3.1 Climate and Air Quality Resources

3.1.1 What are the air quality resources of concern to this project and why are they important?

Air pollution affects human, plant, and wildlife health; visibility; and global climate change. As such, it is a concern to Corridor residents and visitors. Vehicle emissions as well as those from mining, the oil and gas industry, residences that burn wood, fires in recreation areas, controlled burns, and a variety of large-scale manufacturing plants in Jefferson County, also affect air quality in the Corridor. The dry climate in the Corridor contributes to particulate matter (very small dust particles) from windblown dust and road sanding.

The Clean Air Act requires the Environmental Protection Agency to set National Ambient Air Quality Standards (NAAQS) for pollutants, referred to as criteria pollutants, considered harmful to public health and the environment. Most of the Corridor meets NAAQS, with the exception of the east end of the Corridor in Jefferson County, which, along with the rest of the Denver metropolitan area, exceeds air quality standards for ozone.

Criteria Air Pollutants

The Environmental Protection Agency set standards for six criteria air pollutants:

- Carbon monoxide
- Ground level ozone
- Nitrogen dioxide
- Sulfur dioxide
- Lead
- Microscopic dust particles referred to as "particulate matter" or PM

Other pollutants of concern include vehicle emissions of toxic pollutants (referred to as mobile source air toxics or MSATs) and greenhouse gases. The Environmental Protection Agency has not set standards for allowable levels of toxic pollutants or greenhouse gases. A Colorado Executive Order (D 004 08) prescribes specific goals for reducing and reporting greenhouse gas emissions statewide and directs the Colorado Department of Public Health and Environment (CDPHE) to develop and implement a process for identifying and evaluating the benefits and impediments to measures that reduce greenhouse gas tailpipe emissions from cars and light trucks. The Colorado Department of Public Health and Environment has not established specific guidelines for reducing greenhouse gas emissions.

3.1.2 What study area and process was used to analyze air quality resources?

The Corridor includes five counties:

- Garfield
- Eagle
- Summit
- Clear Creek
- Jefferson

The Colorado Department of Transportation (CDOT) characterized air quality throughout the Corridor by analyzing current (2009) data from available air quality monitoring stations in the Corridor maintained by the CDPHE's Air Pollution Control Division. The analysis included calculating emissions of criteria pollutants for each alternative. Ozone is considered a regional pollutant and was not evaluated for each alternative even though the eastern end of the Corridor is in non-attainment for ozone. Project-level conformity determinations will be made during Tier 2 processes. The lead agencies also analyzed visibility, MSATs, and greenhouse gases. In recognition of the need for a short- and long-term sustainable transportation vision, the project analysis uses both a 2035 planning horizon and a 2050 long-term horizon. Over the past decade since the I-70 Mountain Corridor Programmatic Environmental Impact

Statement (PEIS) was initiated, a number of changes have occurred in air quality regulations and monitoring, and this section presents an assessment of the alternatives according to current (2010) standards. The Colorado Department of Transportation used year 2000 traffic volumes as the baseline for the travel demand modeling. As explained in **Section 1.4, "What are the horizon years of analysis for the study?"** the 2000 data set characterizes Corridor conditions and provides a base year to compare future year traffic projections. Therefore, traffic forecasts based on year 2000 data can be used for the air quality analysis. The *I-70 Mountain Corridor PEIS Climate and Air Quality Technical Report* (CDOT, March 2011) provides additional details on the air pollutant monitoring, modeling methods, and emission calculations.

3.1.3 What agencies have CDOT and FHWA coordinated with and what are their relevant issues?

The lead agencies coordinated the air quality issues on this project with the Environmental Protection Agency and APCD. The Environmental Protection Agency asked that Tier 2 processes include in-depth MSAT emission impact analyses. The Air Pollution Control Division monitors air quality within the state and has no specific concerns, noting that airflow patterns and wind speed in the mountain areas disperse pollutants sufficiently so that pollutant concentrations meet the NAAQS.

3.1.4 What are the areas of air quality interest identified in the Corridor?

With the exception of the east end in Jefferson County in the Denver metropolitan area, the Corridor meets the NAAQS for all criteria pollutants. No violations of air quality standards have been recorded outside Jefferson County. However, air quality is a growing concern to Corridor communities because of increasing development, construction, and traffic along the Corridor, combined with windblown dust from street maintenance activities, mine tailings, sand and gravel mining operations, and woodburning. Communities are also concerned about global climate change and the effects that the Action Alternatives may contribute to that issue. Temperature inversions and dry climates exacerbate air quality and visibility concerns throughout the Corridor.

Visibility in the White River National Forest's Class I Eagles Nest Wilderness Area near Vail is an important issue in the Corridor and is addressed in a statewide regional haze reduction plan (CDPHE, 2008). Although visibility is generally good in this area—averaging 140 miles—the plan seeks to improve visibility in all Class I areas and calls for reductions in air pollutants that contribute to haze, such as nitrogen, sulfur dioxide, and dust (particulate matter).

3.1.5 How do the alternatives potentially affect air quality and climate?

The relative differences in air pollutant emissions among the alternatives are presented below. The *I-70 Mountain Corridor PEIS Climate and Air Quality Technical Report* (CDOT, March 2011) presents additional discussion and modeling results.

How do the alternatives affect criteria pollutant emissions?

For the alternatives, future air pollutant emissions of most criteria pollutants (particulate matter of 2.5 microns in diameter or smaller [$PM_{2.5}$], sulfur dioxide, nitrogen dioxide, and carbon monoxide) in 2035 and 2050 are anticipated to be less than current day emissions, even though 2035 and 2050 traffic volumes will be higher than 2000 volumes. Emissions in the future are shown to be generally lower because stricter regulations are being enacted to control emissions and older, higher-polluting vehicles will continue to be replaced by newer, lower-polluting vehicles. Between 2035 and 2050, this trend of decreasing emissions may slow as technological advances become less effective, and vehicle air pollutant emissions may correlate more directly with vehicle miles traveled. Emissions of particulate matter of 10 microns in diameter or smaller (PM_{10}) related to re-entrained dust from winter sanding operations are

correlated to vehicle miles traveled and are not subject to the same decreases related to vehicle technology improvements. However, stricter regulations and more effective best management practices for roadway maintenance do have a positive effect on PM_{10} emissions from re-entrained dust.

To compare the air quality impacts among the various alternatives, total daily $PM_{2.5}$, PM_{10}, sulfur dioxide, nitrogen dioxide, and carbon monoxide emissions were calculated for each alternative and compared to the baseline emissions. The Air Pollution Control Division, in cooperation with the Environmental Protection Agency, monitors air quality and calculates baseline emissions. Because pollutant emissions from vehicles are directly related to vehicle miles traveled, alternatives with higher vehicle miles traveled generally have higher total daily emissions. Transit alternatives that shift travel from cars to transit vehicles have lower emissions. **Table 3.1-1** compares emissions across the alternatives.

As presented in **Table 3.1-1**, emissions for the Preferred Alternative generally fall within the range of the other Action Alternatives, but Transit alternatives have lower emissions than the alternatives that include increased highway capacity.

Table 3.1-1. Estimated Pollutant Emissions by Alternative

Alternatives	Pollutants (tons per day)									
	Re-entrained Dust (PM_{10})		$PM_{2.5}$		Sulfur Dioxide		Nitrogen Dioxide**		Carbon Monoxide	
	2000*	2035	2000*	2035	2000*	2035	2000*	2035	2000*	2035
Baseline	49.54	104.61	3.99	0.14	4.26	0.11	16.45	4.28	113.79	76.03
No Action	N/A	92.83	N/A	0.13	N/A	0.09	N/A	3.87	N/A	69.51
Minimal Action	N/A	91.90	N/A	0.13	N/A	0.09	N/A	3.84	N/A	68.98
Rail with IMC	N/A	87.00	N/A	0.12	N/A	0.09	N/A	3.63	N/A	65.21
AGS	N/A	84.74	N/A	0.12	N/A	0.09	N/A	3.54	N/A	63.56
Dual-Mode Bus in Guideway	N/A	85.56	N/A	0.12	N/A	0.09	N/A	3.56	N/A	64.00
Diesel Bus in Guideway	N/A	86.64	N/A	0.11	N/A	0.09	N/A	3.61	N/A	64.82
Six-Lane Highway (55 or 65 mph)	N/A	102.76	N/A	0.14 (55 mph) 0.13 (65 mph)	N/A	0.11	N/A	4.25	N/A	76.07
Reversible/HOV/HOT Lanes	N/A	103.56	N/A	0.14	N/A	0.11	N/A	4.29	N/A	76.67
Combination Six-Lane Highway with Rail and IMC	N/A	99.45	N/A	0.14	N/A	0.10	N/A	4.12	N/A	73.82
Combination Six-Lane Highway with AGS	N/A	97.73	N/A	0.13	N/A	0.10	N/A	4.06	N/A	72.88
Combination Six-Lane Highway with Dual-Mode Bus in Guideway	N/A	99.12	N/A	0.14	N/A	0.10	N/A	4.09	N/A	73.15
Combination Six-Lane Highway with Diesel Bus in Guideway	N/A	99.85	N/A	0.14	N/A	0.10	N/A	4.12	N/A	73.61

Alternatives	Pollutants (tons per day)									
	Re-entrained Dust (PM_{10})		$PM_{2.5}$		Sulfur Dioxide		Nitrogen Dioxide**		Carbon Monoxide	
	2000*	2035	2000*	2035	2000*	2035	2000*	2035	2000*	2035
Preferred Alternative*	N/A	88.20 to 97.73	N/A	0.12 to 0.13	N/A	0.09 to 0.10	N/A	3.68 to 4.06	N/A	66.00 to 72.88

**The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. Section 2.7.2 of this document describes the triggers for implementing components of the Preferred Alternative.*
***Nitrogen Dioxide totals include emissions of all relevant oxides of nitrogen.*

Key to Abbreviations/Acronyms

AGS = Advanced Guideway System
HOT = high occupancy toll
HOV = high occupancy vehicle
IMC = Intermountain Connection
mph = miles per hour
N/A = not applicable

How do the alternatives affect MSAT emissions?

For all the alternatives, the amount of MSATs emitted is a function of vehicle miles traveled. The vehicle miles traveled estimated for the Preferred Alternative are slightly higher than those for the No Action Alternative because the additional capacity accommodates trips that are suppressed due to congestion. The increase in vehicle miles traveled for some of the alternatives may lead to higher MSAT emissions for these alternatives, although MSAT emissions may decrease along the parallel routes. The emissions increase is offset by lower MSAT emission rates due to increased speeds. According to the Environmental Protection Agency's MOBILE6.2 emissions model, emissions of all of the priority MSATs, except diesel particulate matter, decrease as speeds increase.

Because the estimated vehicle miles traveled under each alternative are nearly the same, overall MSAT emissions are not appreciably different. Regardless of the alternative chosen, future emissions in 2050 are likely to be lower than present levels as a result of the Environmental Protection Agency's national control programs that are projected to reduce MSAT emissions by 72 percent between 1999 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, growth rates of vehicle miles traveled, and local control measures. However, the magnitude of the projected reductions is so great (even after accounting for growth in vehicle miles traveled) the MSAT emissions in the study area are likely to be lower in the future in all cases.

The additional highway travel lanes considered under some of the Action Alternatives and the auxiliary lanes included in all Action Alternatives have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under each alternative, some localized areas may have higher ambient concentrations of MSATs under the Action Alternatives than under the No Action Alternative. The localized increases in MSAT concentrations are likely most pronounced along the roadway sections in Clear Creek County between Silver Plume and Idaho Springs as well as in the Vail valley where the I-70 highway is closer to communities. However, localized increases in MSAT emissions for the Action Alternatives could be offset due to increases in travel speed and reductions in congestion (which are associated with lower MSAT emissions). Mobile source air toxics are lower in other locations when traffic shifts away from communities. On a regional basis, the Environmental Protection Agency's vehicle and fuel regulations, coupled with fleet turnover, cause substantial reductions over time. In almost all cases, regionwide MSAT levels are projected to be lower than today's levels.

The *I-70 Mountain Corridor PEIS Climate and Air Quality Technical Report* (CDOT, March 2011) provides additional details on MSAT emissions.

How do the alternatives affect visibility?

Forecasts for all alternatives show that although traffic volumes are higher, future tailpipe exhaust pollutants are lower because of stricter standards on vehicle emissions and the lower sulfur content of diesel fuel. As a result, for all alternatives, including the No Action Alternative, there is a substantial decrease (approximately 75 percent to 85 percent) in emissions of pollutants (particulate matter, sulfur dioxide, and nitrogen oxides) that affect visibility. The Preferred Alternative falls within the same range. The Class I Eagles Nest Wilderness Area is not adversely affected under any alternative (including the No Action Alternative).

Visibility

Regional haze is caused by fine particles, such as air pollutants and dust, which scatter light and reduce visibility. Vehicle emissions affect visibility but are not directly correlated to a visibility index or range. This is because emissions from other sources, as well as atmospheric conditions, also contribute to visual impairment.

How do the alternatives affect greenhouse gas emissions?

The issue of global climate change is an important national and global concern. The transportation sector is the second largest source of total greenhouse gases in the United States and the greatest source of carbon dioxide emissions—the predominant greenhouse gas. Consumption of petroleum products such as gasoline and diesel fuel account for almost all (98 percent) of transportation-sector emissions.

Recognizing this concern, the lead agencies are working to accomplish the following activities:

- Develop strategies to reduce transportation's contribution to greenhouse gases,
- Assess the risks to transportation systems and services from climate changes,
- Support technological or operational advances that will reduce emissions, and
- Conduct public outreach and implement education programs regarding greenhouse gases and transportation.

Chapter 4, Cumulative Impacts Analysis, contains additional information about the lead agencies' actions to address climate change.

Although emission levels for the alternatives differ, the overall effect of greenhouse gas emissions is expected to be similar across alternatives because emission changes are small compared to global totals. The Colorado Department of Transportation acknowledges that although climate change is a global issue and local impacts do not differ substantially, incremental changes to emission levels will result in some effects.

The *I-70 Mountain Corridor PEIS Climate and Air Quality Technical Report* (CDOT, March 2011) provides additional details on the greenhouse gas emissions of the Action Alternatives.

How does construction of the alternatives affect air quality?

Construction of the Action Alternatives generates vehicle- and dust-related air emissions. Generally, the quantity of construction-related emissions is proportionate to the scope of construction. The act of boring new tunnels generates substantial dust if not properly managed. Construction personnel may be exposed to acute dust during blasting operations. Tunnel borings at the Eisenhower-Johnson Memorial Tunnels and the Twin Tunnels occur under all Action Alternatives, with the exception of the Minimal Action Alternative. The Six-Lane Highway (65 miles per hour [mph]) Alternative includes three additional tunnels not included in the other Action Alternatives. Alternatives with a larger footprint (and tunnel borings) generate more emissions for a longer duration. The Minimal Action generates fewer emissions because it involves less construction. The Combination alternatives, however, are the most complex, have the largest footprints and associated construction areas, take the longest to construct, and, as a result, have the greatest impacts on air quality during construction. The impacts of the Preferred Alternative fall

within the range of the other Action Alternatives, but the adaptive management component of the Preferred Alternative allows greater flexibility in implementing components, which may result in less construction and corresponding reduction in construction-related impacts.

What are the project effects on air quality in 2050?

Emission of traditional air pollutants is related to traffic volumes and congestion. Based on current trends, it is likely that traffic volumes will increase between 2035 and 2050. As new air quality regulations and cleaner car technologies are implemented, the trend of decreasing air pollutant emissions is expected to continue despite the increase in vehicle travel along the Corridor. Between 2035 and 2050, this trend may change, and air pollutant emissions may correlate more directly with vehicles miles traveled.

Emissions of greenhouse gases are likely to continue to increase, even as new programs are established to control those increases. Controlling greenhouse gas emissions is a national and international problem that is difficult to address or affect on a project level. **Chapter 4, Cumulative Impacts Analysis** of this document presents some of the statewide and national efforts to control greenhouse gases. The lead agencies will need to adapt the implementation of the Action Alternatives in accordance with guidance and policies that are expected to continue to evolve into 2050 and beyond. **Chapter 4, Cumulative Impacts Analysis,** also contains a discussion of cumulative air quality effects.

3.1.6 What will be addressed in Tier 2 processes?

The lead agencies will conduct project-specific Tier 2 processes in accordance with Federal Highway Administration (FHWA) and Environmental Protection Agency guidance available when analyses are conducted. Tier 2 processes will include localized air quality modeling (such as hot spot modeling for carbon monoxide and particulate matter) where appropriate in designated non-attainment or maintenance areas. Proposed projects will also need to demonstrate conformity with regional air quality plans. The lead agencies will comply with current practices and standards for modeling and estimating air pollutants and will use the Environmental Protection Agency's latest air quality model, MOVES, where appropriate.

Tier 2 processes will include more detailed analysis of environmental effects, including data for emissions in interim years, between the year of construction and the design year. The Environmental Protection Agency, a federal agency, requests MSAT analysis and mitigation during Tier 2 processes. The traffic volumes will generally exceed the level at which FHWA guidance requires quantitative emissions analysis. In populated areas along the Corridor, this analysis will be performed according to the most current FHWA guidance. New nitrogen dioxide standards will also be included in Tier 2 processes. Future scoping and coordination will be performed when Tier 2 process are initiated to ensure adequate analysis.

3.1.7 What are the mitigation strategies for air quality?

The Colorado Department of Transportation will support policies and programs, as described below to improve air quality in the Corridor:

- Support local jurisdiction efforts, such as those in Clear Creek County, to secure grants to help develop data that will better inform the air quality measurements and mitigation
- Support engine idling ordinance to restrict emissions produced from idling auto and commercial vehicles, especially buses, delivery trucks, etc.
- Continue to explore highway maintenance strategies to minimize the amount of sand used for winter maintenance and to remove the sand from the roadway to minimize re-entrained dust
- Continue to support regional, statewide, and national efforts to reduce air pollutants and comply with current air quality regulations

This document acknowledges that some air quality issues, particularly emissions of greenhouse gases, are global issues that are difficult to affect on a project-specific level. As such, the lead agencies are committed to working on these broad issues, as described in **Chapter 4, Cumulative Impacts Analysis**, while also incorporating measures to control air pollutant emissions locally.

Because project alternatives are not anticipated to cause or result in violations of any NAAQS, most mitigation measures for air quality will center on controlling fugitive dust during construction, operations, and maintenance. The following conceptual techniques for mitigation of construction impacts could be considered:

- Control fugitive dust through a fugitive dust control plan, including wetting of disturbed areas
- Use the cleanest fuels available at the time in construction equipment and vehicles to reduce exhaust emissions
- Keep construction equipment well maintained to ensure that exhaust systems are in good working order
- Control blasting and avoid blasting on days with high winds to minimize windblown dust from blasting, particularly near community areas
- Minimize dust from construction in or near tailing areas
- Air quality monitoring during construction, including PM 2.5 monitoring
- Investigate requirements or incentives for retrofitting construction vehicles and equipment to reduce emissions (such as idling equipment)

During Tier 2 processes, CDOT will conduct the following activities:

- Develop specific and more detailed mitigation strategies and measures
- Develop best management practices specific to each project
- Adhere to any new laws and regulations that may be in place when Tier 2 processes are underway

Mitigation strategies are also discussed in **Section 3.19, Mitigation Summary**.

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