

1. Executive Summary

The Gateway Cities Air Quality Action Plan (AQAP) is a corridor-specific study requested by the I-710 Oversight Policy Committee in 2004. Funding for the AQAP has been secured and the study is now underway. It will assess how best to continue to improve air quality and public health by addressing both near-term and long-term measures for emissions reductions for all Gateway Cities. The Gateway Cities Council of Governments (GCCOG) is responsible for preparing the AQAP.

At the request of the I-710 Project Committee, this Health Impact Assessment (HIA) is one component that was added to the original scope of work for the AQAP. It is intended to assess the proposed I-710 Corridor Project alternatives and to evaluate selected health determinants to assess health outcomes linked to proposed actions of each alternative. At the time the AQAP was initiated (and subsequently the HIA), only draft I-710 technical studies were available. As such, the draft I-710 technical studies were used as resource material for input into this HIA.

For the purpose of context, the Los Angeles County Metropolitan Transportation Authority (Metro) and its funding partners are preparing the I-710 Corridor Project Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) to analyze alternatives for improving Interstate (I-) 710 from Ocean Boulevard in the City of Long Beach to State Route (SR-) 60, a distance of 18 miles. The purpose and need of the I-710 Corridor Project, as stated in the EIR/EIS Notice of Preparation, are to:

- Improve air quality and public health
- Improve traffic safety
- Address design deficiencies
- Address projected traffic volumes
- Address projected growth in population, employment, and economic activities related to goods movement.

An HIA is a public engagement and decision-support tool that can be used to assess planning and policy proposals, and make recommendations to improve the health outcomes associated with those proposals. Environmental, social, demographic, and economic conditions drive the health and wellbeing of communities. Factors such as transportation, employment and income, noise, air quality, access to goods and services, and social networks have well-demonstrated and reproducible links to health outcomes. HIA investigates these relationships in the context of specific policy proposals and makes predictions related to health outcomes through a six-step process, as shown below in Table 1-1.

This executive summary briefly describes the screening and scoping processes of the I-710 HIA, and summarizes key findings and recommendations related to the six domains assessed in the HIA: mobility, air quality, noise, traffic safety, jobs and economic development, and access to neighborhood resources.

Table 1-1. The Steps of Health Impact Assessment

Screening	Determines the need and value of an HIA
Scoping	Determines which health impacts to evaluate, methods for analysis, and a workplan
Assessment	Provides: 1) a profile of existing health conditions 2) evaluation of potential health impacts
Recommendations	Provide strategies to manage identified adverse health impacts
Reporting	Includes: 1) development of the HIA report 2) communication of findings and recommendations
Monitoring	Tracks: 1) impacts on decision-making processes and the decision 2) impacts of the decision on health determinants

1.1 Screening

Screening, the first step of HIA, involves establishing the feasibility and value of an HIA for a particular decision-making context. A number of factors were taken into consideration in making the decision to conduct this HIA on the I-710 Corridor Project:

- Conditions related to the I-710 (e.g., air quality and traffic safety) are currently impacting the health of residents in the surrounding communities, and the proposed project has potentially significant health implications for these residents.
- There is a wealth of research, literature, and methods available to conduct this analysis. This includes the I-710 EIR/EIS, which analyzes the benefits, costs, and impacts of the alternative being considered, and thus contains a large amount of information that can be used as a starting point for analyzing health outcomes in the HIA.
- Residents near the I-710 and other stakeholders have vocalized their health-related concerns regarding the project and have called on decision-making bodies to conduct an HIA.
- Decision-making bodies associated with the I-710 Corridor Project voted in favor of conducting an HIA.

As a result of these factors, it was decided to conduct this HIA. Human Impact Partners led the I-710 HIA with support of a project team that consisted of Metro, GCCOG, ICF International, and Arellano and Associates.

The Project Team for the I-710 HIA was guided by input from the Gateway Cities Air Quality Action Plan I-710 Health Impact Assessment Technical Working Group (TWG), the Gateway Cities Air Quality Action Plan Technical Roundtable, the Gateway Cities Air Quality Action Plan Advisory Roundtable, and the Gateway Cities Environmental Committee. The GCCOG Transportation Committee and Board of Directors also participated in the preparation of the HIA.

The I-710 HIA will be used to inform the development of additional measures to further improve public health outcomes resulting from the I-710 Corridor Project alternatives and will be provided to the I-710 Corridor Project EIR/EIS Project Team upon completion. The decision, which has yet to be made, to include the results of the I-710 HIA in the I-710 Corridor Project EIR/EIS rests with the California Department of Transportation (Caltrans), lead agency for the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).

1.2 Scoping

Scoping, the second step of HIA, involves determining which health determinants and impacts to evaluate, data sources and methods for analysis, and a workplan for completing the HIA.

The initial guidance for the I-710 HIA Scoping was provided by the I-710 Health Impact Assessment Technical Working Group, and subsequently the Gateway Cities Air Quality Action Plan Technical Roundtable, the Gateway Cities Air Quality Action Plan Advisory Roundtable, and the Gateway Cities Environmental Committee.

The goals of this HIA are to:

- Provide I-710 Corridor Project decision-makers and other stakeholders with positive and negative health effects, findings, and recommendations for alternatives being considered.
- Increase stakeholder participation and understanding of the I-710 Corridor Project.
- Identify community health concerns/issues within the Gateway Cities and their relationship to the I-710 Corridor Project.
- Provide a model for future transportation and infrastructure HIAs (including evidence and utility of conducting an HIA).
- Add value to the I-710 related analyses while utilizing the I-710 Corridor Project EIR/EIS technical data in the HIA to the greatest extent possible to reduce redundancy.

These goals set some parameters for the analysis. For example, the HIA analyzed only the alternatives being considered in the EIR/EIS and no other alternatives. These alternatives were:

- Alternative 1—No Build Alternative: This alternative consists of those transportation projects that are already programmed and/or committed to be constructed by or before the study's planning horizon year of 2035.
- Alternative 5A—Freeway Widening up to 10 General Purpose (GP) Lanes: The intent of Alternative 5A is to improve the I-710 mainline by widening the freeway to include ten lanes throughout the length of the corridor and modernizing its design. Alternative 5A also includes: the projects included in Alternative 1; Transportation Systems Management/Transportation Demand Management (TSM/TDM)/Transit/Intelligent Transportation Systems (ITS) improvements—including operational investments, policies, and actions aimed at improving goods movement—and passenger auto and transit travel; and arterial highway and I-710 congestion relief improvements including arterial highway improvements.

- Alternative 6A—10 GP Lanes plus Four-Lane Freight Corridor: Alternative 6A includes all the improvements from Alternative 5A with the addition of four separated freight movement lanes for exclusive use by conventional trucks from the ports (Ocean Boulevard) to the intermodal rail yards in Commerce and Vernon. This alternative is the Locally Preferred Strategy (LPS) that resulted from the prior I-710 Major Corridor Study plus additional design concept refinements.
- Alternative 6B—10 GP Lanes plus a Zero-Emission Four-Lane Freight Corridor. Alternative 6B includes all the improvements of Alternative 6A (described above) with the Freight Corridor restricted to trucks with zero tailpipe emissions. The Freight Corridor does not preclude future conversion to a fixed guideway (e.g. MagLev).
- Alternative 6C—10 GP Lanes plus a tolled Four-Lane Freight Corridor: Alternative 6C includes all the improvements of Alternatives 6A, but would toll trucks using the freight corridor.

The HIA used the same assumptions as, and much data from the draft I-710 technical studies. The HIA was completed before the draft EIR/EIS was completed, however, and not all the EIR/EIS data (e.g., noise and PM_{2.5} modeling) was available. Therefore there are sections of the HIA that should be revisited when all the EIR/EIS data is available.

The following health determinants were selected for study:

- Mobility
- Air quality
- Noise
- Traffic safety
- Jobs and economic development
- Access to neighborhood resources

Pathway diagrams (examples shown in Figures 1-1 and 1-2) for each of these health determinants were developed to describe how the proposed project would impact health. Geographic boundaries were determined for each health determinant. Similar to the draft I-710 technical studies (i.e. the I-710 EIR/EIS), the HIA analyzed impacts in the year 2035 only. In addition to assessing impacts on the general population, impacts on vulnerable populations—including those defined by age, race/ethnicity, and/or income—were considered when stratified data was available.

The detailed scope is available in Chapter 3 of the report.

Figure 1-1. The Potential Health Impacts of the I-710 Corridor Project Mediated through Air Quality

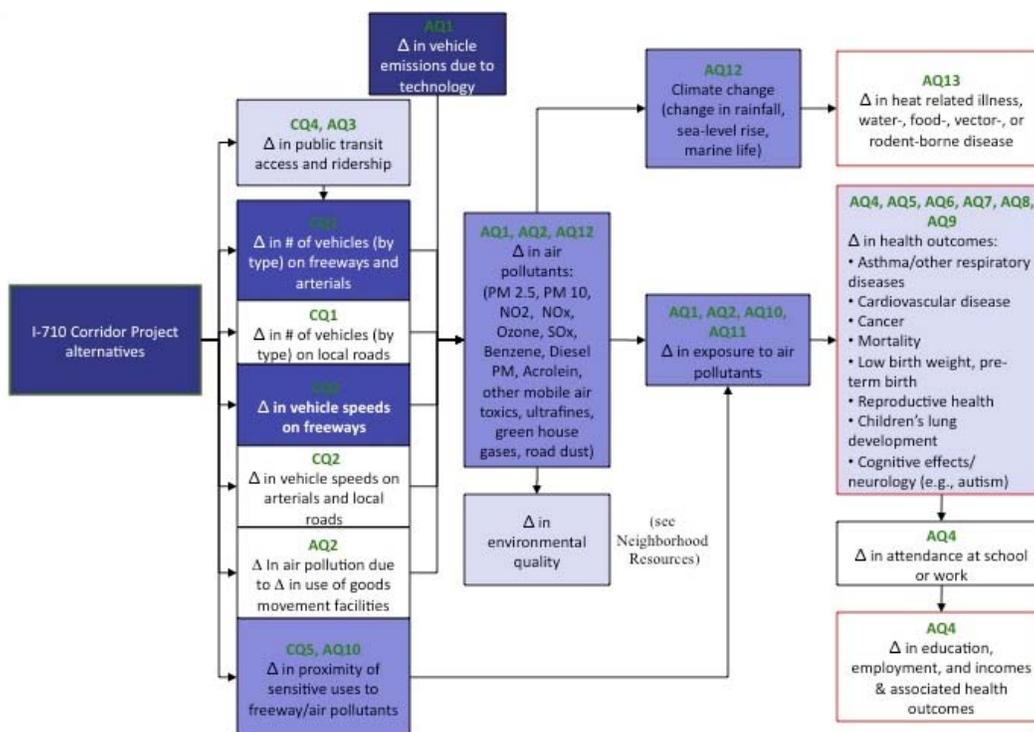
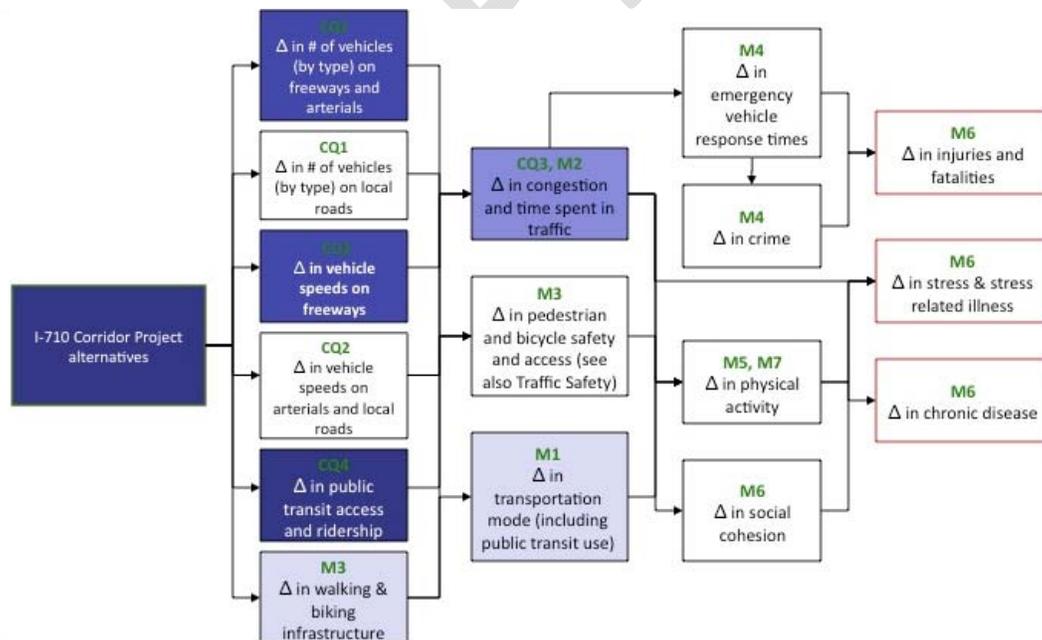


Figure 1-2. The Potential Health Impacts of the I-710 Corridor Project Mediated through Mobility



- Health impacts of stress include: poor mental health, increased inflammatory response, decreased immune response
- Health impacts of chronic disease includes: heart disease, diabetes, hypertension,
- Health impacts of delayed emergency response times include: stress, potential for survival and recovery

1.3 Assessment

Assessment, the third stage of HIA, involves profiling existing conditions and evaluating potential health outcomes. Scientific evidence found in the public health literature was reviewed to evaluate the relationships hypothesized in the pathway diagrams developed during scoping. Existing conditions data was collected from a number of sources, including documents being prepared for the EIR/EIS and other project-related documents (e.g., the Final I-710 Tier 2 Committee Report), the U.S. Census Bureau, the Los Angeles County Department of Public Health, the Office of Statewide Health Planning and Development, Metro, the Statewide Integrated Traffic Records System, and elsewhere. Using all this information, the proposed alternatives were then analyzed to understand how each would impact health.

One important caveat related to the Assessment findings in this HIA is that when analyzing effect levels for public health impacts, the transition from risk exposure to disease is complex and multifactorial. Many diseases are borne of multiple overlapping risk exposures, as well as social, economic, and environmental risk modifiers. Modifying factors are not distributed equally between all subpopulations. In addition, there is often a long delay between exposure and overt disease for many health determinants. This HIA investigates many health impacts and diseases but should not be construed as implying that the I-710 is or will be the only factor that determines health outcomes in the communities discussed.

Findings for each of the six health determinant assessed in the HIA are described in Section 1.4 below.

1.4 Findings and Recommendations

As described below and in greater detail in the full HIA report, the HIA finds that, compared to 2008 baseline, the alternatives under consideration are likely to lead to mixed health impacts:

- Health would likely improve under all the alternatives in terms of air quality impacts and as a result of an increase in the number of jobs available in the I-710 corridor.
- Negative health impacts related to noise and traffic safety will diminish the project's objective of improving public health and traffic safety.
- Based on changes in access to neighborhood resources, the health of some populations (i.e., those living further from the freeway) would be expected to improve, while other populations (i.e., those living closest to the freeway) would be expected to experience negative health impacts.
- Impacts from changes in mobility were not found to be health beneficial, and, as such, the proposed alternatives miss important opportunities to improve public health.

Findings and recommendations for each of the six analyzed health determinants are summarized briefly below.

Many of the issues addressed in the HIA are ongoing concerns in the LA region. It is critically important that implementation of the recommendations to improve conditions related to health outcomes be addressed on a regional scale, with multiple stakeholders, multiple jurisdictions, and multiple agencies

collaborating, and with multiple sources of funding. The I-710 Corridor Project can have a role in implementing these recommendations, though it may not be the lead in all cases and will need to coordinate and work with others. The I-710 Corridor Project can provide some of the impetus for change and doing so would help the project meet its stated public health objectives.

1.4.1 Mobility

Findings

Under all of the alternatives, automobile and truck traffic volumes on the freeway and arterials; speeds on the freeway, and, under some alternatives, on the arterials; vehicle miles traveled (VMT); and vehicle trips are likely to increase. The amount of these increases is dependent on the alternative. Although the EIR/EIS assumes the same public transit ridership for each alternative, the transportation literature indicates that mode share is likely to be dependent on traffic speeds and volumes, which differ between project alternatives. Traffic volumes and speeds are also likely to impact the use of active transportation—walking and biking—as a mode of transportation.

Scientific evidence in the public health literature firmly establishes the relationship between transportation mode choice and health. The health effects of mode choice are mediated through the following:

- Physical activity through active transport: Even small changes in physical activity rates resulting from changes in walking and biking would be likely to lead to changes in diabetes, heart disease, obesity, stress, mental illness, and longevity. Because higher traffic volumes on arterials and higher speeds on arterials and the freeway will reduce rates of walking and biking, Alternatives 6A/B/C are least likely to increase physical activity and positively impact these health outcomes. Alternative 5A is likely to have slightly better outcomes than Alternatives 6A/B/C because freeway speeds are lower. Because congestion may discourage driving, and thus raise the rate of transit use, Alternative 1 is likely to negatively impact physical activity and health the least of all the alternatives being considered. These impacts are likely to most affect children, the elderly, and disabled and lower-income people who have fewer opportunities to participate in sports or formal exercise programs.
- Social cohesion: Social connectivity helps manage stress, and is connected with longer lifespan and access to emotional and physical resources. Generally speaking, reductions in travel times and VMT and increases in walking/biking and public transit use will increase the amount of time one has with family, for social activities, and with neighbors. Because increases in travel speeds are likely to be offset by decreases in walking/biking, Alternatives Alternatives 6A/B/C are unlikely to positively impact social cohesion. Negative impacts on social cohesion are more likely for Alternatives 1 and 5A than for Alternatives 6A/B/C because of longer commute times.
- Emergency response times: Under Alternatives 6A/B/C, emergency response times are likely to improve somewhat as a result of higher traffic speeds and will improve health outcomes associated with medical response. Under Alternative 5A, response times are likely to be similar to current levels because traffic speeds are similar. With lower roadway speeds, Alternative 1 is likely to result in

slightly longer response times, which would put more people at risk of poor outcomes in emergency situations. The impacts of these changes are likely to be minor.

As a result of these changes in active transport and social cohesion, levels of chronic disease (e.g., cardiovascular disease, diabetes) and mental illness (e.g., depression) are expected to stay the same or increase, and lifespan is expected to stay the same or decrease. Small changes in active transport could lead to significant changes in lifespan, chronic disease, and mental health, so this represents a significant lost opportunity to improve public health.

The health impacts of the proposed I-710 Corridor Project EIR/EIS alternatives mediated through mobility are summarized in Table 1-2.

Table 1-2. Summary of Predicted Mobility-Related Health Impacts

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Chronic disease (e.g., cardiovascular disease, diabetes) and decreased lifespan (primarily from changes in active transportation but also changes in social cohesion and stress)					
1	~/-	Potentially significant, non-quantifiable	Mod-High	◆◆◆	Project will have multiple impacts, some of which offset others.
5A					
6A					
6B					
6C					
Mental illness (e.g., depression; primarily from changes in active transportation, but also from changes in social cohesion and stress)					
1	~/-	Potentially significant, non-quantifiable	Mod-High	◆◆	Project will have multiple impacts, some of which offset others.
5A					
6A					
6B					
6C					
Negative health outcomes associated with delayed emergency response					
1	-	Minor	Mod-High	◆	Data in the literature is not conclusive regarding the impact of response time on health outcomes; emergency response time changes roughly estimated.
5A	~	Negligible			
6A	+	Minor			
6B	+	Minor			
6C	+	Minor			
Explanations: <i>Impact</i> refers to whether the alternative will improve (+), harm (-), or not impact health (~). <i>Magnitude</i> reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events): Negligible, Minor, Moderate, Major. <i>Severity</i> reflects the nature of the effect on function and life-expectancy and its permanence: High = intense/severe; Mod = Moderate; Low = not intense or severe. <i>Strength of Causal Evidence</i> refers to the strength of the research/evidence showing causal relationship between mobility and the health outcome: ◆ = plausible but insufficient evidence; ◆◆ = likely but more evidence needed; ◆◆◆ = high degree of confidence in causal relationship. A causal effect means that the effect is likely to occur, irrespective of the magnitude and severity.					

Recommendations

To offset the negative health impacts associated with the reliance on driving as the primary mechanism for mobility, the alternatives being considered should include more concrete proposals and commitments to improve public transit, walkability, and bikeability. For example, public transit, walking, and biking infrastructure improvements proposed in the 2008 Regional Transportation Plan should be fully funded before the I-710 Corridor Project funding commitments are sought. Such proposals and commitments would help the project meet its stated objective of improving public health. A complete set of recommendations is contained in the main HIA chapters below; some key recommendations include:

Vehicle Travel

- Adopt or advocate for policies to reduce automobile and truck usage including, for example, by increasing use of the lowest emission rail technologies to transport freight and continuing to promote land use policies in the Gateway Cities that encourage higher density and mixed use development.
- Reduce and enforce speeds on targeted roadways using traffic calming for safety and to encourage bicycling and walking. Incorporate a bicycle and pedestrian plan (e.g., complete streets) into the project.
- For any alternative selected, fully fund and if necessary strengthen enforcement of truck route regulations.

Public Transportation

- Evaluate options for dedicated bus lanes on targeted arterials to improve transit speed to make it more time-competitive with automobile and train trips.
- Support improvements of bus stops to make them safer, more accessible by foot, and more comfortable.
- Conduct an equity analysis to examine where transit will be most used and will have the greatest impact while serving those with the most need for transit options.

Walkability

- In targeted areas, using physical engineered measures, reduce traffic speeds and volumes on streets with restaurants, stores, and services so that safety and walkability are improved. Examples include chicanes, lateral shifts, reduced lane width, pedestrian refuges, and narrower lane width.
- Support improvements in pedestrian infrastructure, including piano-key crosswalk striping and pedestrian count-down signals at signalized intersections.
- Assist in funding opportunities and/or direct project mitigation (as appropriate) that connects and/or creates pedestrian-friendly links between residential areas, transit-oriented neighborhoods/facilities, selected commercial and mixed use communities across and along the

freeway, arterials, and the LA River (and Rio Honda Channel where appropriate). The cross-links or connectors should provide quality walking environments with access to existing or planned trails or other pedestrian networks.

Bikeability

- Create more bicycling routes and improve bicycling infrastructure beyond what is already proposed with the 2012 Regional Transportation Plan to offset increased traffic and volume associated with any alternative.

1.4.2 Air Quality

Findings

Los Angeles has the worst air pollution in the nation, primarily as a result of motor vehicle use. The I-710 is a major corridor linking the ports of Long Beach and Los Angeles to other major highways and communities in the region. Traffic flow on the I-710 is very high, and over 25% of vehicles are heavy-duty diesel trucks. Vehicle emissions impact air quality in the corridor communities and region, and contribute significantly to regional greenhouse gas emissions.

Scientific evidence in the public health literature firmly establishes the relationship between traffic-related air pollution and numerous negative health impacts. Traffic-related air pollutants known to impact health include the following:

- Criteria air pollutants: ozone, particulate matter (PM, including PM₁₀, PM_{2.5}, and ultrafines), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide, and lead.
- Mobile Source Air Toxics (MSATs): while there are hundreds of MSATs, the six most commonly studied are benzene, 1,3-Butadiene, formaldehyde, acrolein, acetaldehyde, and diesel particulate matter (DPM).
- Greenhouse gases (GHGs) such as carbon dioxide (CO₂).

It is well documented that traffic is a significant source of most of these air pollutants. Other sources include, for example, maritime vessels and point sources such as refineries and warehouses. Research also suggests that low income and minority populations live closer to busy roadways and freeways, and thus are exposed to higher concentrations of air pollutants from vehicle emissions.

Health outcomes causally related to these pollutants include asthma and other respiratory diseases, cardiovascular disease, cancer, premature death, mortality, and preterm and low birth weight births. Furthermore, epidemiologic studies have consistently demonstrated that children and adults living in proximity to busy roadways have poorer health outcomes. Many studies supporting these findings have been conducted in southern California, and several have been specific to the I-710.

Although traffic volumes are assumed to increase significantly, because of cleaner fuels and more efficient technologies, under all the alternatives being considered in the I-710 Corridor Project, air quality in 2035 near the I-710 and in the region is predicted to improve. With reductions in emissions of

and exposure to NO₂, CO, PM_{2.5}, and PM₁₀ as well as the MSATs, asthma, mortality, cancer, cardiovascular disease, and low birth weight and preterm birth levels will decrease. These reductions in air pollution from the I-710 do not ensure that the region will meet PM_{2.5} air quality standards. Also note that these conclusions are based on preliminary and incomplete data contained in an early version of the draft I-710 AQ/HRA technical study.

Due to increased population and vehicle usage, levels of regional GHGs are estimated to increase under all of the alternatives, but this is not expected to noticeably result in impacts to health in the I-710 corridor.

The health impacts of the proposed I-710 Corridor Project EIR/EIS alternatives mediated through air quality are summarized in Table 1-3.

Table 1-3. Summary of Predicted Air Quality–Related Health Impacts

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Asthma					
1	+	Odds ratio of 1.15 for every 10 µg/m ³ increase of annual average NO ₂	High	◆◆◆	Final traffic analyses and air quality modeling were not available at the time of completion of this HIA; modeling results are not always accurate.
5A					
6A					
6B					
6C					
Mortality					
1	+	Estimates pending PM _{2.5} modeling data	High	◆◆◆	Modeled estimates of mortality attributable to PM _{2.5} were not available for this analysis. Magnitude is not estimated.
5A					
6A					
6B					
6C					
Cancer risk (from MSATs from the I-710 corridor)					
1	+	Minor	High	◆◆◆	Final traffic analyses and air quality modeling were not available at the time of completion of this HIA; modeling results are not always accurate.
5A		Minor			
6A		Minor			
6B		Minor			
6C		Not available			
Cardiovascular disease					
1	+	Magnitude not estimated	High	◆◆◆	Final traffic analyses and air quality modeling were not available at the time of completion of this HIA; modeling results are not always accurate.
5A					
6A					
6B					
6C					

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Low birth weight and pre-term births					
1	+	Magnitude not estimated	Mod	◆◆	Final traffic analyses and air quality modeling were not available at the time of completion of this HIA; modeling results are not always accurate.
5A					
6A					
6B					
6C					
<p>Explanations:</p> <p>Impact refers to whether the alternative will improve (+), harm (-), or not impact health (~).</p> <p>Magnitude reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events): Negligible, Minor, Moderate, Major.</p> <p>Severity reflects the nature of the effect on function and life-expectancy and its permanence: High = intense/severe; Mod = Moderate; Low = not intense or severe.</p> <p>Strength of Causal Evidence refers to the strength of the research/evidence showing causal relationship between air quality and the health outcome: ◆ = plausible but insufficient evidence; ◆◆ = likely but more evidence needed; ◆◆◆ = high degree of confidence in causal relationship. A causal effect means that the effect is likely to occur, irrespective of the magnitude and severity.</p>					

Recommendations

Although air quality is predicted to improve, because the issue is a primary concern of the community, there are steps that can be taken to further improve air quality and public health in the I-710 corridor. Many of the recommendations in this HIA can be implemented before the project is complete. A full set of recommendations is contained in the main HIA chapters below.

Research and Analysis

- Confirm the findings in this HIA with the final data from traffic modeling in the I-710 Corridor Project EIR/EIS and the Health Risk Assessment (HRA), including completing the particulate matter analyses.
- Ensure air quality modeling takes into account the distribution of air pollution in the presence of sound walls and the impacts of low noise road surfaces, if there are any.
- Fund a study to understand the most effective way to accelerate the adoption of zero emission technologies for trucks carrying freight under any alternative being considered for the I-710.

Goods Movement, Transportation, and Land Use Planning

- For any alternative, aggressively pursue policies that accelerate the use of zero emission trucks.
- Invest resources for planning and implementation of bike and walking infrastructure to improve walking and biking conditions, increase walking and biking mode share, and reduce vehicle trips.
- Support development and implementation of alternative transport of goods from the ports, such as lowest emission rail technology possible, in the I-710 corridor and beyond.
- Planning departments should ensure that all local land use planning improves the separation of residential and other sensitive uses from the goods movement infrastructure. All attempts should be

made to move the goods movement infrastructure as close to the freeway as possible and to move sensitive uses away from the freeway and its associated traffic as well as away from the goods movement infrastructure. For example, 1) develop truck parking facilities and truck stops with services near the freeway and 2) pass city ordinances that would a) restrict potential land uses to reduce conflicts between sensitive receptors and air pollution-producing facilities and b) require new residential construction or uses to evaluate air existing pollution levels and mitigate if necessary before issuing permits.

- Develop a complete inventory of goods movement facilities (e.g., warehouses, transloading facilities) in the corridor in order to be able to understand the impacts that air pollution related to these facilities have on nearby receptors.

Air Pollution Emissions Reductions and Exposure Mitigations

- Aggressively apply a variety of truck emissions reductions strategies. Aggressively pursue strategies outlined by the Federal Highway Administration (FHWA) to reduce truck emissions through technology advancements and operations. Strategies include the implementation and use of filters and catalysts, the use of alternative “cleaner” fuel, increasing fuel efficiency, replacement of vehicle fleets, and reducing truck idling.
- Provide increased incentives for cleaner trucks, especially for local and small businesses that may not be able to afford truck upgrades/replacement.
- Increase vegetation known to reduce air pollutants (such as conifer trees) along the I-710.

Funding, Enforcing, and Strengthening Air Quality-Related Regulations

- Seek funding for mitigations (such as providing safer and more accessible access to walking, biking, and transit to reduce individual automobile driving by mode shift) and treatment of air quality impacts (e.g., asthma case management programs); or, if Alternative 6C is adopted, use revenue from tolling for this purpose. Consider tolling (per truck or per volume of pollutants emitted) under all alternatives to provide revenue to fund mitigation strategies.
- If cleaner trucks or zero emission trucks are adopted as a strategy, ensure that proper regulatory and enforcement actions maintain emissions reduction goals over time and that such efforts are fully funded.
- Enforce and, if needed, strengthen regulations regarding truck emissions and consider funding truck emissions reduction programs.
- For any alternative selected, fully fund and, if necessary, strengthen enforcement of truck route usage as well as idling regulations. For example, truck routes should not be located near sensitive receptors such as parks, schools, and senior citizen facilities.

Post Build Out Monitoring and Mitigation

- After the project is completed, regularly monitor air quality at sensitive receptors such as schools, community centers, libraries, and senior facilities. If air pollutant levels rise above what is

considered harmful to human health and this is attributable to the I-710 project, commit to retrofit these facilities (e.g., providing upgrades to building thermal performance and ventilation systems) to keep indoor air pollutant levels below that which is considered harmful to human health.

- After the project is completed, regularly monitor air pollution levels at parks and playgrounds. If air pollutant levels rise above what is considered harmful to human health and this is attributable to the I-710 project, commit to providing communities with new parks away from freeways.

If any alternative that includes zero emission trucks is adopted, policies and mechanisms must be put in place before construction begins to ensure that the freight corridor is used only by designated clean trucks. If such policies are not securely in place, there is the possibility that the freight corridor could be built and it is then found that implementing the zero emission truck policy is impossible, which would be detrimental to air quality and health. The communities neighboring the I-710 must have concrete assurances that zero emissions truck policies for the freight corridor will be implemented and enforced.

1.4.3 Noise

Findings

Scientific evidence in the public health literature firmly establishes the relationship between traffic-related noise and health. The health effects of noise from the I-710, truck traffic on arterials and local roads, and goods movement facilities in the communities near the I-710 include the following:

- Annoyance: Annoyance is related to several health effects associated with noise, including elevated blood pressure, circulatory disease, ulcers, and colitis. An estimated 22,000 and 35,000 people would currently report being highly annoyed by exposure to noise in the southern portion of the I-710 corridor (south of I-105). Estimated 2035 noise levels under all alternatives being considered in the EIR/EIS are well above the 50–55 A-weighted decibels (dBA) noise levels at which a causal effect of noise on annoyance has been well established.
- Sleep Disturbance: Sleep disturbance has been shown to begin in the 55–60 dBA range. An estimated 5,000 and 7,000 people would currently be expected to report high degrees of sleep disturbance as a result of noise exposure in the southern portion of the I-710 corridor (south of I-105). Estimated 2035 noise levels under all alternatives at night are likely to be above the range at which sleep disturbance begins. Health consequences of lack of sleep include fatigue, impaired endocrine and immune systems, and psychological effects.
- Cardiovascular disease: Estimated 2035 noise levels under all alternatives are in the range of levels at which noise has been shown to cause hypertension ($L_{dn} = 70$ dBA) and myocardial infarction ($L_d = 60$ dBA).
- Cognitive impairment and academic achievement in children: Without mitigation, under all alternatives being considered, the number of schools with indoor noise levels well above the World Health Organization (WHO) recommended 35 dBA is highly likely to increase. There is significant evidence that many school age children will be at increased risk of attention span, concentration and remembering, and reading ability deficits. These are likely to result in significant impacts on

lifespan, earning potential and the associated impacts on health of income, and prevalence of chronic and contagious disease as well as mental health issues.

- Hearing impairment: There is strong evidence that none of the alternatives being considered is likely to result in noise levels that would lead to hearing impairment. However, people with existing hearing impairment, for example, seniors experiencing hearing loss, will be impacted. Those populations will have more difficulty communicating with others as a result of higher noise levels.

The health impacts of the proposed I-710 Corridor Project EIR/EIS alternatives mediated through noise are summarized in Table 1-4.

Table 1-4. Summary of Predicted Noise-Related Health Impacts

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Annoyance					
1	-	Estimates pending noise modeling data from Caltrans	Low	◆◆◆	Modeled changes in noise exposure were not available for this analysis; magnitude is not estimated.
5A					
6A					
6B					
6C					
Sleep disturbance					
1	-	Estimates pending noise modeling data from Caltrans	Mod-High	◆◆◆	Modeled changes in noise exposure were not available for this analysis; magnitude is not estimated.
5A					
6A					
6B					
6C					
Cardiovascular disease (including hypertension and myocardial infarction)					
1	-	Estimates pending noise modeling data from Caltrans	High	◆◆	Modeled changes in noise exposure were not available for this analysis; magnitude is not estimated.
5A					
6A					
6B					
6C					
Cognitive impairment and academic achievement					
1	-	Estimates pending noise modeling data from Caltrans	Mod-High	◆◆◆	Modeled changes in noise exposure were not available for this analysis; magnitude is not estimated.
5A					
6A					
6B					
6C					

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Hearing impairment					
1	~	None	Mod	◆◆◆	
5A		None			
6A		None			
6B		None			
6C		None			
<p>Explanations:</p> <p>Impact refers to whether the alternative will improve (+), harm (-), or not impact health (~).</p> <p>Magnitude reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events): Negligible, Minor, Moderate, Major.</p> <p>Severity reflects the nature of the effect on function and life-expectancy and its permanence: High = intense/severe; Mod = Moderate; Low = not intense or severe.</p> <p>Strength of Causal Evidence refers to the strength of the research/evidence showing causal relationship between noise and the health outcome: ◆ = plausible but insufficient evidence; ◆◆ = likely but more evidence needed; ◆◆◆ = high degree of confidence in causal relationship. A causal effect means that the effect is likely to occur, irrespective of the magnitude and severity.</p>					

Recommendations

Caltrans has preliminarily identified locations for soundwalls near sensitive receptors along the I-710. This is a very important mitigation measure, but, as the Final I-710 Tier 2 Committee Report states, “Noise issues go beyond simply building more soundwalls.” In addition to building soundwalls the recommendations in the following areas would mitigate impacts of noise on health in the I-710 communities. A complete set of recommendations is contained in the main HIA chapters below.

Noise Analysis

- Complete the noise modeling for the I-710 Corridor Project EIR/EIS alternatives and use the results to quantitatively predict changes in annoyance and sleep disturbance under the proposed alternatives.

Goods Movement, Transportation, and Land Use Planning

- All strategies to reduce the number of trucks should be implemented, including other alternatives for moving freight such as increasing on-dock rail using the lowest emission rail technologies feasible.
- Develop truck parking facilities and truck stops with services (e.g., restaurants, repair shops) near the freeway so that drivers do not need to drive farther into the communities and near sensitive uses.
- Pass city ordinances restricting potential land uses to reduce conflict between sensitive receptors and noise-producing facilities.

Noise Mitigations through Design

- Construct sound walls in all locations in the corridor that are adjacent to a residential area, school, or park. For these soundwalls, use greening and aesthetic principles found in the project's Urban Design and Aesthetics Toolbox Report.
- Use low-noise (e.g., rubberized) road surfaces, evaluating alternative materials with regards to their effects on air quality.

Funding, Enforcing, and Strengthening Noise-Related Regulations

- For any alternative selected, fully fund and if necessary strengthen enforcement of truck route and parking regulations as well as idling regulations. For example, parking rules could prohibit trucks from parking adjacent to parks and other recreational facilities. Local jurisdictions could implement enforcement of the California Air Resources Board's (CARB's) idling regulations.

Post Build-Out Monitoring and Mitigations

- After the project is completed, regularly monitor noise levels at schools, community centers, libraries, and senior facilities. If noise levels rise above what is considered harmful to human health and this is attributable to the I-710 project, commit to retrofitting these facilities (e.g., providing upgrades to windows and ventilation systems) to keep indoor noise below levels considered harmful by the WHO guidelines.

1.4.4 Traffic Safety

Findings

Scientific evidence in the literature firmly establishes the relationship between traffic volumes and speeds and the number and severity of collisions involving cars, trucks, and/or pedestrians and bicyclists. The literature also firmly establishes the links between many roadway and intersection improvements (including the separation of trucks and cars on freeways) and collisions. The literature can generally be summarized as follows:

- Automobiles: The number of collisions involving cars increases with vehicle volume and speed. Many roadway and intersection improvements reduce the number of car collisions. The severity of collisions involving cars increases with speed.
- Trucks: The number and severity of collisions involving trucks increase with vehicle volume and speed. Separation of trucks from cars decreases the number and severity of collisions. Other roadway improvements (e.g., at ramps) can reduce the number of truck collisions as well. Collisions involving trucks tend to be disproportionately severe.
- Pedestrians/bicyclists: The number of collisions between a vehicle and a pedestrian or bicyclist increases with the volume of pedestrians/bikes. These collisions tend to be disproportionately severe.

Based on these findings and on anticipated changes for each alternative being considered in the I-710 Corridor Project EIR/EIS, in the I-710 general purpose lanes and on the arterials near the I-710:

- Alternative 1 will lead to an increase in the number of collisions involving cars, but these are likely to be lower severity collisions. The number of collisions involving trucks will also increase and these are likely to be higher severity collisions.
- It is uncertain how the number and severity of collisions will change under Alternatives 5A and 6A/B/C because some anticipated changes (e.g., increases in volumes and speeds) would increase the number and severity of collisions while others (e.g., separation of cars and trucks, ramp improvements, intersection improvements) would decrease the number and severity of collisions.
- On arterials and other roads nearby, future growth in population and traffic volume will result in an increased frequency of vehicle–pedestrian/bicycle collisions, which are disproportionately severe, under all alternatives. Changes in pedestrian/bicycle volumes specific to each alternative may lead to differences in the number of such collisions.

In addition, the number of hazardous material incidents on the I-710 is expected to increase in proportion to truck volume. Infrequently, such incidents can be highly severe, but most often they are of low severity.

The health impacts of the proposed I-710 Corridor Project EIR/EIS alternatives mediated through traffic safety are summarized in Table 1-5.

Table 1-5. Summary of Predicted Traffic Safety–Related Health Impacts

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Non-Truck Vehicle–Vehicle Fatalities and Injuries					
1	–	Minor	High	◆◆◆	Relative impacts of roadway improvements compared to volume and speed changes uncertain
5A	?	Unknown			
6A	?	Unknown			
6B	?	Unknown			
6C	?	Unknown			
Truck–Auto Fatalities and Injuries					
1	–	Moderate	High	◆◆◆	Relative impacts of roadway improvements compared to volume and speed changes uncertain
5A	?	Unknown			
6A	?	Unknown			
6B	?	Unknown			
6C	?	Unknown			

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Vehicle–Pedestrian/Bicycle Fatalities and Injuries					
1	-	Minor–Mod	High	◆◆	Changes in pedestrian and bicycle activity uncertain
5A		Minor			
6A		Minor			
6B		Minor			
6C		Minor			
Hazardous Materials Exposure from Releases					
1	~/-	Negligible	Typically low, but infrequently high	◆	High severity hazardous material spills are low probability events
5A		Negligible			
6A		Negligible			
6B		Negligible			
6C		Negligible			
<p>Explanations:</p> <p>Impact refers to whether the alternative will improve (+), harm (-), or not impact health (~). “?” indicates that the direction is uncertain.</p> <p>Magnitude reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events): Negligible, Minor, Moderate, Major.</p> <p>Severity reflects the nature of the effect on function and life-expectancy and its permanence: High = intense/severe; Mod = Moderate; Low = not intense or severe.</p> <p>Strength of Causal Evidence refers to the strength of the research/evidence showing causal relationship between traffic safety and the health outcome: ◆ = plausible but insufficient evidence; ◆◆ = likely but more evidence needed; ◆◆◆ = causal relationship certain. A causal effect means that the effect is likely to occur, irrespective of the magnitude and severity.</p>					

Recommendations

Causes of traffic collisions are complex and intertwined. The goals of vehicle-throughput efficiency and improved traffic safety, especially for non-motorized residents, can be at odds. The following recommendations would help mitigate the decreases in traffic safety that may result from changes in vehicle volumes and speeds on the freeway and arterials as well as increases in pedestrian and bicycle volumes on the arterials.

Traffic Safety Analysis

- Traffic safety experts should conduct an analysis of the impacts of the proposed I-710 improvements and the changes in volumes and speeds on collision rates using crash reduction factor methodology.
- Conduct further traffic modeling to determine vehicle speeds and trips taken on arterials to better understand the relationship between freeway expansion and traffic collisions in neighborhoods.

Vehicles

- Separate cars and trucks on the freeway under any alternative. This can be done through the freight corridor, as proposed in Alternative 6A/B/C, or through lane restrictions.
- Strictly enforce truck routes to keep them out of residential neighborhoods in order to reduce truck–pedestrian/bicyclist collisions.

Walking and Bicycling Improvements

- Supplement the intersection improvements outlined in the draft I-710 Corridor Project EIR/EIS with pedestrian-level improvements that increase their visibility and safety. Such improvements include, for example, clearly marked and protected crosswalks (e.g., with laddered crosswalks and pedestrian countdown signals).
- Starting with existing residential streets that are walkable/bikeable, expand the network of walkable/bikeable streets throughout the I-710 corridor to provide safe and pleasant streets that can be used for active transportation. This could include implementing “bicycle boulevards” (i.e., limited-access, low speed streets that have traffic calming features such as mid-block diverters with bicycle cut-outs) in local streets.
- Provide adequate facilities for pedestrians and bicyclists to cross the new Single Point Urban Interchanges (SPUIs) safely so that non-motorized transportation use is not discouraged.

1.4.5 Jobs and Economic Development

Findings

Income is one of the strongest and most consistent predictors of health and disease in the public health research literature, and health is inextricably linked to the availability and affordability of material resources. Because of this, the economic health of a region is an important indicator of the potential health of its residents.

Socioeconomic status (SES) has been extensively researched as a key factor that affects health. Scientific evidence in the public health literature firmly establishes the relationship between education, income, and occupational prestige or status, or “job control” and many health outcomes including lifespan, overall health, and chronic disease. In addition, unemployment has been shown to be a serious risk factor for both chronic disease and mental health.

All the alternatives being considered in the I-710 Corridor Project EIR/EIS assume that the Ports of Los Angeles and Long Beach will expand their operations to process approximately 42 million twenty-foot-equivalent units (TEUs) annually in 2035 (compared to approximately 13 million TEUs in 2008). In making this assumption, the EIR/EIS also therefore assumes that, under any alternative, the goods movement sector will grow the same (substantial) amount. The bulk of goods movement–related job growth is therefore assumed to be the same for all alternatives, and the differences between the alternatives in terms of job growth are limited to changes specific to each alternative. Because of this,

the primary factors that inform this HIA's impact analysis is the speed of moving freight, which may impact the cost of transported goods, and the location of future growth in the goods movement industry.

There are at least two competing hypotheses regarding impacts of the I-710 Corridor Project on the local economy in the study area and in the Gateway Cities:

- It is possible that Alternatives 5A and 6A/B/C will lead to economic growth along the corridor. As a result of decreased congestion and travel times, costs of business inputs may be lower, and the area may become more attractive to businesses for which these factors are important and thus improve commercial land values. On the other hand, under Alternative 1 congestion may increase the costs of doing business (e.g., by requiring the hiring of more truck drivers to move the same amount of goods) and may thereby hurt the local economy.
- It is also possible that, especially for Alternatives 6A/B/C, parts of the goods movement infrastructure (e.g., warehouses) may relocate farther from the ports to locations with cheaper land and less congestion (e.g., the Inland Empire). This could lead to decreased use of the goods movement facilities in the Gateway Cities and negative impacts on the local economy. Using this logic, Alternative 1, on the other hand, could make it more difficult for goods movement related business to move farther inland and thus keep businesses and jobs in the Gateway Cities. This may result in higher costs of doing business under Alternative 1, but an analysis of this is beyond the scope of this HIA.

Evidence suggests that total goods movement jobs will increase in the I-710 corridor because some industries, such as transloading facilities, are highly unlikely to move farther from the ports (Husing 2004). Overall changes in terms of numbers, types, and locations of jobs are difficult to predict and have not been modeled elsewhere. Therefore, there is not enough information to make more specific predictions regarding the impact of the I-710 alternatives on the future economy, the costs of doing business, business locations, the costs of goods and services, or employment in the study area or in the Gateway Cities.

Alternative 6B may also potentially create and foster a new sector of jobs in the research, development, and manufacturing of zero emission technologies. The growth of this "green" industry may help to increase employment rates in the study area, assuming that the education and skills required for these jobs either match the education and skill base of the local population or that a significant investment in local job-training is made. Increased employment would likely result in health benefits (e.g., increased lifespan, reduced chronic disease, and improved mental health) for corridor residents.

Increased employment and economic development is likely to result in increased tax revenue that could be used for health-beneficial services and projects. It is unclear whether income to local governments would offset the increased costs of services required to support businesses as well as the costs of maintaining roads that deteriorate quickly due to high truck volumes.

The increase in jobs in the I-710 corridor would result in health benefits (e.g., increased lifespan, reduced chronic and communicable disease, and improved mental health) for corridor residents if

employment for these jobs is sourced locally and if ample training opportunities are provided. The health impacts of the proposed I-710 Corridor Project EIR/EIS alternatives mediated through jobs and economic development are summarized in Table 1-6.

Table 1-6. Summary of Predicted Jobs-Related Health Impacts

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Chronic disease (e.g., cardiovascular disease, diabetes) and decreased lifespan (e.g., from changes in income, employment, and access to health benefits)					
1	+	Potentially significant, non-quantifiable	High	◆◆◆	Distribution of new jobs between I-710 Corridor Communities and greater region uncertain.
5A					
6A					
6B					
6C					
Mental Illness (e.g., depression; from changes in income and employment)					
1	+	Potentially significant, non-quantifiable	Mod-High	◆◆	Distribution of new jobs between I-710 Corridor Communities and greater region uncertain.
5A					
6A					
6B					
6C					
Explanations: <i>Impact</i> refers to whether the alternative will improve (+), harm (-), or not impact health (~). <i>Magnitude</i> reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events): Negligible, Minor, Moderate, Major. <i>Severity</i> reflects the nature of the effect on function and life-expectancy and its permanence: High = intense/severe; Mod = Moderate; Low = not intense or severe. <i>Strength of Causal Evidence</i> refers to the strength of the research/evidence showing causal relationship between noise and the health outcome: ◆ = plausible but insufficient evidence; ◆◆ = likely but more evidence needed; ◆◆◆ = high degree of confidence in causal relationship. A causal effect means that the effect is likely to occur, irrespective of the magnitude and severity.					

Recommendations

While job growth in the I-710 corridor is expected under all the alternatives, it is unclear how the alternatives will differentially impact the residents and businesses in the I-710 corridor from the perspective of jobs and economic development. The recommendations below would increase the number and quality of jobs available to local residents who currently face high unemployment rates.

Jobs and Economic Analysis

- Conduct economic research and modeling to determine how the proposed I-170 Corridor Project alternatives, through changes in traffic volumes and speeds, will impact local and regional costs of

doing business and job growth. This analysis should include detailed information regarding geographic job distribution as well as a disaggregated analysis of income from new jobs.

- Conduct a cost-benefit analysis that details the benefits of the I-710 Corridor Project (e.g., business costs related to reduced congestion under some alternatives) and costs (e.g., construction). The analysis should include externalities such as potential changes in healthcare-related costs and potential impacts on business sectors unrelated to goods movement.

Local Job Tracking, Creation, and Training

- Measure and track the proportion of local jobs in each industry that are filled by local residents. This data would allow policymakers to make informed decisions regarding strategies to enhance and stimulate local economies.
- Through incentives, encourage new and small businesses to locate in the I-710 corridor communities. Incentives may be in the form of tax breaks or credits or may be in the form of lower loan interest rates for potential small business owners, among others.
- Increase job-training opportunities for residents in the study area to better prepare the workforce for the employment opportunities in the region and reduce unemployment. Training should target jobs that pay a living wage and provide benefits such as health insurance.

Green Jobs Tracking and Stimulus

- The green and sustainable technology jobs created locally (e.g., through Alternative 6B or projects at the ports) could be a strong source of employment, training opportunities, and improved health outcomes for residents in the study area. Opportunities in this relatively new industry should be encouraged to move into the I-710 Corridor Project study area regardless of the build alternative chosen, and government agencies and employers should be encouraged to train local workers in skills that will allow them to succeed in this field.

1.4.6 Neighborhood Resources

Findings

Transportation planning research describes the trade-offs between a freeway's ability to increase mobility and move people and goods through an area and its negative impacts on "place-making." Access to a mix of public services and retail goods is important for health and quality of life, increasing walking and biking, possibilities for healthful and meaningful work, and interactions among neighbors while reducing daily vehicle trips and miles traveled as well as air and noise pollution. Scientific evidence in the public health literature establishes links between the following neighborhood resources and health: childcare, schools, libraries, parks, community centers, community gardens, post offices, banks, pharmacies, public art, food retail, and health care facilities.

The I-710 corridor communities currently have adequately complete neighborhoods, with access to a reasonable variety of resources, though some areas have more access to this variety than other areas.

The I-710 Corridor Project is likely to impact neighborhood resources through changes in access to these resources, investment in the I-710 corridor communities, perceptions of environmental quality, and the usability of these resources, though these are difficult to predict. For example:

- As described in Chapter 6, “Mobility,” none of the alternatives being considered is likely to increase walkability/bikeability, and, therefore, access to goods and services by this mode is likely to, at best, stay the same. Access to resources by car is likely to improve under Alternatives 6A/B/C, stay the same under Alternative 5A, and degrade under Alternative 1.
- Residential property values close to the freeway are likely to decrease (due to environmental factors) while those further away are likely to increase (due to faster commute times).
- Higher traffic volumes and/or an expanded freeway are unlikely to improve feelings of pride in one’s neighborhood and social cohesion, though improvements described in the Urban Design and Aesthetics Toolbox may offset this somewhat.

These changes will impact different populations differently. Access to neighborhood resources will improve for some groups (e.g., those living farther from the freeway) and degrade for others (e.g., those living closest to the freeway). It is likely that physical activity, social cohesion, and neighborhood wealth as mediated through neighborhood resources will improve for some populations and degrade for others. As a result, health outcomes associated with these factors would be impacted. These health outcomes include:

- Chronic disease levels associated with physical activity (e.g., walking to goods and services), diet, access to needed services, and social cohesion;
- Mental health associated with physical activity and from changes in stress as a result of changes in social cohesion;
- Changes in lifespan associated with physical activity and social cohesion; and
- Changes in injury and fatality rates associated with changes in crime levels that could result from changes in social cohesion.

The health impacts of the proposed I-710 Corridor Project EIR/EIS alternatives mediated through access to neighborhood resources are summarized in Table 1-7.

Table 1-7. Summary of Predicted Health Impacts Related to Access to Neighborhood Resources

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Chronic Disease (e.g., cardiovascular disease, diabetes; from changes in physical activity, social cohesion, and stress)					
1	+/-	Potentially significant, non-quantifiable	Mod-High	◆◆	Changes in investment in communities difficult to predict.
5A					
6A					
6B					
6C					
Mental Illness (e.g., depression; from changes in physical activity, social cohesion, & stress)					
1	+/-	Potentially significant, non-quantifiable	Mod-High	◆	Changes in investment in communities difficult to predict.
5A					
6A					
6B					
6C					
Decreased Lifespan (e.g., from changes in physical activity, social cohesion & stress)					
1	+/-	Potentially significant, non-quantifiable	High	◆◆	Changes in investment in communities difficult to predict.
5A					
6A					
6B					
6C					
Injury and fatality (e.g., from crime)					
1	+/-	Potentially significant, non-quantifiable	Mod-High	◆	Changes in investment in communities difficult to predict.
5A					
6A					
6B					
6C					
<p>Explanations:</p> <p><i>Impact</i> refers to whether the alternative will improve (+), harm (-), or not impact health (~).</p> <p><i>Magnitude</i> reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events): Negligible, Minor, Moderate, Major.</p> <p><i>Severity</i> reflects the nature of the effect on function and life-expectancy and its permanence: High = intense/severe; Mod = Moderate; Low = not intense or severe.</p> <p><i>Strength of Causal Evidence</i> refers to the strength of the research/evidence showing causal relationship between access to neighborhood resources and the health outcome: ◆ = plausible but insufficient evidence; ◆◆ = likely but more evidence needed; ◆◆◆ = high degree of confidence in causal relationship. A causal effect means that the effect is likely to occur, irrespective of the magnitude and severity.</p>					

Recommendations

The following recommendations would increase the likelihood that the I-710 Corridor Project results in positive health impacts mediated through changes in access to neighborhood resources.

Access to Neighborhood Resources

- Recommendations contained in Chapter 6, “Mobility,” would help ensure that access to goods and services in the I-710 corridor is maximized; specifically those that describe improvements to public transit infrastructure and accessibility as well as walking and biking infrastructure.
- In order to at least partially offset any potential negative impacts on access to neighborhood resources, the I-710 Corridor Project could include additional improvements to existing neighborhood resources. For example, local jurisdictions could each be given funding as part of the project to invest in the neighborhood resources (e.g., libraries, schools, parks, community centers) that are likely to be impacted by the project.

Environmental Quality

- Recommendations contained in Chapter 7, “Air Quality,” Chapter 8, “Noise,” and Chapter 9, “Traffic Safety,” including those related to future land use, would help ensure improvements to environmental quality. Improved perceptions of environmental quality are likely to follow actual improvements and lead to more investment in the corridor communities, improve social cohesion, increase physical activity, and lead to other neighborhood improvements.
- Fund and implement the recommendations contained in the Urban Design and Aesthetics Toolbox Report.

Public Investment

Increase direct government investment in community infrastructure and services to ensure that people have access to the goods and services they need to live healthy lives and to improve social cohesion in local communities. Such investment could help attract private investment.