amount of MSAT emitted would be proportional to the VMT, assuming that other variables such as the vehicle fleet mix and vehicle speed are the same. The weighted AADT data for the Build and No Action alternatives in the design year (2050) are listed in **Table 6**. The VMT estimated for the Build Alternative is approximately 10% higher than for the No Action Alternative. When considered in isolation, this increase in VMT would lead to higher MSAT emissions for the Build Alternative compared with the No Action Alternative. However, the MSAT emission for most pollutants are lower in the Build Alternative compared with the No Action Alternative. Notably, the vast majority of the projected traffic increase for the Project comes from passenger vehicles. Diesel PM is the primary driver of cancer risk from traffic-related MSAT emissions, and the Project is expected to increase truck AADT by 1.4% (i.e., 260 trucks per day) compared with the No Action Alternative.

Table 6. Weighted AADT (with respect to link length) for Design Year 2050 for I-25 Northbound (NB) and Southbound (SB) General Purpose Lanes (GP) and Express Lanes (EL) within the Air Quality Study Area for the Project

Description	2050 Build (Total)	2050 No Action (Total)	2050 Build (Trucks)	2050 No Action (Trucks)
NB I-25 GP	119,423	102,657	9,450	9,198
NB I-25 EL	15,265	18,060	0	0
SB I-25 GP	119,692	105,441	9,414	9,406
SB I-25 EL	14,650	17,028	0	0
NB+SB Total	**269,030**	**243,186**	**18,864**	**18,604**
Change from No Action	**+25,844 (10%)**	**—**	**+260 (1.4%)**	**—**

Data source: Calculated from traffic data described in the Traffic and Safety Technical Report for the Project.

Increases in MSAT emissions due to increased VMT would be offset to a large extent by lower MSAT emission rates due to increased vehicle speeds. In EPA's MOVES4 model, emission factors for the priority MSAT pollutants decrease as speed increases. This sensitivity to speed is especially pronounced at lower vehicle speeds (i.e., between 0 and 35 mph). The weighted travel speed data for the Project design year (2050) in the Build and No Action alternatives are listed in **Table 7**. The Project's operational improvements in the Build Alternative will reduce congestion, delay and increase the average travel speeds by approximately five to nine miles per hour (mph) during peak travel periods compared with the No Action Alternative.

Table 7. Weighted Travel Speed (with respect to link length) in mph for Design Year 2050 for I-25 General Purpose (GP) Lanes within the Air Quality Study Area for the Project

Description	2050 Build	2050 No Action	Change from No Action
NB I-25 GP AM Peak	59	52	+7
SB I-25 GP AM Peak	31	26	+5
NB I-25 GP PM Peak	38	31	+7
SB I-25 GP PM Peak	53	44	+9

Data source: Calculated from traffic data described in the Traffic and Safety Technical Report for the Project.

The additional general-purpose lane, climbing lane, and auxiliary lanes proposed for portions of the Build Alternative will have the effect of moving some traffic closer to nearby residences and business. This may result in localized areas where ambient concentrations of MSAT could be higher in the Build Alternative compared with the No Action Alternative, but these localized increases would likely be offset due to increases in vehicle speeds and reduced congestion and delay. Existing sound walls can help to minimize any potential localized increases in MSAT concentrations at nearby residences. While the primary purpose of noise barriers is acoustics, solid barriers force roadway emissions to be lofted over the solid structure, which increases the vertical dispersion of pollutants and reduces near-road pollutant concentrations downwind of the barrier (Finn et al. 2010; Baldauf et al. 2008; Baldauf et al. 2016; Steffens et al. 2013; Steffens et al. 2014).

5.2 State-Required Air Quality Analysis

This section documents the results of the state-required air quality analysis conducted for the Project.

5.2.1 State-Required Criteria Pollutant Emissions Inventories Analysis

The emission inventories for the criteria pollutants were developed to meet state regulatory requirements based on applicable guidance and methods (see **Section 3.3**, **Attachment B**, and **Attachment C**). The emission inventories are based on vehicle traffic on roadway segments in the DRCOG TDM (Focus 2.3.3) within the air quality study area for the Project (see **Section 3.3.1**).

The reported emissions in this section represent motor vehicle emissions resulting from the Project; the differences in emissions between the No Action and Build alternatives are attributed solely to the Project.

O_3 emissions are not explicitly quantified in the emissions inventories because this pollutant is a secondary pollutant. Instead, the primary precursor pollutants for O_3 formation, NO_x and VOCs, are quantified.

The criteria pollutant emissions inventory analysis completed to meet federal regulatory requirements also serves to meet state requirements. The results of this analysis are presented in **Section 5.1.3** and not repeated here.

5.2.2 Quantitative MSAT Analysis

A Tier 3 quantitative analysis of MSAT was completed to meet federal NEPA requirements. This also meets state requirements for C.R.S. 43-1-128(4)(a), as it is not intended that a project would have more than one quantitative MSAT analysis (CDOT 2023a). The results of the quantitative MSAT analysis can be found in **Section 5.1.4**.

5.3 Qualitative Analysis of Construction Emissions

Project construction would result in short-term, temporary emissions of fugitive dust and equipment-related exhaust emissions such as NO_x, CO, VOCs, and PM (PM_{10} and $PM_{2.5}$) in the study area. Construction of the Project is expected to last no more than 5 years. Therefore, construction emissions would not need to be accounted for in any hot-spot analysis per 40 CFR 93.123(c)(5). Since hot-spot analysis is not required for the Project under 40 CFR 93.123(c)(5) (see **Section 5.1.1**), a quantitative construction emissions analysis was also not considered for NEPA purposes.

Sources of fugitive dust (PM_{10} and $PM_{2.5}$) during Project construction would include disturbed surface areas at the construction site, trucks carrying uncovered loads of soil and debris, and resuspended road dust from trucks entering and exiting the construction site. Fugitive dust emissions would vary from day to day depending on the nature and magnitude of construction activity and local weather conditions. Dust emissions would depend on conditions such as soil moisture, the silt content of soil, wind speed, and the number of operating construction vehicles.

Exhaust emissions during construction would be generated by fuel combustion in motor vehicles and construction equipment. Construction vehicles and the disruption of normal traffic flow could result in increased motor vehicle emissions in certain areas. These

emissions would be temporary and limited to the immediate area surrounding the construction site.

5.4 Supplemental Analysis: Predicted Changes in Emissions Intensity

This section details the supplemental emissions analysis conducted by CDOT for the I-25 North (US36 to 104th, the "Project") corridor as of March 2026. The primary objective of this analysis is to qualitatively compare the proposed Build Alternative emissions rates of particulate matter (PM_{10} and $PM_{2.5}$) as compared to the No Action through analyzing the relative change in emissions rates under the proposed Build Alternative.

5.4.1 Regulatory Context and Supplemental Analysis Approach

The Project area is currently in attainment for all pollutants except ground level ozone which is a regional pollutant, therefore project-level conformity does not apply. Thus, project level "hotspot" analysis was not completed for the Project. However, a voluntary supplemental emissions analysis was conducted by CDOT to provide additional qualitative information on particulate matter emissions changes between alternatives. CDOT performed a qualitative comparative analysis of the change in link-level PM_{10} and $PM_{2.5}$ emissions rates between the Proposed Build and No Action alternatives in the Project location.

CDOT utilized the EPA's MOVES model with the same assumptions and input files used by the consultant in the emissions inventory for consistency. However, this supplemental analysis did not calculate total mass emissions at the localized (link level) as this was already performed for the emissions inventory. Furthermore, no air dispersion modeling was conducted to analyze any potential beneficial or adverse impacts to localized air quality concentrations for PM_{10} or $PM_{2.5}$. Finally, the supplemental particulate matter analysis only evaluated direct motor vehicle emissions (i.e., tailpipe, brake wear and tire wear). Fugitive emissions (i.e. road dust) of PM_{10} were not included.

Rather than a traditional emissions inventory analysis that calculates total mass emissions from a project for a given suite of pollutants, this study utilizes the MOVES emissions rates model to evaluate the relative change in emissions intensity, measured in grams per mile (gpm) traveled of the Proposed Build Alternative in relation to the No Action Alternative. As documented in the Traffic Technical Memorandum (Appendix D1 Traffic and Safety Technical Report) for the Project, there is not a large difference in the level of vehicle miles traveled (VMT) under the Proposed Action Alternative compared to the No Action Alternative due to a lack of alternate routes in the Project area. Since vehicle volumes and associated VMT are similar across both alternatives, lower emission rates on a specific link under the Proposed Build Alternative suggest a likelihood of air quality benefits rather than adverse impacts compared to the No Action Alternative.

As with the emissions inventory, to ensure an accurate comparison, all assumptions regarding vehicle mix and vehicle fuel types remain consistent across both the Build and No Action scenarios. While all emissions analyses completed for this project under NEPA assume a level of ZEV adoption, including ZEV adoption by commercial vehicles, these vehicles are only accounted for in MOVES through standard fleet turnover rates as identified by APCD using the Department of Motor Vehicles statewide vehicle registration database. Furthermore, while

the emissions analysis does assume future levels of ZEV adoption for 2050, it is important to remember that by 2050 a significant number of internal combustion vehicles (gasoline and diesel) are forecasted to remain onroad and in use in the region. The most important aspect of an emissions analysis under NEPA for transportation is that assumptions on fleet mix and fuel usage remain consistent between alternatives, as was performed in this Air Quality Technical Report. The exception would be if a specific project element under an alternative would change these assumptions, e.g., adding a limited use facility such as an Express Lane which is not the instance for this Project. Keeping vehicle assumptions consistent between alternatives in an emissions analysis ensures that predicted changes in emissions or air quality are the results of forecasted changes in travel behavior specific to an alternative.

5.4.2 The Speed and Emissions Relationship

Figure 2 and **Figure 3** show a simplified example of the emissions rates (in gpm) for passenger cars and heavy trucks for PM_{10} and $PM_{2.5}$ by speed increments in miles per hour (mph). While the MOVES rates illustrated in these figures represent only the summer AM peak period, the final emissions inventory accounts for all time-of-day periods and seasonal variations. Note that "Cars" represents all passenger vehicles, including light-duty trucks and SUVs, and is not limited to sedans and coupes. "Trucks" represent larger commercial vehicles (FHWA Vehicle Classification 5 and greater) that are present in the Project area and region. Variation in seasons and time shows similar trends in emissions rates by speed, so one period, Summer AM peak period, was selected to demonstrate this relationship graphically.

Figure 2. Passenger Vehicles Versus Trucks PM_{10} combined emissions rates (tail pipe, brake wear, and tire wear) by Vehicle Speed in the Project Horizon Year (2050) for Summer AM Conditions

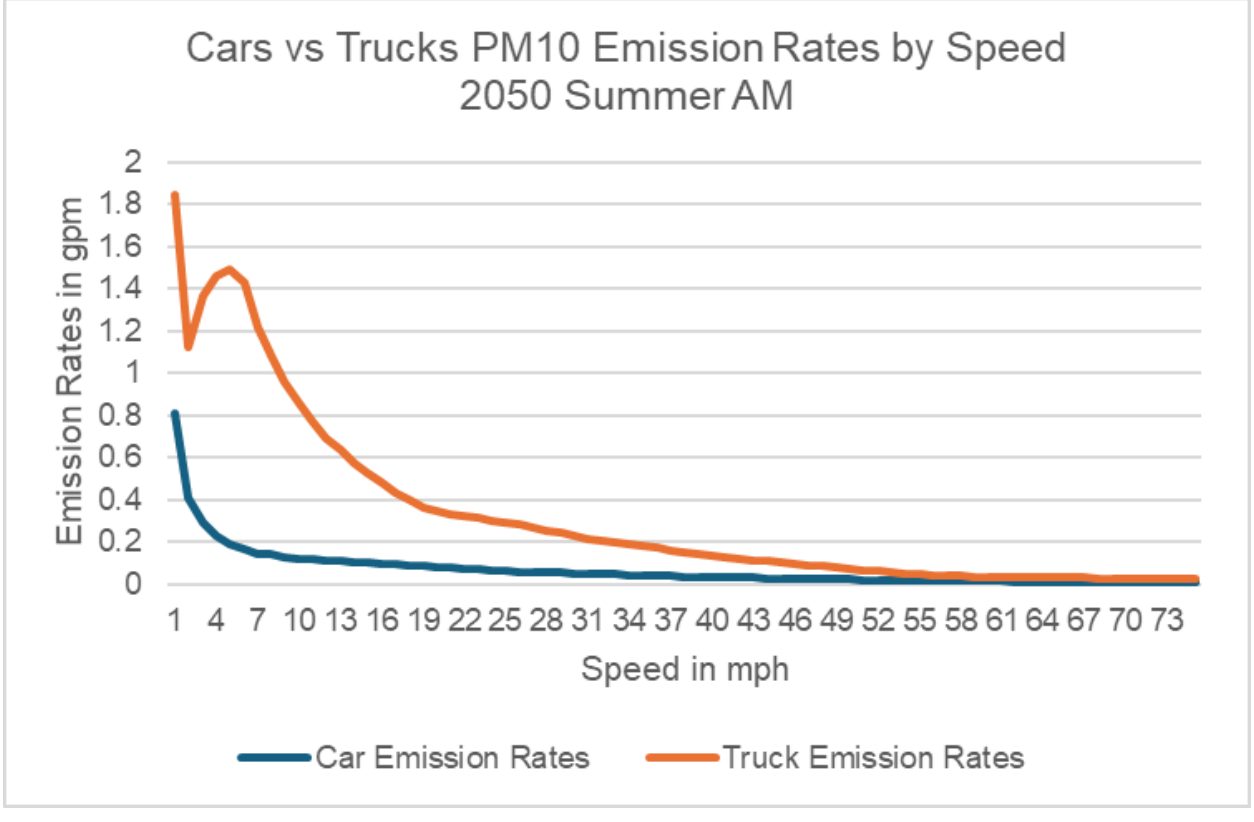


Figure 3. Passenger Vehicles Versus Trucks $PM_{2.5}$ combined emissions rates (tailpipe, brake wear, and tire wear) by Vehicle Speed in the Project Horizon Year (2050) for Summer AM Conditions

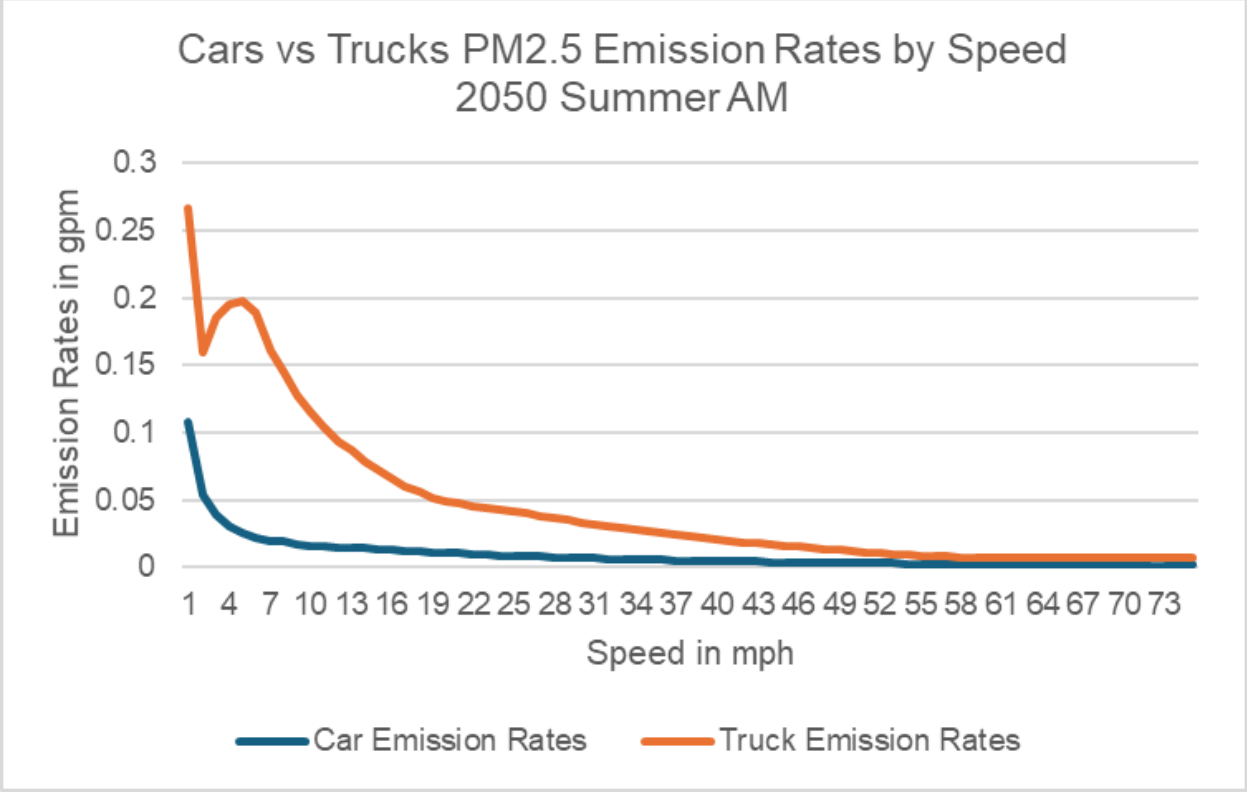


Figure 2 and **Figure 3** demonstrate that emissions rates for both PM_{10} and $PM_{2.5}$ are significantly higher at lower speeds when engines are less efficient, and due to vehicle operations during congestion result in non-tailpipe emissions of particulates, e.g., brake wear and tire wear, that are also emitted by ZEVs. Tailpipe emissions rates are lowest per VMT at speeds near 55 mph, after which they begin to increase. However, **Figure 2** and **Figure 3** also include the predicted emissions rates for brake wear and tire wear which are not as sensitive to higher speeds. The decrease in particulate matter (PM) emission rates at average speeds below 5 mph, as illustrated in **Figure 2** and **Figure 3**, is a direct result of the EPA MOVES model's internal logic regarding how it assigns non-exhaust emissions with vehicles operating at extremely low speeds. Brake and tire wear emissions rates are dependent on active acceleration and braking and make up most of the particulate matter emissions in 2050 (**Section 5.4.4**). The MOVES algorithm assumes that vehicles averaging less than 5 mph spend a significant portion of that hour at a steady-state idle (0 mph), during which no mechanical braking or acceleration are predicted to occur. Consequently, while these extremely low-speed emission rates were developed for the analysis to ensure all potential ramp and corridor movements are accounted for, the "dip" is an artifact of idling assumptions within MOVES rather than a physical reduction in vehicle wear and could potentially underestimate real-world onroad particulate matter emissions from vehicles operating in extremely congested conditions and the braking and acceleration associated with stop and go traffic.

Total Vehicle Miles Traveled (VMT) are expected to remain relatively similar between the two alternatives with an approximately 8.8% increase in VMT forecasted for 2050 under the

Proposed Build Alternative in comparison to the No Action for all roadways in the emissions study area (refer to **Appendix D1: Traffic and Safety Technical Report**). The reason there is limited difference in VMT in the emissions study area is that drivers do not have adequate alternate routes available for their trips and must continue to travel on I-25 under the No Action Alternative. Therefore, the primary driver for changes in emissions of the Proposed Build Alternative as it relates to the No Action Alternative is changes in emissions rates resulting from varying vehicle operating speeds. As shown in **Figure 2** and **Figure 3**, the lowest emissions rates are associated with speeds approaching 55 mph, or near highway free flow speeds. Under "stop and go" congestion (typical of the No Action scenario), engines work harder, and more acceleration and deceleration braking occurs, resulting in a greater level of emissions on a pollutants per mile basis.

5.4.3 Analysis Focus: Season, Time Periods and Vehicles

To reduce the scope of the voluntary supplemental emissions analysis, CDOT only evaluated predicted changes in particulate matter emissions rates for trucks on this segment of I-25 (heavy-duty trucks FHWA Vehicle Classification 5 and larger). The supplemental analysis focused on commercial trucks because as shown in **Figure 2** and **Figure 3**, emissions rates for these vehicles are much higher than passenger cars. To further streamline the qualitative analysis, only rates associated with the 2050 Summer AM peak period were utilized as surrogate rates which were kept consistent between alternatives. This analysis is a qualitative comparison of alternatives as they relate to each other, where the relative changes in emissions rates under the Proposed Build Alternative compared to the No Action Alternative can be assumed to be similar during other seasons and periods of the day.

Commercial trucks were selected for the supplemental emissions analysis because their emission rates per mile are significantly higher than those of passenger cars. However, it is also reasonable to extrapolate these results to the general fleet since passenger vehicles share a similar speed to emissions profile (**Figure 2** and **Figure 3**). A reduction in truck emission rates due to improved traffic flow is highly likely to correspond with a reduction in passenger vehicle emissions rates, though this relationship may not be a direct one to one comparison.

As the supplemental analysis is intended to evaluate changes in predicted emissions rates resulting from changes in forecasted speeds under the Proposed Build Alternative in relation to the No Action Alternative, only the AM and PM peak periods from the travel demand modeling were analyzed. The AM and PM peak are the times of day when the greatest differences in speeds between alternatives are expected due to high volumes of vehicles traveling on the segment and associated congestion. **Figure 4** and **Figure 5** show the AM and PM peak predicted hourly average speeds on the segment by direction, i.e., northbound and southbound.

Figure 4. The Northbound AM and PM Peak Predicted Hourly Average Speeds on General Purpose Lanes in the Project Segment

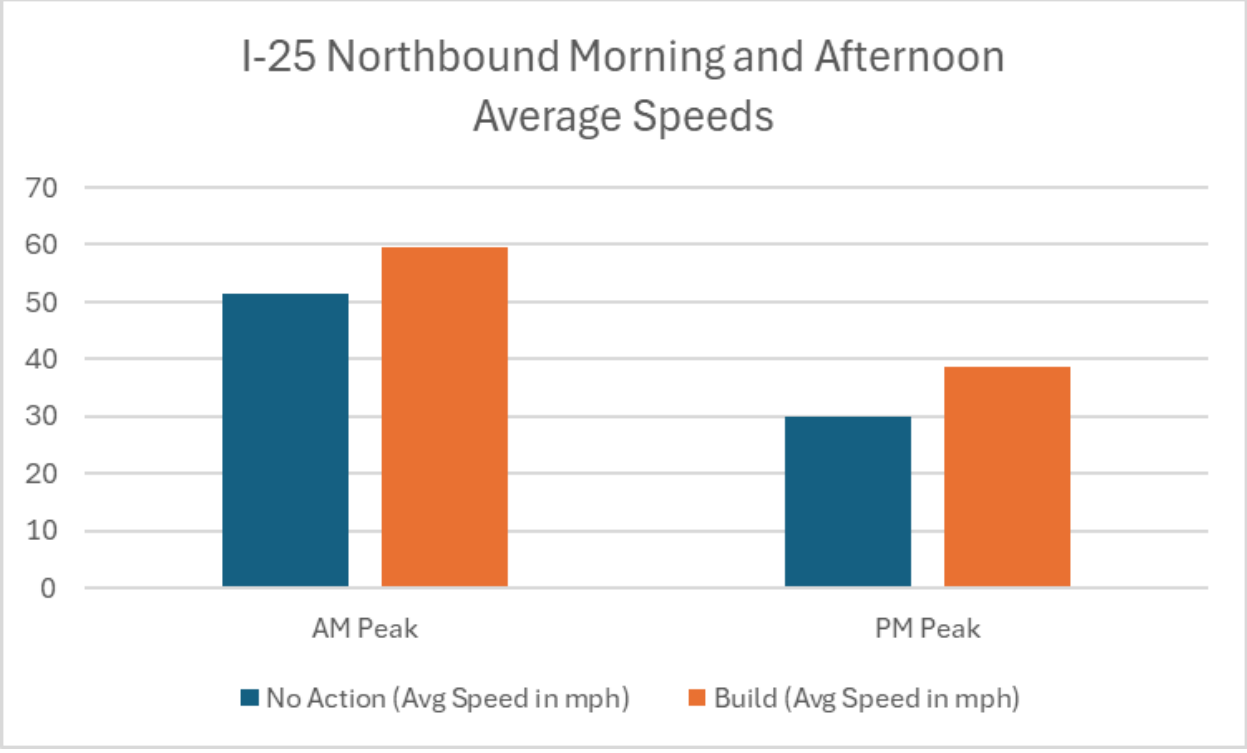
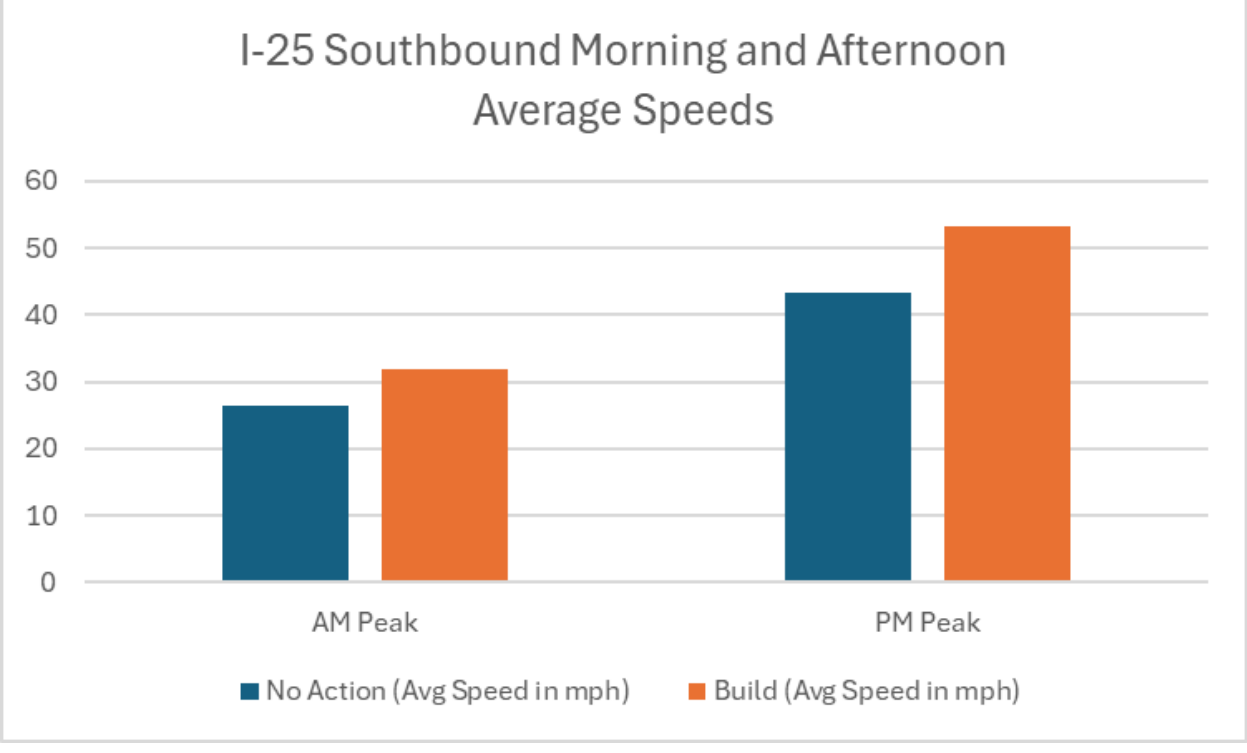


Figure 5. The Southbound AM and PM Peak Predicted Hourly Average Speeds on General Purpose Lanes in the Project Segment



The use of changes in emissions rates only associated with the 2050 peak period travel behavior is warranted as the supplemental analysis does not perform air modeling intended to

predict future concentrations that would require seasonal emissions rates associated with an entire year as was performed in the emissions inventory. Although tailpipe emissions of PM_{10} and $PM_{2.5}$ increase during colder months of the year, as discussed in the following section, tailpipe exhaust emissions of PM_{10} and $PM_{2.5}$ from trucks are predicted to be lower in 2050 than emissions of these pollutants from other vehicle processes, including ZEVs.

5.4.4 Future Predicted Particulate Matter Emissions by Vehicle Process

When evaluating direct mobile source emissions of PM_{10} and $PM_{2.5}$, the analysis accounts for three distinct sources: tailpipe exhaust, brake wear, and tire wear. Accounting for all three mobile source processes is important because although EV commercial vehicles have zero tailpipe emissions of particulates, there are still sources of particulate matter emissions, i.e., brake wear and tire wear. **Figure 6** and **Figure 7** show the predicted 2050 direct mobile source emissions rates of PM_{10} and $PM_{2.5}$ for both diesel and EV heavy-duty trucks traveling at 40 mph on the corridor.

Figure 6. Emissions Rates in 2050 for PM_{10} by Fuel Type

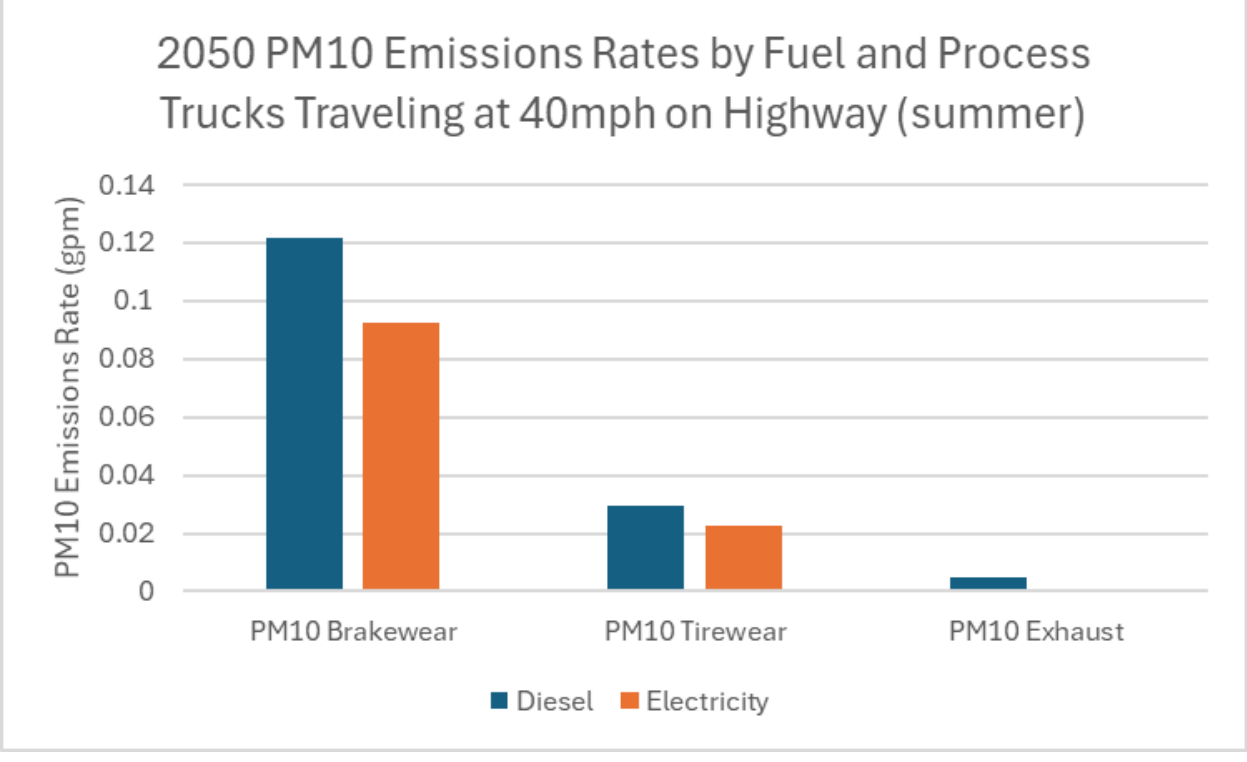


Figure 7. Emissions Rates in 2050 for $PM_{2.5}$ by Fuel Type

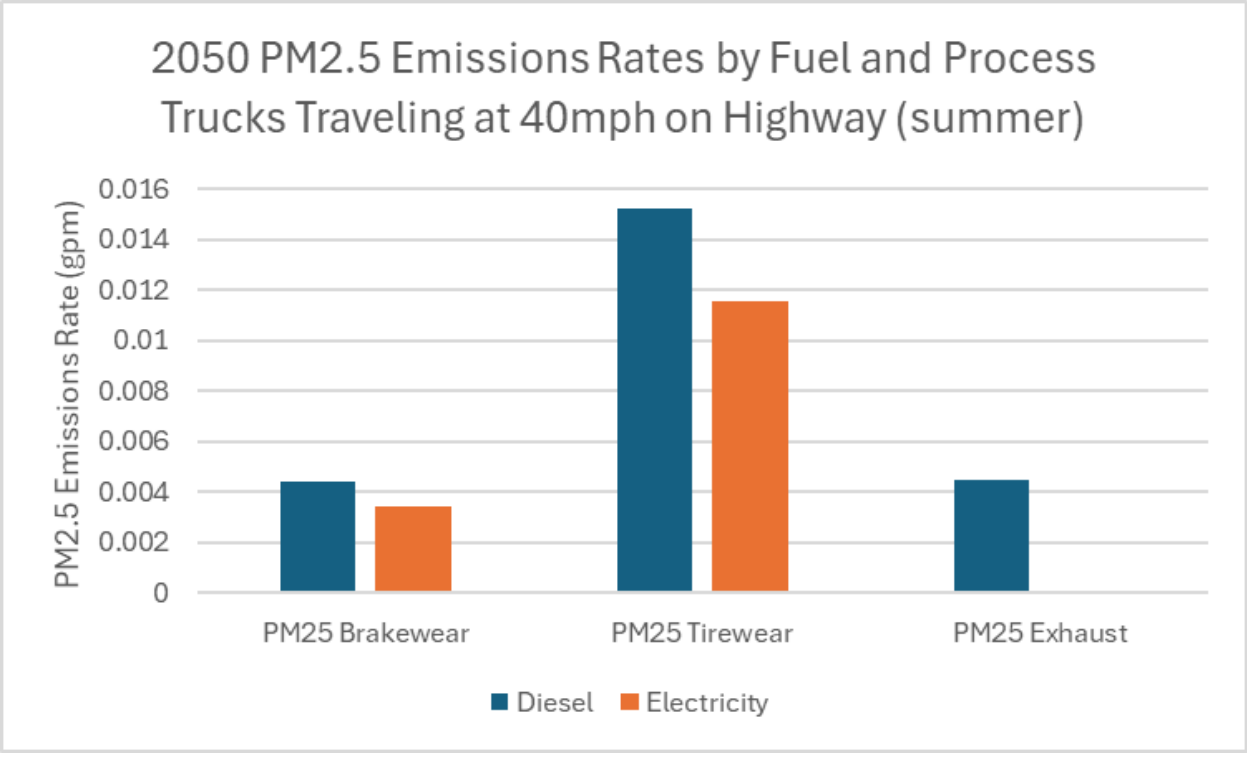


Figure 6 and **Figure 7** demonstrate that by 2050, the emissions rates predicted from MOVES indicate that the mechanical wear of brakes and tires will contribute more to total particulate matter emissions than diesel exhaust alone in the Project area. This is primarily an effect of federal fuel standards and motor vehicle regulations, such as EPA's 2010 Low NOx Rule, that went into effect many years ago, but whose benefits continue to be realized through standard fleet turnover as older and higher emitting vehicles are retired.

Additionally, EV commercial trucks are predicted to emit similar levels of brake wear and tire wear emissions as diesel commercial trucks. This highlights the importance of maintaining steady speeds, as frequent acceleration and deceleration in congested traffic increases particulate matter regardless of the vehicle's fuel source. Unlike the emissions inventory, this supplemental analysis of particulate matter emissions rates does not consider fugitive emissions of PM_{10}, i.e. road dust, as these emissions rates do not vary between alternatives.

5.4.5 Supplemental Analysis Link Level Results

To qualitatively compare the predicted emissions rates of particulates from the Proposed Build Alternative to the No Action Alternative, the small sections of this segment of I-25 referred to as "links" in the travel demand model were mapped to each other so that a given link under the Proposed Build Alternative can be compared to the same corresponding link at the same location on I-25 under the No Action Alternative by direction and time of day. The relative percent change in emissions rates under the Proposed Build Alternative compared to the No Action Alternative were calculated at the individual link level by direction and peak period. **Figure 8** and **Figure 9** show the individual link level calculated relative percent change in particulate matter emissions rates (gpm) by pollutant, direction, and peak period of the proposed Build Alternative in relation to the No Action Alternative.

In **Figure 8** and **Figure 9**, a relative percentage change in emission rates of less than 0% indicates a reduction in the emissions intensity, (i.e., a lower emissions rate in gpm). An emissions rate greater than 0% indicates an increase in the emissions intensity under the Proposed Action Alternative as compared to the No Action Alternative. Note that **Figure 8** and **Figure 9** show the relative percentage change at the individual link level, the link level values are not graphed in a continuous geographic manner along the segment, e.g., North to South, and are instead graphed in random order due to how link IDs are defined in the travel demand model.

Figure 8. Link Level Calculated Relative Percent Change in PM_{10} Emissions Rates

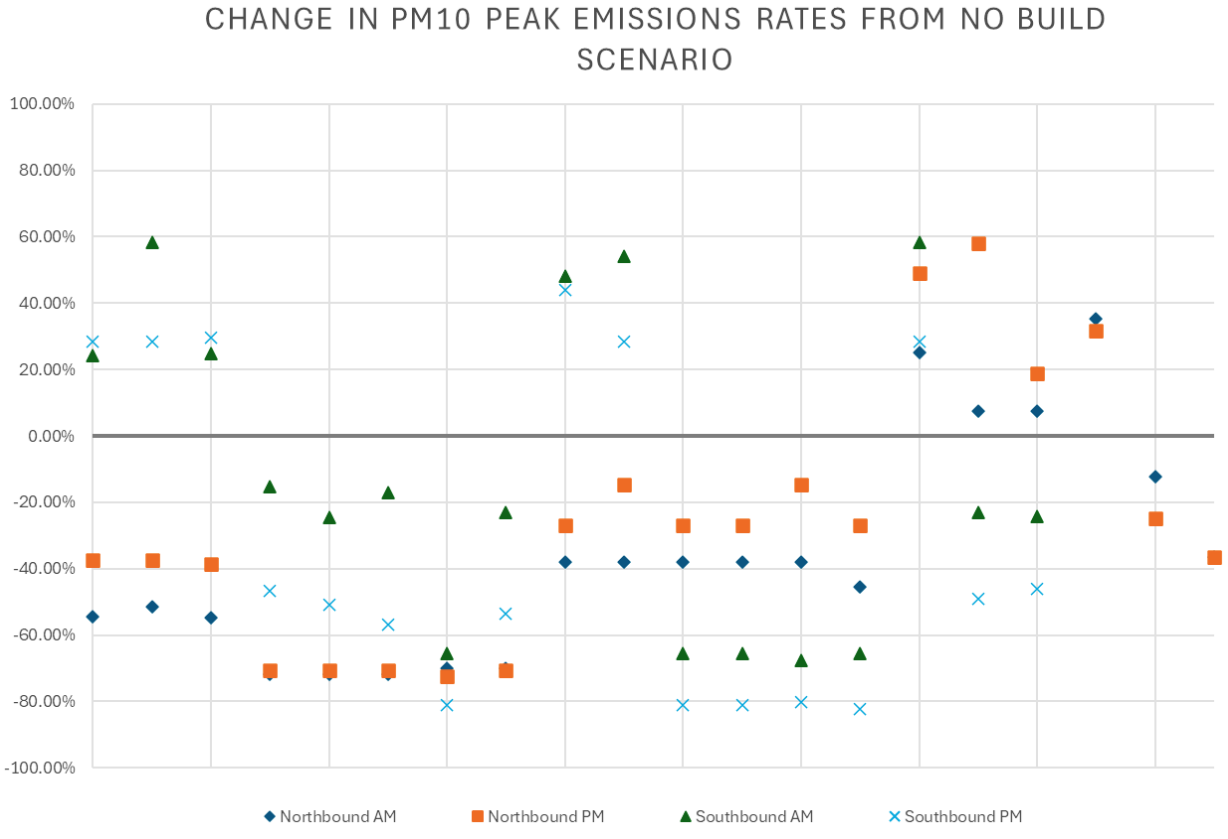
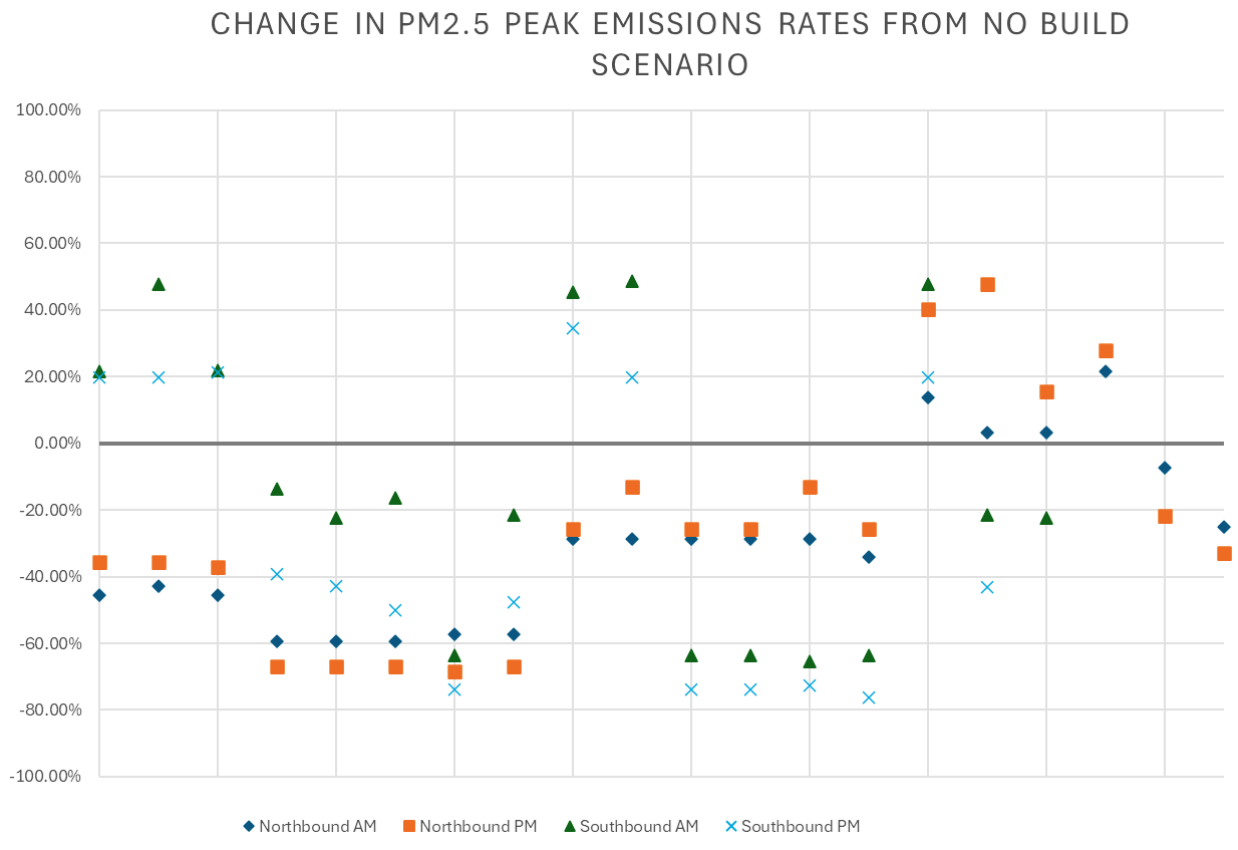


Figure 9. Link Level Calculated Relative Percent Change in $PM_{2.5}$ Emissions Rates



For **Figure 8** and **Figure 9**, under the Proposed Build Alternative, most of the individual links have lower emissions rates as compared to the corresponding No Action Alternative link. Negative values below the x-axis (< 0%) indicate a lower emissions rate from more efficient means of travel under the Proposed Build Alternative in comparison to the No Action Alternative.

5.4.6 Supplemental Analysis Segment Level Findings

To assess the overall relative percent change in emissions rates at the segment level for the Project, the relative percent change in emissions rates at the individual link level were aggregated. However, it would not be accurate to simply take an average value of the relative percentage change in emissions rates because some of the links on the segment have significantly more VMT associated with them than others on the segment. Therefore, the relative percent change in emissions rates under the Proposed Build Alternative as compared to the No Action Alternative at the link level values were first weighted by the calculated total VMT on the segment, by direction, before being aggregated. This "VMT weighting" ensures that longer highway segments or those with higher traffic volumes carry more influence in the overall segment level assessment, preventing outliers on short or low volume links from skewing the overall data.

The table (**Figure 10**) below summarizes the predicted 2050 overall relative change in commercial vehicle emissions intensity under the Proposed Build Alternative as compared to the No Action Alternative by direction and peak period. The "Segment Level" column

represents the combined change across both directions of travel for each peak period assessed. A value of less than 0% indicates lower overall emissions rate, and therefore a more efficient means of travel under the Proposed Build Alternative in comparison to the No Action Alternative.

Figure 10. Northbound, Southbound and Total Segment Link-Level Relative Percent Difference for AM and PM Particulate Matter Peak Emissions Rates

Pollutant	Time Period	Northbound Relative Difference	Southbound Relative Difference	Segment Level Relative Difference
PM10	AM Peak	+6%	-12%	**-3%**
	PM Peak	-23%	-36%	**-29.5%**
PM2.5	AM Peak	+2%	-12%	**-5%**
	PM Peak	-23%	-32%	**-27.5%**

5.4.7 Supplemental Emissions Analysis Conclusion

The supplemental emissions analysis indicates that the Proposed Build Alternative reduces most emissions rates of PM_{10} and $PM_{2.5}$ across the Project during the AM and PM peak periods. While minor increases in the Northbound AM peak are likely the result of the positive grade and increased VMT along this stretch of the corridor, overall reductions across the segment are predicted to provide a net benefit in emissions rates of PM_{10} and $PM_{2.5}$ when compared to the No Action Alternative (**Table 8**). Although the analysis evaluated the percentage change in emissions rates for commercial trucks, it is also reasonable to assume that emission rates of passenger vehicles are also likely to decrease under the Proposed Build Alternative as they follow similar emissions rate and speed profiles as commercial trucks (**Figure 2** and **Figure 3**). CDOT did not focus on passenger vehicle rates in this analysis due to their minimal impact when compared to commercial truck traffic.

By improving traffic flow and reducing congestion, the Proposed Build Alternative emissions analysis shows an increase in average corridor speeds and general smoothing of travel, resulting in lower particulate matter emission rates when compared to the No Action Alternative. This reduction in emissions per mile represents a more efficient form of travel

which supports the critical consideration for this Project, where motorists lack adequate alternate route choices and are likely to travel on the segment regardless. Ultimately, these results indicate that the Proposed Build Alternative is unlikely to result in adverse air quality impacts as compared to the No Action Alternative.

5.5 Corridor-Level Considerations

The Project represents a single segment within the 56 mile long I-25 North Corridor. This segment already contains Express Lanes that are operated with dynamic tolling by the Colorado Transportation Investment Office (CTIO) and the addition of Express Lanes on other segments of I-25 North have been completed or are being considered for future use on the interstate.

Highway expansions generally lead to increased VMT, referred to as induced demand, on the corridor. Some elements of induced demand from highway expansions are desirable and intentional, such as having more users choose to travel on the widened and less congested roadway for shorter and more direct trips, which can lead to corresponding decreases in VMT in the region on other indirect routes. A negative example of induced demand, however, is that the reduction in congestion can cause travelers to take more frequent or longer trips (i.e. latent demand), leading to increases in VMT and associated emissions. In some cases, the amount of travel and congestion on the roadway can increase to a level where there are no longer emissions benefits being realized from improved traffic operations. These undesirable elements of induced demand are sensitive to the availability of travel choices and the land use in the Project area. CDOT's Express Lane operations on I-25 North improve traffic operations in real-time, limiting induced demand that would otherwise likely occur over time with a new General Purpose Lane. This provides increased travel choices throughout segments in the corridor that also support more desirable land use development patterns.

CDOT's Express Lanes actively manage congestion through pricing strategies that discourage latent (induced) demand and allow pricing to change in real-time as corridor conditions adjust during peak periods. Given Colorado's recent growth, Express Lanes provide CTIO/CDOT with a real-time tool to manage unexpected growth without requiring additional construction beyond the Express Lane. Dynamic pricing achieves this by offering drivers a choice: pay a toll for the Express Lane, use the General Purpose Lanes, or delay, or maybe even not make an unnecessary trip to avoid congestion during peak periods. By expanding the road to include an Express Lane, this will not create induced demand through the addition of the tolled lane, which is why an Express Lane is a more beneficial option to manage traffic during peak periods.

The toll rates ensure the Express Lane is used by drivers who need or choose to pay for a maintained speed during peak congestion periods. Furthermore, Express Lane incentivizes HOV3+ and supports public transit by allowing buses to bypass congestion, ensuring faster and more reliable service, which effectively reduces overall traffic along the corridor.

CTIO employs dynamic pricing, which responds to real-time traffic data to determine the correct toll rate to discourage use beyond what the lane can manage, which would result in congestion. By using dynamic pricing, tolls are intentionally set lower outside of peak hours to

encourage use. Whereas during peak hours, higher tolls manage demand to preserve the Express Lane's speed and travel time savings and reliability. The dynamic pricing algorithm operates within a set minimum and maximum rate. The minimum toll covers operating costs, debt service, and maintenance. The maximum toll is reviewed and adjusted annually based on observed speed degradation and other traffic conditions along the corridor.

CDOT's Express Lane operations on I-25 North provides better travel time reliability for transit riders as well as drivers who elect to travel in the Express Lane based on current congestion levels and real-time dynamic tolling levels for non-HOV3+. Through the I-25 North Express Lane operation latent demand is discouraged and congestion mitigation benefits such as reduced emissions from improved traffic flow are dynamically managed based on real-world conditions, in both present and future years. CDOT's Express Lanes as compared to static transportation infrastructure, e.g., general purpose lanes, are better designed to limit the undesirable effects of induced demand, especially those that could occur from future conditions in the area that may not be represented in the current regional long-range planning year assumptions at the time of NEPA analysis.

5.6 Conclusion and Recommendations

The air quality analysis for the I-25 North Safety and Operations Improvements Project demonstrates that the Proposed Build Alternative complies with all federal and state air quality regulations, including NEPA and the Clean Air Act. The Project area is in attainment for all pollutants except ground-level ozone which is a regional pollutant managed through the Denver Metro/North Front Range State Implementation Plan (SIP) conformity motor vehicle emissions budgets. Therefore, the Project is not subject to project-level conformity "hotspot" requirements as all federal clean air standards for particulate matter are currently being met. Furthermore, a quantitative assessment of Mobile Source Air Toxics (MSATs) indicates that while some increases in MSATs may occur due to increases in VMT as compared to the No Action Alternative, these will be largely offset by a projected 80% to 90% reduction in total MSAT emissions by 2050 due to EPA's stringent national fuels and vehicle control programs.

The supplemental emissions analysis (Section 5.4) further indicates the Build Alternative leads to less emissions intense travel, revealing that improving traffic flow and reducing "stop-and-go" congestion will lower the emissions rates of particulate matter (PM_{10} and $PM_{2.5}$) compared to the No Action Alternative. While non-exhaust sources such as brake and tire wear are projected to become the primary drivers of PM by 2050, the Build Alternative's ability to foster steady-state, free-flow speeds minimize the mechanical braking events that generate these pollutants.

This segment of the I-25 North corridor lacks viable alternate routes for the anticipated 2050 traffic volumes, particularly for commercial vehicles. VMT is predicted to increase by 8.7% under the Proposed Build Alternative as compared to the No Action Alternative. Although there are speed and emissions rate improvements associated with the Proposed Build Alternative, there is no significant level of highway expansion associated with the Project that would allow travelers to move at uncongested speeds on the segment in future years that are associated with more frequent and longer trips, with the exception of the Express Lane

travelers on the segment. CTIO manages Express Lane operations with dynamic tolling which ensures congestion mitigation benefits associated with these lanes continue to be realized in future years.

The Proposed Build Alternative represents an effective strategy for managing the emissions that will occur from the level of the required daily trips and associated vehicle miles traveled on the segment. Based on the emissions analysis, the Proposed Build Alternative is predicted to support regional air quality goals by fostering a more efficient travel on this segment of the interstate that reduces the overall emissions per mile traveled and continues to support the broader transportation needs on the I-25 North corridor as a whole.

Following completion of the NEPA analysis, minor design modifications were made to the 104th Avenue interchange; as documented in **Attachment E**, CDOT and FHWA confirmed these geometric changes do not alter traffic data or emissions modeling inputs and do not require reanalysis of the air quality findings in this report.

6.0 Mitigation

Based on the analysis results summarized in **Section 5.0**, the Project is not expected to cause substantial adverse effects on air quality, and the Project will meet transportation conformity requirements upon approval of the updated MVRTP (anticipated November 2026) and TIP.

Although the analysis shows an increase in some pollutant emissions (associated with increases in VMT) for the Build Alternative compared with the No Action Alternative, several strategies have been and continue to be implemented in the Denver Metro/North Front Range O_3 nonattainment area to reduce emissions of the O_3 precursors NO_x and VOCs. The strategies include multimodal transportation options, rideshare programs, reformulated summer season fuels, and vehicle inspection and maintenance programs. Several strategies have also been and continue to be implemented to maintain attainment of the CO and PM_{10} NAAQS, including oxygenated fuels and vehicle inspection and maintenance programs for CO, and diesel smoke inspections and road dust control measures for PM_{10}.

Temporary effects to the local air quality are anticipated during construction because the Project would likely have localized emissions from construction equipment and vehicles traveling to and from the construction site. Therefore, the Project would comply with CDOT's **Standard Specifications for Road and Bridge Construction** (CDOT 2023b) and the Air Quality Control Commission's (AQCC) Regulations 1 (5 CCR 1001-3, Emission Control for Particulate Matter, Smoke, Carbon Monoxide, and Sulfur Oxides) and 3 (5 CCR 1001-5, Stationary Source Permitting and Air Pollutant Emission Notice (APEN) Requirements) to ensure that appropriate control measures are implemented during construction to reduce emissions of most pollutants and control fugitive dust.

Examples of typical emission and dust control measures include but are not limited to the following:

- Conduct ambient air quality monitoring for PM near the Project area to assess air quality conditions and trigger additional mitigation measures if elevated PM readings occur during construction.
- Cover, wet, compact, or use a chemical stabilization binding agent to control dust and excavated materials at construction sites.
- Use wind barriers and wind screens to prevent spreading of dust from the site.
- Have a wheel wash station and/or crushed stone apron at egress/ingress areas to prevent dirt from being tracked onto public streets.
- Use vacuum-powered street sweepers to remove dirt tracked onto public streets.
- Cover all dump trucks that are hauling material leaving the sites to prevent dirt from spilling onto public streets.
- Locate construction diesel engines as far away as possible from residential areas.
- Locate staging areas as far away as possible from residential areas.

The contractor would be required to file an APEN and, if predicted emissions are greater than thresholds defined by CDPHE, apply for a permit. Preparation of a fugitive dust control plan would also be required to specify measures to reduce dust emissions during construction. The contractor would also be required to obtain any air quality permits for non-exempt stationary sources.

Table 8 lists the emission control measure commitments for the Project.

Table 8. Mitigation Commitments

Activity Causing Impact	Location of Activity	Impact	Mitigation Commitment	Responsible Branch	Timing/Phase of Mitigation Implementation
Construction	Study area	Release of fugitive dust from the construction activities	Obtain any required air quality permits prior to the start of construction, including a CDPHE Air Pollutant Emission Notice (APEN), which requires a Fugitive Dust Control Plan to address how dust would be kept at a minimum during construction.	CDOT Engineering and Contractor	Pre-construction
Construction	Study area	Release of fugitive dust from construction activities	Conduct ambient air quality monitoring for PM near the Project area to assess air quality conditions and trigger additional mitigation measures and public notification if elevated PM readings occur during construction.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of fugitive dust from construction activities	Cover, wet, compact, or use a chemical stabilization binding agent to control dust and excavated materials at construction sites.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of fugitive dust from construction activities	Use wind barriers and wind screens to prevent spreading of dust from the site.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of fugitive dust from construction activities	Have a wheel wash station and/or crushed stone apron at egress/ingress areas to prevent dirt from being tracked onto public streets.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of fugitive dust from construction activities	Use vacuum-powered street sweepers to remove dirt tracked onto public streets.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of fugitive dust from construction activities	Cover all dump trucks that are hauling material leaving the sites to prevent dirt from spilling onto public streets.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of fugitive dust from construction activities	Minimize disturbed areas, particularly in winter.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of diesel emissions from construction equipment	Prohibit unnecessary idling of construction equipment.	CDOT Engineering and Contractor	Construction

Activity Causing Impact	Location of Activity	Impact	Mitigation Commitment	Responsible Branch	Timing/Phase of Mitigation Implementation
Construction	Study area	Release of diesel emissions from construction equipment	Locate construction diesel engines as far away as possible from residential areas.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of diesel emissions from construction equipment	Locate staging areas as far away as possible from residential areas.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of diesel emissions from construction equipment	To the extent practical, use heavy construction equipment that has the cleanest available engines or that can be retrofitted with diesel particulate-control technology.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of diesel emissions from construction equipment	To the extent practical, use alternatives to diesel engines and/or diesel fuels, such as biodiesel, liquefied natural gas, or compressed natural gas, fuel cells, and electric engines.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of diesel emissions from construction equipment	Install engine pre-heater devices to eliminate unnecessary idling for wintertime construction.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of diesel emissions from construction equipment	Prohibit tampering with equipment to increase horsepower or to defeat an emission control device's effectiveness.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of diesel emissions from construction equipment	Require construction vehicle engines to be properly tuned and maintained.	CDOT Engineering and Contractor	Construction
Construction	Study area	Release of diesel emissions from construction equipment	Use construction vehicles and equipment with the minimum practical engine size for the intended job.	CDOT Engineering and Contractor	Construction

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Attachment A.

Project Information

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Attachment A: Project Information

October 23, 2026 - Version 15

Subaccount number: 25563

BACKGROUND

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) are proposing transportation improvements to Interstate 25 (I-25) between United States Highway 36 (US 36)/I-270/I-76 interchange and 104th Avenue.

Project History

CDOT has previously completed an Environmental Impact Statement (EIS), a Planning and Environmental Linkages (PEL) study, a safety audit, previous National Environmental Policy Act (NEPA)-level planning, and supplemental operational and transit and safety analyses that recommended improvements to this segment of I-25.

Some of the previously recommended improvements have been constructed, like the Express Lanes approved in the **North I-25 Record of Decision 1** (ROD1) (FHWA and CDOT, 2011), while others have not yet been implemented. The current Project evaluates proposed transportation improvements that reflect and build upon previous recommendations.

Because the current Project includes elements that were not evaluated and approved in the **North I-25 ROD1**, this Project is undergoing new evaluation under the National Environmental Policy Act.

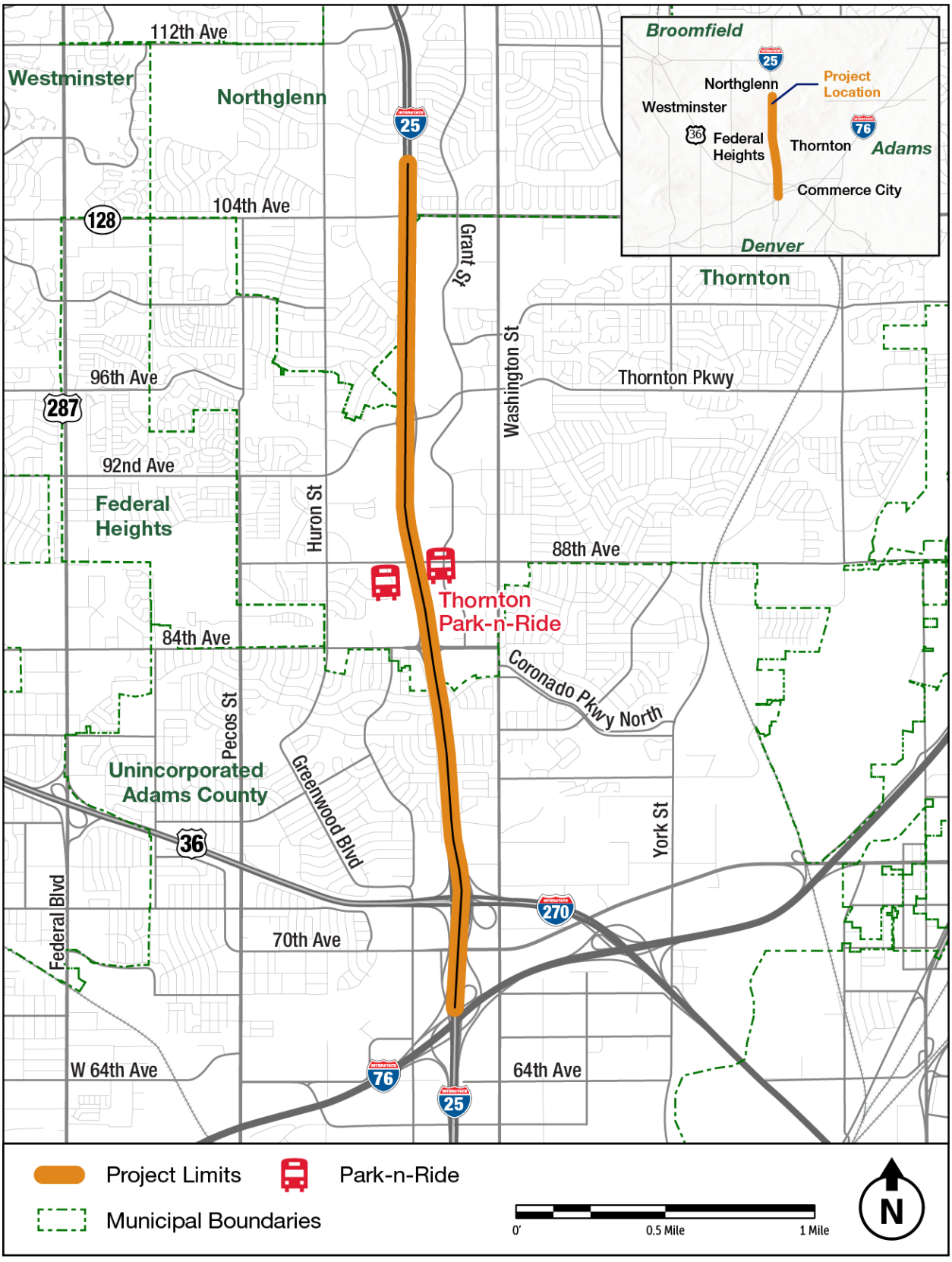
Study Area

The Project limits, illustrated in **Figure 1**, extend along I-25 from the US 36/I-76/I-270 interchange to 104th Avenue. It includes portions of US 36 and I-270, major arterials crossing I-25, and areas of potential drainage improvements. The study area for the Project varies by resource. Each resource's study area is defined within its corresponding technical report or memorandum.

The interchanges included in the Project limits are:

- I-25/US 36/270/I-76
- I-25/84th Avenue
- I-25/88th Transit Slip Ramps
- I-25/Thornton Parkway
- I-25/104th Avenue

Figure 1. Project Limits



PURPOSE AND NEED

The purpose of the Project is to improve I-25 between US 36 and 104th Avenue to address safety concerns and traffic operations.

The Project is needed to:

- Improve safety
- Improve traffic operations

In addition to addressing Project needs, the Project also has the following goal:

- Minimize environmental and community impacts caused by the Project

PROPOSED ACTION

The Project would improve approximately five miles of I-25 between US 36 and 104th Avenue. All lanes are 12 feet in width unless otherwise noted. The current cross-section of this segment of I-25 includes:

- Three general-purpose travel lanes in each direction
- One Express Lane in each direction, along the inside shoulder, separated from the adjacent general-purpose lane by a 2-foot buffer
- A southbound auxiliary lane between the 84th Avenue and US 36 interchanges
- A southbound auxiliary lane between the 88th Avenue transit slip ramp and the 84th Avenue interchange
- A northbound auxiliary lane between the 88th Avenue transit slip ramp and Thornton Parkway interchange
- Inside shoulders varying in width between 2 and 12 feet and outside shoulders varying in width between 6 and 12 feet

The Proposed Action on I-25 between US 36 and 104th Avenue, illustrated in **Figure 2**, includes the general-purpose and Express Lanes listed above and adds the following elements to the existing cross-section:

- A new 12-foot wide southbound general-purpose lane from 104th Avenue to south of 84th Avenue (all new lanes will be 12 feet in width)
- A new northbound climbing lane from the I-76 entrance ramp to 104th Avenue
- An expanded buffer of 4 feet between the Express Lane and the adjacent general-purpose lane
- A new continuous auxiliary lane southbound between the 84th Avenue and Thornton Parkway interchanges
- New continuous northbound auxiliary lanes between the interchanges at I-270 and 84th Avenue, 84th Avenue and Thornton Parkway, and Thornton Parkway and 104th Avenue
- Expanded inside and outside shoulders with typical 10-foot widths, and minimum 6.5-foot inside and 7-foot width in restricted locations

In addition to those changes to the cross-section, the Proposed Action would include the following elements:

- Realignment of the combined I-76 and US 36 on-ramp connection
- Expansion of the I-270 exit to northbound I-25 from one to two lanes; I-270 merge with I-25 shifted farther north (See **Figure 3**)
- Removal of bus-only slip ramps along I-25 at the Thornton Park-n-Ride facilities
- Changes to the Park-n-Ride west parking lot including reduction in size and reconstruction of circulation widths, sidewalks, and median areas to accommodate the proposed open channel of Niver Creek
- Changes to the Park-n-Ride east parking lot including reconstruction of bus bays and relocated shelters and amenities
- Replacement of the 88th Avenue bridge over I-25; wider to accommodate improved bicycle and pedestrian facilities and longer to accommodate I-25 widening

- Realignment of the I-25 adjacent existing trail and pedestrian network within the Niver Creek Open Space and its connections to the Thornton Park-n-Ride facilities (see **Figure 4**)
- Replacement of the aging pedestrian and bikeway underpass at the Thornton Park-n-Ride facility
- Removal of Niver Creek from the existing box culvert at the Thornton Park-n-Ride and conversion of the creek into an open channel
- Relocation of the segment of Niver Creek east of I-25, which currently flows south from the Park-n-Ride east parking lot to the creek's intersection with Tributary L, to the west side of I-25
- New water quality treatment features throughout the project area

Figure 2. Proposed Action

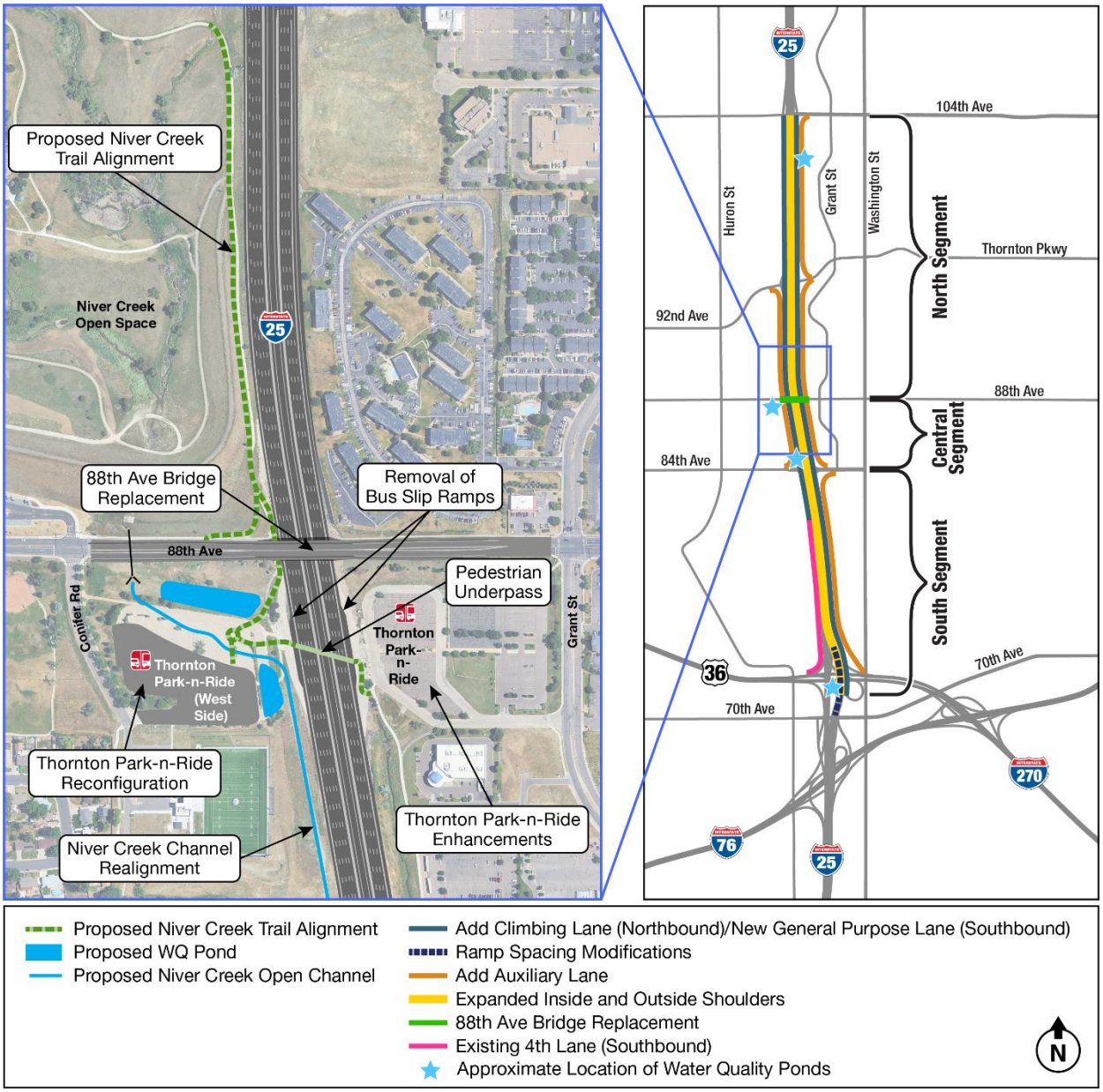


Figure 3. Proposed Improvements to I-270 Exit to NB I-25

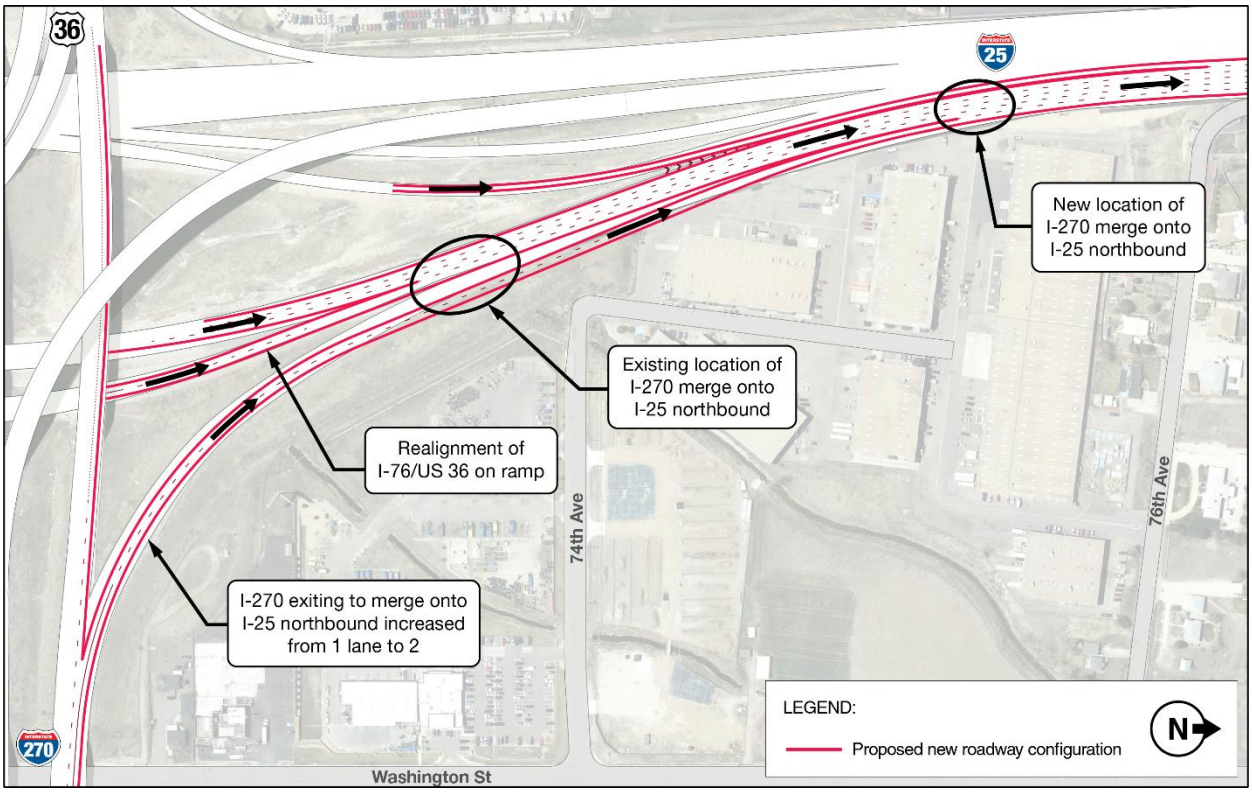
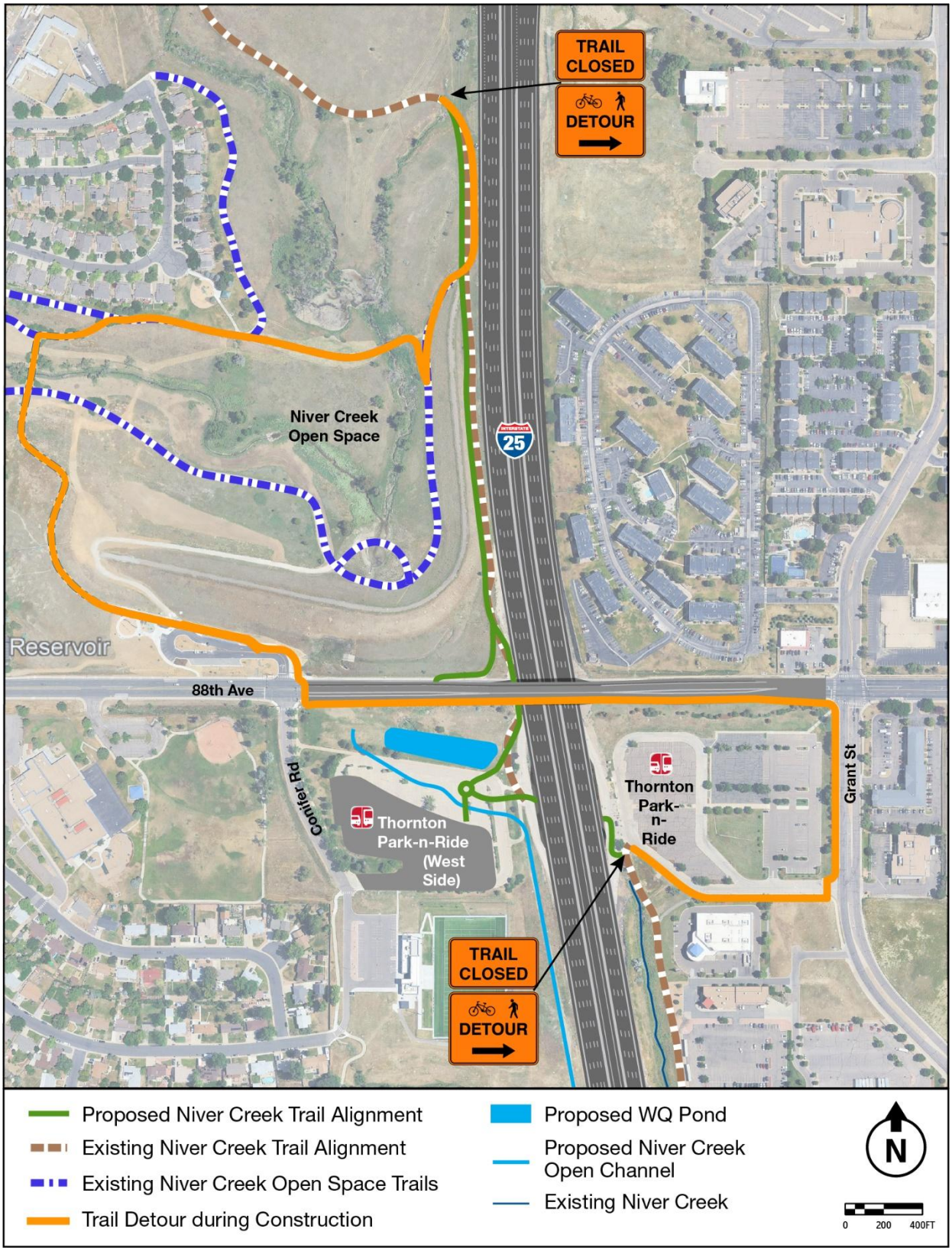


Figure 4. Proposed Realignment of Niver Creek Trail



Attachment B.

Air Quality Analysis Work Plan

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Attachment B. Air Quality Analysis: Work Plan

July 18, 2025
Project Number: PM 0253-299
Subaccount Number: 25563

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Acronyms and Abbreviations

Acronym or Abbreviation	Full Name
APCD	Air Pollution Control Division
AQCC	Air Quality Control Commission
AQ-PLAG	Air Quality Project-Level Analysis Guidance
ATR	Automated Traffic Recorder
AVFT	Alternate Vehicle Fuel and Technology
CAA	Clean Air Act
CAP	criteria air pollutant
CAPPCA	Colorado Air Pollution Prevention and Control Act
CCR	Code of Colorado Regulations
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CO	carbon monoxide
C.R.S	Colorado Revised Statutes
DPM	diesel particulate matter
DRCOG	Denver Regional Council of Governments
EF	emission factor
EPA	U.S. Environmental Protection Agency
EPB	Environmental Program Branch
FAQ	frequently asked question
FHWA	Federal Highway Administration
HPMS	Highway Performance Monitoring System
I-25	Interstate 25
I-270	Interstate 270
I/M	inspection and maintenance
MOVES	Motor Vehicle Emissions Simulator
mph	miles per hour
MPO	metropolitan planning organization
MSAT	mobile source air toxic
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
OTIS	Online Transportation Information System
O_3	ozone
PM	particulate matter
PM_{10}	PM with diameter equal to or less than 10 micrometers
$PM_{2.5}$	PM with diameter equal to or less than 2.5 micrometers
POM	polycyclic organic matter
ppm	parts per million
RS/TC	Regionally Significant Transportation Capacity
RTD	Regional Transportation District
RTP	Regional Transportation Plan
RunSpecs	run specifications
SIP	State Implementation Plan
TDM	travel demand model
TIP	Transportation Improvement Program
TP	time period
US 36	U.S. Highway 36
U.S.C.	United States Code
USDOT	U.S. Department of Transportation
V/C	volume to capacity
VMT	vehicle miles traveled
VOC	volatile organic compound
ZEV	zero emission vehicle

1.0 Introduction and Background

The Colorado Department of Transportation (CDOT) and Federal Highway Administration (FHWA) are proposing transportation improvements to Interstate 25 (I-25) from U.S. Highway 36 (US 36) to 104th Avenue (the Project).[1] This document presents the work plan for the proposed analysis of air quality impacts from the Project. The analysis is based on the latest planning assumptions for the Project. The scope was developed through consultation between FHWA and CDOT, including CDOT Environmental Program Branch (EPB) Air Quality Specialists.[2]

The overall proposed air quality analysis described in this work plan covers federal and state requirements (described in **Section 2.0**) for evaluating air quality impacts and includes the major analysis elements summarized below.

To address federal requirements:

- A quantitative analysis of criteria air pollutants (CAPs) that are regulated through the National Ambient Air Quality Standards (NAAQS) and the Transportation Conformity Rule will be provided.
- A Tier 3 quantitative emissions analysis of mobile source air toxics (MSAT) was found warranted through consultation between CDOT and FHWA. To meet this requirement, the analysis will include a comparative quantitative analysis of MSAT emissions, along with a discussion of (1) changes in emissions associated with expected effects of travel activity in the Proposed Action and No Action alternatives, and (2) national trend data.
- A qualitative discussion of potential emissions and air quality effects from construction of the Proposed Action selected for detailed analysis will be provided, along with potential emissions avoidance, minimization, and control measures.

To address state requirements:

- A quantitative emissions inventory will be developed for comparative analysis of CAPs and MSAT across the (1) Existing Conditions in 2024 (base year), (2) No Action Alternative in 2050 (horizon year), and (3) Proposed Action in 2050.
- The qualitative discussion of construction emissions and effects will be expanded to include monitoring and measurement of (1) CAPs prior to construction and (2) particulate matter (PM) during construction and plans for mitigation and public reporting and alerts during construction.

The remainder of this work plan provides a brief overview of the regulatory context for the analysis of the Project's air quality impacts (**Section 2.0**); describes the methods to be used for each element of the analysis and relevant federal and state guidance that will be followed (**Section 3.0**); and discusses plans for technical reporting of the analysis (**Section 4.0**).

[1] The purpose of the Project is to improve I-25 between US 36 and 104th Avenue to address traffic and transit operations, and safety concerns.
[2] Pre-scoping and scoping meetings were held on January 23 and February 14, 2024.

2.0 Regulatory Setting

The purpose of the air quality analysis is to evaluate potential impacts associated with the Project in accordance with the National Environmental Policy Act (NEPA) and applicable federal and state requirements and guidance. These are described in the subsections below and include,

At the federal level:

- The U.S. Environmental Protection Agency's (EPA) transportation conformity rule as required in Section 176(c) of the Clean Air Act (CAA) (42 United States Code [U.S.C.] 7506(c))
- Interim FHWA guidance and recommendations for MSAT analysis (FHWA 2023a and 2023b)

At the state level:

- Code of Colorado Regulations (CCR) - Regulation 10 Criteria for Analysis of Transportation Conformity (e.g., 5 CCR 1001-12)
- Colorado Revised Statutes (C.R.S.) 43-1-128(4)(a) for this project analysis
- CDOT Interim Guidance for Project Level Compliance of CRS 43-1-128 (NEPA and Construction) DRAFT (CDOT 2023a)
- CDOT Regionally Significant and Transportation Capacity Interpretation and Examples for CDOT Projects (CDOT 2022a)

Emissions that will be analyzed qualitatively and quantitatively in the air quality analysis described in this work plan include the following transportation-related pollutants:

Criteria Air Pollutants (CAPs)

The CAPs in the air quality analysis include carbon monoxide (CO), nitrogen dioxide (NO_2), PM with diameter equal to or less than 10 micrometers (PM_{10}), PM with diameter equal to or less than 2.5 micrometers ($PM_{2.5}$), as well as the ozone (O_3) precursors nitrogen oxides (NO_x) and volatile organic compounds (VOCs).

Mobile Source Air Toxics (MSAT)

The air quality analysis, following FHWA guidance (FHWA 2023a and 2023b), will include the nine MSAT pollutants that are (1) identified by EPA to be among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors (EPA 2014, 2019), and (2) currently considered as priority MSAT by FHWA. These pollutants are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter (POM).

2.1 Federal Regulations

2.1.1 National Environmental Policy Act (NEPA)

The proposed qualitative air quality analysis will be conducted to support the decision-making processes under NEPA (Title 42 U.S.C. Chapter 55). The qualitative discussion of CAPs and

MSAT emissions will be supported by the state-required quantitative comparative analysis of transportation pollutants, as agreed upon by CDOT and FHWA.

2.1.2 Transportation Conformity

The transportation conformity requirement is based on Section 176(c) of the CAA (Title 42 U.S.C. Chapter 85), which prohibits the U.S. Department of Transportation (USDOT) and other federal agencies from funding, authorizing, or approving plans, programs, or projects that do not conform to a State Implementation Plan (SIP) for attaining the National Ambient Air Quality Standards (NAAQS) for CO, NO_2, O_3, PM_{10}, and $PM_{2.5}$. Demonstration of project-level conformity for a transportation project requires that the project comes from a currently conforming Regional Transportation Plan (RTP) and federal Transportation Improvement Program (TIP), follows other requirements of an SIP, and will not:

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

The Project is in a nonattainment area for O_3 (Denver-Boulder-Greeley-Ft. Collins-Loveland severe nonattainment area for the 2008 O_3 NAAQS, and Denver Metro/North Front Range serious nonattainment area for the 2015 O_3 NAAQS). The Project is in a maintenance area for both the 1971 CO NAAQS and the 1987 PM_{10} NAAQS. However, because the required 20-year period of maintenance of the CO and PM_{10} NAAQS for the Denver-Boulder area ended on January 14, 2022, and October 16, 2022, respectively, the area is no longer a maintenance area for the purposes of transportation conformity for those two standards. Therefore, project-level hot-spot analyses for CO and PM_{10} are not required in the air quality analysis to demonstrate conformity. The current (2023-2024) 8-hour CO design value reported by EPA[3] for the area is 2.1 parts per million (ppm), far below the NAAQS of 9 ppm, and the region did not exceed the 24-hour PM_{10} NAAQS[4] between 2022 and 2024. The area is currently in attainment of all other transportation-related NAAQS.

The proposed air quality analysis will include confirmation that the Project has demonstrated conformity within the Denver Regional Council of Governments (DRCOG)[5] RTP and TIP. Confirmation that the design concept, scope, and "open-to-traffic" schedule of the Proposed Action are consistent with the descriptions in the conforming RTP and TIP will serve to demonstrate that the Project meets the regional transportation conformity requirement for ozone. A conformity demonstration is not required for the Project construction-related activities since those activities (during the construction phase of the Project) are not expected to last more than five years at any individual site (see 40 Code of Federal Regulations [CFR] 93.123(c)(5)).

[3] See the EPA design value reports at EPA Air Trends and Air Quality Design Values website.
[4] The level of the 1987 24-hour PM_{10} NAAQS is 150 µg/m^3. The NAAQS metric is the annual estimated number of exceedances, averaged over three consecutive years.
[5] DRCOG is the federally designated metropolitan planning organization (MPO) responsible for transportation planning for the Denver metropolitan region, where the Project is located.

2.2 State Regulations

Regulations adopted by the Colorado Air Quality Control Commission (AQCC) of the Colorado Department of Public Health and Environment (CDPHE), under the Colorado Air Pollution Prevention and Control Act (CAPPCA), address compliance with federal regulations and state-specific requirements regarding (1) interagency consultation, (2) commitments to SIP control measures not in the relevant RTP or TIP, and (3) project-level mitigation and control measures. Applicable regulations in the CCR for criteria pollutants include 5 CCR 1001-3, 5 CCR 1001-5, and 5 CCR 1001-12. As noted earlier, C.R.S. 43-1-128(4)(a) established additional state-level requirements for air quality analyses.

The Project is considered regionally significant by DRCOG and is a planned Regionally Significant Transportation Capacity (RS/TC) project for CDOT purposes. The Project is also contained in the CDOT 10-year plan (CDOT 2022b). The RS/TC determination for the Project is based on the following definition in CDOT guidance (CDOT 2022a): "A roadway-widening project (via construction or restriping) adding at least one general-purpose through lane of one lane-mile or more in length (or two miles in length if in a Rural area with a [volume to capacity] V/C ratio less than 85%)."

To meet the state requirements, CAP and MSAT emissions will be quantified for existing conditions, the No Action Alternative, and the Proposed Action, as described in this work plan.

3.0 Methodology

The methodology for the proposed analysis will be conducted in accordance with all applicable federal and state regulations, and it will be based upon guidance from EPA, FHWA, and CDOT. The following relevant guidance will be applied to the methodology for each element of the proposed analysis, where appropriate, as described in this section of the work plan and agreed upon by CDOT and FHWA:

- NEPA Manual, Version 7 (CDOT 2023b)
- Interim Guidance for Project Level Compliance of CRS 43-1-128 (NEPA and Construction) **DRAFT** (CDOT 2023a)
- Air Quality Project-Level Analysis Guidance (AQ-PLAG), Version 1 (CDOT 2019)
- Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents (FHWA 2023a)
- Frequently Asked Questions (FAQs): Conducting Quantitative Mobile Source Air Toxics (MSAT) Analysis for FHWA NEPA Documents (FHWA 2023b)
- MOVES4 Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity (EPA 2023)

3.1 Quantitative Emissions Analysis

For the proposed quantitative project-level emissions analysis, a lookup table of emission factors (EFs) for all CAPs and MSAT listed in **Section 2.0** will be generated by running the most recent version of EPA's Motor Vehicle Emissions Simulator (MOVES) available when this work plan was initiated (i.e., MOVES4.0.2) for each analysis year.[6] Re-entrained road dust/sanding EFs provided by the CDPHE Air Pollution Control Division (APCD) for PM_{10} will be incorporated with the MOVES EFs into the lookup table. The lookup table, along with the underlying MOVES input/output files, will be provided to CDOT and FHWA for review before the data are used in calculating project-level emissions for the analysis. For each inventory analysis scenario (i.e., Existing Conditions in 2024, No Action Alternative in 2050, and the Proposed Action in 2050), EFs from the lookup table will be combined with the link-level travel activity (traffic) and roadway type data provided by CDOT to calculate the link-level emissions, which will be aggregated to the Project level for each pollutant. The traffic data prepared by CDOT will be based on travel demand model (TDM) results for the proposed emissions inventory analysis using DRCOG's Focus 2.3.3 model. The methodology details for this process are described below.

3.1.1 MOVES Runs – Overview of Approach

MOVES will be run with the Project Scale setting to estimate running exhaust and crankcase running exhaust emissions for all pollutants, as well as brake wear and tire wear PM_{10} and $PM_{2.5}$ emissions. The MOVES runs will produce EFs for the lookup table. Data for Links input for MOVES will be developed based on hypothetical link-level traffic and roadway data that will

[6] Note that using MOVES to generate a project-scale lookup table of EFs eliminates the need to use project-specific traffic data as part of the MOVES inputs and adds flexibility to the analysis. If traffic data change or new links are later added to the analysis, updated emissions can be calculated without needing to revise MOVES inputs and re-run the MOVES model.

cover the range of actual link-level traffic for all analysis scenarios. Inputs to prepare Link Source Types inputs for MOVES will be provided by CDOT.

Mainline and ramp roadway segments will be modeled as urban restricted roadways. A series of hypothetical links with traffic volume of 1 vehicle per hour traveling one mile will be created, with average vehicle speed ranging from 0 to 75 miles per hour (mph) in 1 mph speed bins. Modeling a single road grade of 0% in MOVES is consistent with normal practices for comparative project-level emissions analysis. EFs will be developed for both passenger ("non-truck") vehicle and truck vehicle categories, with appropriate mapping of MOVES source types to non-truck and truck categories based on the best available data available when the modeling begins.[7]

For the proposed analysis, the winter season (represented by the month of January) and summer season (represented by July) will be modeled using appropriate fuels inputs for each season, including updated Alternate Vehicle Fuel and Technology (AVFT) fuels input recommended by CDOT and FHWA. This approach allows modeling of typical "worst-case" wintertime air quality in Denver, as well as the peak summertime period when warm-weather conditions can adversely influence air quality.

EFs from the lookup table will be applied (outside of MOVES) to Project-specific link-level traffic data in order to calculate link-level emissions, which will be aggregated to the project level, for each inventory analysis scenario. The EFs in the lookup table by vehicle type and speed (from the MOVES runs and incorporated PM_{10} road dust/sanding EFs) will be applied to the link-level traffic data to calculate the emissions for each link by traffic time period. The traffic data are anticipated to vary across the four time periods during the day (AM Peak, Midday, PM Peak, and Evening) summarized in **Table 1**, consistent with CDOT's intended use of default time periods in the Focus 2.3.3 TDM.

Table 1. Time Periods for Traffic and Emissions Modeling

Time Period	Hours
AM Peak	6 AM – 9 AM
Midday	9 AM – 3 PM
PM Peak	3 PM – 7 PM
Evening	7 PM – 6 AM

3.1.2 MOVES Run Specification Inputs

MOVES run specifications (RunSpecs) will be created to specify the parameter options for the MOVES model. **Table 2** summarizes the MOVES inputs for the RunSpecs as defined in the navigation panel of the MOVES interface. The following subsections describe the input options needed for the RunSpecs.

[7] The timing for MOVES modeling may be considered as independent of the travel demand modeling and availability of traffic data for any of the proposed analysis scenarios. The lookup table of EFs developed with the MOVES outputs and PM road dust/sanding factors provided by the APCD will be combined in post-processing with traffic data, when available, for the analyses.

Table 2. MOVES RunSpec Options

Navigation Panel	Model Selection
Scale	Project scale; inventory calculation type
Time Spans	Hour; weekdays; January/July; calendar years 2024 and 2050
Geographic Bounds	Adams County
Vehicles	All MOVES4 vehicle and fuel type combinations
Road Types	Urban restricted access
Pollutants and Processes	CAPs and MSAT listed in **Section 2.1**; running exhaust and crankcase running exhaust (all pollutants), and brake wear and tire wear (only PM_{10} and $PM_{2.5}$)
General Output	Units of grams and miles
Output Emissions Detail	Road type

3.1.3 MOVES Project Data Manager Inputs

After the RunSpecs are created, an input database table must be created before running MOVES. This is done using the Project Data Manager to enter project-specific data. **Table 3** summarizes the MOVES Project Data Manager inputs, and they are discussed in more detail below.

Table 3. MOVES Project Data Manager Inputs

Project Data Manager Tab	Data Source
Meteorology Data	Provided by CDOT
Age Distribution	Provided by APCD
Fuel	Fuel Supply, Fuel Formulation and Fuel Usage Fraction inputs provided by APCD; and AVFT[1] data provided by CDOT
Retrofit	No inputs (not applicable)
Inspection and Maintenance (I/M) Program	Provided by APCD
Link Source Type	Generated by the Air Quality Consultant (Spheros Environmental) using data provided by CDOT[2]
Links	Generated by the Air Quality Consultant (Spheros Environmental)

[1] AVFT = Alternate Vehicle Fuel and Technology.

[2] CDOT will provide data based on Automated Traffic Recorder (ATR) stations relevant to the roadways included in the emissions analysis.

Meteorology Data

The meteorology data for this analysis will be provided by CDOT in coordination with APCD, as needed, and will be consistent with those used in the regional emissions analysis for transportation conformity. The relevant data provided by CDOT for each modeled season will be used to calculate average temperature and humidity for each traffic time period in the two seasons. Note that MOVES PM running exhaust, brake wear, and tire wear emissions are not affected by the meteorological inputs, but other pollutants in MOVES such as CO and NOx are affected by the meteorological inputs.

Vehicle Age Distribution

The vehicle age distribution input for the modeling, which will be provided by APCD, is expected to be based on their latest available composite of vehicle registration data from seven Denver area counties (Adams, Arapaho, Boulder, Broomfield, Denver, Douglas, and Jefferson). These data will be used to represent the age distribution in the analysis years (2024 and 2050 for the multi-pollutant inventory analysis).

Fuel

Fuels inputs provided by APCD will be used with the addition of AVFT data provided by CDOT to reflect the future zero emission vehicle (ZEV) fleet resulting from the state's adoption of the Colorado Clean Cars and Advanced Clean Trucks rules that can be accounted for in MOVES4.

Inspection and Maintenance Parameters

Existing and anticipated future vehicle inspection and maintenance (I/M) program parameters for the Denver metropolitan area will be provided by APCD.

Link Source Type

Link source type inputs are used to define the fraction of travel on each link by vehicle type. Two separate sets of MOVES runs will be conducted; one for light-duty vehicles and one for (heavy-duty) trucks. Three sets of link source type inputs will be needed for these MOVES runs: one set with fractions for the four types of MOVES light-duty vehicles (MOVES sourcetypes 11, 21, 31, and 32), and one set with fractions for the nine types of heavy-duty vehicles (MOVES sourcetypes 51, 52, 53, 54, 61, and 62), and one set with fractions for buses (MOVES sourcetypes 41, 42, and 43), assuming travel activity for the listed bus sourcetypes are available for the analyses.[8]

The third set of link source type fractions will be developed to represent the vehicle mix on managed lanes in the Proposed Action, including buses using the managed lanes, in addition to light-duty vehicle activity on managed lanes.[9] The number of buses will be added based on the Regional Transportation District (RTD) and CDOT Bustang schedules to estimate total volumes for the corridor, and not subtracted from some other category (e.g., single-unit trucks) to conserve total modeled traffic volumes. Current RTD and Bustang schedules will be used to estimate daily transit bus volumes in the managed lanes, and DRCOG modeling will provide passenger vehicle volumes in the managed lanes. Regional DRCOG vehicle population data will be used to disaggregate the passenger vehicle volumes into MOVES passenger vehicle sourcetypes; these subtotals and the estimated bus volumes will be used to develop the linksourcetype fractions. This approach will assume that no trucks use the managed lanes.

Link source type inputs for the three groups of vehicles (i.e., light-duty, trucks, and vehicles using the managed lanes) will be developed using Automated Traffic Recorder (ATR) data by each class defined in the Highway Performance Monitoring System (HPMS) for representative freeway segments. CDOT will select continuous count ATR stations within the TDM validation boundary based on roadways that will be included in the emissions quantification to provide input data needed for the MOVES modeling. Along with MOVES default estimates by vehicle miles traveled (VMT) and source type, vehicle population data provided by CDOT and agreed upon by FHWA will also be used for developing the link source type inputs.

[8] Note that the MOVES sourcetype 41 represents all buses that are not transit buses, represented by sourcetype ID 42, or school buses, represented by sourcetype 43.
[9] It is assumed that MOVES input data and traffic activity data for buses will be provided by CDOT for this modeling.

Links

A links input table will be created that represents all possible speeds on the urban restricted road type to generate the lookup table of EFs applicable to any traffic link in the analysis scenarios.

3.1.4 Road Dust Emission Factors

The proposed analysis includes re-entrained PM_{10} road dust emissions[10] based on EFs developed and provided by APCD for the Denver region (an alternative local method developed for local-specific conditions). These factors were developed based on monitoring studies conducted in 1989 and 1990, and they are applied in SIP development and regional transportation conformity analyses. They account for both ongoing re-entrained road dust and emissions that are due, historically, to road sanding (now, deicing) in the winter months. Although it is not anticipated, if enforceable commitments for road dust emissions reductions are made as part of the Project, an alternative set of reduced factors provided by APCD will be used in the analysis. The appropriate set of re-entrained road dust EFs will be added to the lookup table used for calculating PM_{10} emissions for each traffic link and season in this analysis. Since deicing materials are only needed in the winter months, those factors will only be applied to the emissions analysis for the winter season (the month of January); EFs for normal re-entrained dust will be applied in the analyses for the winter and summer seasons.

3.1.5 Calculation of Project-Level Emissions

The project-level emissions for each pollutant and season in each inventory analysis scenario will be calculated from the link-level traffic data for each scenario and appropriate EFs from the lookup table developed using MOVES and the road dust EFs provided by APCD. The calculation will be performed as follows. First, the link-level emissions will be calculated for each traffic time period (TP) as the product (multiplication) of VMT by all vehicles, number of hours, and applicable fleet-average total EF based on the fleet mix (i.e., fraction of passenger and truck vehicles) and average speed in each traffic time period:

$$E_{link}^{TP} = VMT_{link}^{TP} \times hrs \times \left(f_t^{TP} \times EF_t(v^{TP}) + (1 - f_t^{TP}) \times EF_{pass}(v^{TP})\right) \quad \textbf{Equation 1}$$

where

$$E_{link}^{TP} = link - level\ emissions\ for\ a\ single\ time\ period\ (TP)$$
$$VMT_{link}^{TP} = L_{link} \times V_{tot}^{TP}$$
$$L_{link} = link\ length\ (miles)$$
$$V_{tot}^{TP} = V_{pass}^{TP} + V_t^{TP} = total\ vehicle\ volume\ in\ the\ TP$$
$$V_{pass}^{TP} = passenger\ vehicle\ volume\ in\ the\ TP$$
$$V_t^{TP} = truck\ vehicle\ volume\ in\ the\ TP$$
$$hrs = number\ of\ hours\ in\ the\ TP$$
$$f_t^{TP} = \frac{V_t^{TP}}{V_{tot}^{TP}} = truck\ fraction\ of\ V_{tot}^{TP}$$
$$EF_t(v^{TP}) = EF\ for\ truck\ vehicles\ as\ a\ function\ of\ average\ speed, v, for\ the\ TP\ (g/mile)$$
$$EF_{pass}(v^{TP}) = EF\ for\ passenger\ vehicles\ as\ a\ function\ of\ speed, v, for\ the\ TP\ (g/mile)$$

[10] $PM_{2.5}$ road dust is not included in the analysis since the project is not located in a $PM_{2.5}$ nonattainment or maintenance area nor are $PM_{2.5}$ road dust emissions anticipated to be a significant contributor.

Note that the EFs by vehicle type and speed in Equation 1 represent the sum over the emission processes modeled in MOVES (i.e., running exhaust and crankcase running exhaust for all pollutants, plus brake wear and tire wear emissions for PM_{10} and $PM_{2.5}$ as well as the PM_{10} road dust EF based on analysis season. For each traffic link, the average speed for each time period will be used as key to identify the applicable EFs for passenger and truck vehicles in the lookup table. As the Project traffic volumes represent annual average volumes, CDOT monthly ATR summary data will be used to develop seasonal traffic adjustments.

For each scenario, after the link-level emissions by time period for each link have been calculated, the total link-level emissions will be calculated as the summation of Equation 1 over all time periods. Finally, the project-level emissions will be calculated by summing the total link-level emission for each link over all links in the traffic data. The project-level emissions inventories for the different categories of pollutants (i.e., CAPs and MSAT) will be reported in appropriate mass units per day.

3.2 Qualitative Analysis of Construction Emissions

As described in **Section 2.0**, construction for this Project is not expected to last long enough to require quantitative analysis of fugitive dust emissions from construction for transportation conformity. A quantitative analysis is not required for NEPA purposes, but fugitive dust and other pollutant emissions from Project construction will be considered qualitatively. The proposed air quality analysis will include a short discussion of construction emissions, air quality impacts, and potential avoidance, minimization, and control measures for construction of the Project.

4.0 Reporting

After completion of the proposed air quality analysis described in this work plan, an air quality technical report will be prepared in coordination with CDOT to document the results, along with the methodology, input data, and key assumptions used for each element of the analysis. The report will include a discussion of the relevant regulations, air pollutants, and air quality concerns, as well as potential avoidance, minimization, and control strategies. Some aspects of the report, such as any control strategy commitments for the Project, will require contributions from CDOT or other consultants.

5.0 References

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Attachment C.

Air Quality Analysis Methods

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Attachment C: Air Quality Analysis Methods

This attachment describes the approach for modeling operational emissions from motor vehicles using the Mobile Source Vehicle Emissions Simulator (MOVES) model and development of the quantitative emissions inventory for the Project. This process involves setting up a run specification for the MOVES model, entering Project data using a MOVES tool called the Project Data Manager, running MOVES, exporting the results as an emissions lookup table, and then using Project traffic data combined with the lookup table to calculate operating emissions for each year and project alternative. These steps are described in more detail below.

1.0 Traffic Data

As described in the Traffic and Safety Technical Report for the Project, the Project team selected the Denver Regional Council of Governments (DRCOG) Focus version 2.3.3 travel demand model (TDM) for the I-25 traffic analysis. This TDM provides accurate traffic forecasts and detailed simulations and meets the technical requirements established by the Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA). The analysis uses the 2024 base year and 2050 horizon year TDM results for the existing and future traffic condition analyses.

The emissions inventories were developed using lookup tables of emission factors by vehicle type, road type, speed, and traffic time period (described below), and estimates of vehicle miles traveled (VMT) and speeds by vehicle type from the traffic data. The traffic data provide estimates of traffic volume and speed for each modeled roadway segment (link); the traffic volume was combined with the length of each link in miles to estimate VMT. These calculations were performed separately for cars and trucks, as data for these two vehicle types are included in the traffic data.

The emissions inventory includes all Project links and additional roadway links where traffic is affected by the Project. These additional "non-project" links were identified using the criteria contained in FHWA's Mobile Source Air Toxics Frequently Asked Questions,[1] which provides the only available recommendations for identifying links affected by a highway project. FHWA provides several impact criteria that can be considered, including AADT, level of service (LOS), travel time, and intersection delay, but does not specify a distance from project roadways for consideration of impacts. The following streamlined criterion was applied: **A change in AADT of +/- 5% or more for links within a 100-m boundary around the project links**. This criterion was recommended by FHWA and endorsed by CDOT.

This criterion was applied to all roadway links in the traffic modeling for analysis year 2050 to identify the non-project links to be included in the emissions inventory analysis. The final set of project and non-project links included in the emissions inventory analysis are shown in **Table 1** (Existing Conditions), **Table 2** (No Action Alternative), and **Table 3** (Build Alternative).

[1] Frequently Asked Questions (FAQs): FHWA Recommendations for Conducting Quantitative Mobile Source Air Toxics (MSAT) Analysis for FHWA NEPA Documents, FHWA Air Quality Air Toxics Policy and Guidance

Table 1. Roadway Links Included in the Air Quality Analysis for Existing Conditions.

Link Description	Link ID	Road Type
SB I-25 GP Mainline	10043	Freeway
SB I-25 Off-Ramp to I-270	10049	Freeway Ramp
SB I-25 Off-Ramp to 76	10051	System Ramp
SB I-25 GP Mainline	10052	Freeway
NB I-25 GP Mainline	10054	Freeway
NB I-25 GP Mainline	10055	Freeway
SB I-25 GP Mainline	10479	Freeway
SB I-25 Off-Ramp to Thornton Pkwy	10480	Freeway Ramp
SB I-25 GP Mainline	10481	Freeway
SB I-25 GP Mainline	10482	Freeway
SB I-25 Off-Ramp to 84th Ave	10483	Freeway Ramp
SB I-25 GP Mainline	10484	Freeway
NB I-25 GP Mainline	10485	Freeway
NB I-25 GP Mainline	10486	Freeway
NB I-25 Off-Ramp to 84th Ave	10487	Freeway Ramp
NB I-25 GP Mainline	10488	Freeway
NB I-25 GP Mainline	10489	Freeway
NB I-25 Off-Ramp to Thornton Pkwy	10490	Freeway Ramp
84th Ave Ramp to SB I-25	10496	Freeway Ramp
WB 84th Ave Ramp to NB I-25	10498	Freeway Ramp
Thornton Pkwy Ramp to SB I-25	10579	Freeway Ramp
WB Thornton Pkwy Ramp to NB I-25	10581	Freeway Ramp
SB I-25 GP Mainline	10831	Freeway
SB I-25 GP Mainline	10832	Freeway
SB I-25 Off-Ramp to 104th Ave	10833	Freeway Ramp
NB I-25 GP Mainline	10837	Freeway
NB I-25 Off-Ramp to 104th Ave	10838	Freeway Ramp
104th Ave Ramp to SB I-25	10850	Freeway Ramp
WB 104th Ave Ramp to NB I-25	10856	Freeway Ramp
NB I-25 EL	25269	Managed Lane
SB I-25 EL	25270	Managed Lane
SB I-25 EL	25272	Managed Lane
NB I-25 EL	25594	Managed Lane
NB I-25 GP Mainline	25596	Freeway
WB I-270 Ramp to NB I-25	25600	System Ramp
EB I-270 ramp to NB I-25	25602	System Ramp
SB I-25 EL	25603	Managed Lane
SB I-25 GP Mainline	28292	Freeway
SB I-25 Off-Ramp to I-270	28293	System Ramp
NB I-25 EL	28580	Managed Lane
NB I-25 GP Mainline	28709	Freeway
EB I-76 Ramp to NB I-25	28749	System Ramp
I-270 WB Off-Ramp to N Broadway	28755	Freeway Ramp
WB 76 Off-Ramp to NB I-25	29045	System Ramp
NB I-25 Off-Ramp to CO 224	29053	Freeway Ramp
NB I-25 Off-Ramp to 84th Ave	29331	Freeway Ramp
NB I-25 Off-Ramp to 84th Ave	29332	Freeway Ramp
WB 84th Ave Ramp to NB I-25	29334	Freeway Ramp
WB 84th Ave Ramp to NB I-25	29335	Freeway Ramp
SB I-25 Off-Ramp to 84th Ave	29336	Freeway Ramp
SB I-25 Off-Ramp to 84th Ave	29337	Freeway Ramp
84th Ave Ramp to SB I-25	29338	Freeway Ramp
84th Ave Ramp to SB I-25	29339	Freeway Ramp
NB I-25 Off-Ramp to 104th Ave	29340	Freeway Ramp
NB I-25 Off-Ramp to 104th Ave	29342	Freeway Ramp
WB 104th Ave Ramp to NB I-25	29343	Freeway Ramp
WB 104th Ave Ramp to NB I-25	29344	Freeway Ramp
104th Ave Ramp to SB I-25	29346	Freeway Ramp
104th Ave Ramp to SB I-25	29347	Freeway Ramp

Link Description	Link ID	Road Type
SB I-25 Off-Ramp to 104th Ave	29348	Freeway Ramp
SB I-25 Off-Ramp to 104th Ave	29349	Freeway Ramp
SB I-25 GP Mainline	32951	Freeway
NB I-25 EL	40854	Managed Lane
SB I-25 EL	42615	Managed Lane
SB I-25 EL	42619	Managed Lane
NB I-25 EL	42620	Managed Lane
NB I-25 EL	43076	Managed Lane
SB I-25 EL	43077	Managed Lane
SB I-25 EL	43078	Managed Lane
NB I-25 EL	43620	Managed Lane
NB I-25 GP Mainline	43621	Freeway
NB I-25 EL	43622	Managed Lane
NB I-25 EL	43623	Managed Lane
NB I-25 GP Mainline	43624	Freeway
NB I-25 EL	43625	Managed Lane
NB I-25 GP Mainline	43626	Freeway
NB I-25 EL	43627	Managed Lane
NB I-25 EL	43628	Managed Lane
NB I-25 GP Mainline	43629	Freeway
NB I-25 EL	43631	Managed Lane
SB I-25 EL	43634	Managed Lane
NB I-25 GP Mainline	43650	Freeway
SB I-25 EL	43652	Managed Lane
SB I-25 Off-Ramp to I-270	43653	System Ramp
SB I-25 EL	43654	Managed Lane
SB I-25 GP Mainline	43655	Freeway
SB I-25 EL	43656	Managed Lane
SB I-25 GP Mainline	43657	Freeway
SB I-25 EL	43659	Managed Lane
SB I-25 GP Mainline	43660	Freeway
SB I-25 EL	43661	Managed Lane
SB I-25 EL	43662	Managed Lane
SB I-25 GP Mainline	43663	Freeway
SB I-25 EL	43665	Managed Lane
SB I-25 GP Mainline	43666	Freeway
SB I-25 GP Mainline	43667	Freeway
SB I-25 EL	43670	Managed Lane
SB I-25 EL	43671	Managed Lane
SB I-25 EL	43672	Managed Lane
NB I-25 EL	43734	Managed Lane
NB I-25 GP Mainline	43735	Freeway
NB I-25 EL	44007	Managed Lane
SB I-25 EL	44009	Managed Lane
NB I-25 GP Mainline	44036	Freeway
NB I-25 EL	44037	Managed Lane
SB I-25 GP Mainline	44038	Freeway
SB I-25 EL	44039	Managed Lane
NB I-25 GP Mainline	44040	Freeway
NB I-25 EL	44041	Managed Lane
NB I-25 GP Mainline	44042	Freeway
NB I-25 EL	44043	Managed Lane
SB I-25 GP Mainline	44044	Freeway
SB I-25 EL	44045	Managed Lane

Table 2. Roadway Links Included in the Air Quality Analysis for the No Action Alternative.

Link Description	Link ID	Road Type
SB I-25 GP Mainline	10043	Freeway
SB I-25 GP Mainline	10048	Freeway
SB I-25 Off-Ramp to I-76	10051	System Ramp
SB I-25 GP Mainline	10052	Freeway
NB I-25 GP Mainline	10054	Freeway
NB I-25 GP Mainline	10055	Freeway
SB I-25 GP Mainline	10479	Freeway
SB I-25 Off-Ramp to Thornton Pkwy	10480	Freeway Ramp
SB I-25 GP Mainline	10481	Freeway
SB I-25 GP Mainline	10482	Freeway
SB I-25 Off-Ramp to 84th Ave	10483	Freeway Ramp
SB I-25 GP Mainline	10484	Freeway
NB I-25 GP Mainline	10485	Freeway
NB I-25 GP Mainline	10486	Freeway
NB I-25 Off-Ramp to 84th Ave	10487	Freeway Ramp
NB I-25 GP Mainline	10488	Freeway
NB I-25 GP Mainline	10489	Freeway
NB I-25 Off-Ramp to Thornton Pkwy	10490	Freeway Ramp
84th Ave Ramp to SB I-25	10496	Freeway Ramp
WB 84th Ave Ramp to NB I-25	10498	Freeway Ramp
Thornton Pkwy Ramp to SB I-25	10579	Freeway Ramp
WB Thornton Pkwy Ramp to NB I-25	10581	Freeway Ramp
SB I-25 GP Mainline	10831	Freeway
SB I-25 GP Mainline	10832	Freeway
SB I-25 Off-Ramp to 104th Ave	10833	Freeway Ramp
NB I-25 GP Mainline	10837	Freeway
NB I-25 Off-Ramp to 104th Ave	10838	Freeway Ramp
104th Ave Ramp to SB I-25	10850	Freeway Ramp
WB 104th Ave Ramp to NB I-25	10856	Freeway Ramp
NB I-25 EL Off-Ramp to CO 224	25269	Managed Lane
CO 224 On-Ramp to SB I-25 EL	25270	Managed Lane
SB I-25 EL	25272	Managed Lane
SB I-25 EL	25594	Managed Lane
NB I-25 GP Mainline	25596	Freeway
WB I-270 Ramp to NB I-25	25600	System Ramp
EB US 36 Ramp to NB I-25	25602	System Ramp
SB I-25 EL	25603	Managed Lane
SB I-25 GP Mainline	28292	Freeway
SB I-25 Off-Ramp to I-270	28293	System Ramp
NB I-25 EL	28580	Managed Lane
NB I-25 GP Mainline	28709	Freeway
EB 76 Off-Ramp to NB I-25	28749	System Ramp
WB I-270 Off-Ramp to Broadway	28755	Freeway Ramp
EB 76 Off-Ramp to NB I-25	29045	System Ramp
NB I-25 Off-Ramp to CO 224	29053	Freeway Ramp
NB I-25 Off-Ramp to 84th Ave	29331	Freeway Ramp
NB I-25 Off-Ramp to 84th Ave	29332	Freeway Ramp
WB 84th Ave Ramp to NB I-25	29334	Freeway Ramp
WB 84th Ave Ramp to NB I-25	29335	Freeway Ramp
SB I-25 Off-Ramp to 84th Ave	29336	Freeway Ramp

Link Description	Link ID	Road Type
SB I-25 Off-Ramp to 84th Ave	29337	Freeway Ramp
84th Ave Ramp to SB I-25	29338	Freeway Ramp
84th Ave Ramp to SB I-25	29339	Freeway Ramp
NB I-25 Off-Ramp to 104th Ave	29340	Freeway Ramp
NB I-25 Off-Ramp to 104th Ave	29342	Freeway Ramp
WB 104th Ave Ramp to NB I-25	29343	Freeway Ramp
WB 104th Ave Ramp to NB I-25	29344	Freeway Ramp
104th Ave Ramp to SB I-25	29346	Freeway Ramp
104th Ave Ramp to SB I-25	29347	Freeway Ramp
SB I-25 Off-Ramp to 104th Ave	29348	Freeway Ramp
SB I-25 Off-Ramp to 104th Ave	29349	Freeway Ramp
SB I-25 GP Mainline	32951	Freeway
NB I-25 GP Mainline	32952	Freeway
NB I-25 EL	40854	Managed Lane
SB I-25 GP Mainline	41174	Freeway
SB I-25 EL	42615	Managed Lane
NB I-25 EL	42616	Managed Lane
SB I-25 EL	43053	Managed Lane
SB I-25 EL	43055	Managed Lane
SB I-25 GP Mainline	43964	Freeway
SB I-25 GP Mainline	43965	Freeway
SB I-25 Off-Ramp to EB I-270	43967	System Ramp
SB I-25 EL	43968	Managed Lane
SB I-25 GP Mainline	43969	Freeway
SB I-25 EL	43970	Managed Lane
NB I-25 GP Mainline	43971	Freeway
NB I-25 EL	43972	Managed Lane
NB I-25 GP Mainline	43973	Freeway
NB I-25 GP Mainline	43974	Freeway
SB I-25 GP Mainline	43975	Freeway
SB I-25 EL	43976	Managed Lane
NB I-25 EL	43978	Managed Lane
NB I-25 GP Mainline	43980	Freeway
SB I-25 GP Mainline	43981	Freeway
SB I-25 EL	43984	Managed Lane
SB I-25 EL	44002	Managed Lane
SB I-25 EL	44003	Managed Lane
SB I-25 EL	44004	Managed Lane
NB I-25 EL	44006	Managed Lane
SB I-25 EL	44007	Managed Lane
NB I-25 EL	44010	Managed Lane
SB I-25 EL	44012	Managed Lane
NB I-25 EL	44014	Managed Lane
NB I-25 GP Mainline	44112	Freeway
NB I-25 EL	44113	Managed Lane
NB I-25 GP Mainline	44158	Freeway
NB I-25 EL	44159	Managed Lane
SB I-25 EL	44160	Managed Lane
NB I-25 EL	44161	Managed Lane
SB I-25 EL	44162	Managed Lane
NB I-25 EL	44163	Managed Lane

Link Description	Link ID	Road Type
WB I-270 ML Direct Connect Ramp to NB I-25 ML	44655	Managed Lane
I-270 WB ML	44656	Managed Lane
I-270 EB ML	44657	Managed Lane
SB I-25 ML Direct Connect to I-270 EB ML	44672	Managed Lane
I-270 EB ML	45317	Managed Lane
WB I-270 ML Egress to GP Lanes	45318	Managed Lane
SB I-25 Off-Ramp to WB US 36	45403	Freeway Ramp
SB I-25 Off-Ramp to WB US 36	45404	Freeway Ramp

Table 3. Roadway Links Included in the Air Quality Analysis for the Build Alternative.

Link Description	Link ID	Road Type
SB I-25 GP Mainline	10043	Freeway
SB I-25 GP Mainline	10048	Freeway
SB I-25 GP Mainline	10052	Freeway
NB I-25 GP Mainline	10054	Freeway
NB I-25 GP Mainline	10055	Freeway
SB I-25 GP Mainline	10479	Freeway
SB I-25 Off-Ramp to Thornton Pkwy	10480	Freeway Ramp
SB I-25 GP Mainline	10481	Freeway
SB I-25 GP Mainline	10482	Freeway
SB I-25 Off-Ramp to 84th Ave	10483	Freeway Ramp
SB I-25 GP Mainline	10484	Freeway
NB I-25 GP Mainline	10485	Freeway
NB I-25 GP Mainline	10486	Freeway
NB I-25 GP Mainline	10488	Freeway
NB I-25 GP Mainline	10489	Freeway
NB I-25 Off-Ramp to Thornton Pkwy	10490	Freeway Ramp
84th Ave Ramp to SB I-25	10496	Freeway Ramp
WB 84th Ave Ramp to NB I-25	10498	Freeway Ramp
Thornton Pkwy Ramp to SB I-25	10579	Freeway Ramp
WB Thornton Pkwy Ramp to NB I-25	10581	Freeway Ramp
SB I-25 GP Mainline	10831	Freeway
SB I-25 GP Mainline	10832	Freeway
SB I-25 Off-Ramp to 104th Ave	10833	Freeway Ramp
NB I-25 GP Mainline	10837	Freeway
NB I-25 Off-Ramp to 104th Ave	10838	Freeway Ramp
104th Ave Ramp to SB I-25	10850	Freeway Ramp
WB 104th Ave Ramp to NB I-25	10856	Freeway Ramp
NB I-25 EL Off-Ramp to CO 224	25269	Managed Lane
CO 224 On-Ramp to SB I-25 EL	25270	Managed Lane
SB I-25 EL	25272	Managed Lane
NB I-25 GP Mainline	25596	Freeway
WB I-270 Ramp to NB I-25	25600	System Ramp
EB I-270 Ramp to NB I-25	25602	System Ramp
NB I-25 EL	25594	Managed Lane
SB I-25 GP Mainline	28292	Freeway
SB I-25 Off-Ramp to I-270	28293	System Ramp
SB I-25 EL	25603	Managed Lane
NB I-25 GP Mainline	28709	Freeway
WB US 36 Off-Ramp to Broadway	28755	Freeway Ramp
WB 76 Off-Ramp to NB I-25	29045	System Ramp
NB I-25 Off-Ramp to CO 224	29053	Freeway Ramp
NB I-25 Off-Ramp to 84th Ave	29331	Freeway Ramp
NB I-25 Off-Ramp to 84th Ave	29332	Freeway Ramp
WB 84th Ave Ramp to NB I-25	29334	Freeway Ramp
WB 84th Ave Ramp to NB I-25	29335	Freeway Ramp
SB I-25 Off-Ramp to 84th Ave	29336	Freeway Ramp
SB I-25 Off-Ramp to 84th Ave	29337	Freeway Ramp
84th Ave Ramp to SB I-25	29338	Freeway Ramp
84th Ave Ramp to SB I-25	29339	Freeway Ramp
NB I-25 Off-Ramp to 104th Ave	29340	Freeway Ramp

Link Description	Link ID	Road Type
NB I-25 Off-Ramp to 104th Ave	29342	Freeway Ramp
WB 104th Ave Ramp to NB I-25	29343	Freeway Ramp
WB 104th Ave Ramp to NB I-25	29344	Freeway Ramp
104th Ave Ramp to SB I-25	29346	Freeway Ramp
104th Ave Ramp to SB I-25	29347	Freeway Ramp
SB I-25 Off-Ramp to 104th Ave	29348	Freeway Ramp
SB I-25 Off-Ramp to 104th Ave	29349	Freeway Ramp
SB I-25 GP Mainline	32951	Freeway
NB I-25 GP Mainline	32952	Freeway
NB I-25 EL	28580	Managed Lane
SB I-25 GP Mainline	41174	Freeway
NB I-25 EL	40854	Managed Lane
SB I-25 EL	42615	Managed Lane
NB I-25 EL	42616	Managed Lane
SB I-25 EL	43053	Managed Lane
SB I-25 GP Mainline	43964	Freeway
SB I-25 GP Mainline	43965	Freeway
SB I-25 Off-Ramp to I-270	43967	System Ramp
SB I-25 EL	43055	Managed Lane
SB I-25 GP Mainline	43969	Freeway
SB I-25 EL	43968	Managed Lane
NB I-25 GP Mainline	43971	Freeway
SB I-25 EL	43970	Managed Lane
NB I-25 GP Mainline	43973	Freeway
NB I-25 GP Mainline	43974	Freeway
SB I-25 GP Mainline	43975	Freeway
NB I-25 EL	43972	Managed Lane
SB I-25 EL	43976	Managed Lane
NB I-25 GP Mainline	43980	Freeway
SB I-25 GP Mainline	43981	Freeway
NB I-25 EL	43978	Managed Lane
SB I-25 EL	43984	Managed Lane
SB I-25 EL	44002	Managed Lane
SB I-25 EL	44003	Managed Lane
SB I-25 EL	44004	Managed Lane
NB I-25 EL	44006	Managed Lane
SB I-25 EL	44007	Managed Lane
NB I-25 EL	44010	Managed Lane
SB I-25 EL	44012	Managed Lane
NB I-25 GP Mainline	44112	Freeway
NB I-25 EL	44014	Managed Lane
NB I-25 GP Mainline	44158	Freeway
NB I-25 EL	44113	Managed Lane
NB I-25 EL	44159	Managed Lane
SB I-25 EL	44160	Managed Lane
NB I-25 EL	44161	Managed Lane
SB I-25 EL	44162	Managed Lane
NB I-25 EL	44163	Managed Lane
WB I-270 ML Direct Connect Ramp to NB I-25 ML	44655	Managed Lane
I-270 WB ML	44656	Managed Lane
I-270 EB ML	44657	Managed Lane

Link Description	Link ID	Road Type
SB I-25 ML Direct Connect to to I-270 EB ML	44672	Managed Lane
I-270 EB ML	45317	Managed Lane
NB I-25 GP Mainline	45402	Freeway
WB 76 Off-Ramp to NB I-25	45404	System Ramp
NB I-25 GP Mainline	45405	Freeway
EB I-270 Ramp to NB I-25	45407	System Ramp
NB I-25 GP Mainline	45410	Freeway
NB I-25 GP Mainline	45412	Freeway

2.0 MOVES Runs – Overview of Approach

MOVES was run with the Project Scale setting to estimate running exhaust and crankcase running exhaust emissions for all pollutants. The MOVES runs produce emission factors for a lookup table, with emissions by road type, speed, and vehicle type (car or truck). Data for Links input for MOVES were developed based on hypothetical link-level traffic and roadway data that cover the range of actual link-level traffic for all analysis scenarios, as described below. Link Source Type inputs for MOVES, which describe the mix of vehicle types on each link, were developed using data provided by the Colorado Air Pollution Control Division (APCD).

Mainline and ramp roadway segments were modeled as urban restricted roadways. Only on-road links were modeled; no "off-network" links were modeled. "Off-network" links reflect parking facilities, such as park-and-ride lots or truck stops, and no facilities of this type are affected by the Project. A series of hypothetical links with a traffic volume of one vehicle per hour traveling one mile were created, with average vehicle speed ranging from 0 to 75 miles per hour (mph) in 1 mph speed bins.[2] Emission factors were developed for both passenger ("non-truck") vehicle and truck vehicle categories, with appropriate mapping of MOVES source types to non-truck and truck categories.

MOVES modeling was performed for a 2024 base year and a 2050 design year. For the analysis, the winter and summer seasons, represented by the months of January and July, respectively, were modeled using appropriate fuels inputs for each season. This approach allows the modeling to capture wintertime conditions in Denver as well as the peak summertime period when warm-weather conditions impact vehicle air conditioning use.

Emission factors from the lookup table were applied (outside of MOVES) to project-specific link-level traffic data in order to calculate link-level emissions, which were aggregated to the project level for each analysis scenario. The emission factors in the lookup table by vehicle type and speed (from the MOVES runs) were applied to the link-level traffic data to calculate the emissions for each link by traffic time period. The traffic data vary across four time periods during the day (AM Peak, PM Peak, Midday, and Evening).

2.1 Run Specification Inputs

MOVES run specifications (RunSpecs) were created to specify the parameter options for the MOVES model. **Table 4** summarizes the MOVES inputs for the RunSpecs, as defined in the navigation panel of the MOVES interface.

[2] Note that only a single road grade (equal to 0 percent) was modeled in MOVES for the quantitative emissions inventory analysis, consistent with normal practices for emissions inventory development using the MOVES model.

Table 4. MOVES Run Specification Selections

Navigation Panel	Model Selection
Scale	Project scale; inventory calculation type
Time Spans	Hour; weekdays; January/July; calendar years 2024 and 2050
Geographic Bounds	Adams County
Vehicles	All MOVES4 vehicle and fuel type combinations
Road Types	Urban restricted access
Pollutants and Processes	Running exhaust and crankcase running exhaust (all pollutants)
General Output	Units of grams and miles
Output Emissions Detail	Road type

2.2 Project Data Manager Inputs

After the RunSpecs were created, an input database table for each run was created before running MOVES. This was done using the MOVES Project Data Manager to enter project-specific data. **Table 5** summarizes the MOVES Project Data Manager inputs, and they are discussed in more detail below.

Table 5. MOVES Project Data Manager Inputs

Project Data Manager Tab	Data Source
Meteorology Data	Provided by APCD
Age Distribution	Provided by APCD
Fuel	MOVES defaults; and AVFT[1] data provided by CDOT
Retrofit	No inputs (not applicable)
Inspection and Maintenance (I/M) Program	Provided by APCD
Link Source Type	Generated using traffic count data provided by APCD[2]
Links	Generic links designed to produce an emissions lookup table

[1] AVFT = Alternate Vehicle Fuel and Technology

[2] Note that the data provided by APCD are based on local Highway Performance Monitoring System (HPMS) traffic counts and reflect a statewide average for urban freeways, and are only used to define the vehicle type mix for separate "car" and "truck" input files for MOVES. The Project-specific fleet mix was represented in the emissions analysis by the DRCOG TDM results for “car” and “truck” traffic volumes.

2.2.1 Meteorology Data

The meteorology data for this analysis were consistent with those used in the regional emissions analysis for transportation conformity and were provided by APCD. The relevant data provided by APCD for each modeled season were used to calculate average temperature and humidity for each traffic time period in the two seasons.

2.2.2 Vehicle Age Distribution

The vehicle age distribution input for the modeling, provided by APCD, is based on their latest available composite of vehicle registration data from seven Denver area counties (Adams, Arapaho, Boulder, Broomfield, Denver, Douglas, and Jefferson). These data were used to represent the age distribution in the analysis years (2024 and 2050).

2.2.3 Fuel

Consistent with APCD’s standard practice, the default parameters in MOVES for fuel inputs were used, with the addition of AVFT data from CDOT to reflect the future zero emission vehicle (ZEV) fleet resulting from the state’s adoption of the Colorado Clean Cars and

Advanced Clean Trucks rules. The AVFT inputs define vehicle sales by fuel type and vehicle type in each past and future model year, and the CDOT-provided file reflects implementation of these Colorado rules.

2.2.4 Inspection and Maintenance Parameters

Existing and anticipated future vehicle inspection and maintenance (I/M) program parameters for the Denver metropolitan area were provided by APCD.

2.2.5 Link Source Type

Link source type inputs were used to define the fraction of travel on each link by vehicle type. Two separate sets of MOVES runs were conducted: one for light-duty vehicles and one for (heavy-duty) trucks. Three sets of link source type inputs were needed for these MOVES runs: one set with fractions for the four types of MOVES light-duty vehicles (MOVES sourcetypes 11, 21, 31, and 32), and one set with fractions for the six types of heavy-duty vehicles (MOVES sourcetypes 51, 52, 53, 54, 61, and 62), and one set with fractions for buses (MOVES sourcetypes 41, 42, and 43), assuming travel activity for the listed bus sourcetypes were available for the analyses.[3]

The third set of link source type fractions was developed to represent the vehicle mix on managed lanes in the Proposed Action, including buses using the managed lanes, in addition to light-duty vehicle activity on managed lanes.[4] The number of buses was added based on the Regional Transportation District (RTD) and CDOT Bustang schedules to estimate total volumes for the corridor, and not subtracted from some other category (e.g., single-unit trucks) to conserve total modeled traffic volumes. Current RTD and Bustang schedules were used to estimate daily transit bus volumes in the managed lanes, and DRCOG modeling provided passenger vehicle volumes in the managed lanes. Regional DRCOG vehicle population data were used to disaggregate the passenger vehicle volumes into MOVES passenger vehicle sourcetypes; these subtotals and the estimated bus volumes were used to develop the linksourcetype fractions. This approach assumed that no trucks use the managed lanes.

Link source type inputs for the three groups of vehicles (i.e., light-duty vehicles, trucks, and vehicles using the managed lanes) were developed using Automated Traffic Recorder (ATR) data by each class defined in the Highway Performance Monitoring System (HPMS) for representative freeway segments. CDOT selected continuous count ATR stations within the TDM validation boundary based on roadways that were included in the emissions quantification to provide input data needed for the MOVES modeling. Along with MOVES default estimates by vehicle miles traveled (VMT) and source type, vehicle population data provided by CDOT and agreed upon by FHWA were used for developing the link source type inputs.

[3] Note that the MOVES sourcetype 41 represents all buses that are not transit buses, represented by sourcetype ID 42, or school buses, represented by sourcetype 43.
[4] It is assumed that MOVES input data and traffic activity data for buses will be provided by CDOT for this modeling.

2.2.6 Links

A links input table was created that represents all speeds on the urban restricted road type to generate the lookup table of emission factors applicable to any traffic link in the analysis scenarios.

2.3 Road Dust Emission Factors

PM road dust emission factors are not modeled by MOVES. APCD provided the road dust emissions factors that are used for the PM_{10} emissions inventories. PM_{10} emissions factors were provided for freeways and arterial roadways, and for normal year-road dust, as well as an incremental "sanding" factor that applies during the winter months (November through March). These factors are listed in **Table 6**. $PM_{2.5}$ road dust is not modeled because the Denver area is in attainment of the $PM_{2.5}$ NAAQS and neither APCD nor EPA have made a finding that road dust is a significant contributor to $PM_{2.5}$ concentrations.

Table 6. Road Dust Emissions Factors

Pollutant	Road Type	Road Dust Factor, g/mile	Sanding Factor, g/mile
PM_{10}	Freeway	0.1678	0.0513
PM_{10}	Arterial	0.3543	0.0550

Attachment D.

MSAT Discussion for NEPA

Attachment D. MSAT Discussion for NEPA

CDOT is dedicated to providing an accessible experience for everyone. While we are continuously improving our standards, some complex items in this document, such as certain figures and images, are difficult to create with fully accessible parameters to all users. If you need help understanding any part of this document, we are here to assist and have resources to provide additional accessibility assistance to any requests. Please email us at CDOT_Accessibility@state.co.us to request an accommodation, and a member of our I-25 Engineering Program will schedule a time to review the content with you. To learn more about accessibility at CDOT, please visit the Accessibility at CDOT webpage on the CDOT Website.

NOTE: This attachment is not able to be included in the Environmental Assessment at this time due to accessibility. If you would like a copy of this attachment or to sit down with a project team member to review this attachment, please contact the project team at I25.US36to104thAvenue@gmail.com or 720-378-8859.

Attachment E.

Air Quality Technical Report No Additional Analysis Justification for I-25 Project Design Modifications Memorandum

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MEMORANDUM

To: Project File
From: CDOT
Date: June 26, 2026
Subject: Air Quality Technical Report No Additional Analysis Justification for I-25 Project Design Modifications

Purpose:
After completing the NEPA analysis, CDOT identified changes to the design at 104th Avenue that would better facilitate future widening of I-25 north of the 104th Avenue interchange. The goal was to ensure the southbound entrance ramp and northbound exit ramp gore points constructed as part of the Project would not require modification in the future. The modifications on southbound I-25 do not result in changes to the lane configuration that was evaluated in support of NEPA. However, northbound I-25 in the Proposed Action was modified as follows (refer to Figure 1 below):

- The proposed gore point for the exit ramp is shifted 200 feet south (compared to the Proposed Action) and the climbing lane is converted to a decision lane.
    - The climbing lane is then dropped within the interchange (about 1,100 feet north of the gore) with the lane taper beginning approximately 500 feet north of the gore and then there is a 600 foot lane taper.
- A continuous auxiliary lane from the Thornton Parkway entrance ramp becomes an exit-only lane at 104th Avenue to maintain the two-lane exit configuration.

This memorandum serves as technical justification for why recent minor design modifications to the I-25 project do not require a quantitative reanalysis of the previously approved analysis in the Air Quality Technical Report.

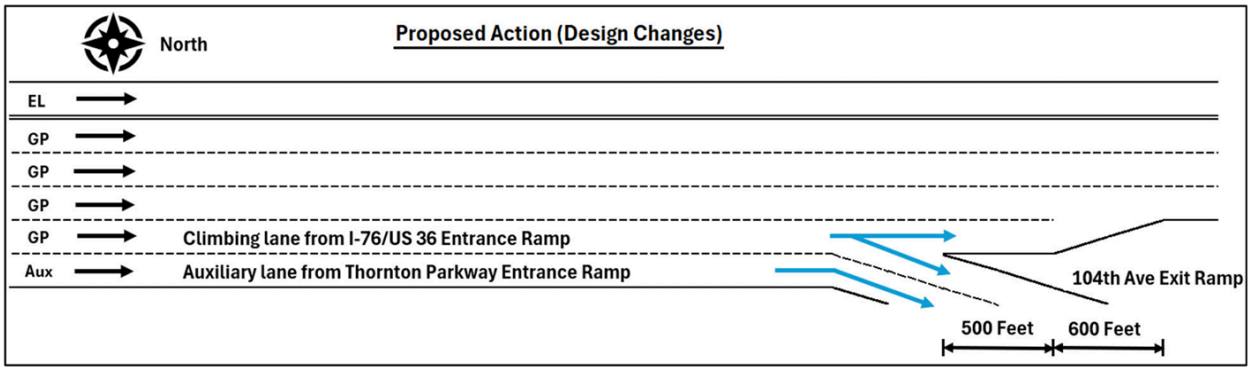

Figure 1: Changes to the Proposed Action at 104th Avenue

Findings:

- **Operational Emissions:**
    - CDOT and FHWA consultation confirmed that regional Travel Demand Model (TDM) results and localized microsimulation outputs are expected to remain unchanged by these geometric adjustments. Traffic inputs (VMT, speeds, fleet mix, AADT) to the Proposed Action are unchanged, therefore additional analysis of the design changes at 104th Avenue will not significantly alter the operational emissions modeling (EPA's MOVES) results for criteria air pollutants and MSATs (i.e. "air pollutants").
    - The project design modifications would also not change the approved Tier 3 MSAT quantitative analysis decision.

Conclusion:
The Air Quality analysis and modeling outcomes are not expected to show a variance in predicted emissions across project alternatives even with the design changes covered in the I-25: US 36 to 104th Avenue Design Changes at 104th Avenue Memorandum, which is included in Appendix D1: Traffic and Safety Technical Report - Attachment I. Furthermore, no significant alterations to the environmental conclusions within the Air Quality Technical Report or the NEPA decision document are anticipated. Because the regional Travel Demand Model (TDM) and localized microsimulation results are expected to remain consistent, the data outputs supporting the air pollutant emissions analysis are expected to also remain consistent.

The original Air Quality Technical Report relied on quantitative modeling to meet state and federal standards. This memorandum provides the qualitative justification for why the minor design modifications, which do not alter traffic data, will not impact the original report's findings, compliance status, or conclusions.