

## 5.20 Human Health Conditions

*This section discusses what the existing concerns are about health issues in the project area (based on public comment), and relates these concerns to the analyses of air quality, noise, and hazardous materials performed for this project.*

*Additionally, at the request of the public commenters, it summarizes human health studies performed in the area in recent years by other parties that are not part of this project specifically.*

Since the Supplemental Draft EIS was published in August 2014, additional analyses and content review have been performed for many of the resources discussed in this document. These updates, along with changes resulting from the comments received on the Supplemental Draft EIS, have been incorporated into this Final EIS.

This Chapter is a new inclusion for the Final EIS and was not included in the Supplemental Draft EIS. Previously, the discussion summarizing health studies was included in Section 5.2, Social and Economic Conditions.

### 5.20.1 Why discuss human health conditions?

Human health conditions are important in the project area. Several of the analyses in the Final EIS are designed to determine if project activities create new health hazards that are not currently present, worsen existing health conditions, or contribute to a cumulative adverse impact to the health of residents or workers in the area.

During project scoping meetings for the proposed improvements to I-70, the public expressed concerns about various health issues within and near the project study area that they felt should be evaluated. In addition, the proximity of Swansea Elementary School to I-70 in the project area raised concerns about potential health impacts to children attending the school.

Following the release of the Draft EIS in 2008 and the Supplemental Draft EIS in 2014, many comments were received on health and how it relates to the project.

### 5.20.2 How are project impacts, benefits, and mitigation measures related to human health evaluated in this document?

The concerns to human health included in this section are organized by topics identified during project scoping and from public comments received on the 2008 Draft EIS and the 2014 Supplemental Draft EIS. Specific resource sections in this Final EIS listed below were reviewed to determine if there would be associated potential impacts to human health. The following discussions are not listed in order of importance, but in the order in which they appear in this Final EIS:

- Transportation facilities and choice
- Air quality
- Noise
- Water quality
- Hazardous materials

A full discussion of project impacts for each of the resources listed above can be found in Chapter 4 and Section 5.2 for transportation facilities and choice, Section 5.10 for air quality, Section 5.12 for noise, Section 5.16 for water quality, and Section 5.18 for hazardous materials. In the following subsections, a short summary of possible outcomes is included.

Each of these resources also includes a discussion of the benefits related to health and the highway cover included in the identified Preferred Alternative, the Partial Cover Lowered Alternative with Managed Lanes Option. Construction impacts and mitigations also are discussed.

#### ***Transportation facilities and choice***

As noted in Chapter 4, Transportation Impacts and Mitigation Measures, of this document, pedestrian and bicycle facility improvements associated with the Build Alternatives will enhance the safety of pedestrians and bicyclists within the study area. Intersections that are being improved will have countdown lights installed at signalized crosswalks to improve pedestrian safety. More opportunities to enhance the pedestrian environment include sidewalk connectivity, ADA improvements, greater sidewalk width, and improved lighting. These enhancements will potentially benefit human health by improving multi-modal connectivity in the project area. In addition, the Build Alternatives will

enhance the safety of the motorists using the facilities by utilizing the current highway design standards (such as shoulder widths, lane widths, grades, and curves).

### Benefits of the highway cover (Preferred Alternative only)

The proposed landscaped highway cover between Columbine Street and Clayton Street that is included as part of the Partial Cover Lowered Alternative will provide multiple benefits to human health in the Elyria and Swansea neighborhood. The proposed cover will reconnect the north and south sides of the neighborhood by providing a safe connection for pedestrians and bicyclists across I-70, allowing them to cross anywhere along the cover area and thereby improving non-motorized connectivity. The cover also will provide a place for activity and exercise. The Partial Cover Lowered Alternative also maintains the existing local north-south street network and it provides a greater sense of neighborhood cohesion by removing the dominant visual barrier created by the highway structure in this neighborhood.

### Construction Mitigation

As discussed in Section 5.2, Social and Economic Conditions, temporary construction impacts associated with project alternatives include construction-related travel disruptions (such as road closures, detours, and access and circulation disruptions), RTD service disruptions and/or delays, and traffic-related travel disruptions. These impacts will cause temporary quality-of-life disruptions to households near construction areas. People who work near construction areas or use affected roadways to travel to other activities (for example, health care) also will experience some temporary disruption during construction.

Proposed mitigation measures for these disruptions include:

- Provide safe and efficient connections through the neighborhood during construction for all modes of transportation, including bicycles and pedestrians.
- Coordinate with local municipal officials during construction to minimize effects on emergency service providers and response times.
- Coordinate with RTD more than 30 days in advance during construction to minimize disruptions to service areas and schedules and notify transit users in advance of any closures, delays, or modifications in bus or rail routes.

### *Air quality*

As summarized in Section 5.10, Air Quality, the air quality analysis follows guidelines established by EPA for conducting analysis of air quality impacts for project alternatives. With regard to carbon monoxide and PM<sub>10</sub> for all project alternatives, the project is not expected to cause any new violations of any standard, increase frequency or severity of any existing violation, or delay timely attainment of the NAAQS or required interim milestones. The modeled values are below the NAAQS and demonstrate that there is no exceedance or impact from the project based on EPA's health-based standards for these pollutants.

Results of the carbon monoxide hotspot analysis indicate that both the 1-hour and 8-hour concentrations at the worst-case location, Colorado Boulevard, are below the NAAQS. Results of PM<sub>10</sub> analysis indicate 24-hour PM<sub>10</sub> concentrations do not exceed the NAAQS for any of the project alternatives, including the identified Preferred Alternative, the Partial Cover Lowered Alternative with Managed Lanes Option.

A comparison of air quality conditions for all pollutants demonstrates the effects of minor differences in traffic volume and roadway configuration between the alternatives; air pollution impacts for all design alternatives are similar.

Several factors are evident at the conclusion of the analysis:

- Air quality conditions under the No-Action Alternative are similar to all alternatives analyzed.
- Traffic volume and traffic speed are the primary drivers of project-level air quality impacts.
- Fugitive dust emissions from road sanding, as well as road dust and brake and tire wear, are the primary indicators of future particulate matter emissions.

Motor vehicle emissions from the implementation of the No-Action Alternative and the Build Alternatives will not cause or contribute to any new localized carbon monoxide or particulate matter violations, nor will they increase the frequency or severity of any existing violations based on the hotspot analysis. Therefore, no specific mitigation measures are necessary for the project to proceed. Although mitigation is not required, one or more of the potential emission reduction measures described below will be utilized to minimize impacts to air quality. Each of these measures will result in a benefit to human health.

- Any transportation-related measures or voluntary baseline emission reduction strategies already included as part of carbon monoxide or particulate matter maintenance plans that relate to I-70 East, such as street sanding/sweeping activities, will continue to be implemented.
- During construction, dust emissions should be minimized by following BMPs to control fugitive dust (see **Exhibit 5.10-26** for a summary of these activities and practices).
- Ongoing and planned strategies to reduce precursor emissions of volatile organic compounds and nitrogen oxides in the Denver/North Front Range ozone nonattainment area—including multi-modal transportation options, rideshare programs, vehicle emissions testing, and intersection improvements—will be implemented. Likewise, several strategies have been, and continue to be, implemented to maintain carbon monoxide and PM<sub>10</sub> attainment. For details of these strategies to manage criteria pollutant emissions, see Attachment J, *Air Quality Technical Report*.
- Construction-related fugitive particle emissions will be minimized by implementing dust control practices in accordance with requirements in CDPHE Air Quality Control Commission Regulation No. 1, Emission Control for Particulate Matter, Smoke, Carbon Monoxide, and Sulfur Oxides.

In summary, the NAAQS limits set by the EPA protect human health. The modeled values for the I-70 East project are below the NAAQS and demonstrate that there is no exceedance or impact from the project based on the EPA's health-based standards for these pollutants. Therefore, there are no projected impacts from the project related to NAAQS.

In addition, CDOT conducted a mobile source air toxic emissions analysis for the area affected by the project, and the analysis estimates that emissions in the project design year will be roughly 80 percent lower than current emissions. Additionally, the emissions for all of the Build Alternatives vary from 2.1 percent to 3.8 percent higher than the No-Action Alternative.

### Benefits of the highway cover (Preferred Alternative only)

The cover included with the Partial Cover Lowered Alternative is an emissions reduction strategy for the area around Swansea Elementary School. The cover will redirect PM<sub>10</sub>, carbon monoxide, and other emissions away from the school and the surrounding neighborhood. It also includes trees as an amenity on top of the highway cover, since trees provide incidental benefits to air quality.

### Construction Mitigation

Dust during construction could be particularly problematic for residents in the Elyria and Swansea Neighborhood who do not have air conditioners and ventilate their homes by opening windows. For households using window ventilation, construction dust could be an issue on windy days. Dust suppression measures (for example, stabilizing and covering loads of soil and debris during transport and storage, or stabilizing and revegetating exposed areas after construction) will be implemented to control dust impacts.

To mitigate additional dust concerns during construction for residents close to the highway, between 45th Avenue and 47th Avenue from Brighton Boulevard to Colorado Boulevard, CDOT will provide:

- Two free portable or window-mounted air conditioning units with air filtration and assistance for the potential additional utility costs
- Interior storm windows

Also, an Air Quality Monitoring, Maintenance, and Mitigation Plan will be prepared prior to construction and will include continuous PM<sub>10</sub> monitoring during construction, as described in Section 5.10, Air Quality.

### Noise

Section 5.12, Noise, of this chapter identifies existing noise conditions and potential noise impacts from the proposed improvements to I-70. Results of the analysis show that all of the alternatives will cause noise to exceed the NAC of 66 dBA at various locations, including Swansea Elementary School. The section includes a discussion on where noise mitigation is needed, what that noise mitigation will look like, and how much noise reduction the mitigation will achieve. **Exhibit 5.20-1** summarizes by alternative the number of noise receptors that exceed the NAC threshold both with and without mitigation.

**Exhibit 5.20-1 Noise Receptors Exceeding NAC Threshold by Alternative**

| Alternative/Option                        | Number of Noise Receptors | Number of Noise Receptors that Exceed NAC Threshold |                 | Number of Noise Receptors with a Substantial Noise Increase |                 |
|---|---------------------------|---|-----------------|---|-----------------|
|   |                           | Without Mitigation                                  | With Mitigation | Without Mitigation  | With Mitigation |
| Existing                                  | 940                       | 91  |                 | N/A   |                 |
| No-Action Alternative, North Option       | 890                       | 362   | 59              | 40  | 0               |
| No-Action Alternative, South Option       | 857                       | 360   | 54              | 34  | 0               |
| Revised Viaduct Alternative, North Option | 896                       | 453   | 114             | 97  | 0               |
| Revised Viaduct Alternative, South Option | 873                       | 432   | 83              | 68  | 2               |
| Partial Cover Lowered Alternative         | 873                       | 155   | 108             | 11  | 0               |

As discussed in Section 5.12, Noise, noise walls will be constructed, where feasible and reasonable, to mitigate the future traffic noise from the reconstructed I-70. In several locations, the proposed noise walls will reduce the number of noise receptors below existing conditions, resulting in a benefit to human health.

#### Benefits of the highway cover (Preferred Alternative only)

The proposed landscaped highway cover between Columbine Street and Clayton Street that is included as part of the Partial Cover Lowered Alternative helps reduce noise pollution at Swansea Elementary School and in the surrounding neighborhood. The highway cover is a noise barrier that will assist in reducing the number of noise receptors below existing conditions, resulting in a benefit to human health.

#### Construction Mitigation

Construction noise will present short-term effects to those receptors located along the corridor and along designated construction access routes. It is anticipated that a portion of the construction will occur at night to minimize traffic disruption. The primary source of construction noise is expected to be diesel-powered equipment, such as trucks and earth-moving equipment, and construction activities, such as demolition hammers on trackhoes, rubble load outs, and tailgate and bucket bang.

Ambient noise from construction is a concern among the residents around the construction zone—specifically in the Elyria and Swansea Neighborhood, since many residents do not have air conditioners and ventilate their homes by opening windows. As previously described under air quality

for construction impacts related to dust, to mitigate noise concerns during construction for residents close to the highway, between 45th Avenue and 47th Avenue from Brighton Boulevard to Colorado Boulevard, CDOT will provide:

- Two free portable or window-mounted air conditioning units with air filtration and assistance for the potential additional utility costs
- Interior storm windows

CDOT also will comply with Denver regulations on construction noise, as discussed in Section 5.12, Noise.

Pile driving and demolition are expected to be the loudest construction operations. Piles will be required at most major bridge installations. Bridge and road demolition also will be required at many locations.

Measures will be taken to minimize noise during construction. Mitigation actions specific to construction noise impacts are summarized in Section 5.12 and include limiting construction noise during school hours in the vicinity of Swansea Elementary School and idling equipment motors when the equipment is not in use.

### ***Water quality***

As discussed in Section 5.16, Water Quality, both the South Platte River and Sand Creek cross the I-70 corridor and are listed on the Section 303(d) list for impaired waters. The primary reason both streams are listed for impairment is most likely due to polluted urban runoff in the highly urbanized watershed in which they are located. CDOT cannot prevent individuals from having contact with these impaired water bodies; however, efforts by CDOT to prevent polluting factors from impacting water quality in the study area will benefit human health.

The following is a list of polluting factors from roadway runoff during storm events and the reason why they are analyzed:

- Lead, copper, and zinc are a concern because they dissolve in water and can have toxic effects when they build up in water plants and aquatic life.
- Total Suspended Solids is a concern because it can increase the murkiness of water; as the floating particles in murky water settle, this can lead to loss of aquatic habitat and channel instability.



- Phosphorus is a concern because it can increase the production of algae in water, which can reduce oxygen levels in streams.

As noted in Section 5.16, Water Quality, runoff from I-70 will be captured and conveyed in a storm drain system that discharges to the South Platte River. Prior to discharging to the receiving streams, the onsite drainage system will discharge to a water quality pond to provide water quality treatment. The outlet of the pond is smaller than the inlet of the pond, so runoff is temporarily stored in the pond and releases over a period of a few days. During this time (CDOT requires a minimum drain time of 40 hours), sediment settles out of the runoff and is stored in the pond; then, the runoff, with reduced sediments, discharges to the receiving stream.

Additional permanent BMPs discussed in Section 5.16 also will be implemented to remove particulate pollutants from stormwater. This will provide further benefits to human health.

### Construction Mitigation

During construction, as soils are disturbed, storm runoff may create erosion and degradation of water quality if proper BMPs are not employed. Alternative implementation will be done in accordance with the programs established under CDOT's MS4 permit. Site-specific engineering design studies will be performed during final design, and care will be exercised during construction to prevent problems of stability and erosion during and after construction. To mitigate these effects, BMPs for erosion and sediment control, dust control, stormwater control, and expansive soils will be implemented during construction. BMPs for erosion and blowing dust during construction include the use of silt fences, erosion control blankets, sediment traps, sediment basins, soil stockpile management, temporary diversion structures, and spill prevention and control measures.

After construction, other BMPs will be followed for permanent erosion control. These include regrading as necessary, seeding and revegetating soils and slopes, mulch protection for new plantings, and stormwater control channels.

### Hazardous materials

During construction activities, hazardous materials may impact the health and safety of workers, as well as environmental resources and community residents located

#### Common contaminants

Common contaminants identified in soil and/or groundwater include:

- Petroleum products (i.e., fuels, oils)
- Chlorinated solvents
- Metals
- Asbestos

within the project corridor and surrounding area. Also, encountering hazardous materials during construction can impact the cost of construction, as contaminated media generated during construction must be managed in accordance with federal and state regulations.

Section 5.18, Hazardous Materials, of this chapter provides a summary of the environmental records search conducted on the project study area. As noted in Section 5.18, the likelihood of impacting hazardous materials is dependent on the number of hazardous materials sites encountered during construction. In addition, the location and amount of contamination remaining at the site also will dictate impacts. The Partial Cover Lowered Alternative could affect up to 25 known hazardous materials sites since it will require a large amount of soil displacement to lower the highway below grade. This soil displacement has raised concerns from local residents since several extensive soil remediation projects have occurred in the project corridor.

Any contamination encountered during the construction of the project will be cleaned up in compliance with applicable state and federal regulations, which will benefit human health by removing contaminated soils. CDOT also is working with the EPA and will collect representative soil samples of recently cleaned-up residential properties pre-, during, and post-construction to test for lead and arsenic to ensure that the properties aren't re-contaminated due to construction activities; this will include identifying three or four properties from the EPA's database and contacting those property owners to ensure they will participate in this activity. Specific mitigation measures related to hazardous materials are detailed in Section 5.18 of this chapter.

### 5.20.3 What conclusions can be drawn about potential human health impacts?

As previously discussed, several impact categories could result in negative effects to human health in the project study area. However, with implementation of BMPs and mitigation measures, these potential negative effects will be avoided or minimized. BMPs and mitigation measures are listed in Chapter 9, Preferred Alternative Mitigation Commitments. **Exhibit 5.20-2** summarizes the impacts and mitigations highlighted in this section.

**Exhibit 5.20-2 Summary of Impacts and Mitigations**

| Resource                              | Impacts and/or Benefits and Mitigations  |
|---------------------------------------|--|
| Transportation facilities and choices | <ul style="list-style-type: none"> <li>• Pedestrian and bicycle facility improvements associated with the Build Alternatives will enhance the safety of pedestrians and bicyclists within the study area</li> <li>• The proposed cover will reconnect the north and south sides of the neighborhood by providing a safe connection for pedestrians and bicyclists across I-70, the cover also will provide a place for activity and exercise</li> </ul>  |
| Air quality                           | <ul style="list-style-type: none"> <li>• Air quality conditions under the No-Action Alternative are similar to all alternatives analyzed</li> <li>• Motor vehicle emissions from the implementation of the No-Action Alternative and the Build Alternatives will not cause or contribute to any new localized carbon monoxide or particulate matter violations, nor will they increase the frequency or severity of any existing violations based on the hotspot analysis</li> <li>• Modeled values for the I-70 East project are below the NAAQS and demonstrate that there is no exceedance or impact from the project based on EPA's health-based standards for these pollutants</li> <li>• The cover included with the Preferred Alternative is an emissions reduction strategy for the area around Swansea Elementary School. The cover will redirect PM<sub>10</sub>, carbon monoxide, and other emissions away from that stretch of highway and the surrounding neighborhood</li> </ul> |
| Noise                                 | <ul style="list-style-type: none"> <li>• Noise walls will be constructed, where feasible and reasonable, to mitigate the future traffic noise from the reconstructed I-70</li> <li>• In several locations, the proposed noise walls will reduce the number of noise receptors below existing conditions, resulting in a benefit to human health</li> <li>• The highway cover included with the Preferred Alternative is a noise barrier that will assist in reducing the number of noise receptors below existing conditions, resulting in a benefit to human health</li> </ul>  |
| Water quality                         | <ul style="list-style-type: none"> <li>• Prior to discharging to the receiving streams, the onsite drainage system will discharge to a water quality pond to provide water quality treatment</li> <li>• Additional permanent BMPs discussed in Section 5.16 also will be implemented to remove particulate pollutants from stormwater which will provide further benefits to human health</li> </ul>   |
| Hazardous materials                   | <ul style="list-style-type: none"> <li>• Any contamination encountered during the construction of the project will be cleaned up in compliance with applicable state and federal regulations, which will benefit human health by removing contaminated soils</li> <li>• Collect representative soil samples of three or four recently cleaned-up residential properties pre-, during, and post-construction to test for lead and arsenic to ensure that the properties aren't re-contaminated due to construction activities</li> </ul>  |

Additionally, the landscaped cover over the highway in the identified Preferred Alternative will potentially provide improved health outcomes. When combined with project BMPs and mitigation measures, opportunities to improve existing human health conditions may be even greater.

#### 5.20.4 What additional studies were conducted by others on human health conditions within or near the study area?

In addition to the project impacts, benefits, and mitigation measures (discussed in the previous subsection) that could have an impact on human health due to the project alternatives, a review of recent studies of human health conditions within and near the project area was conducted. Studies conducted by major agencies responsible for public health—including CDPHE, the Denver Department of Environmental Health, and the USDA—were identified that included information about the study corridor.

Although not a study, the EPA announced in December 2014 that residential soil sampling and cleanup is complete at the Vasquez Boulevard and I-70 Superfund site. However, EPA was not able to gain access from the owners of a few properties. Reviewing these properties will be part of the state of Colorado's operation and maintenance responsibilities and these properties will be reviewed as part of future Vasquez Boulevard and I-70 five-year reviews.

Some of the reports summarized below have been brought to the attention of the project team by members of the public. The listing of these studies does not infer any endorsement, nor does it include any conclusions regarding the accuracy or applicability of these studies. Six relevant studies were identified to review:

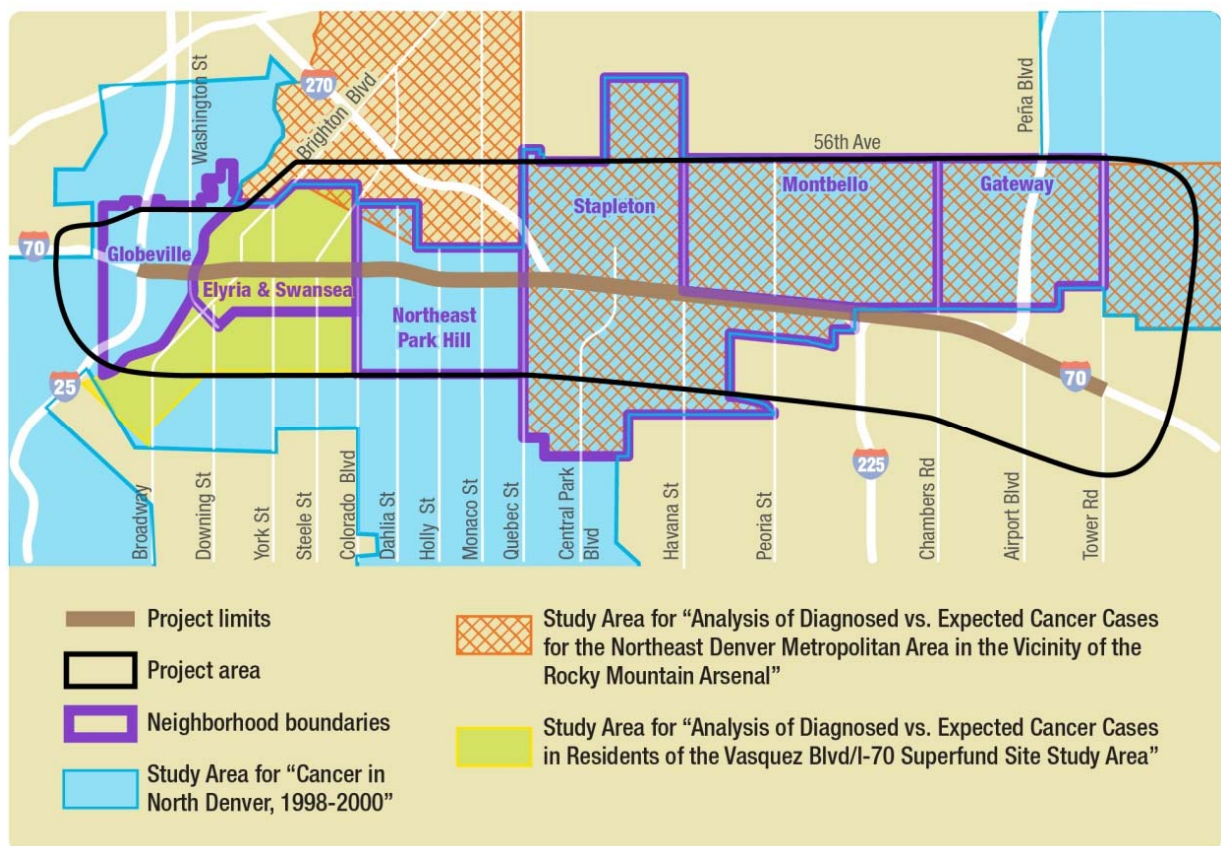
- Health Impact Assessment: *How Neighborhood Planning Affects Health in Globeville and Elyria Swansea* (Denver, 2014)
- *Good Neighbor Project* (Denver Department of Environmental Health, 2007)
- CDPHE cancer study: Urban Air Toxics Concentration in Denver, May 2002 through April 2003 (CDPHE, 2006)
- CDPHE cancer study: *Analysis of Diagnosed Versus Expected Cancer Cases in Residents of the Vasquez*

*Boulevard/I-70 Superfund Site Study Area* (CDPHE, 2003a)

- CDPHE cancer study: *Cancer in North Denver: 1998-2000* (CDPHE, 2002)
- CDPHE cancer study: *Analysis of Diagnosed Versus Expected Cancer Cases for the Northeast Denver Metropolitan Area in the Vicinity of the Rocky Mountain Arsenal, 1979-1996 and 1997-2000* (CDPHE, 2003a and 2003b)

A summary of each study is discussed below and the study areas for three of these studies are shown in **Exhibit 5.20-3**. Boundaries are not shown for the other three studies as they are too small or are consistent with neighborhood boundaries.

**Exhibit 5.20-3 Areas of Analysis for Studies Conducted by Others Within or Near the Study Area**



Cancer occurrence studies were conducted by the CDPHE in response to concerns about exposure to environmental contaminants associated with hazardous waste sites located within and near the project study area. The studies provide an index of cancer occurrence in some of the communities in

and near the study area. Based on CDPHE's cancer study results, the occurrence of certain types of cancer is higher in the EIS study area than in the Denver MSA as a whole. CDPHE noted that other factors—such as exposure to carcinogens in the occupational, indoor, and ambient air—and behavioral risk factors—such as smoking, dietary habits, and alcohol consumption—also may contribute to the overall individual and population risk (CDPHE 2002, 2003a, 2003b, 2003c). The most recent update of this information does not indicate a change in the previously reported trends (CDPHE, 2010).

This discussion is not a comprehensive assessment of the current health status in the study area. The studies summarized here do not provide indicators of human health as it relates to the proposed project and are being provided only to establish that many studies of this area have been done over the past 15 to 35 years.

### ***How Neighborhood Planning Affects Health in Globeville and Elyria Swansea***

The Health Impact Assessment (HIA), *How Neighborhood Planning Affects Health in Globeville and Elyria Swansea* was completed in September 2014 by the Denver Department of Environmental Health. The HIA focuses solely on the Globeville and Elyria Swansea Neighborhood Plans and does not examine specific development projects, including I-70 East. This HIA is described as a “process to incorporate health considerations into a plan, project, or policy.” Through resident participation in the neighborhood planning and HIA processes, five major health factors were identified and analyzed in the HIA. These included:

- Environmental quality
- Connectivity and mobility
- Access to goods and services
- Community safety
- Mental wellbeing

Key findings of the HIA reflect the public's concerns for the population groups and resources identified in Sections 5.2.4 and 5.2.5 of the Final EIS, and the findings of studies previously discussed in this section. The key findings of the HIA are discussed in the following subsections.

### Environmental quality

- Highway traffic is the main source of air pollution in the communities
- There are noticeable spikes in poor air quality depending on location, time of day, and weather. Annual average air pollution is not higher than in other areas of Denver.
- Odors emitted from industrial operations sometimes cause short-term health effects, such as watering eyes or throat irritation.
- Highway traffic, freight trains, and industrial plants generate noise at levels that sometimes exceed recommended federal thresholds.
- Two large soil cleanup projects have mostly been completed over the last several decades, yet residents continue to express concerns about hazardous materials in the soil and a distrust of government intentions in the cleanup efforts.
- A lack of trees and green infrastructure in the Globeville and Elyria and Swansea neighborhoods does not help to improve air and water quality.

### Connectivity and mobility

- Physical barriers, such as railroad tracks and disconnected roads, isolate residents and limit opportunities for physical activity, including walking.
- Residents are concerned with the number of freight trucks on residential streets.
- Many streets lack sidewalks, bus stops lack benches or safe places to stand, and there is minimal bicycle infrastructure.
- Many residents do not own a vehicle and therefore, must rely on public transportation. Pedestrian, bicycle, and bus connections to four new transit rail stations in the neighborhoods are unclear to residents.

### Access to goods and services

- There is no grocery store in the community and convenience stores do not offer affordable, nutritious, or fresh produce.
- Residents must travel outside of the neighborhoods since there are few retail stores or local services.

- Residents reported concerns about safety and amenities in the neighborhoods. Residents also identified a lack of programming at neighborhood recreation centers that meets their needs.

### Community safety

- Vehicle crashes at some intersections has raised concerns about unsafe conditions for pedestrians and bicyclists.
- Resident perception of crime is higher than reported crime rates. There is some concern that crime may go unreported due to resident unwillingness to interact with law enforcement.
- Street lighting is inadequate and less than in other Denver neighborhoods.
- Residents raised safety concerns due to the presence of graffiti, illegal activities, and stray animals.

### Mental wellbeing

- Odor and noise impacts add stress to residents in their lives.
- Trains cause lengthy delays for vehicles and pedestrians.
- Concerns about safety limit resident use of parks and the South Platte River Greenway trail.
- Resident perception of and fear of pollution continue despite the substantial environmental cleanup activities. Lack of outreach in Spanish regarding this issue has led to continued misperceptions among residents who only speak Spanish.
- Unknown impacts associated with the construction activities of the I-70 project and other large redevelopment projects in the neighborhoods add to residents' stress.

### ***Good Neighbor Project***

*Going One Step Beyond in North Denver: A Neighborhood Scale Air Toxics Assessment* (Denver Department of Environmental Health, 2007), otherwise known as the Good Neighbor Project, was a detailed air pollution modeling assessment that evaluated known sources of emissions in the Globeville and Elyria and Swansea neighborhoods, as well as in Commerce City. It built upon previous



assessments conducted by the Denver Department of Environmental Health.

The primary goal of the Good Neighbor Project was to evaluate concentration gradients of air pollutants near major roadways like I-70, I-25, I-270, and Colorado Boulevard. Earlier Denver Department of Environmental Health assessments apportioned county-level emissions to census block groups using a variety of surrogate data, such as VMT and population density. Earlier assessments tended to spread the emissions across the entire block group, whereas the Good Neighbor Project allocated on-road mobile source emissions to actual roadways.

Key findings of this study include:

- Modeled mean annual concentrations from highways were well below estimated Integrated Risk Information System (IRIS) cancer (1/100,000) and non-cancer risk values for all six MSAT;
- Modeled concentrations dropped off sharply within 150 feet of roadways;
- Modeled MSAT concentrations tended to be higher along highways near the Denver Central Business District (CBD) than along the I-70 East corridor (in some cases, they were higher within the CBD itself, as were the monitored values); and
- Dispersion model results were generally lower than monitored concentrations but within a factor of two at all locations.

These findings match with air pollution monitoring data collected along freeways in California (Zhu et al, 2002). The Good Neighbor Project study provided a much improved level of detail over earlier Denver Department of Environmental Health assessments, though it required a significantly higher level of resources across a limited geographic area.

***CDPHE cancer studies: Urban Air Toxics Concentration in Denver, May 2002 through April 2003***

In this 2006 report, CDPHE discusses occurrences of cancer, from May 2002 to April 2003, and airborne pollutants exhibited at air monitoring stations near I-70 East (CDPHE, 2006). Although none of the pollutants or the pollutant concentrations were unique to Denver, total cancer risks were found to range from 100 to 200 excess cancers per one

million people. This range slightly exceeds the EPA's proposed "acceptable" health risk for carcinogens which is one in one million to 100 per million. The report also concluded that there were little to no known non-cancer health risks associated with the pollutants exhibited in the area.

***CDPHE cancer studies: Analysis of Diagnosed Versus Expected Cancer Cases in Residents of the Vasquez Boulevard/I-70 Superfund Site Study Area***

The *Analysis of Diagnosed Versus Expected Cancer Cases in Residents of the Vasquez Boulevard/I-70 Superfund Site Study Area* (CDPHE, 2003a) investigated cancer occurrence for neighborhoods in the Vasquez Boulevard/I-70 Superfund Site in north-central Denver. Previous studies conducted by the U.S. EPA have indicated high levels of arsenic and lead in soil at some homes in the Elyria and Swansea, Clayton, Cole, and southwest Globeville neighborhoods. The study was conducted at the request of citizen representatives of Colorado People's Environmental and Economic Network and the Cole, Elyria and Swansea, and Clayton Neighborhood Coalition to conduct a review of cancer rates in their community. The study area for this report is shown in **Exhibit 5.20-3**.

CDPHE found an elevated incidence of cancer in the Superfund Site Study Area. Additional statistical analyses did not detect an association between the occurrence of lung cancer and high levels of arsenic in the soil of homes where individuals with lung cancer lived. CDPHE notes that many or most of the lung and laryngeal cancers reported from these neighborhoods are likely related to smoking.

***CDPHE cancer studies: Cancer in North Denver: 1998-2000***

The primary focus of *Cancer in North Denver: 1998-2000* (CDPHE, 2002) was to analyze cancer rates in North Denver compared to those in the Denver MSA, and to identify behavioral and other risk factors that could be contributing to observed elevated rates. The study area for this report is shown in **Exhibit 5.20-3**.

The principal findings of the comparisons between North Denver and the remainder of the Denver MSA include:

- For all cancer types combined, cancer rates in North Denver were statistically higher for men of all racial/ethnic backgrounds combined, and for non-

- Latino White men and women considered as subgroups.
- For some specific cancer types, cancer rates in North Denver were statistically higher for men and women of all racial/ethnic backgrounds combined, and for non-Latino White men and women considered as subgroups, but not for Latino men or women, nor for non-Latino African-American men or women.
  - Cancer rates in North Denver were not statistically higher for Latino or non-Latino African-American men and women, either considering all cancer types together or for individual types of cancer.

***CDPHE cancer studies: Analysis of Diagnosed Versus Expected Cancer Cases for the Northeast Denver Metropolitan Area in the Vicinity of the Rocky Mountain Arsenal, 1979-1996 and 1997-2000***

These two reports (CDPHE, 2003a and 2003b), covering the periods 1979 through 1996 and 1997 through 2000, report the initial and follow-up findings of previous cancer surveillance for communities in the northeast Denver metropolitan area—specifically, the area surrounding the Rocky Mountain Arsenal National Wildlife Refuge in Adams County (north of 56th Avenue), and the Stapleton and Montbello neighborhoods. Both reports have the same study area shown in **Exhibit 5.20-3**.

As indicated in both the 1979 to 1996 and 1997 to 2000 analyses, when all cancers were combined together within a study area, there were not statistically significant differences between the study area populations and the Denver metropolitan area population. However, when the data were disaggregated and examined to show different types of cancer, statistically significant differences between the populations of each study area and the Denver metropolitan area population were identified.

### 5.20.5 What additional studies conducted by others on human health conditions outside of the study area were reviewed?

As previously noted, air quality in the project area or the Denver region is not anticipated to worsen over existing conditions. However, public concern regarding air quality continues. An additional review of literature on air pollution health effects was conducted, including the following reports:

- Health Risk Contributions from Highway Projects
- Status of Research on Potential Mitigation Concepts to Reduce Exposure to Nearby Traffic Pollution (Air Resources Board of California Environmental Protection, 2012)
- Air Quality in Southern California—Time for a Paradigm Shift (Winer, 2004)
- Near-Roadway Air Pollution and Coronary Heart Disease: Burden of Disease and Potential Impact of a Greenhouse Gas Reduction Strategy in Southern California (Environmental Health Perspectives, July 2015)
- Associations of Mortality with Long-Term Exposures to Fine and Ultrafine Particles, Species and Sources: Results from the California Teachers Study Cohort (Environmental Health Perspectives, June 2015)

The last four reports were cited by members of the public, identifying correlations between human health effects to roadway proximity. FHWA's listing of the last four studies does not infer any endorsement, nor does it include any conclusions regarding the accuracy or applicability of these studies. The following are summaries of the additional literature review.

#### ***Health Risk Contributions from Highway Projects***

At the request of EPA, FHWA conducted a review of four separate health risk assessments from around the country for the South Mountain Freeway (Loop 202) EIS in Arizona. FHWA's review focused on the methodologies used in the studies and the findings related to incremental health risks. All four studies reported a very low risk of estimated incremental cancer risk from vehicle traffic at each studies' worst-case location. The following is the conclusion from the South Mountain Freeway EIS review of these reports.

“To help put these low health risks from roadway emissions into perspective, FHWA compared them with health risks from traffic fatalities. In 2010, there were 2.47 million deaths in the United States, and 32,728 of these were due to traffic fatalities, meaning that the risk of dying in a traffic accident in 2010 was 0.0106 percent. Converted to terms of risk per million people, this represents a risk of 106 in a million per year, or 7,420 in a million as a 70-year lifetime risk, consistent with cancer risk estimation. While this risk is very high, and while FHWA is actively working to improve highway safety, most people seem to consider this risk “acceptable” in the sense that they do not avoid vehicle trips to reduce it. Also, if the MSAT risk estimates in the studies summarized above are correct, it means that the incremental risk of cancer from breathing air near a major roadway is several hundred times lower than the risk of a fatal accident from using a major roadway.

EPA must make decisions regarding acceptable risk when it develops regulations to control hazardous air pollutants (air toxics) under Titles II and III of the Clean Air Act. EPA’s National Emission Standards for Hazardous Air Pollutants for benzene emissions is based on attaining a risk level of no more than 100 cases of cancer per million people. EPA’s 2007 MSATs rule, covering vehicles, fuels, and fuel containers, is designed to result in a remaining risk of approximately 5 in a million. Both of these risk levels, considered acceptable by EPA as an outcome of its rulemaking processes, are much higher than the estimated risk from the highway projects that FHWA reviewed.” (pg 4-81, AZDOT FEIS 2014)

***Status of Research on Potential Mitigation Concepts to Reduce Exposure to Nearby Traffic Pollution (Air Resources Board of California Environmental Protection, 2012)***

In the *Status of Research on Potential Mitigation Concepts to Reduce Exposure to Nearby Traffic Pollution*, the Air Resources Board of California Environmental Protection reports that populations living within 500 feet of busy roadways are highly prone to pollutants associated with vehicular traffic. They also reported that among residents living near roadways, children are more vulnerable to adverse health effects of traffic emissions because they tend

to spend a larger amount of time outside and have higher breathing rates per unit of body mass relative to adults.

***Air Quality in Southern California—Time for a Paradigm Shift (Winer, 2004)***

The *Air Quality in Southern California – Time for a Paradigm Shift*, reports that poor health conditions exist in close proximity to heavy traffic corridors, especially at locations where the traffic make-up consists of diesel fuel vehicles. Pollution from these vehicles has been linked with declines in lung function and increased respiratory symptoms. The study concludes that pollution is both a regional and localized issue for people living near to major roadways.

***Near-Roadway Air Pollution and Coronary Heart Disease: Burden of Disease and Potential Impact of a Greenhouse Gas Reduction Strategy in Southern California (Environmental Health Perspectives, July 2015)***

The study investigated the burden of coronary heart disease from near-roadway air pollution and compared it with the PM<sub>2.5</sub> burden in the California South Coast Air Basin for 2008 and under a compact urban growth greenhouse gas reduction scenario for 2035. The study results suggest that a large burden of preventable coronary heart disease mortality is attributable to near-roadway air pollution and is likely to increase even with decreasing exposure by 2035 due to the vulnerability of an aging population. The study also notes that greenhouse gas reduction strategies developed to mitigate climate change offer unexploited opportunities for air pollution health co-benefits.

***Associations of Mortality with Long-Term Exposures to Fine and Ultrafine Particles, Species and Sources: Results from the California Teachers Study Cohort (Environmental Health Perspectives, June 2015)***

The study researched the effectiveness of near-road vehicle emissions modeling to assess human effects. Using an emissions-based model, the research team observed significant positive associations between ischemic heart disease mortality and both fine and ultrafine particle species and sources. The results of this research project suggest that the exposure model effectively measured local exposures and facilitated the examination of the relative toxicity of particle species.