4.1.2 Human Health Risk

4.1.2.1 Introduction

The proposed Project would make certain improvements within the north airfield, develop a new concourse and terminal with new gates, and provide for ground access (roadway) improvements to help relieve traffic congestion on Sepulveda Boulevard and provide landside access to the new terminal. Although the proposed Project itself would not result in any changes to future aviation activity levels projected for LAX at build-out, the modifications and additions to the airfield, terminals, and ground access facilities would alter the locations and amounts of toxic air contaminants (TAC) released by aircraft, ground support equipment (GSE), vehicles, and stationary sources in ways that could result in impacts on human health. In addition, construction of the proposed improvements would release TAC.

As with all activities at facilities that accommodate vehicles and equipment that consume fuel, activities at LAX release TAC to the air. These TAC may come from aircraft; GSE; other motor vehicles; combustion of fossil fuels to produce hot water, steam, and power; and other sources. These operational releases, and releases during construction activities, could have an impact on people living and working in the vicinity of the airport. Impacts to human health associated with TAC releases may include increased cancer risks, increased chronic (long-term) non-cancer health hazards, and increased acute (short-term) non-cancer health hazards from inhalation of TAC.

The objective of this Human Health Risk Assessment (HHRA) is to assess potential health impacts from changes in TAC exposure from constructing and operating the proposed Project. For this analysis, construction of the proposed Project is assumed to begin in 2021 and end in 2028, with operations starting in 2028. Operational emissions were quantified for existing conditions (2018) and build-out of the proposed Project (2028). The approach and methods used in this HHRA have been consistently applied over several years as part of EIRs prepared to evaluate LAWA projects. The analysis discloses whether implementation of the proposed Project would increase health risks for people living, working, or attending school near LAX.

4.1.2.2 Methodology

The methodology for the HHRA was documented in a human health risk assessment protocol that was presented to, and reviewed by, the South Coast Air Quality Management District (SCAQMD) prior to the initiation of the HHRA.[1] This methodology is described below, with supporting information provided in **Appendix C.6** and **Appendix C.8**.

4.1.2.2.1 TAC Emissions and Concentrations

The analysis uses estimates of the TAC emissions and concentrations in air in order to calculate cancer risk and chronic and acute non-cancer health hazards. TAC concentrations are estimated from a dispersion model using estimated emission rates, meteorological data, and geographic information as inputs.

Project-related concentrations of TAC from construction and operational sources were estimated using model options of 1-hour maximum, 8-hour maximum, and annual average concentrations. Key modeling and analytical parameters included the following:

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1 CDM Smith, *Los Angeles International Airport – Airfield and Terminal Modernization Project, Final Supplement 1 – Human Health Risk Assessment Methodology to the CEQA Protocol for Conducting an Air Quality Impact Analysis of Criteria Air Pollutants*, March 16, 2020. This protocol is included as **Appendix C.8** of this EIR.

- Baseline conditions were modeled by using 2018 operations data and applying typical emissions rates for aircraft, vehicles, and stationary sources.
- Construction-related TAC emissions were modeled for each year of construction using the schedule for proposed Project construction activities and typical emissions factors for construction equipment and activities. Year-by-year emissions estimates were used to account for changes in both location and types of activities anticipated to occur as Project construction progresses. In addition, indirect construction emissions caused by construction-related incremental aircraft taxiing and idling delays during the temporary closure of the north airfield runways were also included in TAC emissions and dispersion analyses.
- Proposed Project operations were modeled for conditions in 2028.

Additional information on how emissions and concentrations were developed, and which reference documents and information were used, is summarized in the LAX Airfield and Terminal Modernization Project CEQA Protocol for Conducting an Air Quality Impact Analysis for Criteria Air Pollutants in Appendix C,[2] Supplement 1 – Human Health Risk Assessment Methodology to the CEQA Protocol,[3] and the methodology discussion in Section 4.1.1, *Air Quality*, of this EIR.

The potential incremental impacts were determined by comparing the estimated emissions in 2028 to the emissions in the 2018 baseline conditions. The difference between these two conditions was used to determine incremental Project-related emissions in 2028.[4] Incremental short-term 1-hour concentrations were used to estimate acute non-cancer health hazard impacts. Incremental annual average concentrations were used to estimate cancer risk and chronic non-cancer health hazards.

California Environmental Protection Agency (CalEPA) guidance[5] requires that impacts to health be evaluated for a 30-year exposure duration. Based on Project construction starting in 2021, the HHRA for cancer risks covered a time period that extends to 2050.

In order to remove the influence of background growth and the differences in motor vehicle emission factors between 2018 and 2028, a comparison between concentrations from the proposed Project in 2028 and concentrations from the Future Without Project scenario in 2028 is provided. The difference between these two scenarios highlights the air pollutant concentration impacts of the proposed Project compared to future concentrations that are projected to occur without the Project. This comparison is made for informational purposes only and the significance of the Project impacts is not based on this comparison.

4.1.2.2.2 Exposure Locations

TAC concentrations were estimated at various receptor locations within the study area, including adjacent to the LAX property line, the CTA, and communities around LAX. In addition, several on-airport locations that were not within the Project site, and locations near possible Project construction sites were also selected. These locations were selected in accordance with CalEPA Office of Environmental Health Hazard Assessment (OEHHA) guidance for conducting an HHRA. The modeled concentrations at these locations were used to estimate the incremental human health risks and hazards and to determine the level of significance.

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2 CDM Smith, *Los Angeles International Airport – Airfield and Terminal Modernization Project, Final CEQA Protocol for Conducting an Air Quality Impact Analysis of Criteria Air Pollutants*, June 4, 2020. This protocol is included as **Appendix C.8** of this EIR.

3 CDM Smith, *Los Angeles International Airport – Airfield and Terminal Modernization Project, Final Supplement 1 – Human Health Risk Assessment Methodology to the CEQA Protocol for Conducting an Air Quality Impact Analysis of Criteria Air Pollutants*, March 16, 2020. This protocol is included as **Appendix C.8** of this EIR.

4 Operational baseline conditions are 2018 existing operational conditions. Because no Project-related construction occurred in 2018, the construction baseline condition is zero emissions.

5 South Coast Air Quality Management District, *AB 2588 and Rule 1402 Supplemental Guidelines (Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act)*, July 2018. Available: http://www.aqmd.gov/docs/default-source/planning/risk-assessment/ab2588supplementalguidelines.pdf.

4.1.2.2.3 Overview of Risk Assessment

This HHRA followed State and federal guidance for performance of risk assessments and was conducted using the four steps defined in SCAQMD, CalEPA, and United States Environmental Protection Agency (USEPA) guidance.[6,7,8] These four steps, summarized in the following sections, consist of: selection of TAC of concern, exposure assessment, toxicity assessment, and risk characterization. Following OEHHA guidance, the equations and calculations from the Hot Spots Analysis and Reporting Program Version 2 (HARP2) model, developed by the California Air Resources Board (CARB), were built into an Excel spreadsheet to calculate and present health risk assessment results. This approach allowed for customization of the calculations to address Project-specific criteria. Additional details of the risk assessment methodology are provided in the HHRA protocol.[9]

4.1.2.2.3.1 Selection of TAC of Concern

California Assembly Bill 2588 (AB 2588) identifies TAC for which OEHHA has developed cancer slope factors and chronic and/or acute reference exposure levels (RELs)[10] Cancer slope factors define the relationship between inhalation of TAC and risk of developing cancer. RELs define the relationship between inhalation of TAC and subsequent non-cancer health impacts. REL levels are separately identified for both long- and short-term exposure durations. RELs are based on the most sensitive, relevant, adverse health effect reported in the medical and toxicological literature. Since margins of safety are incorporated to address data gaps and uncertainties, exceeding an REL does not automatically indicate an adverse health impact.[11] For this analysis, TAC of concern were derived based on the AB 2588 list, emissions estimates, human toxicity information, and results of previous HHRAs conducted for LAX.[12] The

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6 South Coast Air Quality Management District, *AB 2588 and Rule 1402 Supplemental Guidelines (Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act)*, July 2018. Available: http://www.aqmd.gov/docs/default-source/planning/risk-assessment/ab2588supplementalguidelines.pdf.

7 California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part I: The Determination of Acute Reference Exposure Levels for Airborne Toxicants*, March 1999. Available: https://oehha.ca.gov/air/crnr/adoption-air-toxics-hot-spots-risk-assessment-guidelines-part-i-technical-support-document; California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Risk Assessment Guidelines, Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow early life stage exposures,* May 2009. Available: https://oehha.ca.gov/media/downloads/crnr/tsdcancerpotency.pdf; California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Risk Assessment Guidelines, Technical Support Document for the Derivation of Noncancer Reference Exposure Levels*, June 2008. Available: https://oehha.ca.gov/media/downloads/crnr/noncancertsdfinal.pdf; California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxic Hot Spots Program Risk Assessment Guidelines, Technical Support Document for Exposure Assessment and Stochastic Analysis*, August 2012. Available: https://oehha.ca.gov/air/crnr/notice-adoption-technical-support-document-exposure-assessment-and-stochastic-analysis-aug; California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program, Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments*, February 2015. Available: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.

8 U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, *Risk Assessment Guidance for Superfund, Vol. I, Human Health Evaluation Manual (Part A), Interim Final*, EPA/540/1-89/002, December 1989. Available: https://www.epa.gov/sites/production/files/2015-09/documents/rags_a.pdf.

9 CDM Smith, *Los Angeles International Airport – Airfield and Terminal Modernization Project, Final, Supplement 1 – Human Health Risk Assessment Methodology to the CEQA Protocol for Conducting an Air Quality Impact Analysis of Criteria Air Pollutants*, March 16, 2020. This protocol is included as **Appendix C.8** of this EIR.

10 California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Toxicity Criteria Online Database.* Available: https://oehha.ca.gov/chemicals, accessed January 15, 2020.

11 Margin of safety is a ratio of the no-observed-effect level to the estimated exposure dose. Margins of safety are incorporated in the development of toxicity values to account for differences in dose-response among individuals. For example, the same dose of alcohol may have a greater effect on a woman than a man, not only because a woman is smaller in body size but also because men and women metabolize alcohol at different rates.

12 City of Los Angeles, Los Angeles World Airports, *Final Environmental Impact Report for Los Angeles International Airport (LAX) Proposed Master Plan Improvements,* (SCH 1997061047), Section 4.24.1, Human Health Risk Assessment, Technical Report 14a, Health Risk Assessment, and Technical Report S-9a, Supplemental Health Risk Assessment, April 2004. Available: https://www.lawa.org/en/lawa-our-lax/environmental-documents/documents-certified/2004-lax-master-plan-program/final-environmental-impact-report-feir.

list of TAC of concern evaluated in this HHRA, and their primary emission source, is provided in **Table 4.1.2-1**.

Table 4.1.2-1
Toxic Air Contaminants (TAC) of Concern for the Proposed Project

Toxic Air Contaminant	Type	Primary Source
Acetaldehyde	VOC	Diesel Exhaust
Acrolein	VOC	Aircraft Exhaust
Benzene	VOC	Gasoline Exhaust
1,3-Butadiene	VOC	Aircraft Exhaust
Ethylbenzene	VOC	Gasoline Exhaust
Cyclohexane	VOC	Diesel and Gasoline Exhaust
Formaldehyde	VOC	Aircraft and Diesel Exhaust
n-Hexane	VOC	Diesel and Gasoline Exhaust
Isoprene	VOC	Gasoline Exhaust
Isopropylbenzene (Cumene)	VOC	Aircraft, Diesel, and Gasoline Exhaust
Methyl alcohol	VOC	Aircraft Exhaust
Methyl ethyl ketone	VOC	Diesel Exhaust
Propionaldehyde	VOC	Aircraft, Diesel, and Gasoline Exhaust
Propylene	VOC	Aircraft, Gasoline, and Diesel Exhaust
Styrene	VOC	Aircraft and Gasoline Exhaust
Toluene	VOC	Gasoline Exhaust
1,2,4-Trimethylbenzene	VOC	Aircraft, Diesel and Gasoline Exhaust
2,2,4-Trimethylpentane	VOC	Diesel and Gasoline Exhaust
Xylene (total)	VOC	Gasoline Exhaust
Naphthalene	PAH	Gasoline Exhaust
Aluminum	PM-Metal	Brake Wear, Tire Wear, and Construction Dust
Antimony	PM-Metal	Construction Dust
Arsenic	PM-Metal	Construction Dust
Barium	PM-Metal	Aircraft Exhaust, Brake Wear, Tire Wear, and Construction Dust
Cadmium	PM-Metal	Construction Dust and Diesel Exhaust
Chromium VI	PM-Metal	Aircraft Exhaust and Brake Wear
Cobalt	PM-Metal	Gasoline Exhaust and Construction Dust
Copper	PM-Metal	Brake Wear
Lead	PM-Metal	Construction Dust
Manganese	PM-Metal	Aircraft Exhaust, Brake Wear, and Construction Dust
Mercury	PM-Metal	Construction Dust and Diesel Exhaust
Nickel	PM-Metal	Brake Wear and Gasoline Exhaust
Selenium	PM-Metal	Brake Wear and Tire Wear
Silver	PM-Metal	Construction Dust
Vanadium	PM-Metal	Brake Wear and Construction Dust
Zinc	PM-Metal	Brake Wear, Tire Wear, Gasoline Exhaust, and Construction Dust
Diesel PM	Diesel Exhaust	Diesel Exhaust
Ammonium ion	PM-Inorganics	Brake Wear, Tire Wear, and Construction Dust
Bromine	PM-Inorganics	Brake Wear, Tire Wear, Gasoline Exhaust, and Construction Dust

Table 4.1.2-1
Toxic Air Contaminants (TAC) of Concern for the Proposed Project

Toxic Air Contaminant	Type	Primary Source
Chlorine	PM-Inorganics	Gasoline Exhaust
Phosphorus	PM-Inorganics	Tire Wear and Construction Dust
Silicon	PM-Inorganics	Construction Dust
Sulfates	PM-Inorganics	Brake Wear and Diesel Exhaust

Source: CDM Smith January 2020.

Key:
PAH = Polycyclic aromatic hydrocarbons; PM = Particulate matter; VOC = Volatile organic compounds

4.1.2.2.3.2 Exposure Assessment

The following sensitive receptors were selected for quantitative evaluation: on-airport workers, off-airport workers, and community receptors including adult residents, child residents, and school children. These receptors were selected because they represent unique populations and a range of exposure conditions (i.e., location and duration of exposure). In addition, these receptors would be subject to the highest exposures, allowing for assessment of the risks and hazards to Maximally Exposed Individuals (MEI), which is required to evaluate the level of significance. In addition to identifying the MEIs, the locations of receptors need to be far enough out so that the locations where impacts drop below the level of significance can be determined.

To assess a receptor's exposure to TAC, the various exposure pathways must be considered.

An exposure pathway consists of four parts:

- A TAC source (e.g., construction equipment fuel combustion)
- A release mechanism (e.g., construction equipment engine exhaust)
- A means of transport from point of release to point of exposure (e.g., local winds)
- A route of exposure (e.g., inhalation)

If any of these elements of an exposure pathway is absent, no exposure can take place and the pathway is considered incomplete. Incomplete pathways were not evaluated in this HHRA.

In the programmatic HHRA developed for the LAX Master Plan EIR,[13] multiple exposure pathways, including uptake from soil into homegrown vegetables, transport of TAC in soil to indoor dust and/or surface water, and other indirect pathways, were addressed quantitatively. These analyses showed that inhalation was the only exposure pathway that was an important contributor to human health risk. Based on this previous analysis, inhalation of airport-related TAC was the only exposure pathway used to evaluate human health risk for the proposed Project.

4.1.2.2.3.3 Toxicity Assessment

A toxicity assessment for TAC of concern was conducted for the LAX Master Plan Final EIR.[14] Cancer risks and chronic non-cancer health hazards associated with longer-term inhalation of emissions from

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13 City of Los Angeles, Los Angeles World Airports, *Final Environmental Impact Report for Los Angeles International Airport (LAX) Proposed Master Plan Improvements,* (SCH 1997061047), Technical Report 14a, Health Risk Assessment, and Technical Report S-9a, Supplemental Health Risk Assessment, April 2004. Available: https://www.lawa.org/en/lawa-our-lax/environmental-documents/documents-certified/2004-lax-master-plan-program/final-environmental-impact-report-feir.

14 City of Los Angeles, Los Angeles World Airports, *Final Environmental Impact Report for Los Angeles International Airport (LAX) Proposed Master Plan Improvements,* (SCH 1997061047), Technical Report 14a, Health Risk Assessment, and Technical Report S-9a, Supplemental Health Risk Assessment, April 2004. Available: https://www.lawa.org/en/lawa-our-lax/environmental-documents/documents-certified/2004-lax-master-plan-program/final-environmental-impact-report-feir.

construction and operational activities were characterized using cancer slope factors and chronic RELs developed by the State of California.[15] Tables of the toxicity values used in the HHRA calculations are provided in **Appendix C.6**.

Acute RELs developed by the State of California were used in the characterization of acute non-cancer health hazards associated with the proposed Project. These RELS were used to characterize short-term exposure (usually exposures on the order of 1 hour or 8 hours). Acute RELs are applicable to all receptors, including both children and adults. Hazards are the ratio of estimated or measured concentrations and the REL.

4.1.2.2.3.4 Risk Characterization

Consistent with OEHHA guidance,[16] the assessment of chronic human health impacts due to release of airport-related TAC from the proposed Project was based on the following time frames for receptor exposure: 9- and 30- year periods for child and adult residential receptors, respectively; 12-year period for school children; and a 25-year period for off-airport workers.

During construction, the location and magnitude of TAC emissions would depend on the level of activity, types of equipment used, and the phase of the work. To incorporate this variability into the model, construction emissions were modeled separately for each year of construction. The total risks to each receptor were calculated as the sum of cancer risks from each individual year. Risks associated with operations were modeled for the 2028 build-out year. The total risks to each receptor were calculated as the sum of cancer risks over their exposure periods to these operations.

The risk characterization results in estimates of MEIs, which are land use specific. On-airport locations were used to identify commercial and on-airport worker TAC concentrations for operational emissions. For off-airport locations, land uses were designated as residential, commercial, or residential/commercial and then evaluated to identify appropriate receptor types for the designated land use (i.e., workers at commercial locations or adults and children at residential locations). In addition, locations of schools, hospitals, nursing homes, and day care facilities were identified as sensitive receptor locations and designated as residential/commercial so that these locations would be evaluated for both worker and residential receptors. The modeled receptor locations are shown on **Figure 4.1.2-1**. These locations were initially selected to capture areas most likely impacted by the proposed Project based on locations of on-airport and off-airport improvements.

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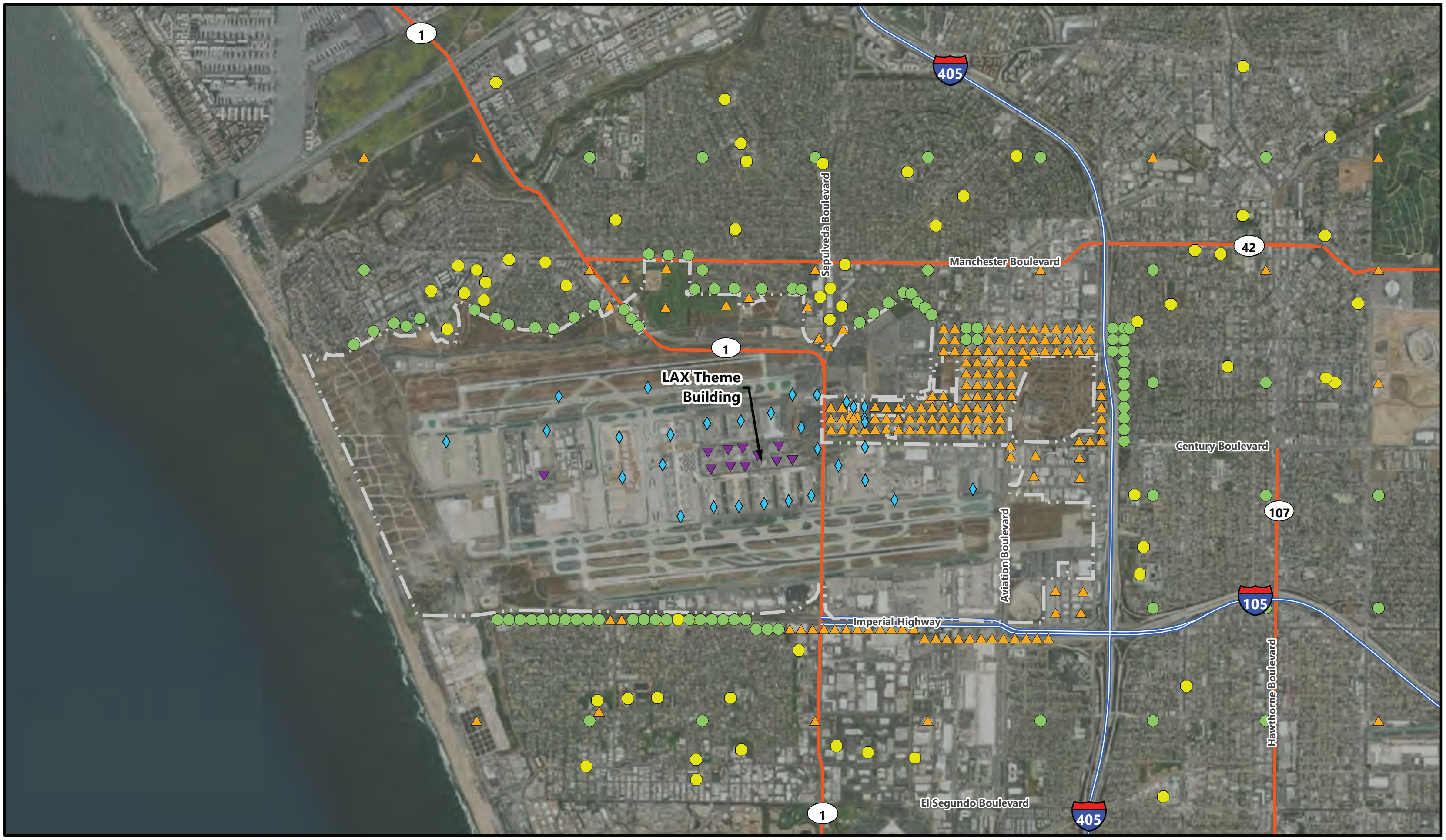
[15] California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Toxicity Criteria Online Database*. Available: https://oehha.ca.gov/chemicals, accessed January 15, 2020.

[16] California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program, Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments*, February 2015. Available: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.



Legend

- LAX Property Boundary
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- Interstate Highway
- California State Highway

Notes:

1. Grid points indicate locations where receptors were evaluated for the construction and operations scenarios. Receptor types are identified in the legend.
2. Beause future schools could be sited in any area zoned as residential, school child receptors were evaluated at all residential grid nodes.

0 0.5 1 Miles
Scale

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Construction and Operations Grid Point Locations

Figure 4.1.2-1

Methodology for Evaluating Cancer Risks

Cancer risks were estimated by multiplying exposure estimates for carcinogenic chemicals by corresponding cancer slope factors. The result is a risk estimate expressed as the probability of developing cancer. As noted above, consistent with OEHHA guidance,[17] cancer risks were based on exposure durations of 30 years for adult residents, 9 years for child residents, 12 years for school children, and 25 years for off-airport workers. The methodology is conservative, as it assumes individuals would be exposed to TAC for almost every hour of each day of the receptor's respective exposure duration. For each receptor's years of exposure after construction, the increment of future operational risk over the 2018 baseline operational risk was added to the risk calculated for the construction period. Impacts of exposure to multiple TAC were accounted for by summing cancer risk estimates for exposure to each individual TAC.

Methodology for Evaluating Chronic Non-Cancer Health Hazards

Chronic non-cancer health hazard estimates were calculated by dividing exposure estimates by RELs. In the context of non-cancer health hazards, RELs are estimates of the highest exposure levels that would not cause adverse chronic health effects even if exposures continue over a lifetime. The ratio of exposure concentration to reference concentration is termed the "hazard quotient" (HQ). A HQ greater than 1 indicates the potential for adverse health effects and a HQ less than 1 indicates that adverse health effects are unlikely. RELs are developed by OEHHA and account for the most vulnerable members of a population. Therefore, it is generally accepted that HQs only slightly higher than 1 are associated with low or no risks of adverse effects and the potential for adverse effects increases as the HQ gets larger.[18]

Exposure to multiple TAC with the potential to cause adverse chronic non-cancer health effects were accounted for by summing HQs for chemicals that would affect like target organs or tissues in the human body. This sum is the total chronic Hazard Index (HI) which reflects the total possible chronic non-cancer health hazard increment. Although inhalation is the only pathway determined to have an important contribution to risk, exposure to TAC through inhalation has the potential to affect multiple organ systems. Therefore, the combined risk for each target organ system was evaluated for exposure to TAC associated with the proposed Project.

Methodology for Evaluating Acute Non-Cancer Health Hazards

Short-term concentrations for TAC associated with construction of the proposed Project were estimated by modeling 1-hour maximum concentrations. Acute non-cancer health hazards were then estimated at each receptor location by dividing estimated maximum 1-hour TAC concentrations in air by acute RELs to determine the HQ.

Exposure to multiple TAC with the potential to cause adverse acute non-cancer health effects were accounted for by summing HQs for chemicals that would affect like target organs or tissues in the human body. This sum is the total acute HI, which reflects the total possible acute non-cancer health hazard increment.

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[17] California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program, Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments*, February 2015. Available: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.

[18] California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program, Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments*, February 2015. Available: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.

Methodology for Evaluating Occupational Health Hazards

Impacts to on-airport workers were evaluated based on California Division of Occupational Safety and Health (CalOSHA) Permissible Exposure Limits (PELs).[19] PELs are established to protect on-site workers from hazardous exposure. For each TAC of concern for which CalOSHA PEL thresholds have been established, the maximum 8-hour modeled concentration was compared against the corresponding CalOSHA PEL.

Methodology for Evaluating Population-Based Risks

When MEI risks exceed threshold levels, CalEPA guidance indicates that population-based risks should be evaluated.[20] A population-based assessment estimates the cancer burden that might be experienced within an exposed population. The cancer burden is the sum of individual risks for people living in the study area. It is calculated in a manner similar to individual cancer risk based on an exposure period ranging from the third trimester to age 70 and corresponding age sensitivity factors and exposure parameters. Population-based risk conservatively assumes that a population (not necessarily the same individuals) will live within the study area over a 70-year lifetime period. In this sense, cancer burden calculations are more conservative than individual cancer risks, which are calculated assuming an exposure duration of 30 years.

For the proposed Project, the population based risk was calculated by utilizing census population counts for census tracts within the 1 in 1 million maximally exposed individual resident (MEIR) exposure area and multiplying the identified population counts by the average individual 70-year burden risk modeled for the tract. For example, if 100,000 people live in an area that experiences an increased cancer risk of 10 in 1 million due to airport emissions, the chance of a single case of cancer in this population caused by airport emissions would be 1 in 100 (100,000 times 10×10^{-6}). In cases where a single census block may contain more than one modeled receptor point, the average of the calculated risks for the points was used for the calculation. The sum of population-based risks in all modeled census tracts represented the total cancer burden associated with Project impacts.

Methodology for Evaluating Cumulative Impacts

Cumulative impacts of emissions on health risks were based on studies conducted by governmental agencies. Specifically, the evaluation of cumulative cancer risks was based on the most recent Multiple Air Toxics Exposure Study, MATES-IV, prepared by SCAQMD.[21] Data presented in USEPA's National Air Toxics Assessment[22] were used to evaluate cumulative chronic non-cancer health hazards. For cumulative acute non-cancer health hazards, conservative approximations of short-term concentrations were made using generic conversion factors and the annual average estimates of TAC in air from USEPA, which were used to provide a semi-quantitative evaluation of the possible range of cumulative impacts.

Uncertainties

Uncertainties are unavoidable in an HHRA. For this analysis, these include uncertainties associated with emission estimates and dispersion modeling, evaluation of sensitive receptor populations, exposure parameter assumptions, toxicity assessment, the assumptions inherent in the 2015 OEHHA Air Toxics

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19 California Occupational Safety and Health Administration, *Table AC-1, Permissible Exposure Limits for Chemical Contaminants*. Available: https://www.dir.ca.gov/title8/5155table_ac1.html, accessed December 20, 2019.

20 California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program, Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments,* February 2015. Available: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.

21 South Coast Air Quality Management District, *Final Report – Multiple Air Toxics Exposure Study in the South Coast Air Basin – MATES-IV*, May 2015. Available: http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7.

22 U.S. Environmental Protection Agency, *2014 National Air Toxics Assessment*, 2018. Available: https://www.epa.gov/national-air-toxics-assessment/2014-nata-assessment-results, accessed February 5, 2020.

Methodology, and interactions among acrolein and criteria pollutants.[23] Detailed discussions of these uncertainties associated with the HHRA are presented in **Appendix C.6**. The approach used in this EIR health impact analysis follows accepted regulatory guidance and uses conservative (i.e., health protective) assumptions and methods to account for multiple uncertainties.

4.1.2.3 Existing Conditions

4.1.2.3.1 Regulatory Setting

4.1.2.3.1.1 Federal

The USEPA provides guidance on performing HHRAs for certain purposes through its Office of Emergency and Remedial Response.[24] The FAA does not prepare or use HHRAs in the airport context.

4.1.2.3.1.2 State

CARB's statewide comprehensive air toxics program was established in the early 1980s. The Toxic Air Contaminant Identification and Control Act (AB 1807) created California's program to reduce exposure to air toxics.

In September 1987, the California Legislature established the AB 2588 air toxics "Hot Spots" program. It requires facilities to report their air toxics emissions, ascertain health risks, and notify nearby residents of significant risks. In September 1992, the "Hot Spots" Act was amended by Senate Bill 1731, which required facilities that pose a significant health risk to the community to reduce their risk through a risk management plan. Beginning in 2000, CARB has adopted diesel risk reduction plans and measures to reduce diesel particulate matter (DPM) emissions and their associated health risk. These are discussed in more detail below.

In 2004, CARB adopted a control measure to limit commercial heavy-duty diesel motor vehicle idling in order to reduce public exposure to DPM and other TAC. The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. In general, it prohibits idling for more than 5 minutes at any location.

In addition to limiting exhaust from idling trucks, CARB promulgated emission standards for off-road diesel construction equipment such as bulldozers, loaders, backhoes, and forklifts, as well as many other self-propelled off-road diesel vehicles. A CARB regulation that became effective on June 15, 2008 aims to reduce emissions by requiring installation of diesel soot filters and encouraging the replacement of older, dirtier engines with newer, emission-controlled models. The regulation requires that fleets limit their unnecessary idling to 5 minutes; there are exceptions for vehicles that need to idle to perform work (such as a crane providing hydraulic power to a boom), vehicles being serviced, or in a queue waiting for work. A prohibition against acquiring certain vehicles (e.g., Tier 0 and Tier 1) began on March 1, 2009. Implementation of the fleet averaging emission standards is staggered based on fleet size, with the largest operators required to begin compliance in 2014.[25] CARB has estimated that, with these regulations, DPM

[23] California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program, Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments*, February 2015. Available: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.

[24] U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, *Risk Assessment Guidance for Superfund, Vol I, Human Health Evaluation Manual (Part A), Interim Final*, EPA/540/1-89/002, December 1989. Available: https://www.epa.gov/sites/production/files/2015-09/documents/rags_a.pdf.

[25] California Air Resources Board, *In-Use Off-Road Diesel Vehicle Regulation, Overview*, Revised October 2016. Available: https://www.arb.ca.gov/msprog/ordiesel/faq/overview_fact_sheet_dec_2010-final.pdf.

will have been reduced by 74 percent and NO_X (an ozone precursor emitted from diesel engines) by 32 percent by 2020, compared to what emissions would have been without the regulation.[26]

CalEPA provides guidance on performing an HHRA through its OEHHA publications:

- Air Toxics Hot Spots Program Risk Assessment Guidelines, Part I: The Determination of Acute Reference Exposure Levels for Airborne Toxicants, March 1999
- Air Toxics Hot Spots Program Risk Assessment Guidelines, Technical Support Document for Cancer Potency Factors, May 2009
- Air Toxics Hot Spots Program Risk Assessment Guidelines, Technical Support Document for the Derivation of Noncancer Reference Exposure Levels, June 2008
- Air Toxic Hot Spots Program Risk Assessment Guidelines, Technical Support Document for Exposure Assessment and Stochastic Analysis, August 2012
- Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, February 2015

LAWA has adhered to this guidance in preparing this analysis.

4.1.2.3.1.3 Regional/Local

SCAQMD has jurisdiction over the air quality of the South Coast Air Basin. SCAQMD adopted a significance criterion for cancer health risks of a 10 in 1 million increase in the chance of developing cancer. SCAQMD also adopted a significance criterion for cancer burden. SCAQMD's adopted significance criterion for cancer burden is greater than 0.5 excess cancer cases in areas with an incremental increase in cancer risk greater than or equal to 1 in 1 million. The significance of non-cancer (acute and chronic) risks is evaluated in terms of HIs for different endpoints. SCAQMD's threshold for non–cancer risk for both acute and chronic HI is 1.0.[27]

4.1.2.3.2 Environmental Setting

In June 1987, the SCAQMD published the first MATES, which was the most comprehensive air toxics study ever conducted in an urban environment. This original study has been updated several times; the most recent study, MATES-IV, was published in May 2015.[28] MATES-IV estimates cancer risk from TAC emissions throughout the South Coast Air Basin by conducting a comprehensive monitoring program, an updated emissions inventory of TAC, and a modeling effort to fully characterize health risks for those living in the South Coast Air Basin. The study includes a series of maps showing regional trends in estimated outdoor inhalation cancer risk from toxic emissions. These risk maps depict inhalation cancer risk due to modeled outdoor TAC pollutant levels, and do not account for cancer risk due to other types of exposure. The study found that the largest contributors to inhalation cancer risk are diesel engines. According to MATES-IV, cancer risks in the South Coast Air Basin range from 320 in 1 million to 480 in 1 million, with an average of 418 in 1 million. These cancer risk estimates are relatively high (although substantially lower than those found in MATES-III) and indicate that current impacts associated with ongoing releases of TAC (e.g., from vehicle exhaust), and from sources of TAC from past and present projects in the region, are substantial.

As part of the MATES-III Study, the SCAQMD prepared a series of maps that show regional trends in estimated outdoor inhalation cancer risk from toxic emissions, as part of an ongoing effort to provide

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26 California Air Resources Board, *Facts about Emissions and Health Benefits of Regulation for In-Use Off-Road Diesel Vehicles*, revised September 20, 2007. Available: http://www.arb.ca.gov/msprog/ordiesel/documents/OFRDDIESELhealthFS.pdf.

27 South Coast Air Quality Management District, *South Coast AQMD Air Quality Significance Thresholds*, April 2019. Available: http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2.

28 South Coast Air Quality Management District, *Final Report – Multiple Air Toxics Exposure Study in the South Coast Air Basin – MATES-IV*, May 2015. Available: http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7.

insight into relative risks. The maps' estimates represent the number of potential cancers per million people associated with a lifetime of breathing air toxics (24 hours per day outdoors for 70 years) in parts of the South Coast Air Basin. The estimated lifetime cancer risk from exposure to TAC for those residing within the vicinity of the proposed Project is 884 cancers per million, while the vast majority of the area surrounding LAX ranges between 500 to 1,200 cancers per million.[29] However, the visual resolution available in the map is 1 kilometer by 1 kilometer and, thus, impacts for individual neighborhoods are not discernible on this map. In general, the risk at the Project site is comparable with other areas in the Los Angeles area; the risk from air toxics is lower near the coastline, and increases inland, with higher risks concentrated near large diesel sources (e.g., freeways, airports, and ports).

SCAQMD also provides guidance on performing an HHRA through its publication, *Supplemental Guidelines for Preparing Risk Assessment for the Air Toxics Hot Spots Information and Assessment Act*.[30] This guidance incorporates the updated risk methodologies established by OEHHA's 2015 Guidance Manual that take into account early childhood exposure. According to MATES-IV, while generally there has been an overall South Coast Air Basin-wide reduction in air toxics concentrations since MATES-III, application of the updated risk estimation methods adopted by OEHHA in 2015 results in an estimated population-weighted risk across the South Coast Air Basin of 897 per million, an increase in cancer risks.

CARB also prepares a series of maps that show regional trends in estimated outdoor inhalable cancer risk from air toxic emissions. The Year 2010 Los Angeles County Central map, which is the most recently available map to represent existing conditions, shows cancer risk ranging from 500 to 1,500 cancers per million in the Project area, which is generally consistent with the SCAQMD's risk maps.[31]

The data from the SCAQMD and CARB provide a slightly different range of risk. This difference is primarily related to the fact that the SCAQMD risk is based on monitored pollutant concentrations and the CARB risk is based on dispersion modeling and emission inventories. Regardless, the SCAQMD and CARB data show that an inherent health risk associated with living in urbanized areas of the South Coast Air Basin, where mobile sources (e.g., cars, trucks, trains, ships, aircraft, etc.) represent the greatest contributors to the overall risk.

4.1.2.3.2.1 Sources of Toxic Air Contaminants of Concern

Baseline sources of TAC at LAX, which would be affected by the proposed Project, include both stationary and mobile sources. Stationary sources consist of equipment such as water heaters, space heaters, and emergency generators. Mobile sources of TAC include aircraft, auxiliary power units, GSE, and on- and off-airport vehicles. These sources generate a number of TAC of concern, including volatile organics, polycyclic aromatic hydrocarbons, metals, and other constituents. During construction, there would be no stationary sources of TAC; construction-related mobile sources of TAC would consist of construction dust, heavy-duty construction equipment, and on- and off-airport vehicles.

4.1.2.3.2.2 Exposed Populations

Screening-level air dispersion modeling conducted for the LAX Master Plan Final EIR indicated that the greatest area of human health risk from airport activities is confined to the airport property. However, health risks from LAX may affect populations in the nearby area. The exposed population within nearby areas includes workers, residents, and sensitive receptors such as schools, hospitals, and nursing facilities.

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29 South Coast Air Quality Management District, *Multiple Air Toxics Exposure Study III Model Estimated Carcinogenic Risk.* Available: http://www3.aqmd.gov/webappl/matesiii/, accessed August 11, 2016.

30 South Coast Air Quality Management District, *AB 2588 and Rule 1402 Supplemental Guidelines (Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act)*, July 2018. Available: http://www.aqmd.gov/docs/default-source/planning/risk-assessment/ab2588supplementalguidelines.pdf.

31 California Air Resources Board, *Cancer Inhalation Risk: Local Trend Maps*. Available: http://www.arb.ca.gov/ch/communities/hlthrisk/cncrinhl/rskmapvwtrend.htm.400, accessed January 19, 2017.

The airport is bound to the north and south by residential areas that are likely to contain populations that are particularly sensitive to air pollution. These population groups include children, elderly, and acutely and chronically ill persons (especially those with cardio-respiratory diseases). Sensitive land uses in close proximity to the Project site include the following:

- The El Segundo residential neighborhood located approximately 1,300 feet to the south of Runway 7R-25L
- The Westchester residential neighborhood located approximately 1,300 feet to the north of Runway 6L-24R

4.1.2.4 Thresholds of Significance

LAWA has not adopted thresholds of significance for impacts to human health from TACs. LAWA generally relies on guidance issued by SCAQMD to determine the significance of such impacts. The thresholds listed below are based on SCAQMD guidance.[32] Thresholds for workers are based on standards developed by CalOSHA. No significance threshold specific to human health risk from exposure to TAC is included in Appendix G of the State CEQA Guidelines.

Significance determinations for health impacts are assessed as incremental increases or decreases in cancer risks and non-cancer health hazards. A significant[33] incremental impact to human health would occur if changes related to construction or operation of the proposed Project would result in:

Threshold 4.1.2-1 An increased incremental cancer risk greater than, or equal to, 10 in 1 million (10×10^{-6}) for potentially exposed off-airport workers, residents, or school children.[34]

Threshold 4.1.2-2 A cancer burden greater than, or equal to 0.5 excess cancer cases in areas within the greater than 1 in 1 million zone of impact.

Threshold 4.1.2-3 A total incremental chronic hazard index (HI) greater than, or equal to, 1 for any target organ system at any receptor location.[35]

Threshold 4.1.2-4 A total incremental acute HI greater than, or equal to, 1 for any target organ system at any receptor location.

Threshold 4.1.2-5 Exceedance of Permissible Exposure Limits - Time Weighted Average or Threshold Limit Values for workers.

4.1.2.5 Project Impacts

4.1.2.5.1 Impact 4.1.2-1

Summary Conclusion for Impact 4.1.2-1: The proposed Project would not increase incremental cancer risk greater than, or equal to, 10 in 1 million (10×10^{-6}) for potentially exposed off-airport workers, residents, or school children. This would be a *less than significant impact* for construction and operations.

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[32] South Coast Air Quality Management District, *South Coast AQMD Air Quality Significance Thresholds*, April 2019. Available: http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2.

[33] The term "significant" is used as defined in CEQA and does not imply an independent judgment of the acceptability of risk or hazard.

[34] Incremental cancer risk is defined as the difference in cancer risks between the proposed Project and the 2018 baseline condition.

[35] For purposes of this analysis, a health hazard is any non-cancer adverse impact on health. (Cancer-related risks are addressed separately in this analysis.) A chronic health hazard is a hazard caused by repeated exposure to small amounts of a TAC. An acute health hazard is a hazard caused by a single or a few exposures to relatively large amounts of a chemical. A hazard index is the sum of ratios of estimated exposures to TAC and recognized safe exposures developed by regulatory agencies.

4.1.2.5.1.1 Construction

The MEI cancer risks associated with TAC exposure starting during construction and continuing through operations for the remainder of each receptor's exposure period are presented in **Table 4.1.2-2**. Supporting risk calculations are included in **Appendix C.6** for all receptors. As shown, construction-related cancer risks would be ***less than significant*** for off-airport workers, residents, and school children.

Table 4.1.2-2
Incremental Cancer Risks for Maximally Exposed Individuals during Combined With Project Construction and Operational Periods

Receptor Type	Cancer Risks[1,2,3,4] (per million people)	Threshold (per million people)	Equal to or Exceeds Threshold?
Off-Airport Worker, 25 years	5	10	No
Adult Resident, 70 years	-2	10	No
Adult Resident, 30 years	-1	10	No
Child Resident, 9 years	-0.1	10	No
School Child, 12 years	-0.2	10	No

Source: **Appendix C.6** of this EIR.

Notes:

1 Construction of the proposed Project is estimated to take 8 years – starting in 2021 and ending in 2028. Following construction, it was assumed that beginning in the 8th year (2028), construction and operations would be overlapping and continuing through the remainder of the receptors' exposure periods. Starting in 2028, receptors would be exposed to incremental 2028 With Project operations-related TAC as compared to 2018 baseline operations.

2 Maximally Exposed Individual (MEI) locations are shown on Figure 4.1.2-2.

3 The MEI value for the school child cancer risk is at a residential/commercial grid location and not at an existing school location. The highest estimated cancer risk for school children at an existing school is estimated to be -0.4 in 1 million at Cowan Avenue Elementary School (the school at grid point 176).

4 Negative values indicate a beneficial impact.

Off-Airport Workers

For the purposes of evaluating MEI cancer risk, off-airport workers were evaluated at 236 representative off-airport receptor locations identified as commercial or residential/commercial. Construction of the proposed Project is estimated to take 8 years – starting in 2021 and ending in 2028. Following construction, it was assumed that the TAC emissions for the worker's 17 remaining years of the 25-year exposure period would be equal to the increment of the operations-related TAC emissions from 2028 with the proposed Project over 2018 baseline operations.

Incremental MEI cancer risk for off-airport workers is estimated to be 5 in 1 million, which is below the threshold of significance of 10 in 1 million. The MEI cancer risk location for off-airport workers is shown on **Figure 4.1.2-2**.

Residents

For the purposes of evaluating MEI cancer risk, residential risks were evaluated using 155 representative off-airport receptor locations identified as residential, residential/commercial, or sensitive receptor locations. Construction of the proposed Project is estimated to take 8 years – starting in 2021 and ending in 2028. Following construction, it was assumed that annual operations-related TAC emissions would be equal to the increment of the operations-related TAC emissions from 2028 with the proposed Project over 2018 baseline operations for each receptors remaining years in their respective exposure periods, as defined in Table 4.1.2-2.

Legend

- LAX Property Boundary
- MEI Adult Resident Cancer Risk
- MEI Child Resident Cancer Risk
- MEI Off-Airport Worker Cancer Risk
- MEI School Child Cancer Risk
- Peak Existing School Child Cancer Risk
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- California State Highway
- Interstate Highway

Notes:

1. Grid points indicate locations where receptors were evaluated for the construction scenario. Receptor types are indentified in the legend.
2. Because future schools could be sited in any area zoned as residential, school child receptors were evaluated at all residential grid nodes.
3. Cancer risk theshold is 10 in 1 million. None of the cancer risks exceed this threshold. Only the maximum incremental cancer risk is shown on this figure.
4. Construction of the proposed project is estimated to take 8 years - starting in 2021 and ending in 2028. Following construction, it was assumed that beginning in the 8th year (2028) construction and operations would be overlapping and continuing through the remainder of the receptors' exposure periods. Starting in 2028, receptors would be exposed to incremental 2028 With Project operations-related TAC as compared to the 2018 baseline operations.

0 1.5 Miles

Scale

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020

Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project	Peak Incremental Cancer Risk Locations - Construction	Figure 4.1.2-2

Incremental MEI cancer risks for 30-year and 70-year adult residents are estimated to be -1 in 1 million and -2 in 1 million, respectively. Both values are below the threshold of significance of 10 in 1 million. The negative values indicate that compared to the 2018 baseline, the proposed Project would result in decreases of some TAC concentrations (most notably DPM), which thereby results in decreases in cancer risk estimates, producing beneficial impacts for adult residents. Over 90 percent of cancer risk is driven by DPM, and DPM emissions from both on-road truck and shuttle trips, as well as from airport ground support equipment, would be lower under the proposed Project,[36] producing the reduction in cancer risk. The MEI cancer risk location for adult residents is shown on Figure 4.1.2-2.

Incremental MEI cancer risk for child residents is estimated to be -0.1 in 1 million, which is below the threshold of significance of 10 in 1 million. Because children have a shorter exposure period than adults and beneficial effects are cumulative with each year of exposure, they would experience less beneficial impacts than adults, resulting in a higher incremental cancer risk. The MEI cancer risk location for child residents is shown on Figure 4.1.2-2.

School Children

For the purposes of evaluating MEI cancer risk, 12-year school child risks were evaluated using 155 representative off-airport receptor locations identified as residential, residential/commercial, or sensitive receptor locations. Construction of the proposed Project is estimated to take 8 years – starting in 2021 and ending in 2028. Following construction, it was assumed that for the remaining 4 years of their 12-year exposure period, school children would be exposed to operations-related TAC emissions equivalent to the increment of the operations-related TAC emissions from 2028 with the proposed Project over 2018 baseline operations.

Incremental MEI cancer risk for school children is estimated to be -0.2 in 1 million, which is below the threshold of significance of 10 in 1 million. The MEI cancer risk location for school children is shown on Figure 4.1.2-2. This MEI location is at a residential grid location and not at an existing school location. The highest estimated cancer risk for school children at an existing school is estimated to be -0.4 in 1 million at Cowan Avenue Elementary School (the school at grid point 176).

4.1.2.5.1.2 Operations

As noted in Section 4.1.2.2.1, incremental operations-related TAC estimated for the proposed Project from 2028 With Project compared to the 2018 baseline conditions is used to determine the significance of operational human health impacts under CEQA. For informational purposes, the 2028 Future Without Project scenario was also compared to the 2018 baseline conditions; however, the level of significance of Project-related human health impacts is not determined based on this comparison.

Comparison of 2028 With Project and 2018 Baseline Conditions

The MEI cancer risks associated with TAC exposure starting during the first year of operations in 2028 and continuing throughout the remainder of each exposure period are presented in **Table 4.1.2-3**. Supporting risk calculations are included in **Appendix C.6** for all receptors. As shown, operations-related incremental cancer risks would be ***less than significant*** for off-airport workers, residents, or school children.

[36] As discussed in Section 4.1.1.5.2.1 and shown in Table 4.1.1-10 in Section 4.1.1, *Air Quality*, although there would be more GSE equipment operating hours in 2028 under the Future With Project scenario, the cleaner GSE fleet would result in a decrease in emissions in 2028 compared to 2018 for all pollutants.

Table 4.1.2-3
Incremental Cancer Risks for Maximally Exposed Individuals during the With Project Operational Period Compared to 2018 Baseline

Receptor Type	Cancer Risks[1,2,3,4] (per million people)	Threshold (per million people)	Equal to or Exceeds Threshold?
Off-Airport Worker, 25 years	5	10	No
Adult Resident, 70 years	-4	10	No
Adult Resident, 30 years	-4	10	No
Child Resident, 9 years	-3	10	No
School Child, 12 years	-1	10	No

Source: **Appendix C.6** of this EIR.

Notes:

1 It was assumed that for operations, receptors are exposed to operations-related TAC beginning in 2028 and continuing through the remainder of the receptors' exposure periods.

2 Maximally Exposed Individual (MEI) locations are shown on Figure 4.1.2-3.

3 The MEI value for the school child cancer risk is at a residential/commercial grid location and not at an existing school location. The highest estimated cancer risk for school children at an existing school is estimated to be -1 in 1 million at Cowan Avenue Elementary School (the school at grid point 176).

4 Negative values indicate a beneficial impact.

Off-Airport Workers

For the purposes of evaluating MEI cancer risk, off-airport workers were evaluated at 239 representative off-airport receptor locations (identified as commercial or residential/commercial) for exposure to operations-related TAC beginning the 8th year of overlapping construction and operations (2028) and continuing for the 17 remaining years of the worker's 25-year exposure period. Incremental MEI cancer risk for off-airport workers is estimated to be 5 in 1 million, which is below the threshold of significance of 10 in 1 million. The MEI cancer risk location for off-airport workers is shown on **Figure 4.1.2-3**.

Residents

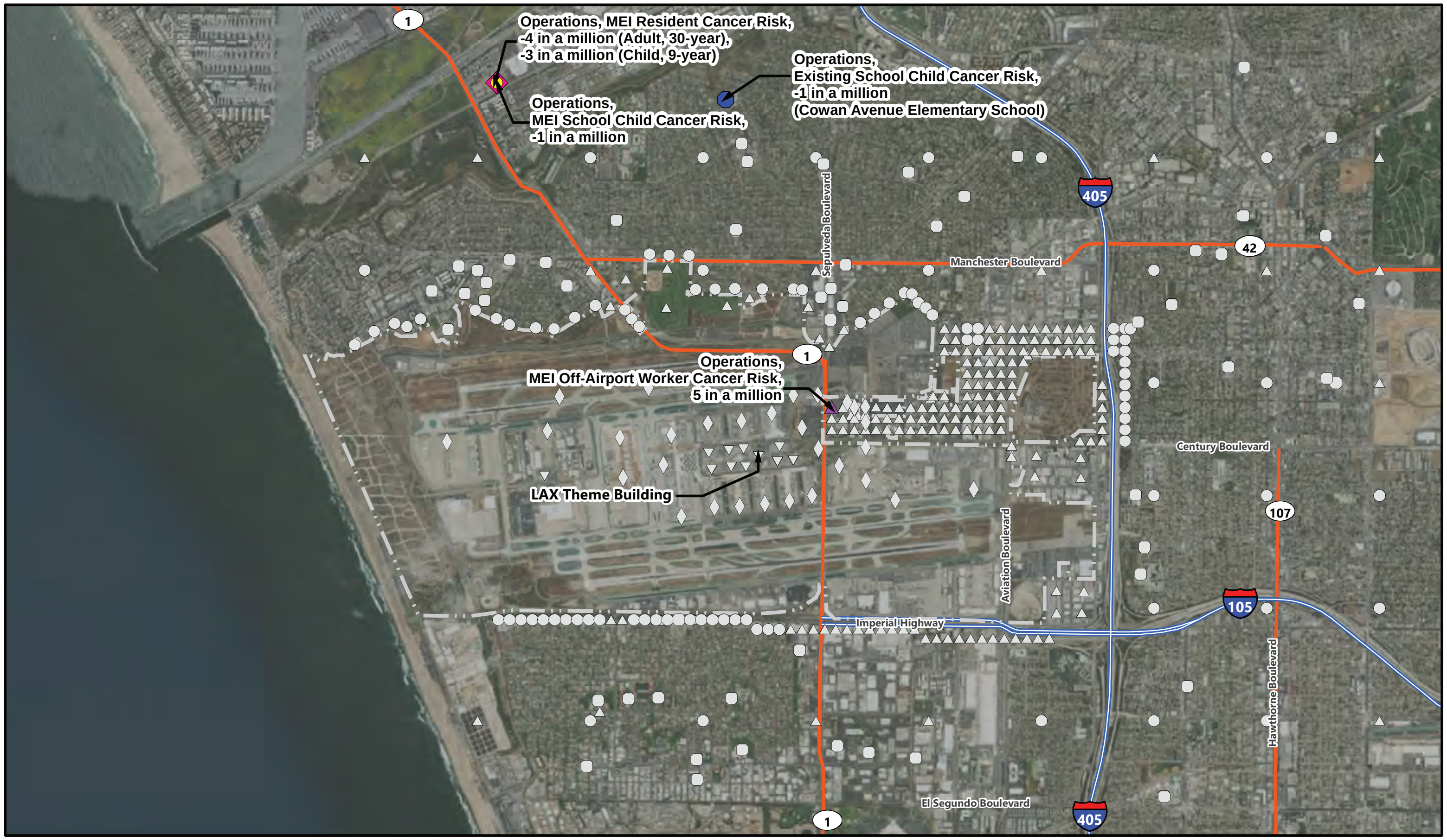
For the purposes of evaluating MEI cancer risk, residential risks were evaluated using 155 representative off-airport receptor locations identified as residential, residential/commercial, or sensitive receptor locations for exposure to operations-related TAC beginning the 7th year of overlapping construction and operations (2028) and continuing through the remainder of the 30-year or 70-year exposure period for the adult and 9-year exposure period for the child.

Incremental MEI cancer risks for 30-year and 70-year adult residents are both estimated to be -4 in 1 million. The value is negative, indicating a beneficial impact, and below the threshold of significance of 10 in 1 million. The MEI cancer risk location for adult residents is shown on Figure 4.1.2-3.

Incremental MEI cancer risk for child residents is estimated to be -3 in 1 million, which is negative, indicating a beneficial impact, and below the threshold of significance of 10 in 1 million. The MEI cancer risk location for child residents is shown on Figure 4.1.2-3.

School Children

For the purposes of evaluating MEI cancer risk, 12-year school child risks were evaluated using 155 representative off-airport receptor locations identified as residential, residential/commercial, or sensitive receptor locations for exposure to operations-related TAC beginning the 7th year of overlapping construction and operations (2028) and continuing through the remainder of their 12-year exposure period.



Legend

- LAX Property Boundary
- MEI Resident Cancer Risk
- MEI Off-Airport Worker Cancer Risk
- MEI School Child Cancer Risk
- Peak Existing School Child Cancer Risk
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- California State Highway
- Interstate Highway

Notes:

1. Grid points indicate locations where receptors were evaluated for the operations scenario. Receptor types are indentified in the legend.
2. Because future schools could be sited in any area zoned as residential, school child receptors were evaluated at all residential grid nodes.
3. Cancer risk theshold is 10 in 1 million. None of the cancer risks exceed this threshold. Only the maximum incremental cancer risk is shown on this figure.
4. It was assumed that for operations, receptors are exposed to operations-related TAC beginning in 2028 and continuing through the remainder of the receptors' exposure periods.

0 1.5 Miles

Scale

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020

Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Peak Incremental Cancer Risk Locations - Operations (2028 With Project Compared to 2018 Baseline)

Figure 4.1.2-3

Incremental MEI cancer risk for school children is estimated to be -1 in 1 million, which is negative, indicating a beneficial impact, and below the threshold of significance of 10 in 1 million. The MEI cancer risk location for school children is shown on Figure 4.1.2-3. This MEI location is at a residential/commercial grid location and not at an existing school location. The highest estimated cancer risk for school children at an existing school is estimated to be -1 in 1 million at Cowan Avenue Elementary School (the school at grid point 176).

Comparison of 2028 With Project and 2028 Without Project

As noted in Section 4.1.2.2.1, the 2028 With Project scenario was also compared to the 2028 Without Project scenario for informational purposes. The incremental cancer risks associated with operations-related TAC exposure for MEI for both scenarios was calculated in comparison to 2018 baseline conditions and are presented in **Table 4.1.2-4.** MEI locations are shown in **Figure 4.1.2-4**. Supporting risk calculations are included in **Appendix C.6** for all receptors. Incremental MEI cancer risks for the 2028 Without Project scenario compared to 2018 baseline conditions are the same or lower than the incremental cancer risks for the 2028 With Project scenario compared to 2018 baseline conditions for the evaluated receptors.

Table 4.1.2-4
Incremental Cancer Risks for Maximally Exposed Individuals for 2028 With Project Operations Compared to 2018 Baseline and 2028 Without Project Compared to 2018 Baseline

Receptor Type	Incremental Cancer Risks[1,2,3,4] (per million people)	
	2028 With Project Operations Compared to 2018 Baseline	2028 Without Project Operations Compared to 2018 Baseline
Off-Airport Worker, 25 years	5	-0.2
Adult Resident, 70 years	-4	-4
Adult Resident, 30 years	-4	-3
Child Resident, 9 years	-3	-2
School Child, 12 years	-1	-0.9

Source: **Appendix C.6** of this EIR.

Notes:

1 It was assumed that for operations, receptors are exposed to operations-related TAC beginning in 2028 and continuing through the remainder of the receptors' exposure periods.
2 Maximally Exposed Individual (MEI) locations are shown on Figure 4.1.2-4.
3 The MEI value for the school child cancer risk is at a residential/commercial grid location and not at an existing school location. The highest estimated cancer risk for school children at an existing school is estimated to be -1 in 1 million at Cowan Avenue Elementary School (the school at grid point 176).
4 Negative values indicate a beneficial impact.

4.1.2.5.1.3 Mitigation Measures

Because the proposed Project would result in a ***less than significant impact*** relative to incremental cancer risk, no mitigation is required for construction or operations. However, it should be noted that mitigation measures that are recommended to reduce air pollutant emissions, greenhouse gas emissions, and transportation impacts would also reduce human health risk impacts. Such measures that address construction impacts are Mitigation Measures MM-AQ/GHG (ATMP)-1 and 2, described in Section 4.1.1, *Air Quality.* Such measures that address operational impacts are Mitigation Measures MM-AQ/GHG (ATMP)-5 described in Section 4.1.1, *Air Quality;* MM GHG (ATMP)-3, described in Section 4.4, *Greenhouse Gas Emissions*; and MM-TR (ATMP)-1, described in Section 4.8, *Transportation*.

Legend

- LAX Property Boundary
- MEI Resident Cancer Risk
- MEI Off-Airport Worker Cancer Risk
- Peak Existing School Child Cancer Risk
- MEI School Child Cancer Risk
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- California State Highway
- Interstate Highway

Notes:

1. Grid points indicate locations where receptors were evaluated for the operations scenario. Receptor types are indentified in the legend.
2. Because future schools could be sited in any area zoned as residential, school child receptors were evaluated at all residential grid nodes.
3. Cancer risk theshold is 10 in 1 million. None of the cancer risks exceed this threshold. Only the maximum incremental cancer risk is shown on this figure.
4. It was assumed that for operations, receptors are exposed to operations-related TAC beginning in 2028 and continuing through the remainder of the receptors' exposire periods.

0 0.5 1.5 Miles

Scale

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Peak Incremental Cancer Risk Locations - Operations
(2028 Future Without Project Compared to 2018 Baseline)

Figure
4.1.2-4

4.1.2.5.1.4 Significance of Impact After Mitigation

As indicated above, no mitigation is required to address the potential for the Project to result in incremental cancer risk. The proposed Project would result in a ***less than significant impact*** for construction and operations.

4.1.2.5.2 Impact 4.1.2-2

Summary Conclusion for Impact 4.1.2-2: The proposed Project would not result in a cancer burden greater than, or equal to, 0.5 excess cancer cases in areas within the greater than 1 in 1 million zone of impact. This would be a *less than significant impact* for construction and operations.

4.1.2.5.2.1 Construction

The incremental MEI cancer risk estimates (presented in Table 4.1.2-2) during proposed Project construction do not exceed the significance threshold of 10 in one million. In addition, the MEI cancer risk estimate for the 70-year residential scenario is negative. Since a beneficial impact occurs at this maximally exposed location, this indicates that all estimated impacts under this scenario are negative. Thus, when these negative cancer risks are multiplied by the census tract population, the cancer burden for the proposed Project is also negative. When summed across all census tracts, the total cancer burden would be negative and less than the significance threshold of 0.5. Therefore, construction-related cancer burden would be ***less than significant*** for the proposed Project.

4.1.2.5.2.2 Operations

<u>Comparison of 2028 With Project and 2018 Baseline Conditions</u>

The incremental MEI cancer risk estimates (presented in Table 4.1.2-3) during proposed Project operations do not exceed the significance threshold of 10 in one million. In addition, the MEI cancer risk estimate for the 70-year residential scenario is negative. Since a beneficial impact occurs at this maximally exposed location, this indicates that all estimated impacts under this scenario are negative. Thus, when these negative cancer risks are multiplied by the census tract population, the cancer burden for the proposed Project is also negative. When summed across all census tracts, the total cancer burden would be negative and less than the significance threshold of 0.5. Therefore, operations-related cancer burden would be ***less than significant*** for the proposed Project.

<u>Comparison of 2028 With Project and 2028 Without Project</u>

As noted in Section 4.1.2.2.1, the 2028 With Project scenario was also compared to the 2028 Without Project scenario for informational purposes. As presented in Table 4.1.2-4, the incremental MEI cancer risk estimates for the 2028 Without Project scenario over the 2018 baseline operations for the 70-year residential scenario is negative. Since a beneficial impact occurs at this maximally exposed location, this indicates that all estimated impacts under this scenario are negative. Thus, when these negative cancer risks are multiplied by the census tract population, the cancer burden for the 2028 Without Project scenario over the 2018 baseline operations is also negative.

4.1.2.5.2.3 Mitigation Measures

Because the proposed Project would result in a ***less than significant impact*** related to cancer burden, no mitigation is required for construction or operations. However, it should be noted that mitigation measures that are recommended to reduce air pollutant emissions, greenhouse gas emissions, and transportation impacts would also reduce human health risk impacts. Such measures that address construction impacts are Mitigation Measures MM-AQ/GHG (ATMP)-1 and 2, described in Section 4.1.1, *Air Quality.* Such measures that address operational impacts are Mitigation Measures

MM-AQ/GHG (ATMP)-5 described in Section 4.1.1, *Air Quality;* MM GHG (ATMP)-3, described in Section 4.4, *Greenhouse Gas Emissions*; and MM-TR (ATMP)-1, described in Section 4.8, *Transportation*.

4.1.2.5.2.4 Significance of Impact After Mitigation

As indicated above, no mitigation is required to address the potential for the Project to result in cancer burden. The proposed Project would result in a ***less than significant impact*** for construction and operations.

4.1.2.5.3 Impact 4.1.2-3

Summary Conclusion for Impact 4.1.2-3: The proposed Project would not result in a total incremental chronic hazard index (HI) greater than, or equal to, 1 for any target organ system at any receptor location. This would be a *less than significant impact* for construction and operations.

4.1.2.5.3.1 Construction

Project-related chronic non-cancer hazard indices for construction-related TAC exposure are presented in Table 4.1.2-4. Chronic non-cancer health hazards were evaluated for all receptor locations by initially calculating maximum HI by summing the HQs for all TAC, irrespective of target organ. If the screening had resulted in an HI exceeding the HI threshold of 1, a detailed analysis would have been used, which would have summed the HQs of all TAC known to affect like organ systems and presented the maximum HI for any organ system. However, as shown in **Table 4.1.2-5**, the maximum total HI for chronic exposure to all TAC during construction would not be greater than the threshold of 1; thus, no organ-system breakdown was necessary. Incremental hazard indices are shown for the peak year of construction (2023). As shown, chronic non-cancer human health hazards would be ***less than significant*** at both resident and worker receptor locations during proposed Project construction.

Table 4.1.2-5
Incremental Chronic Non-Cancer Human Health Hazards for Maximally Exposed Individuals during Peak With Project Construction and 2028 With Project Operations Compared to 2018 Baseline

Year	Resident HI[1]	Worker HI[1]	Significance Threshold	Equal to or Exceeds Threshold?
Peak Construction Year, 2023	0.08	0.3	1	No
First Year of Operations, 2028	0.02	0.09	1	No

Source: **Appendix C.6** of this EIR.

Note:

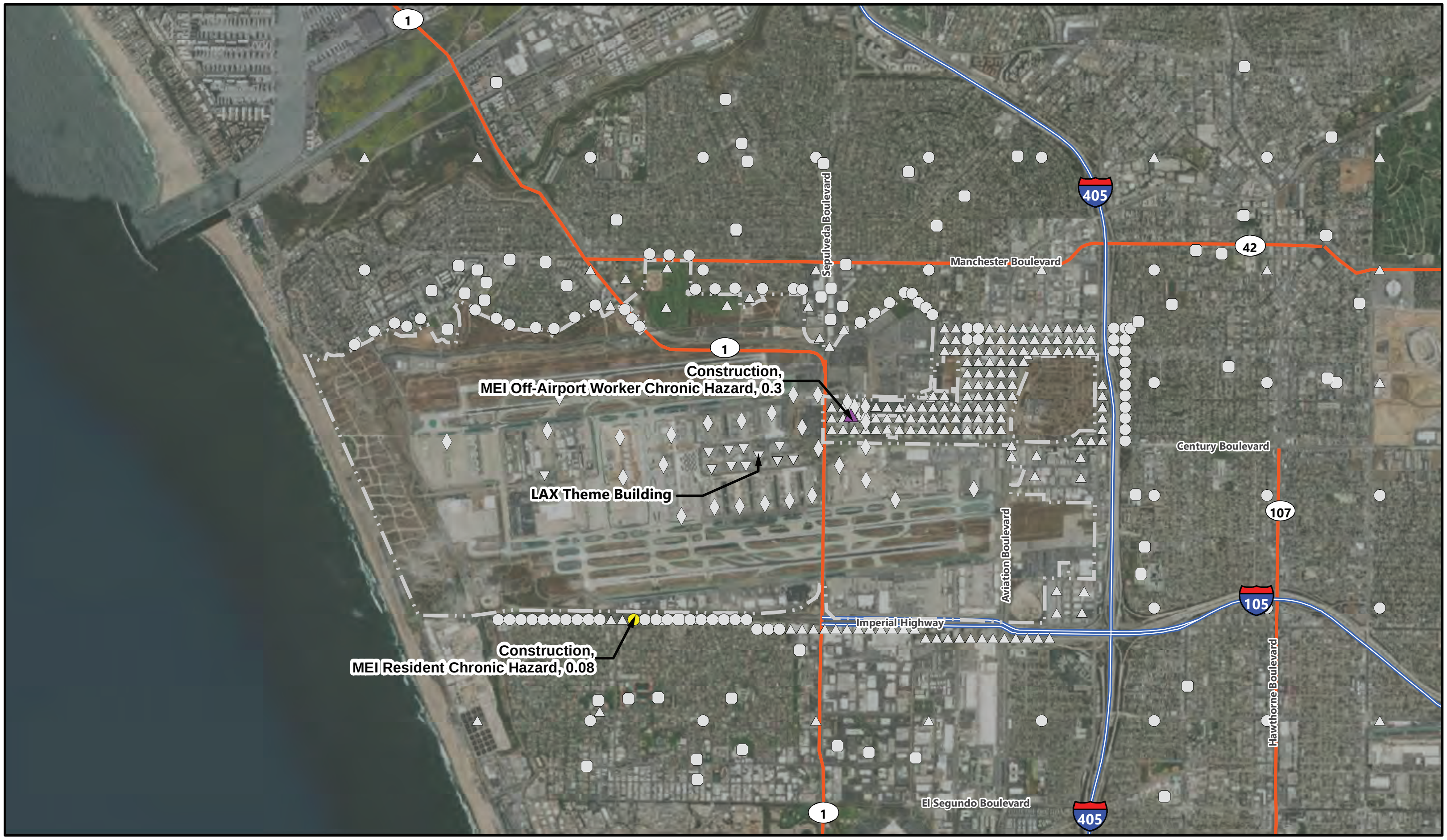
[1] Hazard indices (HI) are unitless.

Off-Airport Workers

The maximum total chronic non-cancer HI for an off-airport adult worker working in the study area during construction is 0.3, projected to occur in 2023. The peak off-airport adult worker hazard location during construction is shown on **Figure 4.1.2-5**. As shown in Table 4.1.2-5, the peak incremental chronic non-cancer health hazard for off-airport workers would be below the significance threshold of 1.

Residents

The maximum total chronic non-cancer HI for a resident living in the study area during construction is 0.08, projected to occur in 2023. The peak residential hazard location during construction is shown on Figure 4.1.2-5. As shown in Table 4.1.2-5, the peak incremental chronic non-cancer health hazard for residents would be below the significance threshold of 1.



Legend

- LAX Property Boundary
- MEI Resident Chronic Hazard
- MEI Off-Airport Worker Chronic Hazard
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- Interstate Highway
- California State Highway

Notes:
1. Grid points indicate locations where receptors were evaluated for the construction scenario. Receptor types are identified in the legend.
2. Non-cancer hazard index threshold is 1. None of the non-cancer hazard indices exceed this threshold. Only the maximum incremental non-cancer hazard index is shown on this figure.

0 0.5 1 Miles
Scale

Source: CEsri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Peak Incremental Chronic Hazard Locations - Construction

Figure
4.1.2-5

4.1.2.5.3.2 Operations

Comparison of 2028 With Project and 2018 Baseline Conditions

Project-related chronic incremental non-cancer hazard indices for operations-related TAC exposure are presented in Table 4.1.2-5. Incremental hazard indices are shown for the first year of operations (2028). Incremental operations-related TAC concentrations were estimated by comparing 2028 with proposed Project TAC concentrations to 2018 baseline operations TAC concentrations. Chronic non-cancer health hazards were evaluated for all receptor locations by initially calculating maximum HI by summing the HQs for all TAC, irrespective of target organ. If the screening had resulted in an HI exceeding the HI threshold of 1, a detailed analysis would have been used, which would have summed the HQs of all TAC known to affect like organ systems and presented the maximum HI for any organ system. However, as shown in Table 4.1.2-5, the maximum total HI for chronic exposure to all TAC during Project operations would not be greater than the threshold of 1; thus, no organ-system breakdown was necessary. As shown, chronic non-cancer human health hazards would be ***less than significant*** at both resident and worker receptor locations during proposed Project operations.

Off-Airport Workers

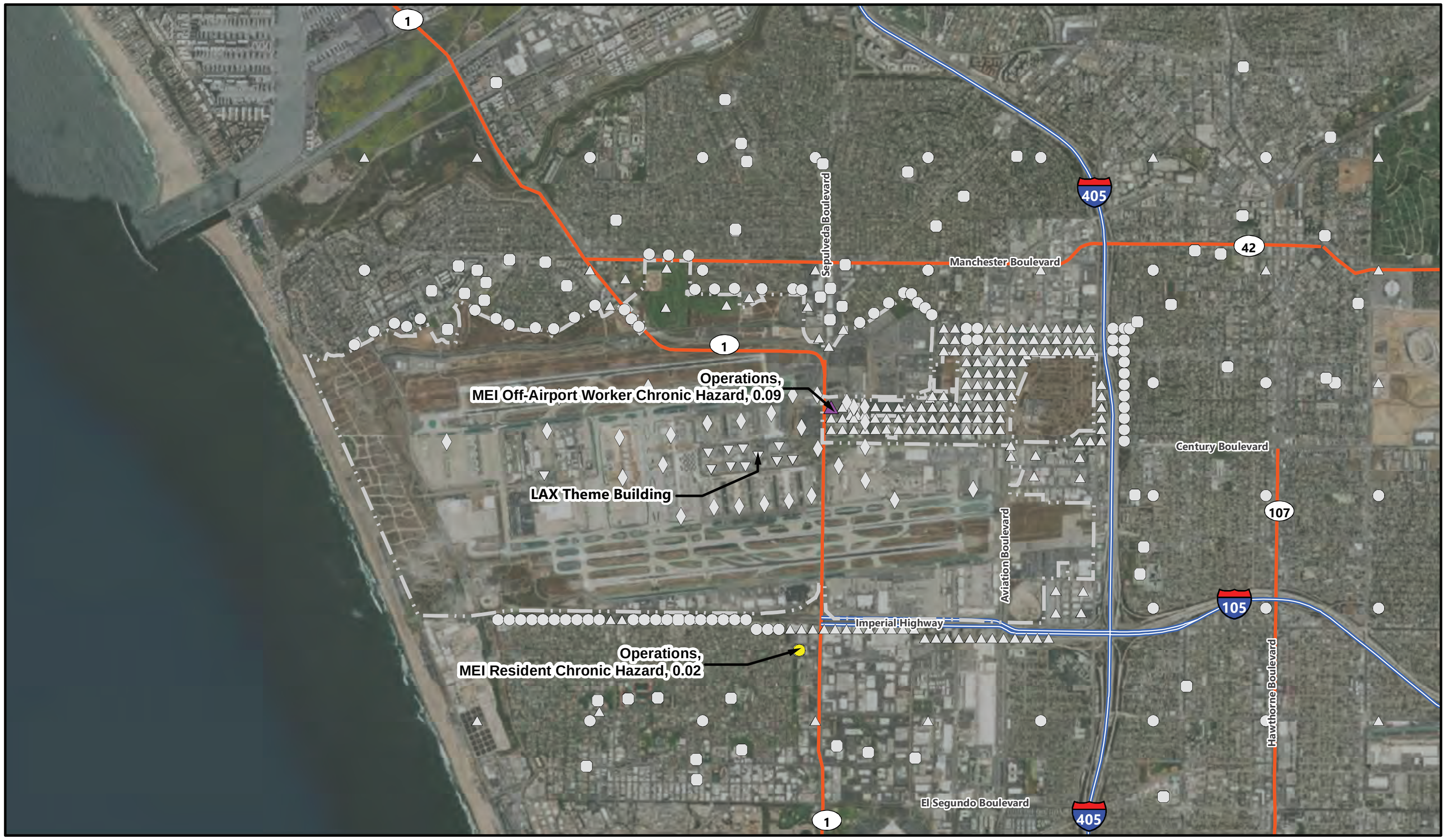
The maximum total chronic non-cancer HI for an off-airport adult worker at the peak hazard location for the first year of operations is 0.09. The peak off-airport adult worker hazard location for operations is shown on **Figure 4.1.2-6**. As shown in Table 4.1.2-5, peak incremental chronic non-cancer health hazards for off-airport workers would be below the significance threshold of 1.

Residents

The maximum HI for a resident living in the study area for the first year of operations is 0.02. The peak residential hazard location for operations is shown on Figure 4.1.2-6. As shown in Table 4.1.2-5, peak incremental chronic non-cancer health hazards for residents would be below the significance threshold of 1.

Comparison of 2028 With Project and 2028 Without Project

As noted in Section 4.1.2.2.1, the 2028 With Project conditions were also compared to the 2028 Without Project conditions for informational purposes. Project-related chronic incremental non-cancer hazard indices for operations-related TAC exposure for these scenarios are presented in **Table 4.1.2-6**.



Legend

- LAX Property Boundary
- MEI Resident Chronic Hazard
- MEI Off-Airport Worker Chronic Hazard
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- Interstate Highway
- California State Highway

Notes:
1. Grid points indicate locations where receptors were evaluated for the operations scenario. Receptor types are identified in the legend.
2. Non-cancer hazard index threshold is 1. None of the non-cancer hazard indices exceed this threshold. Only the maximum incremental non-cancer hazard index is shown on this figure.

0 0.5 1 Miles
Scale

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Peak Incremental Chronic Hazard Locations - Operations (2028 With Project Compared to 2018 Baseline)

Figure 4.1.2-6

Table 4.1.2-6
Incremental Chronic Non-Cancer Human Health Hazards for Maximally Exposed Individuals for 2028 With Project Operations Compared to 2018 Baseline and 2028 Without Project Compared to 2018 Baseline

Receptor Type	Incremental Hazards[2]			
	2028 With Project Operations Compared to 2018 Baseline		2028 Without Project Operations Compared to 2018 Baseline	
	Resident HI[1]	Worker HI[1]	Resident HI[1]	Worker HI[1]
First Year of Operations, 2028	0.02	0.09	-0.006	0.01

Source: **Appendix C.6** of this EIR.

Notes:

1 Hazard indices (HI) are unitless.

2 Maximally Exposed Individual (MEI) locations for the 2028 With Project Operations Compared to 2018 Baseline are shown on Figure 4.1.2-6. Maximally Exposed Individual (MEI) locations for the 2028 Without Project Operations Compared to 2018 Baseline are shown on Figure 4.1.2-7.

Off-Airport Workers

The Without Project maximum chronic non-cancer HI for an off-airport adult worker at the peak hazard location for the first year of operations is 0.01. The peak off-airport adult worker hazard location for operations is shown on **Figure 4.1.2-7**.

Residents

The Without Project maximum HI for a resident living in the study area for the first year of operations is -0.006. The peak residential hazard location for operations is shown on Figure 4.1.2-7.

4.1.2.5.3.3 Mitigation Measures

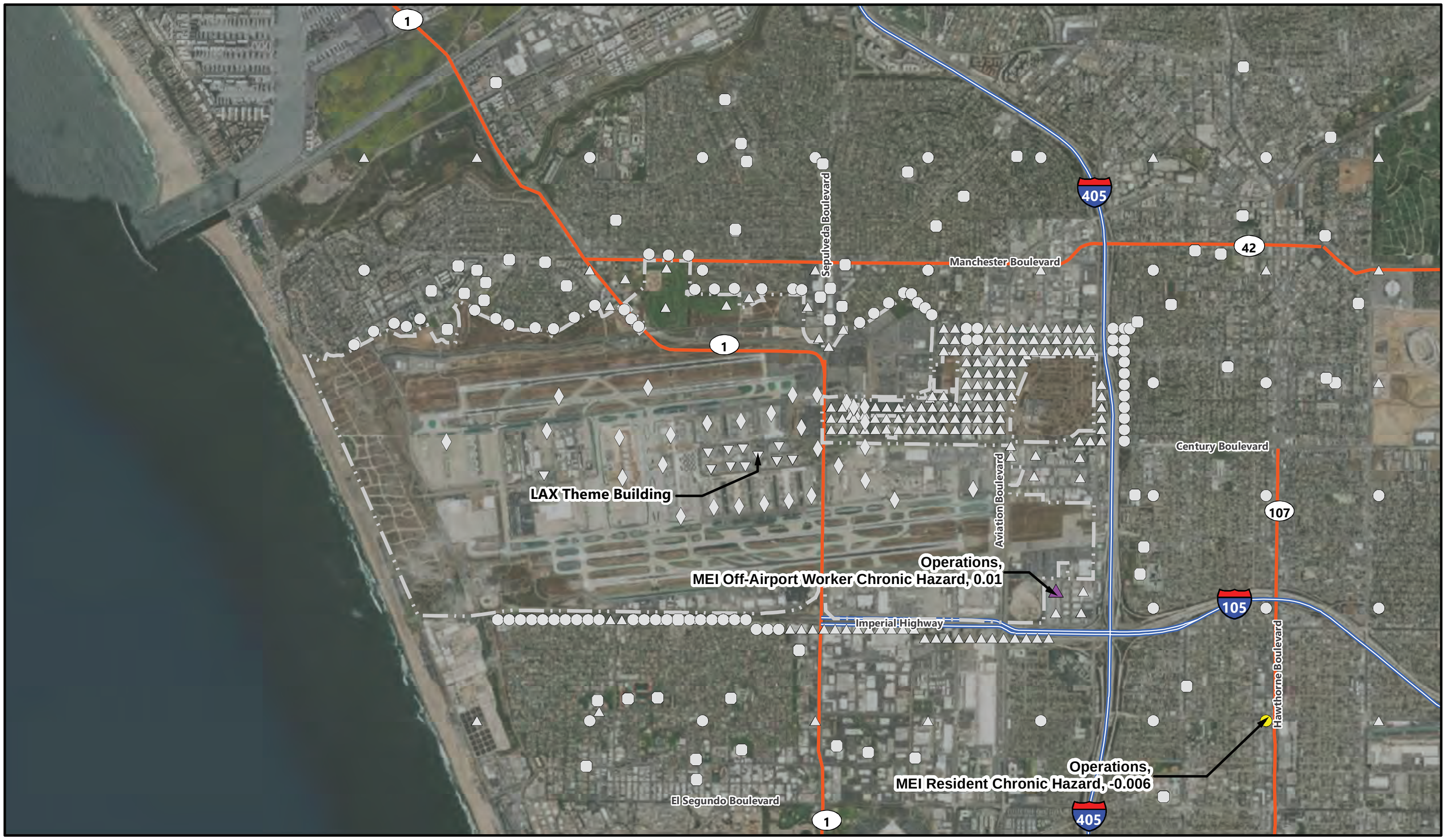
Because the proposed Project would result in a ***less than significant impact*** related to incremental chronic non-cancer health hazards, no mitigation is required for construction or operations. However, it should be noted that mitigation measures that are recommended to reduce air pollutant emissions, greenhouse gas emissions, and transportation impacts would also reduce human health risk impacts. Such measures that address construction impacts are Mitigation Measures MM-AQ/GHG (ATMP)-1 and 2, described in Section 4.1.1, *Air Quality.* Such measures that address operational impacts are Mitigation Measures MM-AQ/GHG (ATMP)-5 described in Section 4.1.1, *Air Quality;* MM GHG (ATMP)-3, described in Section 4.4, *Greenhouse Gas Emissions*; and MM-TR (ATMP)-1, described in Section 4.8, *Transportation*.

4.1.2.5.3.4 Significance of Impact After Mitigation

As indicated above, no mitigation is required to address the potential for the Project to result in incremental chronic non-cancer health hazards. The proposed Project would result in a ***less than significant impact*** for construction and operations.

4.1.2.5.4 Impact 4.1.2-4

Summary Conclusion for Impact 4.1.2-4: The proposed Project would not result in a total incremental acute HI greater than, or equal to, 1 for any target organ system at any receptor location. This would be a *less than significant impact* for construction and operations.



Legend

- LAX Property Boundary
- MEI Resident Chronic Hazard
- MEI Off-Airport Worker Chronic Hazard
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- Interstate Highway
- California State Highway

Notes:
1. Grid points indicate locations where receptors were evaluated for the operations scenario. Receptor types are identified in the legend.
2. Non-cancer hazard index threshold is 1. None of the non-cancer hazard indices exceed this threshold. Only the maximum incremental non-cancer hazard index is shown on this figure.

0 0.5 1 Miles
Scale

Source: CEsri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Peak Incremental Chronic Hazard Locations - Operations
(2028 Future Without Project Compared to 2018 Baseline)

Figure
4.1.2-7

4.1.2.5.4.1 Construction

Acute non-cancer health hazards were evaluated for each year of construction from 2021 to 2028. Project sources were estimated using the AERMOD option for 1-hour maximum concentrations. These concentrations represent the highest predicted concentrations of TAC for a 1-hour period. The peak emission year for acute non-cancer health hazards during construction was identified as 2023.

Acute non-cancer health hazards were evaluated for all receptor locations by initially calculating maximum HI by summing the HQs for all TAC, irrespective of target organ and TAC location. If the screening had resulted in an HI exceeding the HI threshold of 1, a detailed analysis would have been used, which would have summed the HQs of all TAC known to affect like organ systems and presented the maximum HI for any organ system. However, as shown in **Table 4.1.2-7**, the maximum HI for acute 1-hour exposure to all TAC during construction would not be greater than the threshold of 1; thus, no organ-system breakdown was necessary. Construction-related acute non-cancer health hazards would be ***less than significant*** for off-airport workers and residents.

Table 4.1.2-7
Peak Construction-Related Incremental Acute (1-Hour) Non-Cancer Health Hazards for With Project

MEI (Construction)	Acrolein HQ[1]	Benzene HQ[1]	Formaldehyde HQ[1]	Manganese HQ[1]	Nickel HQ[1]	Total HI[2]	Significance Threshold	Equal to or Exceeds Threshold?
Off-Airport Adult Worker	0.2	0.04	0.1	0.1	0.009	0.5	1	No
Resident	0.2	0.02	0.06	0.03	0.003	0.3	1	No

Source: **Appendix C.6** of this EIR.

Notes:

1 Hazard quotients (HQs) and hazard indices (HIs) are unitless.

2 Total acute non-cancer health hazards may not add up exactly due to trace hazard quotients from unlisted TAC. The HQs for the TACs shown represent 97 percent or more of the calculated peak total hazard index.

Off-Airport Workers

For construction-related health hazards evaluated for acute 1-hour exposure, the maximum HI at the peak off-airport adult worker hazard location is 0.5, which is less than the threshold of 1. The peak acute hazard locations for off-airport adult worker is shown on **Figure 4.1.2-8**.

Residents

For construction-related health hazards evaluated for acute 1-hour exposure, the maximum HI at the peak residential location is 0.3, which is less than the threshold of 1. The peak acute hazard locations for residents are shown on Figure 4.1.2-8.

4.1.2.5.4.2 Operations

Comparison of 2028 With Project and 2018 Baseline Conditions

Acute non-cancer health hazards were evaluated for operations in 2028. Project sources were estimated using the AERMOD option for 1-hour maximum concentrations. Incremental operations-related TAC concentrations were estimated by comparing 2028 with proposed Project TAC concentrations to 2018 baseline operations TAC concentrations. These concentrations represent the highest predicted incremental concentrations of TAC for a 1-hour period.

Legend

- LAX Property Boundary
- MEI Resident Acute Hazard
- MEI Off-Airport Worker Acute Hazard
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- Interstate Highway
- California State Highway

Notes:
1. Grid points indicate locations where receptors were evaluated for the construction scenario. Receptor types are identified in the legend.
2. Acute non-cancer hazard index threshold is 1. None of the acute non-cancer hazard indices exceed this threshold. Only the maximum incremental non-cancer hazard index is shown on this figure.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project	Peak Incremental Acute Hazard Locations - Construction	Figure 4.1.2-8

Acute non-cancer health hazards were evaluated for all receptor locations by initially calculating maximum HI by summing the maximum HQs for all TAC, irrespective of target organ and TAC location. If the screening had resulted in an HI exceeding the HI threshold of 1, a detailed analysis would have been used, which would have summed the HQs of all TAC known to affect like organ systems and presented the maximum HI for any organ system. However, as shown in **Table 4.1.2-8**, the maximum HI for acute 1-hour exposure to all TAC during operations would be less than the threshold of 1; thus, no organ-system breakdown was necessary. Operations-related acute non-cancer health hazards would be ***less than significant*** for off-airport workers and residents.

Table 4.1.2-8
Operation-Related Incremental Acute (1-Hour) Non-Cancer Health Hazards for 2028 With Project Compared to 2018 Baseline

MEI (Operation)	Acrolein HQ[1]	Benzene HQ[1]	Formaldehyde HQ[1]	Manganese HQ[1]	Nickel HQ[1]	Total HI[2]	Significance Threshold	Equal to or Exceeds Threshold?
Off-Airport Adult Worker	0.4	0.02	0.07	0.04	0.01	0.6	1	No
Resident	0.2	0.009	0.04	0.02	0.005	0.3	1	No

Source: **Appendix C.6** of this EIR.

Notes:

1 Hazard quotients (HQs) and hazard indices (HIs) are unitless.

2 Total acute non-cancer health hazards may not add up exactly due to trace hazard quotients from unlisted TAC. The HQs for the TACs shown represent 98 percent or more of the calculated peak total hazard index.

Off-Airport Workers

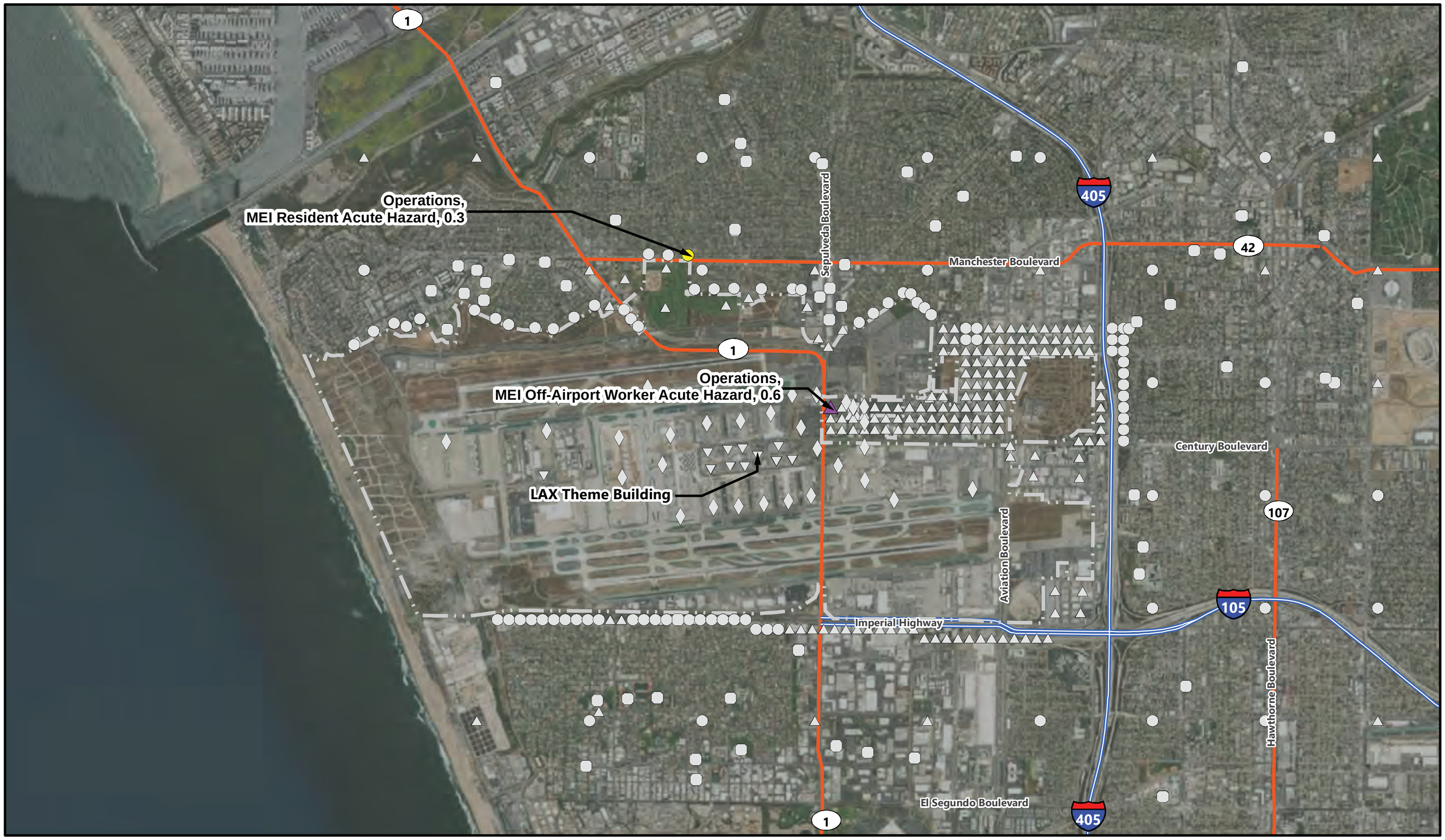
For operations-related health hazards evaluated for acute 1-hour exposure, the maximum HI at the peak off-airport adult worker hazard location is 0.6, which is less than the threshold of 1. This health hazard risk is driven by acrolein, responsible for 74 percent of the maximum HI. The peak acute hazard location for off-airport adult worker is shown on **Figure 4.1.2-9**.

Residents

For operations-related health hazards evaluated for acute 1-hour exposure, the maximum HI at the peak residential location is 0.3, which is less than the threshold of 1. This health hazard risk is driven by acrolein, responsible for 72 percent of the maximum HI. The peak acute hazard location for residents is shown on Figure 4.1.2-9.

Comparison of 2028 With Project and 2028 Without Project

As noted in Section 4.1.2.2.1, the 2028 With Project over 2018 baseline conditions was also compared to the 2028 Without Project over 2018 baseline conditions for informational purposes. Project-related acute incremental non-cancer hazard indices for operations-related TAC exposure for these scenarios are presented in **Table 4.1.2-9**.



Legend

- LAX Property Boundary
- MEI Resident Acute Hazard
- MEI Off-Airport Worker Acute Hazard
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- Interstate Highway
- California State Highway

Notes:
1. Grid points indicate locations where receptors were evaluated for the operations scenario. Receptor types are identified in the legend.
2. Acute non-cancer hazard index threshold is 1. None of the acute non-cancer hazard indices exceed this threshold. Only the maximum incremental non-cancer hazard index is shown on this figure.

0 0.5 1 Miles
Scale

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Peak Incremental Acute Hazard Locations - Operations
(2028 With Project Compared to 2018 Baseline)

Figure
4.1.2-9

Table 4.1.2-9
Operation-Related Incremental Acute (1-Hour) Non-Cancer Health Hazards for 2028 With Project Compared to 2018 Baseline and 2028 Without Project Compared to 2018 Baseline

MEI (Operation)	Acrolein HQ[1]	Benzene HQ[1]	FormaldehydeHQ[1]	Manganese HQ[1]	Nickel HQ[1]	Total HI[2]
2028 With Project Construction Compared to 2018 Baseline						
Off-Airport Adult Worker	0.4	0.02	0.07	0.04	0.01	0.6
Resident	0.2	0.009	0.04	0.02	0.005	0.3
2028 Without Project Construction Compared to 2018 Baseline						
Off-Airport Adult Worker	0.2	0.009	0.04	0.03	0.01	0.3
Resident	0.3	0.0007	0.03	0.01	0.004	0.4

Source: **Appendix C.6** of this EIR.

Notes:

1 Hazard quotients (HQs) and hazard indices (HIs) are unitless.

2 Total acute non-cancer health hazards may not add up exactly due to trace hazard quotients from unlisted TAC. The HQs for the TACs shown represent 98 percent or more of the calculated peak total hazard index.

Off-Airport Workers

For Without Project operations-related health hazards evaluated for acute 1-hour exposure, the maximum HI at the peak off-airport adult worker hazard location is 0.3. The peak acute hazard location for off-airport adult worker is shown on **Figure 4.1.2-10**.

Residents

For Without Project operations-related health hazards evaluated for acute 1-hour exposure, the maximum HI at the peak residential location is 0.4. The peak acute hazard location for residents is shown on Figure 4.1.2-9.

4.1.2.5.4.3 Mitigation Measures

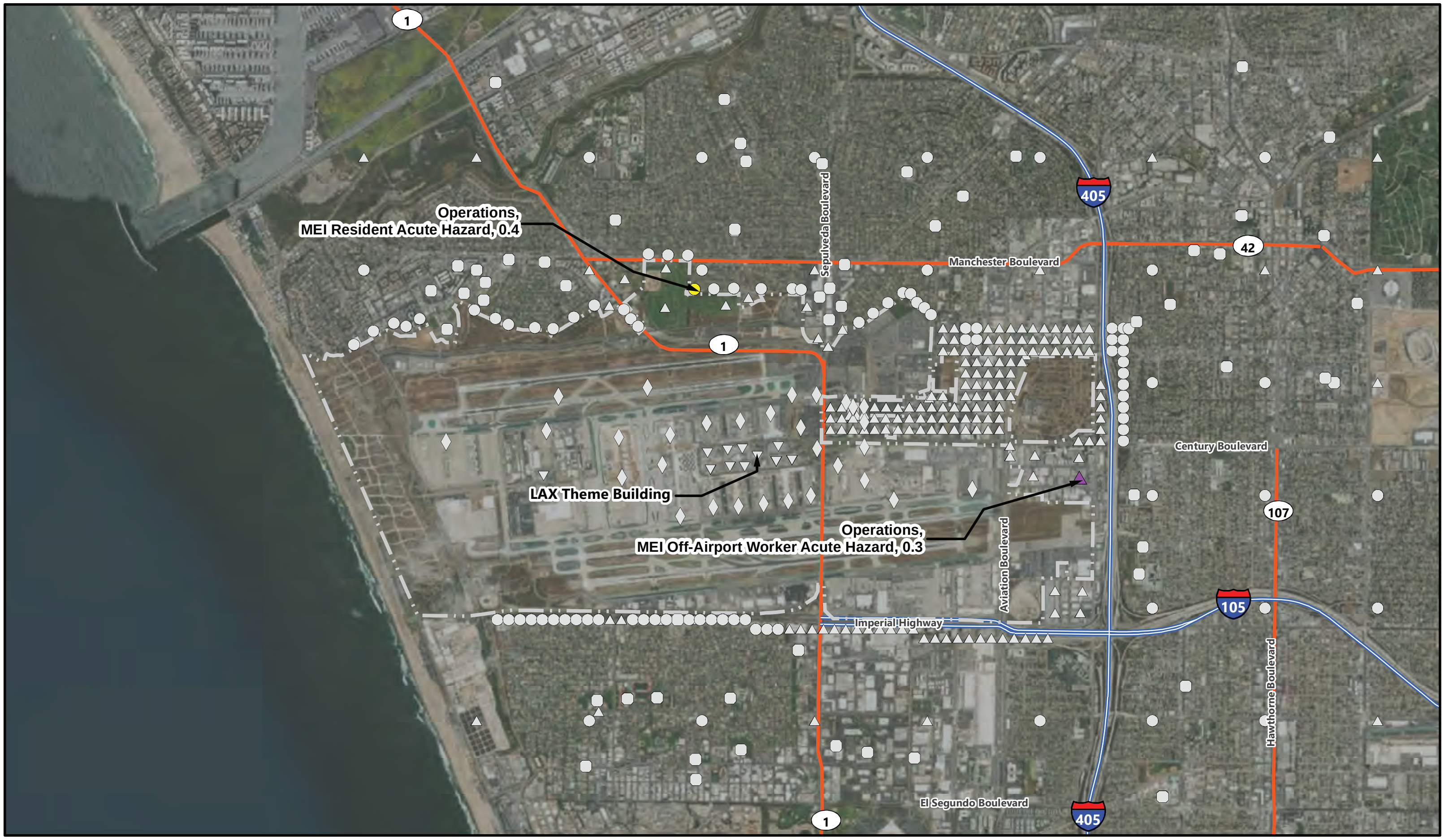
Because the proposed Project would result in a ***less than significant impact*** related to incremental acute non-cancer health hazards, no mitigation is required for construction or operations. However, it should be noted that mitigation measures that are recommended to reduce air pollutant emissions, greenhouse gas emissions, and transportation impacts would also reduce human health risk impacts. Such measures that address construction impacts are Mitigation Measures MM-AQ/GHG (ATMP)-1 and 2, described in Section 4.1.1, *Air Quality.* Such measures that address operational impacts are Mitigation Measures MM-AQ/GHG (ATMP)-5 described in Section 4.1.1, *Air Quality;* MM GHG (ATMP)-3, described in Section 4.4, *Greenhouse Gas Emissions*; and MM-TR (ATMP)-1, described in Section 4.8, *Transportation*.

4.1.2.5.4.4 Significance of Impact After Mitigation

As indicated above, no mitigation is required to address the potential for the Project to result in incremental acute non-cancer health hazards. The proposed Project would result in a ***less than significant impact*** for construction and operations.

4.1.2.5.5 Impact 4.1.2-5

Summary Conclusion for Impact 4.1.2-5: The proposed Project would not result in an exceedance of Permissible Exposure Limits - Time Weighted Average or Threshold Limit Values for workers. This would be a *less than significant impact* for construction and operations.



Legend

- LAX Property Boundary
- MEI Resident Acute Hazard
- MEI Off-Airport Worker Acute Hazard
- Commercial
- On-Airport Commercial
- On-Airport Construction, Commercial
- Residential
- Residential/Commercial
- Interstate Highway
- California State Highway

Notes:
1. Grid points indicate locations where receptors were evaluated for the operations scenario. Receptor types are identified in the legend.
2. Acute non-cancer hazard index threshold is 1. None of the acute non-cancer hazard indices exceed this threshold. Only the maximum incremental non-cancer hazard index is shown on this figure.

0 0.5 1 Miles
Scale

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, August 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Peak Incremental Acute Hazard Locations - Operations
(2028 Future Without Project Compared to 2018 Baseline)

Figure
4.1.2-10

4.1.2.5.5.1 Construction

On-airport worker health hazards for the proposed Project were evaluated by comparing modeled on-airport maximum 8-hour concentrations for each TAC during its peak year of construction (peak year is 2023 for all TAC, except barium, which peaks in 2024), against the corresponding Cal/OSHA PEL. On-airport worker health hazards were assessed at 13 on-airport locations located at the airfield-facing ends of each terminal and at the Midfield Satellite Concourse. These receptors are being evaluated for occupational health only as they are neither ambient air, nor peak impact areas. As shown in **Table 4.1.2-10**, construction of the proposed Project would result in on-airport concentrations of TAC less than the respective Cal/OSHA PEL for all TAC. Impacts from TAC concentrations during proposed Project construction would be ***less than significant*** for on-airport workers.

Table 4.1.2-10
Comparison of Peak On-Airport Worker TAC Concentrations During With Project Construction Against Cal/OSHA PEL

Toxic Air Contaminant (TAC)	Cal/OSHA PEL[1] (ug/m^3)	Maximum 8-hour On-Airport TAC Concentration[2] (ug/m^3)	Exceeds PEL?
1,2,4-Trimethylbenzene	125,000	0.08[4]	No
1,3-Butadiene	2,200	0.2[4]	No
2,2,4-Trimethylpentane	NA	0.03[3]	No
Acetaldehyde	45,000	1.0[4]	No
Acrolein	250	0.3[4]	No
Benzene	3,190	0.4[4]	No
Cumene	245,000	0.001[4]	No
Cyclohexane	1,050,000	0.003[3]	No
Ethyl benzene	22,000	0.07[4]	No
Formaldehyde	922	2.5[4]	No
Hexane	180,000	0.02[3]	No
Isoprene, except from vegetative emission sources	NA	0.0002[5]	No
Methanol	260,000	0.2[4]	No
Methyl Ethyl Ketone (2-butanone)	590,000	0.1[3]	No
Naphthalene	500	0.07[4]	No
Propionaldehyde	NA	0.2[4]	No
Propylene	NA	0.7[4]	No
Styrene	215,000	0.04[4]	No
Toluene	37,000	0.3[4]	No
Xylenes	435,000	0.2	No
Aluminum	2,000	0.6[3]	No
Ammonium	18,000	0.006[3]	No
Antimony	500	0.0002[3]	No
Arsenic	10	0.0002[3]	No
Barium	500	0.03[5]	No

Table 4.1.2-10
Comparison of Peak On-Airport Worker TAC Concentrations During With Project Construction Against Cal/OSHA PEL

Toxic Air Contaminant (TAC)	Cal/OSHA PEL[1] (ug/m^3)	Maximum 8-hour On-Airport TAC Concentration[2] (ug/m^3)	Exceeds PEL?
Bromine	700	0.0003[3]	No
Cadmium	5	0.0003[3]	No
Chlorine	1,500	0.03[3]	No
Chromium	5	0.002[3]	No
Cobalt	20	0.0008[3]	No
Copper	100	0.007[5]	No
Lead	50	0.004[3]	No
Manganese	200	0.007[3]	No
Mercury	25	0.0002[3]	No
Nickel	500	0.0007[5]	No
Phosphorus	100	0.01[3]	No
Selenium	200	0.00006[3]	No
Silicon	5,000	1.4[3]	No
Silver	10	0.0001[3]	No
Sulfates	NA	0.07[3]	No
Vanadium (fume or dust)	50	0.002[3]	No
Zinc	NA	0.01[3]	No

Source: **Appendix C.6** of this EIR.

Notes:
[1] Cal/OSHA PEL are permittable exposure levels for chemical contaminants for workers as detailed in the California Code of Regulations, Title 8, Section 5155, Airborne Contaminants.
[2] Listed on-airport maximum 8-hour concentrations during peak year of construction are from 2021.
[3] Listed on-airport maximum 8-hour concentrations during peak year of construction are from 2022.
[4] Listed on-airport maximum 8-hour concentrations during peak year of construction are from 2023.
[5] Listed on-airport maximum 8-hour concentrations during peak year of construction are from 2024.

Key:
NA = Not available; NV = No value; PEL = Permissible Exposure Limit; µg/m3 Micrograms per Cubic Meter

4.1.2.5.5.2 Operations

On-airport worker health hazards for the proposed Project were evaluated by comparing modeled on-airport maximum 8-hour concentrations for each TAC during 2028 operations, against the corresponding Cal/OSHA PEL. On-airport worker health hazards were assessed at 11 on-airport locations. As shown in **Table 4.1.2-11**, operation of the proposed Project would result in on-airport concentrations of TAC less than the respective Cal/OSHA PEL for all TAC. Impacts from TAC concentrations during proposed Project operation would be ***less than significant*** for on-airport workers.

Table 4.1.2-11
Comparison of Peak On-Airport Worker TAC Concentrations During With Project Operations Against Cal/OSHA PEL

Toxic Air Contaminant (TAC)	Cal/OSHA PEL[1] (ug/m^3)	Maximum 8-hour On-Airport TAC Concentration (ug/m^3)	Exceeds PEL?
1,2,4-Trimethylbenzene	125,000	1.4	No
1,3-Butadiene	2,200	3.3	No
2,2,4-Trimethylpentane	NA	0.7	No
Acetaldehyde	45,000	11.1	No
Acrolein	250	4.6	No
Benzene	3,190	4.6	No
Cumene	245,000	0.01	No
Cyclohexane	1,050,000	0.06	No
Ethyl benzene	22,000	0.6	No
Formaldehyde	922	29.4	No
Hexane	180,000	0.2	No
Isoprene, except from vegetative emission sources	NA	0.01	No
Methanol	260,000	3.4	No
Methyl ethyl Ketone (2-butanone)	590,000	0.6	No
Naphthalene	500	1.1	No
Propionaldehyde	NA	1.8	No
Propylene	NA	9.9	No
Styrene	215,000	0.6	No
Toluene	37,000	2.5	No
Xylenes	435,000	0.5	No
Aluminum	2,000	0.003	No
Ammonium	18,000	0.007	No
Antimony	500	0.00007	No
Arsenic	10	0.00006	No
Barium	500	0.3	No
Bromine	700	0.002	No
Cadmium	5	0.00008	No
Chlorine	1,500	0.2	No
Chromium	5	0.0004	No
Cobalt	20	0.001	No
Copper	100	0.06	No
Lead	50	0.001	No

Table 4.1.2-11
Comparison of Peak On-Airport Worker TAC Concentrations During With Project Operations Against Cal/OSHA PEL

Toxic Air Contaminant (TAC)	Cal/OSHA PEL[1] (ug/m^3)	Maximum 8-hour On-Airport TAC Concentration (ug/m^3)	Exceeds PEL?
Manganese	200	0.01	No
Mercury	25	0.00006	No
Nickel	500	0.005	No
Phosphorus	100	0.002	No
Selenium	200	0.0001	No
Silicon	5,000	0.3	No
Silver	10	0.00006	No
Sulfates	NA	1.4	No
Vanadium (fume or dust)	50	0.003	No
Zinc	NA	0.009	No

Source: **Appendix C.6** of this EIR.

Note:

1 Cal/OSHA PEL are permittable exposure levels for chemical contaminants for workers as detailed in the California Code of Regulations, Title 8, Section 5155, Airborne Contaminants.

Key:

PEL = Permissible Exposure Limit; µg/m3 Micrograms per Cubic Meter

4.1.2.5.5.3 Mitigation Measures

Because the proposed Project would result in a ***less than significant impact*** related to an exceedance of Permissible Exposure Limits - Time Weighted Average or Threshold Limit Values for workers, no mitigation is required for construction or operations. However, it should be noted that mitigation measures that are recommended to reduce air pollutant emissions, greenhouse gas emissions, and transportation impacts would also reduce human health risk impacts. Such measures that address construction impacts are Mitigation Measures MM-AQ/GHG (ATMP)-1 and 2, described in Section 4.1.1, *Air Quality.* Such measures that address operational impacts are Mitigation Measures MM-AQ/GHG (ATMP)-5 described in Section 4.1.1, *Air Quality;* MM GHG (ATMP)-3, described in Section 4.4, *Greenhouse Gas Emissions*; and MM-TR (ATMP)-1, described in Section 4.8, *Transportation*.

4.1.2.5.5.4 Significance of Impact After Mitigation

As indicated above, no mitigation is required to address the potential for the Project to result in an exceedance of Permissible Exposure Limits - Time Weighted Average or Threshold Limit Values for workers. The proposed Project would result in a ***less than significant impact*** for construction and operations.

4.1.2.5.6 Human Health Risk Assessment (HHRA) Summary

The purpose of the HHRA is to address potential human health impacts from inhalation of TAC caused by construction and operation of the proposed Project, including both cancer risks and acute (short-term) and chronic (long-term) non-cancer health hazards. Risk assessment is an evolving and highly uncertain process. Large uncertainties exist in emission estimates and dispersion modeling, evaluation of sensitive receptor populations, exposure parameter assumptions, toxicity assessment, the assumptions inherent in the 2015 OEHHA Air Toxics Methodology, and interactions among acrolein and criteria pollutants.[37] This HHRA relied upon the data and methods based on the current state of the science.

Although the proposed Project itself would not result in any changes to future aviation activity levels projected for LAX at build-out, the modifications and additions to the airfield, terminals, and ground access facilities would alter the locations and amounts of TAC released by aircraft, GSE, vehicles, and stationary sources in ways that could result in impacts on human health during both construction and operation of the proposed Project. In addition, construction of the proposed improvements and associated construction equipment would release TAC. Potential impacts to human health associated with releases of TAC may include increased cancer risks and increased acute and chronic non-cancer health hazards from inhalation of TAC.

Although no regulations exist that establish thresholds of significance for an entire facility like LAX, LAWA has developed human health risk assessment significance thresholds based on recent SCAQMD policies. The significance thresholds used in the analysis represent a best effort to understand and evaluate the potential impacts to human health in terms of cancer risk to workers, residents and children within the study area, cancer burden (evaluation of population-wide cancer risk), chronic non-cancer health hazards, acute non-cancer health hazards, and the potential for criteria pollutants to exceed established exposure concentrations. The specific impact thresholds are described in detail in Section 4.1.2.4.

The primary findings of the health risk assessment are as follows:

- The incremental cancer risks for both construction and operations for off-airport workers would be higher than 2018 baseline conditions but would be less than the significance threshold of 10 in 1 million.
- The incremental cancer risks for both construction and operations for adult residents (70- and 30-year exposure), child residents, and school children would be negative when compared to baseline conditions, and thus beneficial. Because of these negative impacts, the calculated cancer burden would similarly be negative. Impacts would be less than the respective significance thresholds.
- The incremental chronic non-cancer health hazards for both residents and workers would be greater than baseline conditions during both construction and operations. However, impacts would be less than the significance threshold.
- The incremental acute non-cancer health hazards for both residents and workers would be greater than baseline conditions during both construction and operations but would be less than the significance threshold.
- On-airport worker health hazards for the proposed Project were compared to the Cal/OSHA PEL during the peak year of construction and during operations. Estimated 8-hour concentrations of each TAC were found to be less than the Cal/OSHA PEL in all cases and would be less than significant.

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[37] California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program, Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments*, February 2015. Available: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.

- The cumulative cancer risk from the proposed Project would slightly increase, amounting to approximately 1 percent of the cancer risk in the South Coast Air Basin and would not add substantially to the already high regional cumulative cancer risk in the South Coast Air Basin.
- Cumulative non-cancer hazards (chronic and acute) could only be evaluated semi-quantitatively because of substantial uncertainties associated with the USEPA predictions for TAC emissions and concentrations. However, because of the relatively small hazard indices associated with the proposed Project emissions, the proposed Project is not expected to add significantly to cumulative acute and chronic health hazards.

4.1.2.6 Cumulative Impacts

Although air quality has established standards that determine acceptable levels of pollutant concentrations, no USEPA standards exist that establish acceptable levels of human health risks or that identify a threshold of significance for cumulative health risk impacts. Therefore, while the discussion below addresses cumulative health risk impacts, and Project-related contributions to those impacts; no determination is made regarding the significance of cumulative impacts. Since these results are not used for significance determination, a general discussion of the cumulative impacts for the proposed Project is provided. Based on information available from the SCAQMD and USEPA, the geographic areas considered in the cumulative health risk impacts analysis include the South Coast Air Basin for cancer risk and the LAX area for non-cancer health hazards.

4.1.2.6.1 Cancer Risks

As noted in Section 4.1.2.3.2, according to MATES-IV,[38] cancer risks in the South Coast Air Basin range from 320 in 1 million to 480 in 1 million, with an average of 418 in 1 million. These cancer risk estimates are high and indicate that current impacts associated with ongoing releases of TAC (e.g., from vehicle exhaust) and from sources of TAC from past and present projects in the region are substantial. Although the MATES-IV study is an appropriate estimate of present cumulative impacts of TAC emissions in the South Coast Air Basin, it does not have sufficient resolution to determine the fractional contribution of current LAX operations to TAC in the airshed. Only possible incremental contributions to cumulative impacts can be assessed. Meaningful quantification of future cumulative health risk exposure in the entire South Coast Air Basin is not possible. Moreover, the threshold of significance used to determine cancer risk impacts is based on cancer risks associated with individual projects and this threshold cannot be applied to conclusions regarding cumulative cancer risks.

Based on the relatively high cancer risk level associated with TAC in air in the South Coast Air Basin, the proposed Project off-airport worker risk would amount to approximately 1 percent of the cancer risk in the South Coast Air Basin and would not add substantially to the already high cumulative cancer risk. Neither this small increase estimated for off-airport workers, nor the risk decreases estimated for residents, would be measurable in collected cancer statistics against urban background conditions in the South Coast Air Basin.

The above comparisons do not account for possible positive changes in air quality in the South Coast Air Basin in the future. SCAQMD and other agencies are consistently working to reduce air pollution. In particular, reductions in emissions of diesel particulates are being considered and implemented. Since DPM is the major contributor to estimated cancer risks, substantial reductions in diesel emissions would result in substantial reductions in cumulative cancer risks. These, and other such regulations intended to reduce TAC emissions within the South Coast Air Basin, would reduce cumulative impacts overall.

[38] South Coast Air Quality Management District, *Final Report – Multiple Air Toxics Exposure Study in the South Coast Air Basin – MATES-IV*, May 2015. Available: http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7.

Continued, if not increased, regulation by the SCAQMD of point sources, as well as more stringent emission controls on mobile sources, would reduce TAC emissions; whether such measures would alter incremental contributions of TAC releases to cumulative impacts under the proposed Project cannot be ascertained.

4.1.2.6.2 Chronic Non-Cancer Hazards

For the proposed Project, chronic non-cancer health hazards are primarily attributable to acrolein, DPM, and chlorine, and to a lesser extent silicon, formaldehyde, and 1,3-butadiene. In 2018, USEPA[39] published an independent study that included annual average air concentrations within the South Coast Air Basin associated with a variety of TAC, including acrolein, chlorine, and DPM. These estimates provide a means for assessing cumulative chronic non-cancer health hazard impacts of airport operations in much the same manner as cumulative cancer risks were assessed using the MATES-IV results.

Within the study area, USEPA predictions for annual average concentrations yield acrolein hazard quotients by census tract ranging from 0.1 to 0.5, with an average of 0.2; DPM hazard indices range from 0.05 to 0.09, with an average of 0.07; and chlorine hazard indices range from 0.05 to 0.08, with an average of 0.07. Incremental chronic non-cancer hazard indices for the proposed Project were estimated to range from 0.02 to 0.3, all below the threshold of significance of one. Given the relatively small hazard indices associated with proposed Project emissions, the proposed Project is not expected to add significantly to cumulative chronic non-cancer health hazards.

Because of the substantial uncertainties associated with the USEPA estimates, the cumulative analysis for chronic non-cancer health hazard impacts is semi-quantitative and based on a range of possible contributions. This cumulative analysis does not address the issue of potential interactions among acrolein and criteria pollutants. Such interactions cannot, at this time, be addressed in a quantitative fashion. A qualitative discussion of the issue is presented in the LAX Master Plan Final EIR[40] Technical Report S-9a, Section 7.

As discussed in the LAX Master Plan Final EIR[41] (Section 4.24.1.2), limited data are available for describing regional acrolein emissions. Therefore, estimates of chronic non-cancer health hazards are very uncertain. Chronic non-cancer health hazards associated with the proposed Project should only be used to provide a relative comparison to basin-wide conditions. These hazards should not be viewed as absolute estimates of potential health impacts. Moreover, USEPA's estimates are based on data from 2014 and are therefore several years old. Emissions from some important sources may have been reduced as a result of continuing efforts by SCAQMD and other agencies to improve air quality in the South Coast Air Basin. Finally, the estimates do not consider degradation of TAC in the atmosphere. Degradation may be very important for relatively reactive chemicals such as acrolein.

4.1.2.6.3 Acute Non-Cancer Hazards

Acrolein, formaldehyde, and manganese are the primary TAC of concern in proposed Project construction emissions that might be present at concentrations approaching the threshold for acute non-cancer health

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39 U.S. Environmental Protection Agency, *2014 National Air Toxics Assessment*, 2018. Available: https://www.epa.gov/national-air-toxics-assessment/2014-nata-assessment-results, accessed February 5, 2020.

40 City of Los Angeles, Los Angeles World Airports, *Final Environmental Impact Report for Los Angeles International Airport (LAX) Proposed Master Plan Improvements*, (SCH 1997061047), Technical Report 14a, Health Risk Assessment, and Technical Report S-9a, Supplemental Health Risk Assessment*, April 2004. Available:* https://www.lawa.org/en/lawa-our-lax/environmental-documents/documents-certified/2004-lax-master-plan-program/final-environmental-impact-report-feir.

41 City of Los Angeles, Los Angeles World Airports, *Final Environmental Impact Report for Los Angeles International Airport (LAX) Proposed Master Plan Improvements,* (SCH 1997061047), Section 4.24.1, Human Health Risk Assessment, Technical Report 14a, Health Risk Assessment, and Technical Report S-9a, Supplemental Health Risk Assessment, April 2004. Available: https://www.lawa.org/en/lawa-our-lax/environmental-documents/documents-certified/2004-lax-master-plan-program/final-environmental-impact-report-feir.

hazards. The primary TAC of concern in proposed Project operations emissions for acute non-cancer hazards is acrolein. Predicted concentrations of TAC released from both construction activities and operations for the proposed Project estimate that acute non-cancer health hazards are below the significance threshold of 1.

The assessment of cumulative acute non-cancer health hazards follows the methods used to evaluate cumulative acute non-cancer health hazards presented in the LAX Master Plan Final EIR[42] (Section 4.24.1.7 and Technical Report S-9a, Section 6.3), incorporating updated National-Scale Air Toxics Assessment (NATA)[43] tables from 2014. USEPA-modeled emission estimates by census tract were used to estimate annual average ambient air concentrations. These census tract emission estimates are subject to high uncertainty, thus, for the analysis of cumulative acute non-cancer health hazards, estimates for each census tract within the study area within Los Angeles County were identified and the range of concentrations was used as an estimate of the possible range of annual average concentrations.

This range of concentrations was used to estimate a range of acute non-cancer hazard indices within the study area using the same methods as described in the LAX Master Plan Final EIR[44] (Section 4.24.1.7 and Technical Report S-9a, Section 6.1). The methodology entails converting the USEPA annual average estimates to maximum 1-hour average concentrations and then calculating the acute non-cancer hazard indices. The range of hazard indices was then used as a basis for comparison with estimated maximum acute non-cancer health hazards for the proposed Project. The relative magnitude of acute non-cancer health hazards calculated using this method were taken as a general measure of relative cumulative impacts.

When USEPA annual average estimates within the HHRA study area are converted to possible maximum 1-hour average concentrations, acrolein acute non-cancer hazard indices are estimated to range from 0.2 to 0.8, with an average of 0.4; formaldehyde acute non-cancer hazard indices are estimated to range from 0.3 to 0.5, with an average of 0.4; and manganese acute non-cancer hazard indices are estimated to range from 0.08 to 0.2, with an average of 0.1. Predicted overall maximum incremental acute non-cancer health hazards for the proposed Project from construction and operations ranged from 0.1 to 0.4 for acrolein; from 0.04 to 0.1 for formaldehyde; and from 0.02 to 0.1 for manganese. The target organ for manganese is the nervous system, while the target organ for formaldehyde and acrolein is the eyes. Thus, the hazard quotient for manganese would not be summed with the hazard quotients for formaldehyde and acrolein in an organ system breakdown of the hazard index. With the resulting hazard indices being below 1, this analysis indicates that the acute non-cancer health hazards for the proposed Project would not be cumulatively considerable.

4.1.2.6.4 Summary of Cumulative Impacts

Although no defined thresholds for cumulative health risk impacts are available, it is the policy of the SCAQMD to use the same significance thresholds for cumulative impacts as for the project-specific impacts analyzed in the EIR. Based on this policy, the proposed Project's contribution to the cumulative cancer risk would not be cumulatively considerable under the construction and operation scenarios since

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42 City of Los Angeles, Los Angeles World Airports, *Final Environmental Impact Report for Los Angeles International Airport (LAX) Proposed Master Plan Improvements*, (SCH 1997061047), Section 4.24.1, Human Health Risk Assessment, Technical Report 14a, Health Risk Assessment, and Technical Report S-9a, Supplemental Health Risk Assessment, April 2004. Available: https://www.lawa.org/en/lawa-our-lax/environmental-documents/documents-certified/2004-lax-master-plan-program/final-environmental-impact-report-feir.

43 U.S. Environmental Protection Agency, *2014 National Air Toxics Assessment*, 2018. Available: https://www.epa.gov/national-air-toxics-assessment/2014-nata-assessment-results, accessed February 5, 2020.

44 City of Los Angeles, Los Angeles World Airports, *Final Environmental Impact Report for Los Angeles International Airport (LAX) Proposed Master Plan Improvements*, (SCH 1997061047), Section 4.24.1, Human Health Risk Assessment, Technical Report 14a, Health Risk Assessment, and Technical Report S-9a, Supplemental Health Risk Assessment, April 2004. Available: https://www.lawa.org/en/lawa-our-lax/environmental-documents/documents-certified/2004-lax-master-plan-program/final-environmental-impact-report-feir.

the incremental cancer risk impacts for both construction and operation for evaluated receptors would be below the individual cancer risk significance thresholds of 10 in one million.

In contrast to cancer risk, the SCAQMD policy does have different significance thresholds for project-specific and cumulative impacts for hazard indices for TAC emissions. A project-specific significance threshold is one (1.0) while the cumulative threshold is 3.0. Based on this SCAQMD policy, chronic and acute non-cancer hazard indices associated with airport emissions for both construction and operation under the proposed Project would not be cumulatively considerable.

4.1.2.7 Summary of Impact Determinations

Table 4.1.2-12 summarizes the impact determinations of the proposed Project related to human health risk, as described above in Sections 4.1.2.5 and 4.1.2.6. Impact determinations are based on the significance criteria presented in Section 4.1.2.4, and the information and data sources cited throughout Section 4.1.2.

Table 4.1.2-12
Summary of Impacts and Mitigation Measures Associated with the Proposed Project Related to Human Health Risk

Environmental Impacts	Impact Determination	Mitigation Measures	Level of Significance After Mitigation
Impact 4.1.2-1: The proposed Project would not increase incremental cancer risk greater than, or equal to, 10 in 1 million (10 x 10-6) for potentially exposed off-airport workers, residents, or school children. This would be a ***less than significant impact*** for construction and operations.	Construction: Less than Significant Operations: Less than Significant	Construction: No mitigation is required Operations: No mitigation is required	Construction: Less than Significant Operations: Less than Significant
Impact 4.1.2-2: The proposed Project would not result in a cancer burden greater than, or equal to 0.5 excess cancer cases in areas within the greater than 1 in 1 million zone of impact. This would be a ***less than significant impact*** for construction and operations.	Construction: Less than Significant Operations: Less than Significant	Construction: No mitigation is required Operations: No mitigation is required	Construction: Less than Significant Operations: Less than Significant
Impact 4.1.2-3: The proposed Project would not result in a total incremental chronic hazard index (HI) greater than, or equal to, 1 for any target organ system at any receptor location. This would be a ***less than significant impact*** for construction and operations.	Construction: Less than Significant Operations: Less than Significant	Construction: No mitigation is required Operations: No mitigation is required	Construction: Less than Significant Operations: Less than Significant
Impact 4.1.2-4: The proposed Project would not result in a total incremental acute HI greater than, or equal to, 1 for any target organ system at any receptor location. This would be a ***less than significant impact*** for construction and operations.	Construction: Less than Significant Operations: Less than Significant	Construction: No mitigation is required Operations: No mitigation is required	Construction: Less than Significant Operations: Less than Significant

Table 4.1.2-12
Summary of Impacts and Mitigation Measures Associated with the Proposed Project Related to Human Health Risk

Environmental Impacts	Impact Determination	Mitigation Measures	Level of Significance After Mitigation
Impact 4.1.2-5: The proposed Project would not result in an exceedance of Permissible Exposure Limits - Time Weighted Average or Threshold Limit Values for workers. This would be a ***less than significant impact*** for construction and operations.	Construction: Less than Significant Operations: Less than Significant	Construction: No mitigation is required Operations: No mitigation is required	Construction: Less than Significant Operations: Less than Significant

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