LOS ANGELES
DEPARTMENT OF CITY
PLANNING
221 North Figueroa St., Suite 1350
Los Angeles, CA 90012

RECIRCULATED PORTION OF DRAFT ENVIRONMENTAL IMPACT REPORT

Hollywood Community Plan Update

Environmental Case: ENV-2016-1451-EIR
State Clearinghouse No.: 2016041093

Project Location: The Hollywood Community Plan Area (CPA) is located within the incorporated City of Los Angeles and contains approximately 13,962 acres or 21.8 square miles. The CPA extends roughly south of the Cities of Burbank and Glendale and the Ventura Freeway (State Highway 134), west of the Golden State Freeway (Interstate 5), north of Melrose Avenue and south of Mulholland Drive and the Cities of West Hollywood and Beverly Hills, including land south of the City of West Hollywood, and north of Rosewood Avenue, between La Cienega Boulevard and La Brea Avenue.

Community Plan Area: Hollywood

Council District: 4 – Ryu, 5 – Koretz, 13 – O'Farrell

Project Description: The Hollywood Community Plan Update (Project) would guide development for the Hollywood CPA through 2040 and includes amending both the text and the land use map of the Hollywood Community Plan. The Proposed Project would also adopt several resolutions and zoning ordinances to implement the updates to the Community Plan, including changes for certain portions of the Hollywood CPA to allow specific uses and changes to development standards (including height, floor area ratio (FAR), and density). These zoning ordinances would take a number of different forms, including amendments to the Zoning Map for zone and height district changes under Los Angeles Municipal Code (LAMC) Section 12.32, amendments to an existing specific plan (Vermont/Western Transit Oriented District Specific Plan), and adoption of a Hollywood Community Plan Implementation Overlay (CPIO) District. Also, to ensure consistency between the updated Community Plan and other City plans and ordinances, the Proposed Project includes amendments to the Framework and Mobility Elements of the General Plan, and other elements as necessary.

Since the publication of the Proposed Project's Draft EIR, the City of Los Angeles adopted new transportation thresholds in July 2019 pursuant to Senate Bill 743. Section 4.15, Transportation and Traffic, of the Draft EIR is updated to reflect the City's new transportation thresholds, which use vehicle miles traveled (VMT) as the primary metric for determining transportation impacts. Also, the transportation analyses in Chapter 5.0, Alternatives, is updated to reflect the City's new adopted VMT transportation thresholds. Finally, a new appendix (Appendix N) is provided for the Draft EIR to supplement the analysis in Section 4.3-Air Quality to respond to the decision in Sierra Club v. County of Fresno (December 2018) and why it is not feasible to further describe the associated health effects of the projects significant and unavoidable air quality impacts. The Partially Recirculated Draft EIR, therefore, consists of Section 4.15, Chapter 5.0, and the new Appendix N.

PREPARED FOR:

The City of Los Angeles
Department of City Planning

PREPARED BY:

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October 2019

HOLLYWOOD COMMUNITY PLAN UPDATE

PARTIALLY RECIRCULATED DRAFT ENVIRONMENTAL IMPACT REPORT

Prepared for

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October 2019

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1.0 INTRODUCTION TO THE RECIRCULATED DRAFT EIR

NOTICE: This is a partial recirculation to the Hollywood Community Plan Update Draft EIR published on November 15, 2018 (City EIR No. ENV-2016-1451-EIR). The only portions being recirculated are Sections 4.15, Transportation and Chapter 5.0 Alternatives, and new Appendix N. The City is requesting that reviewers limit their comments to the revised Section 4.15, Chapter 5.0 and new Appendix N that are recirculated in the Recirculated Draft EIR (RDEIR). Pursuant to CEQA Guidelines Section 15088.5, in the Final EIR, the City will provide responses to (i) comments received during the initial circulation period that relate to chapters, sections, appendices or portions of the Draft EIR that were not revised and recirculated, and (ii) comments received during the recirculation period that relate to the chapter, sections, appendices of the Draft EIR that were revised and recirculated. The proposed revisions in Section 4.15 and Chapter 5.0, and Appendix N are summarized below.

1.1 INTRODUCTION TO THE RECIRCULATED DRAFT EIR

Since the publication of the Hollywood Community Plan Update Draft EIR in November 2018, the Natural Resources Agency certified new guidelines for transportation impacts under the California Environmental Quality Act (CEQA). The CEQA guidelines were updated in response to Senate Bill (SB) 743 which directed the Office of Planning and Research (OPR) to establish criteria for determining the significance of transportation impacts by a metric other than level of service (LOS) or similar measures of vehicular capacity or traffic congestion.[1] In response to SB 743 and the new CEQA Guidelines Section 15064.3, Determining the Significance of Transportation Impacts, the City of Los Angeles adopted new transportation thresholds for CEQA in July 2019.[2]

SB 743 changes the way cities measure project impacts by encouraging projects to reduce their GHG emissions through measuring vehicle miles traveled (VMT) versus the historical priority of reducing vehicle delay at intersections (LOS) through roadway widening as a mitigation. The State as a whole, including the City, recently updated their CEQA Guidelines with respect to the focus of transportation planning and traffic impact analysis. The previous significance thresholds for traffic operations impacts based on LOS are no longer relevant. Instead, as directed by SB 743, the State, including the City, has moved to a VMT focus, with the objective being to reduce VMT (and therefore GHG) as appropriate.

Los Angeles, like all urban environments, is in a constant state of gradual evolution. As population grows, as the built environment changes, and as technology advances, the City must find new ways to achieve its many goals, including its goal of improving mobility. Historically, roadway capacity enhancement projects have been used to mitigate congestion and improve LOS. However, in urban areas like Hollywood, roadway capacity improvements would require acquisition of right-of-way, including the demolition of buildings on parcels adjacent to existing roadways that would physically alter the makeup of communities. Additionally, research has shown that adding roadway capacity does not reduce congestion, but rather induces more vehicle travel as well as GHG emissions associated with that additional vehicle travel.[3] In addition to the constraints of the built environment, recent legislation, such as SB 743, has shaped the types of transportation improvements being considered by the City.

[1] SB 743, 2013-2014 CA State Cong. § 386 (2013)

[2] City of Los Angeles California Environmental Quality Act (CEQA) Transportation Thresholds, 2019.

[3] National Center for Sustainable Transportation Policy Brief. Department of Environmental Science and Policy, University of California, Davis. Handy, Susan. 2015, October. *Increasing Highway Capacity Unlikely to Relieve Traffic Congestion.* Available: http://www.dot.ca.gov/research/researchreports/reports/2015/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf. Accessed on: May 24, 2016.

The transportation improvements identified in the Proposed Plan are consistent with the City's Mobility Plan 2035 and were developed to improve the circulation system as measured by VMT, rather than LOS. As described by the OPR, possible mitigations for VMT include improving or increasing access to transit, improving pedestrian or bicycle networks, providing traffic calming, providing bicycle parking, providing car-sharing, bike sharing, and ride sharing programs, and parking demand management programs. The Proposed Plan's preliminary list of representative transportation improvement types are not exhaustive and include transit enhancements, active transportation projects, transportation demand management programs, and roadway and ITS projects; these improvements are intended to mitigate VMT.

Section 4.15, Transportation and Traffic, has been updated to reflect the new CEQA Guidelines and City's adopted transportation thresholds. The mobility network contained in the Proposed Plan has not changed since the publication of the Draft EIR. However, the Recirculated Draft EIR section has been updated to reflect VMT as the primary metric for transportation impacts and the impact conclusions and mitigation measures have been updated accordingly.

Chapter 5.0, Alternatives, has also been updated to reflect the new CEQA Guidelines. The discussion of transportation impacts and impact conclusions for each of the Project Alternatives in the Recirculated Draft EIR Alternatives chapter has been revised to reflect the City's adopted transportation thresholds. Specifically, the comparison of existing traffic conditions to the Proposed Plan and Project Alternatives as well as Table 5-3 and Table 5-4 have been updated to reflect VMT as the primary metric for transportation impacts. No changes have been made to the five Project Alternatives included in the Draft EIR or to the other impact conclusions.

In addition to considering the primary impacts of the Proposed Plan, CEQA also requires that any secondary impacts resulting from the Proposed Plan also be considered. The potential secondary impacts of the Proposed Plan have been included in Section 4.15, Transportation and Traffic. Specifically, the discussion of emergency access has been updated to reflect the potential secondary impacts resulting from increased congestion in the Plan Area due to additional development and regional background growth. While congestion is no longer the primary metric for considering transportation impacts under CEQA, LOS may still be relevant in certain areas when considering the secondary impacts of a project.

Finally, a new appendix (Appendix N) is provided for the Hollywood Community Plan Update Draft EIR to supplement the analysis in Section 4.3, Air Quality. In 2018, the Supreme Court held in *Sierra Club v. County of Fresno* (December 2018) that when a project has significant and unavoidable air quality impacts, the lead agency is required to discuss and identify the associated health effects that will result from those air quality impacts and also that if the lead agency did not do that it provide an explanation in the EIR as to why it could not do that analysis. The City has prepared a white paper with the assistance of an expert panel of air quality experts to explain with evidence why it is not feasible based on the existing models and methodologies to identify the associated health effects of the Proposed Plan resulting from the identified significant and unavoidable air quality impacts.

1.2 RECIRCULATED DRAFT EIR REVIEW PROCESS

In accordance with CEQA Guidelines Section 15088.5(f)(2), the City is requesting that reviewers limit their comments to the revised Section 4.15, Chapter 5.0 and Appendix N that are recirculated in the Recirculated Draft EIR (RDEIR). Pursuant to CEQA Guidelines Section 15088.5(f)(2), in the Final EIR, the City will provide responses to (i) comments received during the initial circulation period that relate to chapters, sections, appendices or portions of the Draft EIR that were not revised and recirculated, and (ii) comments received during the recirculation period that relate to the chapter, sections, appendices of the Draft EIR that were revised and recirculated.

The Recirculated Draft EIR is available for public review for a 45-day period from October 31, 2019 to December 16, 2019. The Recirculated Draft EIR will also be submitted to the State Clearinghouse for distribution to state agencies.

During the review period, copies of the Recirculated Draft EIR will be available for review at the City of Los Angeles Department of City Planning during normal business hours (see address below).

City of Los Angeles
Department of City Planning
200 North Spring Street, Room 667
Los Angeles, CA 90012

The RDEIR can be downloaded or reviewed at the Department of City Planning's website [planning.lacity.org/development-services/eir].

If you wish to submit comments on the RDEIR, comply with the following instructions. The comments shall be written or typed and the comment shall include the commenter's name, contact information, and file number ENV-2016-1451-EIR. The written or typed comments shall be submitted to Linda Lou, in one of the following manners:

Mail: Linda Lou
Los Angeles Department of City Planning
200 N. Spring Street, Room 667
Los Angeles, California 90012

E-mail: linda.lou@lacity.org

4.15 TRANSPORTATION AND TRAFFIC

This section provides an overview of transportation and mobility in the Project Area and analyzes the operational impacts associated with the Proposed Plan. Topics addressed in this include the circulation and mobility systems, vehicle miles traveled (VMT), and emergency access.

REGULATORY FRAMEWORK

Federal, state, regional, and local laws, regulations, plans, and guidelines that are potentially applicable to the Proposed Plan are summarized below.

FEDERAL

Americans with Disabilities (ADA) Act of 1990. Titles I, II, III, and V of the ADA have been codified in Title 42 of the United States Code, beginning at Section 12101. Title III prohibits discrimination based on disability in "places of public accommodation" (businesses and non-profit agencies that serve the public) and "commercial facilities" (other businesses). The regulation includes Appendix A through Part 36 (Standards for Accessible Design), establishing minimum standards for ensuring accessibility when designing and constructing a new facility or altering an existing facility. Examples of key guidelines include detectable warnings for pedestrians entering traffic where there is no curb, a clear zone of 48 inches for the pedestrian travel way, and a vibration-free zone for pedestrians.

STATE

Complete Streets Act. Assembly Bill 1358, the Complete Streets Act (Government Code Sections 65040.2 and 65302), was signed into law by Governor Arnold Schwarzenegger in September 2008. As of January 1, 2011, the law requires cities and counties, when updating the part of a local general plan that addresses roadways and traffic flows, to ensure that those plans account for the needs of all roadway users. Specifically, the legislation requires cities and counties to ensure that local roads and streets adequately accommodate the needs of bicyclists, pedestrians and transit riders, as well as motorists.

At the same time, the California Department of Transportation (Caltrans), which administers transportation programming for the State, unveiled a revised version of Deputy Directive 64 (DD-64-R1 October 2008), an internal policy document that now explicitly embraces Complete Streets as the policy covering all phases of state highway projects, from planning to construction to maintenance and repair.

Complete Streets Directive. California Department of Transportation (Caltrans) enacted Complete Streets: Integrating the Transportation System (Complete Streets Directive) in October 2008, which required cities to plan for a "balanced, multimodal transportation network that meets the needs of all users of streets."[1] A complete street is a transportation facility that is planned, designed, operated, and maintained to provide safe mobility for all users, including bicyclists, pedestrians, transit vehicles, truckers, and motorists, appropriate to the function and context of the facility. Every complete street looks different, according to its context, community preferences, the types of road users, and their needs.

Statewide Transportation Improvement Program (STIP). Caltrans administers transportation programming for the State. Transportation programming is the public decision-making process that sets priorities and funds projects envisioned in long-range transportation plans. It commits expected revenues

[1] Caltrans, *Implementation Policy of Complete Streets: Integrating the Transportation System,* http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets.html, accessed on September 9, 2014.

over a multi-year period to transportation projects. The STIP is a multi-year capital improvement program of transportation projects on and off the State Highway System, funded with revenues from the State Highway Account and other funding sources.

Congestion Management Program (CMP). To address the increasing public concern that traffic congestion is impacting the quality of life and economic vitality of the State, the CMP was enacted by Proposition 111, passed by voters in 1990. The intent of the CMP is to provide the analytical basis for transportation decisions through the STIP process.

Senate Bill (SB) 743. SB 743 directs the Office of Planning and Research (OPR) to develop revisions to the California Environmental Quality Act (CEQA) Guidelines by July 1, 2014 to establish new criteria for determining the significance of transportation impacts and define alternative metrics for traffic LOS. On September 27, 2013, California Governor Jerry Brown signed SB 743 into law and started a process that changes transportation impact analysis as part of CEQA compliance. These changes will include elimination of auto delay, level of service (LOS), and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant impacts for land use projects and plans in California. Further, parking impacts are not considered significant impacts on the environment for particular types of development projects within certain infill areas with nearby frequent transit service. According to the legislative intent contained in SB 743, these changes to current practice were necessary to "…more appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions."

On January 20, 2016, OPR released the Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA, which was an update to Updating Transportation Impacts Analysis in the CEQA Guidelines, Preliminary Discussion Draft of Updates to the CEQA Guidelines Implementing Senate Bill 743, which had been released August 6, 2014. The Draft EIR was prepared in consideration of the OPR proposed updates. Of particular relevance was the updated text of the proposed new Section 15064.3 that relates to the determination of the significance of transportations impacts, alternatives and mitigation measures. The following key text concerning the analysis of transportation impacts is taken directly from the document:

> *(b) Criteria for Analyzing Transportation Impacts.*
>
> *Lead agencies may use thresholds of significance for vehicle miles traveled recommended by other public agencies or experts provided the threshold is supported by substantial evidence.*
>
> *(1) Vehicle Miles Traveled and Land Use Projects. A development project that results in vehicle miles traveled exceeding an applicable threshold of significance may indicate a significant impact. Generally, development projects that locate within one-half mile of either an existing major transit stop or a stop along an existing high quality transit corridor may be presumed to cause a less than significant transportation impact. Similarly, development projects that decrease vehicle miles traveled in the project area compared to existing conditions may be considered to have a less than significant transportation impact.*
>
> *(2) Induced Vehicle Travel and Transportation Projects. Additional lane miles may induce automobile travel, and vehicle miles traveled, compared to existing conditions. Transportation projects that reduce, or have no impact on, vehicle miles traveled may be presumed to cause a less than significant transportation impact. To the extent that the potential for induced travel has already been adequately analyzed at a programmatic level, a lead agency may incorporate that analysis by reference.*

In November 2017, OPR submitted the final guidelines to the Natural Resources Agency. The subsequent "rulemaking" process took one year, with the guidelines certified and adopted in December 2018. SB 743 is in effect, and agencies have an opt-in period until July 1, 2020. As discussed above, this Recirculated Draft EIR includes a revised Section 4.15 to respond to the new Guideline Section 15064.3, which reads:

(a) Purpose.

This section describes specific considerations for evaluating a project's transportation impacts. Generally, vehicle miles traveled is the most appropriate measure of transportation impacts. For the purposes of this section, "vehicle miles traveled" refers to the amount and distance of automobile travel attributable to a project. Other relevant considerations may include the effects of the project on transit and non-motorized travel. Except as provided in subdivision (b)(2) below (regarding roadway capacity), a project's effect on automobile delay shall not constitute a significant environmental impact.

(b) Criteria for Analyzing Transportation Impacts.

(1) Land Use Projects. Vehicle miles traveled exceeding an applicable threshold of significance may indicate a significant impact. Generally, projects within one-half mile of either an existing major transit stop or a stop along an existing high quality transit corridor should be presumed to cause a less than significant transportation impact. Projects that decrease vehicle miles traveled in the project area compared to existing conditions should be presumed to have a less than significant transportation impact.

(2) Transportation Projects. Transportation projects that reduce, or have no impact on, vehicle miles traveled should be presumed to cause a less than significant transportation impact. For roadway capacity projects, agencies have discretion to determine the appropriate measure of transportation impact consistent with CEQA and other applicable requirements. To the extent that such impacts have already been adequately addressed at a programmatic level, such as in a regional transportation plan EIR, a lead agency may tier from that analysis as provided in Section 15152.

(3) Qualitative Analysis. If existing models or methods are not available to estimate the vehicle miles traveled for the particular project being considered, a lead agency may analyze the project's vehicle miles traveled qualitatively. Such a qualitative analysis would evaluate factors such as the availability of transit, proximity to other destinations, etc. For many projects, a qualitative analysis of construction traffic may be appropriate.

(4) Methodology. A lead agency has discretion to choose the most appropriate methodology to evaluate a project's vehicle miles traveled, including whether to express the change in absolute terms, per capita, per household or in any other measure. A lead agency may use models to estimate a project's vehicle miles traveled, and may revise those estimates to reflect professional judgment based on substantial evidence. Any assumptions used to estimate vehicle miles traveled and any revisions to model outputs should be documented and explained in the environmental document prepared for the project. The standard of adequacy in Section 15151 shall apply to the analysis described in this section.

(c) Applicability.

The provisions of this section shall apply prospectively as described in section 15007. A lead agency may elect to be governed by the provisions of this section immediately. Beginning on July 1, 2020, the provisions of this section shall apply statewide.

Parking Cash Out. Assembly Bill (AB) 2109, is a state law requiring employers of 50 or more employees who lease their parking and subsidize any part of their employee parking to offer their employees the opportunity to give up their parking space and rideshare to work instead. In return for giving up their parking space, the employer pays the employee the cost of the parking space.

Assembly Bill 32 (AB32) and Senate Bill 375 (SB 375). With the passage of AB 32, the Global Warming Solutions Act of 2006, the State of California committed itself to reducing statewide greenhouse gas (GHG) emissions to 1990 levels by 2020. The California Air Resources Board (California ARB) is coordinating the response to comply with AB 32.

On December 11, 2008, California ARB adopted its Proposed Scoping Plan for AB 32. This scoping plan included the approval of SB 375 as the means for achieving regional transportation-related GHG targets. SB 375 provides guidance on how curbing emissions from cars and light trucks can help the state comply with AB 32.

There are five major components to SB 375. First, regional GHG emissions targets: California ARB's Regional Targets Advisory Committee guides the adoption of targets to be met by 2020 and 2035 for each Metropolitan Planning Organization (MPO) in the state. These targets, which MPOs may propose themselves, are updated every eight years in conjunction with the revision schedule of housing and transportation elements.

Second, MPOs are required to prepare a Sustainable Communities Strategy (SCS) that provides a plan for meeting regional targets. The SCS and the Regional Transportation Plan (RTP) must be consistent with each other, including action items and financing decisions. If the SCS does not meet the regional target, the MPO must produce an Alternative Planning Strategy that details an alternative plan to meet the target.

Third, SB 375 requires that regional housing elements and transportation plans be synchronized on 8-year schedules. In addition, Regional Housing Needs Assessment (RHNA) allocation numbers must conform to the SCS. If local jurisdictions are required to rezone land as a result of changes in the housing element, rezoning must take place within three years.

Fourth, SB 375 provides CEQA streamlining incentives for preferred development types. Certain residential or mixed-use projects qualify if they conform to the SCS. Transit-oriented developments (TODs) also qualify if they (1) are at least 50% residential, (2) meet density requirements, and (3) are within 0.5 mile of a transit stop. The degree of CEQA streamlining is based on the degree of compliance with these development preferences.

Finally, MPOs must use transportation and air emissions modeling techniques consistent with guidelines prepared by the California Transportation Commission (CTC). Regional Transportation Planning Agencies, cities, and counties are encouraged, but not required, to use travel demand models consistent with the CTC guidelines.

California Vehicle Code (CVC). The CVC provides requirements for ensuring emergency vehicle access regardless of traffic conditions. Sections 21806(a)(1), 21806(a)(2), and 21806(c) define how motorists and pedestrians are required to yield the right-of-way to emergency vehicles.

REGIONAL

A number of regional improvement plans affect transportation in the City of Los Angeles. They include the Los Angeles County CMP and the Long Range Transportation Plan (LRTP) prepared by Los Angeles County Metropolitan Transportation Authority (Metro), the RTP/SCS, and the Regional Transportation Improvement Plan (RTIP), prepared by Southern California Association of Governments (SCAG), and the City of Los Angeles General Plan, which includes the Mobility Plan (MP) 2035.

Metro Congestion Management Program (CMP). The Los Angeles County Metropolitan Transportation Authority (Metro) has been required by state law to prepare, and update on a biennial basis, the Congestion Management Program (CMP) for the County of Los Angeles. The CMP process was established as part of a 1990 legislative package to implement Proposition 111, which increased the state gas tax from 9 to 18 cents per gallon. The intent of the CMP was to tie the appropriation of new gas tax revenues by linking transportation and land use decisions to mitigate congestion. Under the CMP, the 88 incorporated cities plus the County of Los Angeles share various statutory responsibilities, including monitoring traffic count locations on select arterials, implementing transportation improvements, adoption of travel demand management and land use ordinances, and mitigating congestion impacts. The framework for the CMP is based on the premise that congestion can be mitigated by continuing to add capacity to roadways. This is evidenced by the primary metric that drives the program, which is Level of Service (LOS).

While the CMP requirement was one of the pioneering efforts to conduct performance-based planning, the approach has become antiquated and expensive. Recent state laws, such as AB 32, SB 375, and SB 743,—all move away from LOS directly or indirectly and instead focus on VMT as the appropriate metric to evaluate the performance of transportation investment. In sum, the CMP contradicts these key state policies and Metro's own efforts to promote a more sustainable and equitable regional transportation plan.

On June 28, 2018, the Metro Board of Directors initiated the process to opt out of the state mandated CMP. California Government Code §65088.3 states that jurisdictions within a county may opt out of the CMP requirement without penalty, if a majority of local jurisdictions representing a majority of the county's population formally adopt resolutions requesting to opt out of the program. The City of Los Angeles opted out of the CMP in July 2019 upon the adoption of the City's new CEQA metrics for transportation. On August 28, 2019, the City was notified by Metro that the provisions of the CMP no longer apply to any of the 89 local jurisdictions in Los Angeles County.

Metro 2009 Long Range Transportation Plan (LRTP). The 2009 LRTP includes funding for general categories of improvements, such as Arterial Improvements, Non-motorized Transportation, Rideshare and Other Incentive Programs, Park-and-Ride Lot Expansion, and Intelligent Transportation System (ITS) improvements for which Call for Project Applications can be submitted for projects in Los Angeles County. Metro also has a Short Range Transportation Plan to define the near-term (through year 2024) transportation priorities in Los Angeles County. In addition to the regional transportation plans, Metro has recently adopted a Complete Streets Policy and a First Last Mile Strategic Plan.

Metro Complete Streets Policy. Metro's recently adopted Complete Streets policy is reinforcing the California Complete Streets Act (AB 1358). Effective January 1, 2017, Metro is requiring that all local jurisdictions within Los Angeles County adopt a Complete Streets Policy, an adopted city council resolution supporting Complete Streets, or an adopted general plan consistent with the California Complete Streets Act of 2008 in order to be eligible for Metro capital grant funding programs, starting with the 2017 grant cycles.

Metro Short Range Transportation Plan (SRTP). The 2014 Metro SRTP is a 10-year action plan that guides future Metro programs and projects through 2024 and advances Metro towards the long-term goals identified in the 2009 Metro LRTP. The SRTP identifies the short-term challenges, provides an analysis of our financial resources, proposes action plans for the public transportation and highway modes, and includes other project and program initiatives. In addition, it addresses sustainability, future funding strategies, and lastly, measures the Plan's performance.[2]

[2] Los Angeles Metropolitan Transportation Authority, *2014 Short Range Transportation Plan,* 2014.

Southern California Association of Governments (SCAG) 2016-2040 Regional Transportation Plan and Sustainable Communities Strategy and Regional Transportation Improvement Program. SCAG adopted the 2016-2040 RTP/SCS in April 2016. The RTP/SCS is a planning document required under state and federal statute that encompasses the SCAG region, including six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial. The RTP/SCS forecasts long-term transportation demands and identifies policies, actions, and funding sources to accommodate these demands. The RTP/SCS consists of the construction of new transportation facilities, transportation systems management strategies, transportation demand management and land use strategies. The RTIP, also prepared by SCAG based on the RTP/SCS, lists all of the regional funded/programmed improvements over a six-year period.

LOCAL

City of Los Angeles General Plan Framework and Safety Elements. The Citywide General Plan Framework (Framework), an element of the City of Los Angeles General Plan, is a guide for Community Plans to implement growth and development policies by providing a comprehensive long-range view of the City as a whole. It provides a comprehensive strategy for accommodating long-term growth should it occur as predicted. Chapter 9 Infrastructure and Public Services of the Framework Element addresses fire prevention, fire protection and emergency medical services provided to the City. The Safety Element of the General Plan identifies existing police, fire, and emergency services and the service needs of the City of Los Angeles in the event of a natural disaster. The Safety Element goals, objectives, policies, and programs are broadly stated to reflect the comprehensive scope of the Emergency Operations Organization (EOO), which is the program that implements the Safety Element. The Framework and Safety Elements include goals, objectives, and policies that are applicable to emergency services.

Los Angeles Municipal Code (LAMC). LAMC Section 12.26 contains required Transportation Demand Management (TDM) and Trip Reduction Measures. TDM is defined as the alteration of travel behavior through programs of incentives, services, and policies, including encouraging the use of alternatives to single-occupant vehicles such as public transit, cycling, walking, carpooling/vanpooling and changes in work schedule that move trips out of the peak period or eliminate them altogether (as in the case in telecommuting or compressed work weeks). Trip Reduction is defined as reduction in the number of work-related trips made by single-occupant vehicles. Specific requirements for developments of various sizes are summarized from the code below:

- Development in excess of 25,000 square feet of gross floor area shall provide a bulletin board, display case, or kiosk (displaying transportation information) where the greatest numbers of employees are likely to see it. The transportation information displayed should include, but is not limited to current routes and schedules for public transit serving the site; telephone numbers for referrals on transportation information including numbers for the regional ridesharing agency and local transit operations; ridesharing promotion material supplied by commuter-oriented organizations; regional/local bicycle route and facility information; and a listing of on-site services or facilities that are available for carpoolers, vanpoolers, bicyclists, and transit riders.
- Development in excess of 50,000 square feet of gross floor area shall provide the above plus: (1) designated parking areas for employee carpools and vanpools as close as practical to the main pedestrian entrance(s) of the building(s); (2) one permanent, clearly identified (signed and striped) carpool/vanpool parking space for the first 50,000 to 100,000 square feet of gross floor area and one additional permanent, clearly identified (signed and striped) carpool/vanpool parking space for any development over 100,000 square feet of gross floor area; and (3) parking spaces clearly identified (signed and striped) shall be provided in the designated carpool/vanpool parking area at any time during the building's occupancy sufficient to meet employee demand for such spaces. Absent such demand, parking spaces within the designated carpool/vanpool parking area may be used by other vehicles and other amenities.

- Development in excess of 100,000 square feet of gross floor area shall provide the above plus: (1) a safe and convenient area in which carpool/vanpool vehicles may load and unload passengers other than in their assigned parking area; (2) sidewalks or other designated pathways following direct and safe routes from the external pedestrian circulation system to each building in the development; (3) possible bus stop improvements; and (4) safe and convenient access from the external circulation system to bicycle parking facilities on-site.

City of Los Angeles Mobility Plan (MP) 2035. The City updated the Transportation Element of the City's General Plan, now referred to as Mobility Plan 2035 or MP 2035, to reflect policies and programs that lay the policy foundation for safe, accessible, and enjoyable streets for pedestrians, bicyclists, transit users, and vehicles throughout the City of Los Angeles. The MP 2035 and Final EIR were adopted on August 11, 2015. MP 2035 is compliant with the 2008 Complete Streets Act (AB 1358), which mandates that the circulation element of a city's General Plan be modified to plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways, defined to include motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban, or urban context of the general plan.

The goals and objectives of MP 2035 that are relevant to the Proposed Plan are as follows:

- **Safety First:** focuses on topics related to crashes, speed, protection, security, safety, education, and enforcement.
  - Objective: Vision Zero: Decrease transportation related fatality rate to zero by 2035.
- **World Class Infrastructure:** focuses on topics related to the Complete Streets Network (walking, bicycling, transit, vehicles, green streets, and goods movement), Great Streets, Bridges, Street Design Manual, and demand management.
  - Objective: Provide 95% on-time arrival reliability of buses traveling on the Transit Enhanced Network by 2035. Establish an off-peak 5-minute bus frequency on 25% of the Transit Enhanced Network by 2035.
  - Objective: Increase vehicular travel time reliability on all segments of the Vehicle Enhanced Network by 2035.
  - Objective: Maintain the Automated Traffic Control Surveillance and Control System (ATSAC) Communications Network.
- **Access for all Angelenos**: focuses on topics related to affordability, least cost transportation, land use, operations, reliability, demand management, and community connections.
  - Objective: Ensure that 90% of households are within one mile of the Transit Enhanced Network by 2035.
  - Objective: Ensure that 90% of all households have access within one-half mile of high quality bicycling facilities by 2035 (protected bicycle lanes, paths, and neighborhood enhanced streets).
  - Objective: Increase the combined mode split of persons who travel by walking, bicycling or transit to 50% by 2035.
- **Collaboration, Communication & Informed Choices:** focuses on topics related to real-time information, open source data, transparency, monitoring, reporting, emergency response, departmental and agency cooperation and data base management.
  - Objective: Install street parking occupancy-detection capability at 50% of on-street parking locations by 2035.
  - Objective: Implement coordinated wayfinding at all major transit stations by 2035.

- **Clean Environment and Healthy Communities:** focuses on topics related to environment, health, clean air, clean fuels and fleets, and open street events.
  - Objective: Decrease vehicle miles traveled (VMT) per capita by 5% every five years, to 20% by 2035.
  - Objective: Meet a 9% per capita GHG reduction for 2020 and a 16% per capita reduction for 2035 (SCAG RTP).
  - Objective: Reduce the number of unhealthy air quality days to zero by 2025.

California's Complete Streets Act (AB 1358) was signed into law in 2008 and mandates that complete street policies and standards be incorporated into a city's general plan. The idea behind Complete Streets is to make streets safe, comfortable, and convenient for people of all mode types. Mobility Plan 2035 also sets forth street designations and related standards in a Complete Street Design Guide. The Guide provides a compilation of design concepts and best practices that promote the major tenets of Complete Streets, safety and accessibility. The Guide is not meant to supersede existing technical standards provided for in other City or national manuals. Rather, it is meant to supplement existing engineering practices and requirements in order to meet the goals of Complete Streets.

Due to specific site and operational characteristics associated with any given street, any proposed street improvement project must still undergo detailed technical analyses by the appropriate city departments. Overall, this Design Guide will indoctrinate the concept of Complete Streets into Los Angeles' present and future street design so that all stakeholders are able to plan for, implement, and maintain safe and accessible streets for everyone.

Great Streets for Los Angeles/LADOT Strategic Plan. In September 2014, the Mayor's Office and LADOT released the Great Streets for Los Angeles, LADOT's first strategic plan to turn the city's essential infrastructure -- its streets and sidewalks -- into safer, more livable 21st century public spaces that accommodate everyone who uses them. The plan builds upon Mayor Garcetti's Great Streets Initiative, which looks at Los Angeles's streets as valuable assets that can help revitalize neighborhoods across the City and make it easier for Angelenos to get around whether they walk, bike, drive, or take transit. The plan also stresses the importance of working closely with other city and regional agencies, such as the Bureau of Street Services and Metro, to improve safe, accessible transportation services and infrastructure.

The plan focuses on Mayor Garcetti's priorities of making the city safe, prosperous, and livable with a well-run government and includes the following key goals:

- **Vision Zero:** Eliminate traffic deaths by 2025 and design streets to increase the safety of pedestrians, including adding 100 new high-visibility continental crosswalks.
- **Great Streets:** Implement changes to the 15 Great Street corridors and launch programs to reduce dangerous speeding in residential neighborhoods. Increase bike infrastructure and launch a regional bikeshare program. Expand bus service and improve its quality and connectivity with surrounding neighborhoods.
- **A 21st Century DOT:** Streamline LADOT's operations to implement needed safety and mobility projects quickly and efficiently. Enhance technologies to manage traffic, meters, and parking operations.
- **World-Class Streets for a World-Class Economy:** Real-time traffic information and more efficient allocation of the street to support local foot traffic and better manage freight traffic. Build Great Streets for vibrant and prosperous neighborhood business districts.

Los Angeles Department of Transportation (LADOT). As part of project review, LADOT determines whether a project requires a traffic study and evaluates project site plans to ensure that they follow standard engineering practice and City design regulations. The department's Transportation Impact Study Guidelines includes the requirements related to elements such as driveway design, use of off-street parking, and loading facilities. These design related requirements are often imposed through zone changes, conditional use approvals, division of land or the traffic review process. In many cases it is necessary to clear these traffic requirements, i.e., certify that they have been carried out. This is done by LADOT's representative on the Subdivision Committee, who must approve any plans affected by such requirements.

Los Angeles Fire Department (LAFD) Strategic Plan. LAFD released its first Strategic Plan in 2015 and then followed up with another Strategic Plan (A Safer City 2.0), which covers the years 2018-2020.

The Strategic Plan 2015-2017 focuses on nine goals and corresponding strategic actions that guide the LAFD. The primary goals that are applicable to the Proposed Plan include providing exceptional public safety and emergency service and implementing and capitalizing on advanced technologies. Some of the key priorities associated with these goals include:

- Improving response times by utilizing data and metrics to identify gaps in LAFD's response strategies and exploring response time improvements through dialogue, cognitive inquiry, innovation, and follow-up;
- Delivery of emergency medical services by expanding LAFD Emergency Medical Service (EMS) response capabilities for special events and addressing period of high vehicle traffic; and
- Implementing advanced technologies by developing performance metrics, tracking standards, data collection, analysis and reporting procedures (FireStatLA).

The Strategic Plan also focuses on the development of an even more professional workforce and promotion of a positive work environment to address risk management issues and strengthening community relationships to improve preparedness and enhance resiliency during emergency events.

LAFD's Strategic Plan 2018-2020 states that more than 70% of the goals from the first Strategic Plan were completed through the collaboration of members and stakeholders, and the new 2018-2020 Plan focuses on these five guiding goals: 1) Provide Exceptional Public Safety and Emergency Service, 2) Embrace a Healthy, Safe and Productive Work Environment, 3) Capitalize on Advanced Technology, 4) Enhance LAFD Sustainability & Community Resiliency, and 5) Increase Opportunities for Personal Growth and Professional Development.

ENVIRONMENTAL SETTING

OVERVIEW

The Project Area is the Hollywood Community Plan Area (CPA), which is located in the City of Los Angeles approximately 2.5 miles northwest of downtown Los Angeles. The analysis evaluates the transportation network within the boundaries of the Project Area as well as the surrounding transportation network that could be potentially impacted by the Project. For the purposes of this EIR transportation impact analysis, Existing Conditions (baseline) is defined as Year 2016, which corresponds to the date of the release of the Notice of Preparation (NOP).

Hollywood, like many other urban regions throughout the country, experiences significant traffic congestion. Despite an extensive street network and transit options, vehicular circulation continues to deteriorate due to historical over-reliance on the car as the primary mode of transportation. The combination of many regional destinations, oversaturated roadways, and unreliable travel times for autos and bus transit underlie the need for creating a transportation network for the Project Area that will better serve all modes of transportation, improve the efficiency of the overall system, and enhance the livability along major boulevards.

The Project Area is served by a network of grid system of arterials, except in areas north of Franklin Avenue, where the road network becomes increasingly curvilinear into the hills. Rapid and local bus transit lines operate on most major and minor arterials. Pedestrian facilities primarily consist of sidewalks adjacent to roadways, and a limited bicycle network is provided. The transportation network in the Project Area is primarily auto- and bus transit-oriented.

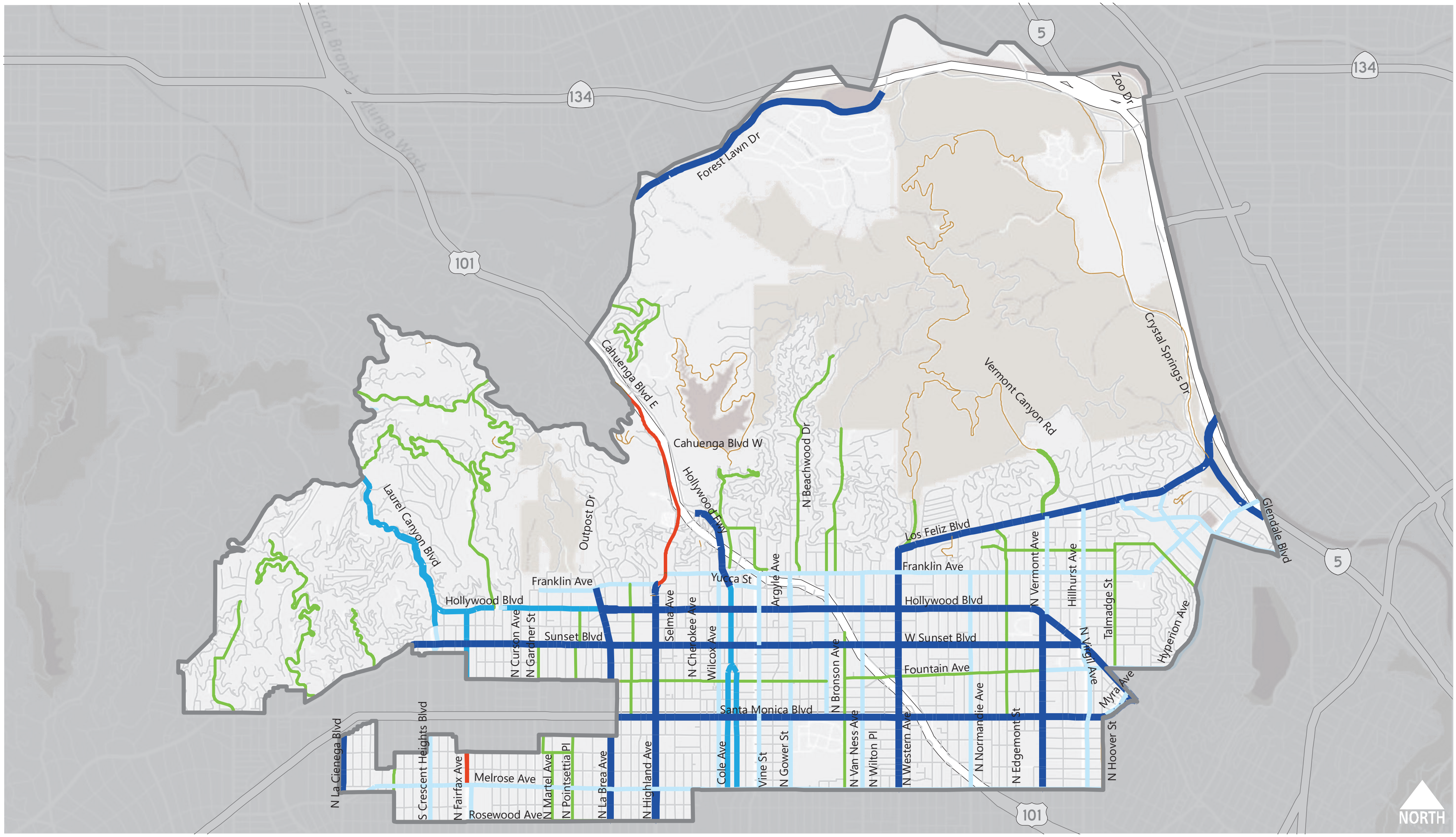
Regional access is provided by the Ventura Freeway (US-101 and SR-134) and the Santa Ana Freeway (I-5). There are several key Boulevards and Avenues including Western Avenue, Normandie Avenue, Vermont Avenue, Cahuenga Boulevard, Highland Avenue, La Brea Boulevard, Fairfax Avenue and Crescent Heights Boulevard, which generally run north-south; and Franklin Avenue, Hollywood Boulevard, Sunset Boulevard, Santa Monica Boulevard and Melrose Avenue, which generally run east-west. The Project Area is also served by collector and local streets.

HIGHWAY AND STREET SYSTEM

The roadway network in the Project Area ranges from major freeways, such as US-101, SR-134 and I-5, to neighborhood-serving local roadways. **Figure 4.15-1** displays the roadways within the Project Area and illustrates the classification of roadway facilities. Below is a brief description of the facility types in the City's MP 2035 and Complete Streets Design Guide, including those identified on **Figure 4.15-1**.[3]

- **Boulevard I (Major Highway Class I).** Boulevard I streets are generally defined as having three to four lanes in each direction along with a median turn lane. The width of a Class I Boulevard is usually 100 feet, with a typical sidewalk width of 18 feet and a target operating speed of 35 miles per hour (mph).
- **Boulevard II (Major Highway Class II).** Boulevard II streets are generally defined as having two to three lanes in each direction along with a median turn lane. The width of a Class II Boulevard is usually 80 feet, with a typical sidewalk width of 15 feet and a target operating speed of 35 mph.
- **Avenue I (Secondary Highway).** Avenue I streets typically have one to two lanes in each direction, a roadway width of 70 feet, and a normal sidewalk width of 15 feet and a target operating speed of 35 mph. An Avenue I typically includes streets with a high amount of retail uses and local destinations.
- **Avenue II (Secondary Highway).** Avenue II streets usually have one to two lanes in each direction, with a typical roadway width of 56 feet, a typical sidewalk width of 15 feet and a target operating speed of 30 mph. Such streets are typically located in parts of the City with dense active uses, and a busy pedestrian environment.
- **Avenue III (Secondary Highway).** Avenue III streets are defined to have one to two lanes in each direction, with a roadway width of 46 feet, a normal sidewalk width of 15 feet, and a target operating speed of 25 mph. This classification was developed to maintain roadway width in older, more historic parts of the City.

[3]City of Los Angeles, *Complete Streets Design Guide*, adopted August 11, 2015, https://losangeles2b.files.wordpress.com/2015/05/2015_csdg_web-4-22.pdf.



Road Classifications

- Avenue I
- Avenue II
- Avenue III
- Boulevard II
- Collector
- Local Street
- Private

SOURCE: Mobility Plan 2035, 2016; Fehr & Peers, 2019.

FIGURE 4.15-1

ROADWAY NETWORK

- **Collector Street.** Collector Streets generally have one travel lane in each direction, with a roadway width of 40 feet and a sidewalk width of 13 feet. The target operating speed for Collector Streets is 25 mph. Such streets are typically intended for vehicle trips that start or end in the immediate vicinity of the street.
- **Industrial Collector Street.** Industrial Collector Streets vary from normal collector streets in that larger curb returns are incorporated to allow for the wider turning radii of trucks.
- **Local Street Standard.** Local Street Standard roadways typically have one lane in each direction, and are designed to have a 36-foot width, 12-foot sidewalks, and a target operating speed of 20 mph. Such streets are not designed for through traffic; rather, their focus is to allow access to and from destination points. Unrestricted parking is typically available on both sides of the street.
- **Local Street Limited.** Local Street Limited roadways typically have one lane in each direction, and are designed to have a 30-foot width, 10-foot sidewalks, and a target operating speed of 15 mph.
- **Industrial Local Street.** Although similar to the normal local streets, Industrial Local Streets differ primarily in width for the purpose of providing adequate space for trucks to maneuver. The typical roadway width for an Industrial Local Street is 44 feet, with 10-foot sidewalks and a target operating speed of 20 mph.

Signalized Intersections and Traffic Control Devices. The City of Los Angeles' Automated Traffic Surveillance and Control (ATSAC) System is a computer-based traffic signal control system that monitors traffic conditions and system performance to allow ATSAC operations to manage signal timing to improve traffic flow conditions. This system allows monitoring and control of the signal from a central Traffic Operations Center at City Hall. The importance of linking to the ATSAC System is the ability to coordinate the signals in relationship with other signals along a travel corridor. Signal coordination minimizes delay due to stops and enhances vehicle flow. Studies by LADOT and independent third parties have shown that the ATSAC system reduces congestion and increases average travel speeds.[4] The Adaptive Traffic Control System (ATCS) is an enhancement to ATSAC and provides fully traffic-adaptive signal control based on real-time traffic conditions. In addition, LADOT staff can manually adjust traffic signals remotely from the department's command center to respond to collisions, weather, special events, and other emergencies. All signalized intersections in the Project Area are currently operating under the City's ATSAC System and ATCS.

EXISTING TRAFFIC OPERATIONS

This section presents existing traffic conditions by applying the newly approved method of studying Vehicle Miles Traveled (VMT) to evaluate significant traffic impacts under CEQA. VMT is a measure of the number of miles being driven within a defined area, and are based on the number of Vehicle Trips (VT) multiplied by the average trip lengths (in miles) for various trip types. The vehicle-trip generation estimated by the Travel Demand Forecasting (TDF) model was categorized according to the origin and destination of each trip. Internal-to-internal (II) trips remain within the Plan Area. Internal-to-external (IX) trips originate within the Plan Area and terminate at an outside destination. External-to-internal (XI) trips originate outside the Plan Area and terminate within it. The VMT calculation accounts for all internal (II) trips and trips that begin or end (IX or XI) within the Plan Area, as these trips are generated by or attracted to land uses within the Hollywood CPA. To obtain an average VMT per service population, the total VMT is divided by the total population and employees within the area of analysis. The section that follows provides a brief summary of these characteristics for the City of Los Angeles, and provides a detailed summary of these

[4]LADOT, *Los Angeles Signal Synchronization Fact Sheet*, February 14, 2016, http://ladot.lacity.org/sites/g/files/wph266/f/LADOT%20ATSAC%20%26%20Signals%20_%20Fact%20Sheet%202-14-2016.pdf, accessed July 27, 2017.

characteristics for the Community Plan Area (CPA). For more information on the use of VMT as an impact threshold, see the *Thresholds of Significance* section.

Table 4.15-1 summarizes the Existing Conditions for the Hollywood CPA and presents the model estimates of vehicle mode split for automobiles, transit, bicycles and walk trips. According to model estimates, approximately 23 percent of all trips within the Plan Area are made by transit, walking or biking. This is consistent with recent U.S. Census Bureau data, which found that 24 percent of Hollywood area residents use non-automobile methods (transit/bike/walk/other) on their journey to work as compared to approximately 17 percent citywide.

TABLE 4.15-1: 2016 MODE SPLIT

Travel Mode	Plan Area Percentage (%)
Automobile	77%
Non-Automobile (transit/bike/walk)	23%

Note: U.S. Census Bureau, *2011-2015 American Community Survey 5-Year Estimates Table S0801 Commuting Characteristics by Sex.*
SOURCE: Fehr & Peers, *Hollywood Subarea TDF Model*, 2019.

VMT is reported as Total Daily VMT per Service Population, which equates to all VMT for the Plan Area divided by the number of people living and working within the Plan Area. For more information on the use of VMT and service population, see the *Thresholds of Significance* section. **Table 4.15-2** summarizes the daily vehicle trips and VMT generated by the Plan Area. The daily VMT generated by uses within the Plan Area is approximately 5.6 million miles, which equates to 18.3 VMT per service population. Service population is the sum of population and employment. **Table 4.15-3** summarizes the daily vehicle trips and VMT region-wide based on the 2016 SCAG TDF model. As shown, the SCAG region VMT per service population is approximately 90 percent higher than the Plan Area's VMT per service population.

TABLE 4.15-2: 2016 DAILY VEHICLE TRIPS AND VEHICLE MILES TRAVELED GENERATED BY PLAN AREA

Transportation Metrics	Plan Area Daily Total
Vehicle Trips (VT)	706,000
Total Vehicle Miles Traveled (VMT)	5,624,000
Vehicle Miles Traveled per Service Population	18.3

SOURCE: Fehr & Peers, *Hollywood Subarea TDF Model*, 2019.

TABLE 4.15-3: 2016 SCAG REGIONWIDE DAILY VEHICLE TRIPS AND VEHICLE MILES TRAVELED

Transportation Metrics	SCAG Region Daily Total
Vehicle Trips (VT)	82,283,000
Total Vehicle Miles Traveled (VMT)	948,656,000
Vehicle Miles Traveled per Service Population	35.4

SOURCE: Fehr & Peers, *SCAG 2016 RTP Model*, 2019.

Another way to understand existing traffic conditions is to study existing traffic volumes with an analysis of the operating conditions, indicated through volume-to-capacity (V/C) ratios and Level of Service (LOS). LOS was the commonly used metric until the new method of studying VMT was recently approved. LOS is a qualitative measure used to describe the condition of traffic flow, ranging from excellent conditions at LOS A (free-flow traffic conditions with little or no delay) to overloaded conditions at LOS F (traffic flows exceed design capacity resulting in extensive vehicle queues and delays). LOS can be determined by dividing the number of vehicles (i.e., volume (V)) by roadway capacity (C), and the resulting V/C ratio is then used to obtain the corresponding LOS. To determine the operations of the roadway network during peak commute hours, a LOS analysis was conducted for the roadways in the Plan Area.

As discussed under Special Event Traffic Operations below, special events in Hollywood frequently require partial or full closure of Hollywood Boulevard in the Project Area, including sidewalks and crosswalks, for periods of several hours to several days at a time. The data collection effort for the Existing Conditions assessment included traffic counts recorded by the Regional Integration of ITS Projects (RIITS) during the months of February, March, April and May on a Tuesday, Wednesday and Thursday. These periods represent typical traffic conditions, with schools in session and the least likelihood of a holiday or long-weekend related change compared to normal traffic patterns. The available traffic count data was post-processed to calculate the average hourly volumes for the Existing Conditions analysis. Time periods with no volume data due to roadway closures were not included in the average hourly volumes. To the extent that event traffic occurred on a weekday (Tuesday, Wednesday or Thursday) between February and May 2016, these travel demands are accounted for when calculating the average hourly volumes within the Plan Area.

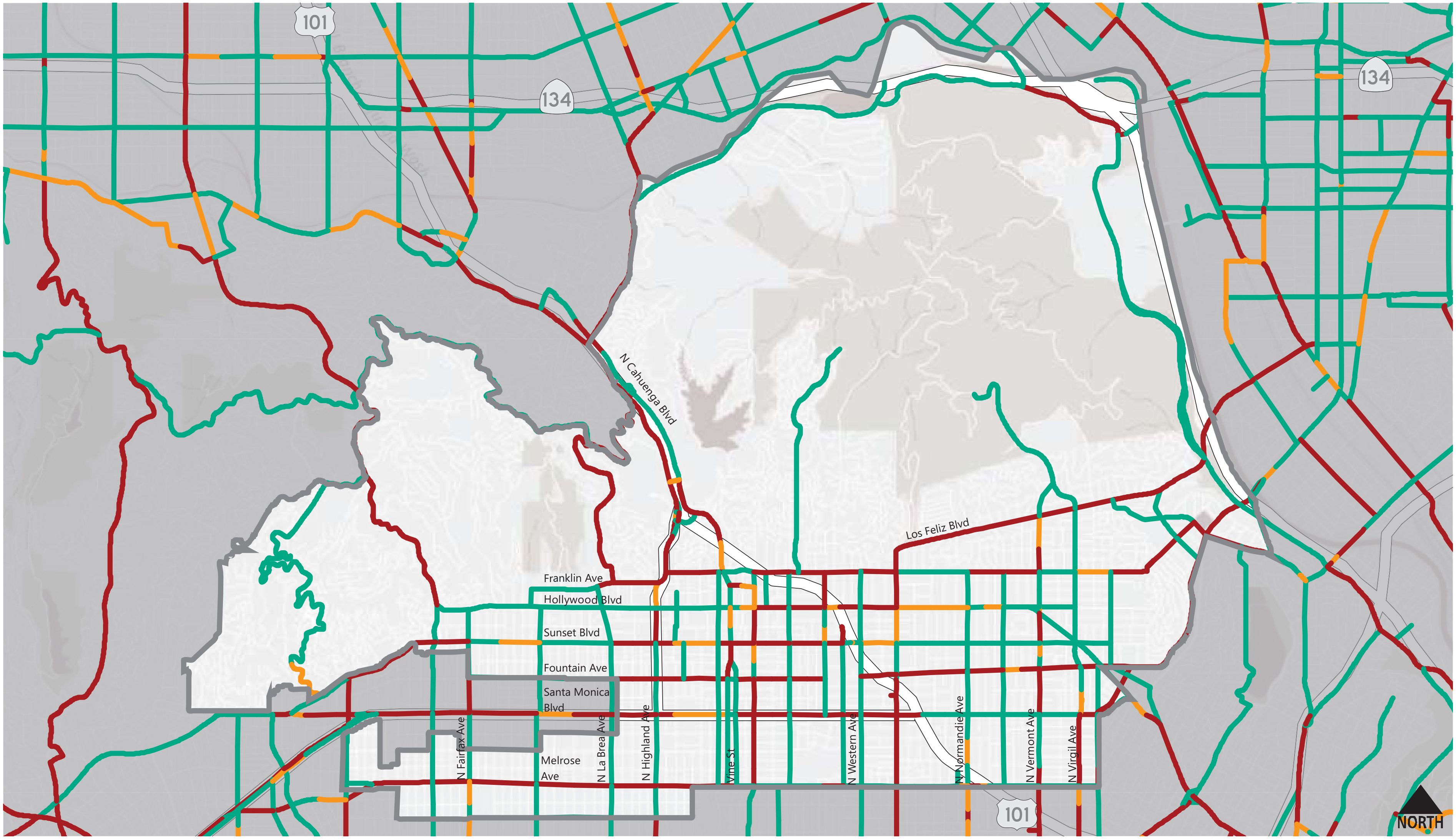
See **Table 4.15-5** and accompanying text, in the Methodology discussion below, for a description of LOS A through F, and discussion for weighted average V/C.

Figure 4.15-2 and **Figure 4.15-3** illustrate the AM Peak Period LOS and PM Peak Period LOS, respectively. It should be noted that because traffic volumes are a result of the collective travel choices of thousands of individual drivers, variation in the daily and peak period volumes on any given facility is both expected and observed. The Federal Highway Administration (FHWA) guidelines recommend traffic models are calibrated to within 7 to 15 percent for freeway and arterial volumes to account for this regular variation. This range is based on studies that show that this range represents the average daily fluctuation in traffic for major roadways. Accordingly, the estimates of both existing and future conditions are subject to regular variation due to fluctuations in travel demand (or the travel choices of the thousands of individual drivers using the Project Area roadways).

The number of travel lanes on roadways within the Project Area are displayed in **Figure 4.15-4**. The number of travel lanes on several roadways, such as Los Feliz Boulevard, Sunset Boulevard, Santa Monica Boulevard increase by one travel lane in each direction during peak travel periods due to on-street parking restrictions; these street segments are indicated on **Figure 4.15-4**. The peak hour lane capacities were used to determine roadway segment operations during morning and evening commute periods.

The LOS of the study corridors was determined based on the V/C ratio using the Hollywood Subarea TDF Model.[5] This ratio was calculated by comparing peak hour traffic volumes to the roadway capacity for each facility. The roadway capacities reflect the operating characteristics of the study corridors, such as functional classifications, number of lanes, and travel speeds. Functional classification is a scale that determines the vehicles-per-lane-per-hour capacity; higher classifications generally have more and wider lanes and are designed to facilitate a higher volume of vehicles per hour.

[5] Fehr & Peers, *Hollywood Community Plan Model Development Report*, 2016.



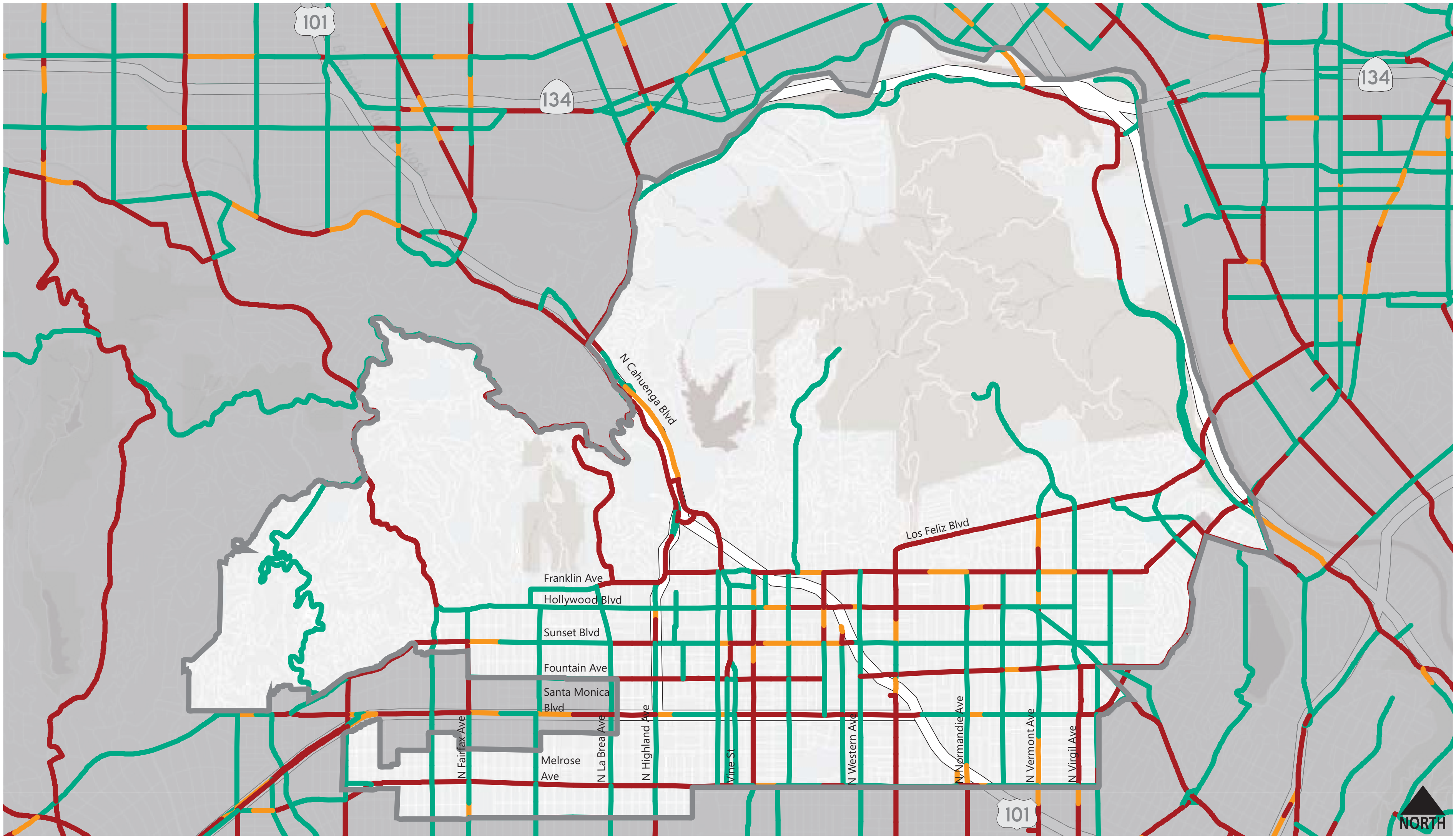
Segment Level of Service

- Acceptable Operations (V/C < 0.80)
- Approaching Capacity (V/C 0.80 - 0.90)
- Approaching or Over Capacity (V/C > 0.90)

SOURCE: Fehr & Peers, 2019.

FIGURE 4.15-2

AM PEAK PERIOD LEVEL OF SERVICE:
2016 EXISTING CONDITIONS



Segment Level of Service

Acceptable Operations (V/C < 0.80)

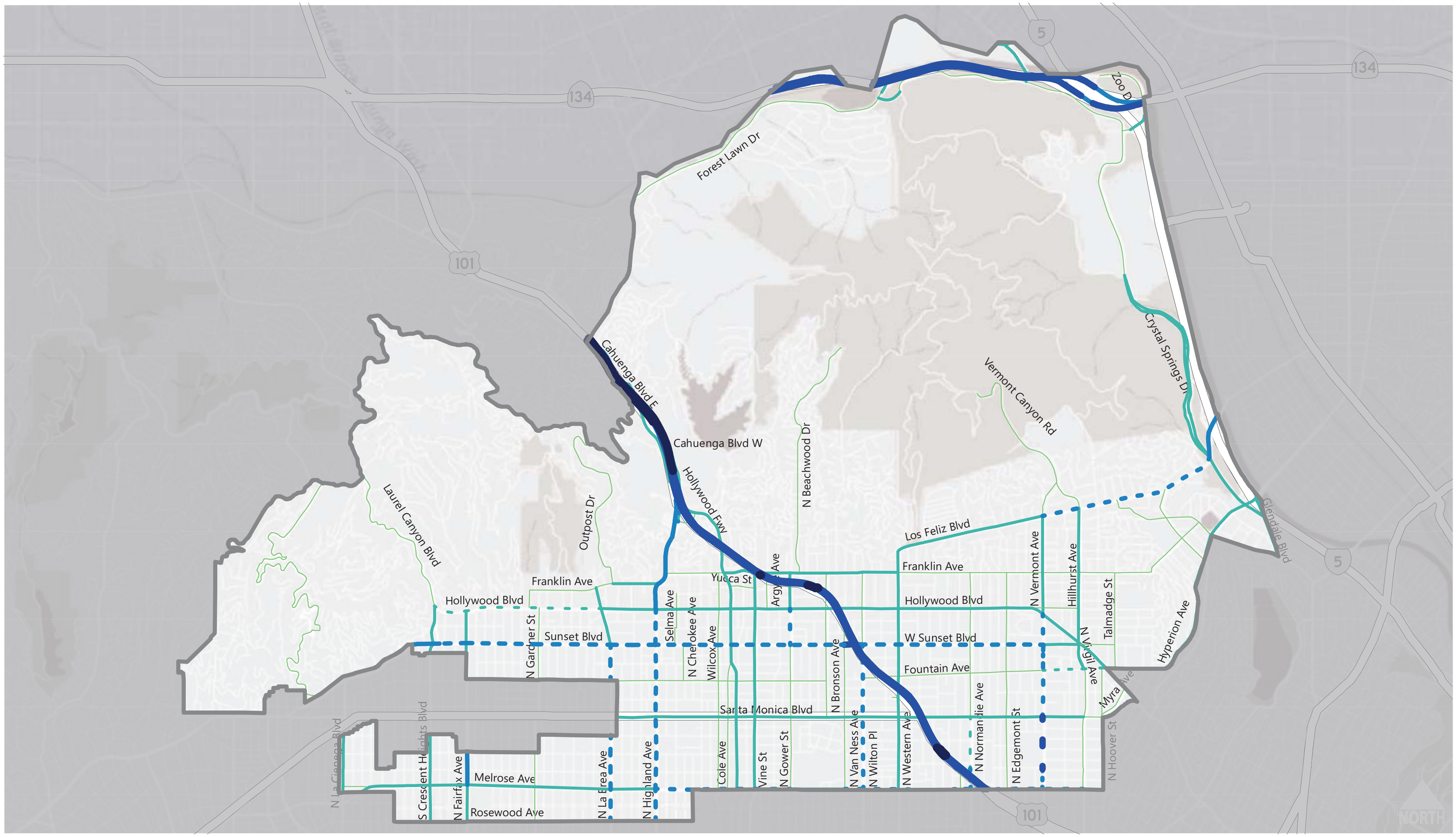
Approaching Capacity (V/C 0.80 - 0.90)

Approaching or Over Capacity (V/C > 0.90)

SOURCE: Fehr & Peers, 2019.

FIGURE 4.15-3

PM PEAK PERIOD LEVEL OF SERVICE:
2016 EXISTING CONDITIONS



Number of Lanes on Road in Each Direction During Peak Period

- 0 - 1
- 2
- 3
- 4
- 5 - 7
- Road segments with a dashed line have peak period parking restrictions in order to accomodate an additional travel lane

SOURCE: Fehr & Peers, 2019.

FIGURE 4.15-4

EXISTING ROADWAY NETWORK CAPACITY

Table 4.15-4 summarizes the typical travel conditions for the roadway network (using a weighted average V/C ratio) and the percentage of roadway segments operating at LOS E or F. The weighted average V/C ratio represents typical travel conditions for the roadway network in the Project Area.

TABLE 4.15-4: EXISTING 2016 ROADWAY SEGMENT LEVEL OF SERVICE (LOS)		
	Analyzed Time Period	
Transportation Metrics	AM Peak Period	PM Peak Period
Weighted Average V/C	0.876 (LOS D)	0.890 (LOS D)
Percentage (%) of Street Segments at LOS E or F	37%	37%
WEIGHTED AVERAGE V/C BY FACILITY TYPE		
Avenue	1.165 (LOS F)	1.186 (LOS F)
Boulevard / Parkway	0.862 (LOS D)	0.870 (LOS D)
Local / Collector	0.840 (LOS D)	0.922 (LOS E)
SOURCE: Fehr & Peers, *Hollywood Subarea TDF Model*, 2016.		

Approximately 37 percent of the roadways operate at LOS E or F during either peak period. The weighted average V/C ratio is 0.876 (LOS D) in the AM peak period and 0.890 (LOS D) in the PM peak period. As a general matter, this means a little more than a third of road network (Avenues, Boulevards, and Local/Collector streets) in the Hollywood area experiences substantial delay during the peak period, and overall the network is approaching the limits of its capacity.

RELIABILITY

The traffic volume, travel time, and LOS results presented in this section reflect typical weekday (Tuesday through Thursday) conditions within the Project Area without major incidents and under mild weather conditions. Atypical traffic conditions, such as a collision on the US-101, rainy weather or a special event, can impact travelers in the Project Area. The reliability of the roadway network can be impacted by these occurrences and is a common frustration for drivers. The bus transit system can also be affected by these events.

EMERGENCY ACCESS

California state law requires that drivers yield the right-of-way to emergency vehicles and remain stopped until the emergency vehicles have passed. Generally, multi-lane roadways allow the emergency vehicles to travel at higher speeds and permit other traffic to maneuver out of the path of the emergency vehicle. Within the Project Area, multi-lane roadways running north-south include Western Avenue, Normandie Avenue, Vermont Avenue, Cahuenga Boulevard, Highland Avenue, La Brea Boulevard, Fairfax Avenue and Crescent Heights Boulevard. Roadways running east-west include Franklin Avenue, Hollywood Boulevard, Fountain Avenue, Sunset Boulevard, Santa Monica Boulevard and Melrose Avenue. Additionally, the US-101, SR-134 and I-5 provide emergency access to and from locations within the Project Area. In addition, the LAFD in collaboration with LADOT has developed a Fire Preemption System (FPS), a system that automatically turns traffic lights to green for emergency vehicles travelling on designated streets in the City.[6]

Within the City of Los Angeles, fire prevention and suppression and emergency medical services are provided by the LAFD. Public protection service and law enforcement are provided by LAPD. New development projects in the City may increase the demand for fire protection and emergency medical

[6]LADOT, *ATSAC Fact Sheet*, http://ladot.lacity.org/what-we-do/operations/signal-synchronization0.

services, and the LAFD evaluates new project impacts on a project-by-project basis. Consideration is given to project size and components, required fire-flow, response time and distance for engine and truck companies, fire hydrant sizing and placement standards, access, and potential to use or store hazardous materials.[7] The adequacy of emergency service may be influenced by factors such as staffing levels, emergency response times, technology improvements, management strategies, and mutual aid agreements. Every year, LAFD assesses its resources and reallocates them based on demand and need citywide. The provision of new fire stations varies as a function of not only the geographic distribution of physical stations but also due to the availability of fire trucks, ambulances, and other equipment as well as access to reciprocal agreements with neighboring jurisdictions. The City requires that development plans be submitted to the City for review and approval to ensure that new development has adequate access, including driveway access and turning radius in compliance with existing City regulations.[8]

Table 4.15-5 identifies the existing fire stations in the Plan Area and provides the 2016 average response times for Non-EMS and EMS calls. See **Figure 4.14-1** in Section 4.14 Public Services of the EIR for the map of the fire stations.

TABLE 4.15-5: LAFD FIRE STATIONS SERVING THE PROJECT AREA

Fire Station	Address	LAFD Community	2016 Average Response Times (mins) /a/		Staffing	Service and Equipment
			Non-EMS	EMS		
27	1327 N. Cole Ave. Los Angeles, CA 90028	Hollywood	5:40	6:23	15	• Task Force Truck • Ambulance Unit • Urban Search & Rescue
35	1601 N. Hillhurst Ave. Los Angeles, CA 90027	Los Feliz	5:56	6:02	12	• Truck Company • Engine Company • Ambulance Unit
41	1439 N. Gardner St. Los Angeles, CA 90046	Hollywood (North Hills & Northwest)	7:11	6:45	8	• Truck Company • Engine Company • Ambulance Unit
52	4957 Melrose Ave. Los Angeles, CA 90029	Hollywood (Southeast)	6:04	6:18	7	• Engine Company • Ambulance Unit
56	2759 Rowena Ave. Los Angeles, CA 90039	Silver Lake	7:28	7:29	4	• Engine Company • Ambulance Unit • Heavy Rescue
76	3111 N. Cahuenga Blvd. Los Angeles, CA 90068	Cahuenga Pass	7:38	7:46	4	• Engine Company • Ambulance Unit
82	5769 Hollywood Blvd. Los Angeles, CA 90028 (West Bureau Headquarters)	Hollywood (Hills & Northeast)	6:31	6:11	6	• Engine Company • Ambulance Unit

Note: Non-EMS = fire and other services; EMS = Emergency Medical Services
/a/ Average response metrics for January-December 2016.
SOURCE: LAFD, *FireStatLA*, www.lafd.org, Navigate LA; TAHA, 2017, 2019.

[7] City of Los Angeles, *CEQA Thresholds Guide*, 2006, page K.2.2.
[8] LAMC Section 12.21.A.5 "Design of Parking Facilities".

PUBLIC TRANSIT SERVICE

Metro's Red Line subway provides high-speed local and regional transit connections both with the San Fernando Valley and downtown Los Angeles, including a direct connection to Union Station. Other public transit service within the Project Area consists primarily of local bus services linking riders to localized businesses and destinations. A relatively dense network of buses provides local access as well as first/last-mile connections to the Red Line subway stations. Pedestrian access to transit in Hollywood tends to rank near the average for major transit stops/stations in Los Angeles County, with an average rating of 91 out of 100, as reported by WalkScore.com.[9] Bicycle access to major transit stops in the area is less robust, falling well below the countywide average and receiving an average score of 61 out of 100, as reported by WalkScore.com.

Services are provided by multiple transit operators, including Metro and LADOT Downtown Area Short Hop (DASH) and Commuter Express; headways can be as frequent as 15 minutes or less. **Figure 4.15-5** shows transit service coverage in the Hollywood Project Area.

Below are brief descriptions of the transit operators that provide service within the City:

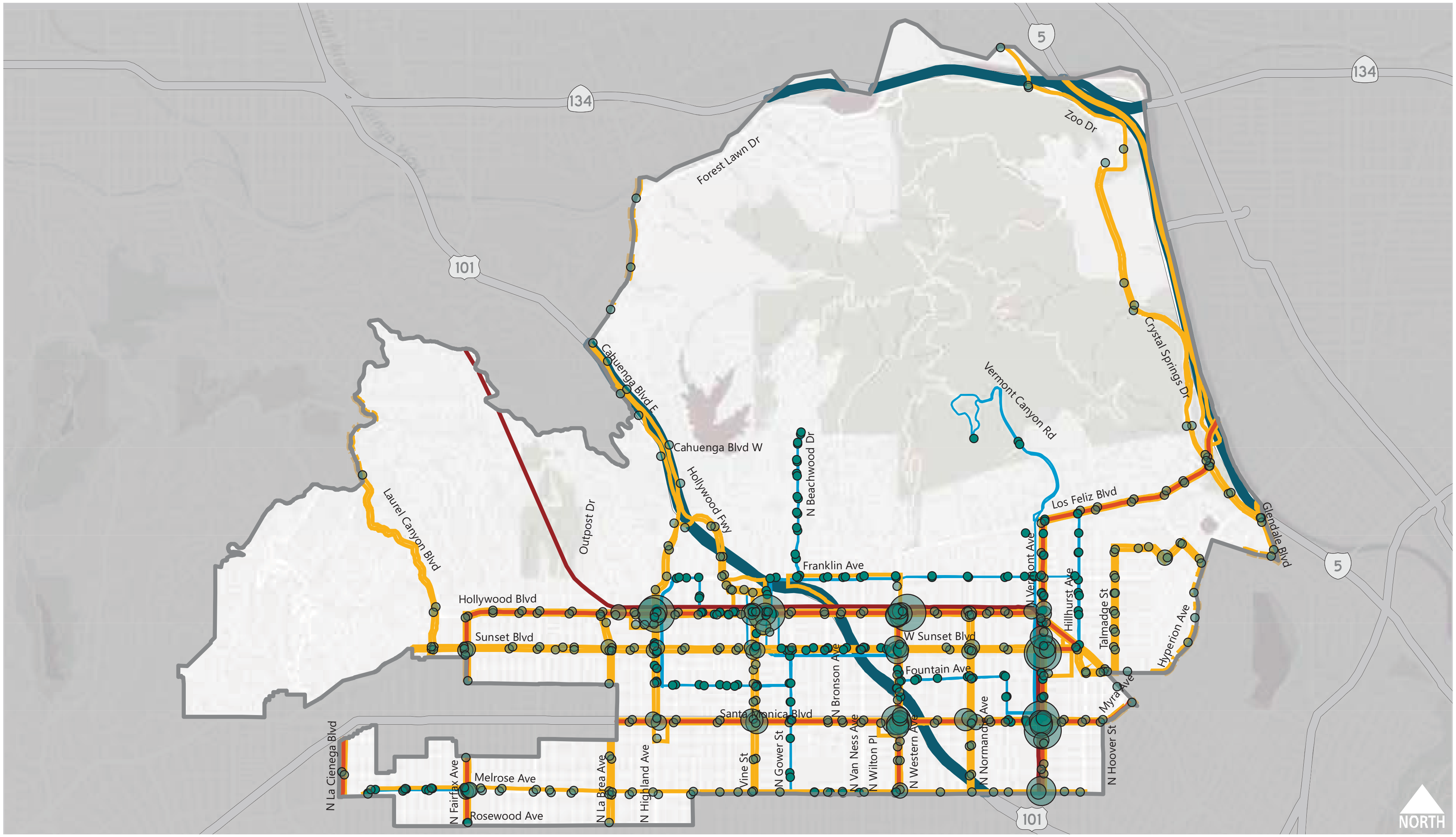
Los Angeles County Metropolitan Transportation Authority (Metro). Metro is the primary transit operator in Los Angeles County, providing bus, light rail, and subway services. There are two Metro heavy rail lines (Red and Purple), four Metro light rail lines (Blue, Green, Gold, Expo Phase 1) and two bus rapid transit (BRT) lines (Orange and Silver) operating in exclusive rights-of-way. Bicycles are allowed in designated areas on Metro trains at no extra charge at all times. Metro also operates approximately 180 bus routes in mixed traffic. These bus services vary considerably in speed, frequency and capacity. Buses are equipped with two bicycle racks at the front of the bus, and bicyclists are allowed to load their bicycles on the rack when there is space available at no extra charge. If the rack is full, bicyclists are asked to wait for the next bus.

The following Metro lines currently provide transit service in and through the Project Area:

- Metro Red Line (subway)
- Metro Rapid Lines
  - 704
  - 705
  - 754
  - 757
  - 780
- Metro Local Lines
  - 2
  - 4
  - 10
  - 92
  - 96
  - 105
  - 175
  - 180
  - 201
  - 204
  - 206
  - 207
  - 210
  - 212
  - 217
  - 218
  - 222
  - 237

Los Angeles Department of Transportation (LADOT). LADOT provides local and commuter express bus services in the City of Los Angeles. DASH operates 32 community circulator routes covering downtown Los Angeles and many outlying communities within the City. The Commuter Express operates 14 routes, making a limited number of stops and transporting passengers between downtown Los Angeles and other major centers within the City. Most Commuter Express routes operate during the peak hours only in the peak direction.

[9] Fehr & Peers, *Metro Active Transportation Strategic Plan*, April 2016.



Daily Ridership by Stop

- 0 - 250
- 250 - 500
- 500 - 1,000
- 1,000 - 2,000
- 2,000+

Transit Lines

- Metro Red Line
- Metro Rapid Bus
- Metro Local Bus
- LADOT DASH
- LADOT Commuter Express

SOURCE: METRO, LADOT, 2016.

taha 2016-021

Hollywood Community Plan Update
Draft Environmental Impact Report
CITY OF LOS ANGELES

FIGURE 4.15-5

EXISTING TRANSIT SERVICE & RIDERSHIP

LADOT buses are equipped with three bicycle racks at the front of the bus, and bicyclists are allowed to load their bicycles on the rack when there is space available at no extra charge. If the rack is full, bicyclists are asked to wait for the next bus. The following LADOT services operate within and through Hollywood Project Area:

- Commuter Express 422
- DASH Beachwood Canyon
- DASH Fairfax
- DASH Hollywood
- DASH Hollywood/Wilshire
- DASH Los Feliz
- DASH Weekend Observatory Shuttle

West Hollywood CityLine X. The City of West Hollywood operates the "CityLine X" public transit route, a peak-period service connecting West Hollywood with the Metro Red Line station at Hollywood and Highland. Service operates weekdays between 7:00 a.m. and 9:00 a.m. and 5:30 p.m. to 7:00 p.m. every 15-20 minutes. The route includes local stops in West Hollywood along Santa Monica Boulevard.

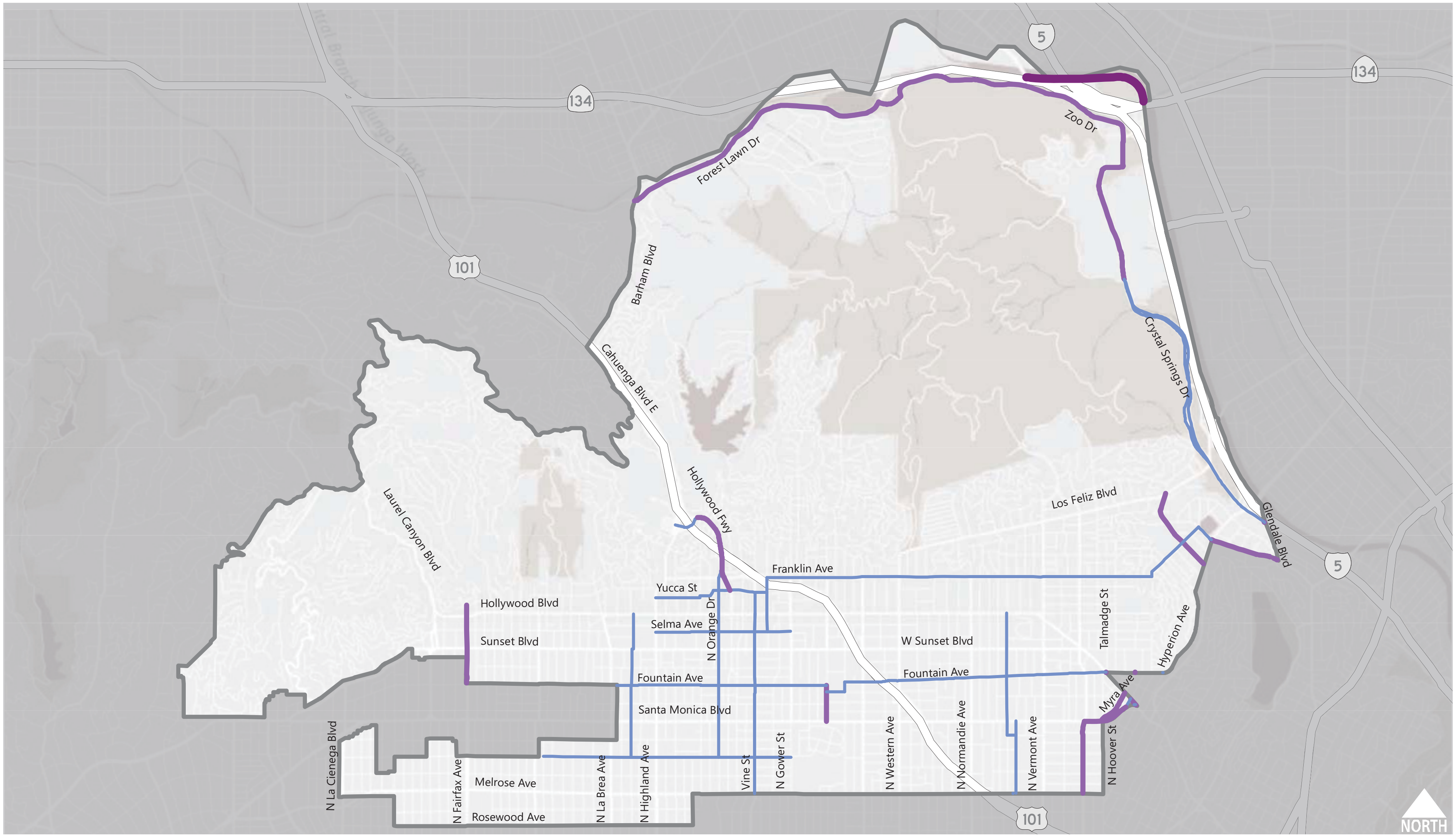
BICYCLE AND PEDESTRIAN FACILITIES

The Project Area consists of a modest network of bicycle facilities; pedestrian facilities primarily consist of sidewalks adjacent to roadways. Pursuant to the California Vehicle Code, bicycles are allowed on any street within the local street system. Pursuant to Los Angeles City Code, bicycles are also allowed on the sidewalk (LAMC Section 56.15). Most roadways are aligned on a grid system providing multiple route options for traveling throughout the Project Area.

Bicycle facilities are defined as off-street bicycle paths (Class I), on-street signed and striped bicycle lanes (Class II), on-street signed bicycle routes (Class III), and protected bicycle lanes or cycle tracks (Class IV). The design features of the various types of bicycle facilities are summarized below:

- **Bicycle Path:** A paved pathway separated from motorized vehicular traffic by an open space or barrier and either within the highway rights-of-way or within an independent alignment. Bicycle paths may be used by bicyclists, skaters, wheelchairs users, joggers, and other non-motorized users. Caltrans refers to this facility as Class I Bikeway, which "provides a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flow of motorists minimized."
- **Buffered Bike Lanes:** Buffered bicycle lanes provide on-street right-of-way in the form of a painted buffer that directs motorists to travel away from the bike lane and provides room for bicyclists to pass another bicyclist without entering the adjacent motor vehicle travel lane. A buffered bicycle lane is considered a Class II bikeway.
- **Bicycle Lane:** A striped lane for 1-way bicycle travel on a street or highway. Caltrans refers to this facility as a Class II bikeway.
- **Bicycle Route:** is a shared roadway specifically identified for use by bicyclists, providing a superior route based on traffic volumes and speeds, street width, directness, and/or cross-street priority, denoted by signs only. Caltrans refers to this facility as a Class III Bikeway.
- **Protected Bicycle Lane (Cycle Track):** A bicycle lane that provides further protection from other travel lanes with a physical roadway intervention. This is considered a Class IV Bikeway.

Within the Project Area, there are several existing bicycle facilities in addition to bicycle racks provided at various public and private locations throughout the Project Area. **Figure 4.15-6** shows the locations of the existing bicycle facilities within the Project Area.



Bicycle Facilties

- Class I (Bicycle paths)
- Class II (Bicycle lanes)
- Class III (Bicycle routes/bicycle friendly streets)

SOURCE: LADOT, 2016.

taha environmental planners
taha 2016-021

Hollywood Community Plan Update
Draft Environmental Impact Report
CITY OF LOS ANGELES

FIGURE 4.15-6

EXISTING BICYCLE NETWORK

The pedestrian network includes sidewalks, crosswalks, and curb ramps, as well as pedestrian amenities such as street trees and benches in some areas. Similar to many areas in the City, the Project Area has an aging network of pedestrian facilities including sidewalks of varying widths and wide crosswalks at most major intersections. Many areas have pedestrian-friendly features such as curb-side parking, and traffic signal modifications to ensure longer pedestrian crossing times, where warranted. Conditions vary widely in terms of sidewalk condition, pavement marking visibility, and obstructions in the sidewalk realm. An estimated 42 percent of the City's 10,750 miles of sidewalks are in disrepair.[10]

In 2015, as part of the Great Streets program, the City reconfigured the Hollywood Boulevard/Highland Avenue intersection to include an exclusive pedestrian signal phase in which all vehicular movement is prohibited. This configuration is also known as a "pedestrian scramble" and improves safety for pedestrians as well as optimizing traffic operations at an intersection with high volumes of pedestrians and turning vehicles.

In April 2015, the City of Los Angeles agreed to spend $1.3 billion over the next 30 years to fix sidewalks throughout the City and produce two reports per year to document its progress in repairing substandard sidewalks.

SPECIAL EVENT TRAFFIC OPERATIONS

Citywide Special Event Traffic Operations

Special events, such as the Los Angeles Marathon, AIDS/Lifecycle bike ride, CicLAvia, weekly farmers' markets, organized marches, races, block parties and similar events, frequently require partial or full closure of city streets, including sidewalks and crosswalks, for periods of several hours to several days at a time.

Hollywood Community Plan Area Special Event Traffic Operations

Additional information is provided below regarding special events that occur in Hollywood. The description of special events is intended to provide an overview of the various activities that occur in Hollywood to illustrate the robust levels of activity and events in the area and is not meant to be an exhaustive list of all current or potential future events.

Filming

Film-related events, such as film premieres and awards ceremonies, frequently require partial or full closure of Hollywood Boulevard in the Project Area, including sidewalks and crosswalks, for periods of several hours to several days at a time. One block of Hollywood Boulevard, between Highland Avenue and Orange Drive, sees frequent closures for special events, for up to 14 days for the Academy Awards ceremony and typically three days for film premiers.

Hollywood Bowl

The Hollywood Bowl (the Bowl) is a large outdoor music venue located at 2301 North Highland Avenue in the Project Area. With a seating capacity of 17,500 people, the Bowl draws large crowds to evening concerts and other events on the weekends and two or more additional nights per week during the season, June through September. The Bowl also hosts concerts by various sponsors (i.e. "for lease events") throughout the year. Located in a hilly, residential area, the Bowl is accessible from the Highland Avenue/Hollywood Bowl and Cahuenga Boulevard/Vine Street exits of US-101. Event parking at the Bowl

[10]Los Angeles Times, *A Citizens Sidewalk Brigade for L.A*, September 11, 2012.

is provided in four lots on either side of Cahuenga Boulevard/Highland Avenue and Odin Street. All parking is stacked with no early exit.

Visitors are encouraged to take advantage of a number of transportation options for events. These include 13 Park & Ride locations throughout Los Angeles County, offering roundtrip bus service to and from the Bowl. The Bowl Shuttle also offers roundtrip service from five locations, including two Metro stations: Hollywood/Highland on the Metro Red Line and Union Station, where Metro Gold, Red, and Purple Lines along with many local and regional bus lines converge.

John Anson Ford Theatre

The John Anson Ford Theatre is a music venue located at 2580 Cahuenga Boulevard East. The outdoor amphitheater can host 1,200 people and has a range of events, such as dance, film, and music, throughout the year. Visitors have a variety of options to get to the theater. A free Ford shuttle picks up at the Universal City/Studio City Metro Shop. Visitors can pay to park off-site (non-stacked and a free shuttle to the theater) or on-site (stacked). LA Metro bus lines 156 and 222 also provide service to the theater.

Hollywood Palladium

The Hollywood Palladium is a music venue located at 6215 Sunset Boulevard. The Palladium can host up to 4,000 people. Visitors can take the Metro Red Line to the Hollywood/Vine station. The venue also provides paid, on-site parking, with several other paid lots and on-street metered parking in the vicinity.

The Fonda Theatre

The Fonda Theatre is a concert venue located at 6126 Hollywood Boulevard. The Fonda can host 1,200 people and primarily has concerts but also hosts live events, private parties, and film/TV shoots. Visitors can take the Metro Red Line to the Hollywood/Vine station or several bus lines (180, 181, and 217). The Fonda also has onsite parking that must be reserved in advance.

Hollywood Pantages Theatre

The Hollywood Pantages Theatre is located at 6233 Hollywood Boulevard. The theater can host 2,700 people and primarily has live stage and Broadway productions. The Pantages also occasionally hosts concerts, filming, and special live events. Visitors can take the Metro Red Line to the Hollywood/Vine station and several bus lines (Metro 180, 181, 217, 222, 780 and DASH Hollywood and Hollywood/Wilshire). The theater does not provide onsite parking but provides visitors the option to reserve parking spots at nearby independently managed parking lots.

THRESHOLDS OF SIGNIFICANCE

This section explains the metrics used to measure the performance of the Proposed Plan. The metrics used are from the updated CEQA Guidelines from the California State Office of Planning and Research (OPR) in effect since late December 2018.

HISTORY

Senate Bill 743 directed OPR to "prepare, develop, and transmit to the Secretary of the Natural Resources Agency for certification and adoption proposed revisions to the guidelines adopted pursuant to Section 21083 establishing criteria for determining the significance of transportation impacts of projects within transit priority areas… Upon certification of the guidelines by the Secretary of the Natural Resources Agency pursuant to this section, automobile delay, as described solely by LOS or similar measures of vehicular capacity or traffic congestion within a transit priority area, shall not support a finding of significance pursuant to this division…"[11]

On January 20, 2016, OPR updated the CEQA Guidelines "Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA," the evaluation of vehicle miles traveled (VMT) was recognized as "generally the most appropriate measure of transportation impacts."

On November 2017, OPR proposed a new section, 15064.3, to help determine the significance of transportation impacts. This section was updated July 2, 2018 and finalized on December 28, 2018 with criteria for analyzing transportation impacts, and is seen below in the section *Thresholds of Significance Applied to Proposed Plan*. Its purpose is to describe specific elements for considering the transportation impacts of a given project given the use of VMT as the primary measurement.

Per the guidance from OPR, "a lead agency may elect to be governed by the provisions of this section immediately. Beginning on July 1, 2020, the provisions of this section shall apply statewide."[12]

PERFORMANCE METRICS

The current metrics shift the focus from level of service (LOS) to vehicle trips (VT) and vehicle miles traveled (VMT). These are defined as follows, with methodology specifics outlined in the following *Methodology* section:

Vehicle Trips (VT). VT are defined as the number of trips undertaken in an automobile, such as in single occupancy vehicles, private automobiles, and vehicles that contain two or more travelers, such as carpools, taxis, or ride-share vehicles. A reduction in VT over time can be used as an indicator of reduced reliance on the automobile as well as an indicator of more travel by carpools.

Vehicle Miles Traveled (VMT). VMT is a measurement of miles traveled (e.g., private automobiles, trucks and buses) generated by all land uses (e.g., residential, retail, office) in the Project Area. To compare scenarios, VMT per service population is used. A reduction in VMT overall and in VMT per service population can be used as an indicator of reduced reliance on vehicular travel, primarily by private automobiles.

Service Population. Service Population is the sum of population and employment. It is used in this study to represent both residents and employees. Some VMT metrics focus on VMT per capita and VMT per employee as separate markers of these indications; however, VMT per service population showcases the effects of all vehicular movement in an area. It includes not only trips that are attracted and produced by home and work trips, but those that fit in neither category (i.e. school to grocery store) as well as truck trips. It is therefore more representative of the effect of users and trips on the roadways in this CPA.

THRESHOLDS OF SIGNIFICANCE APPLIED TO PROPOSED PLAN

In accordance with Appendix G of the aforementioned CEQA Guidelines, the Proposed Plan would have a significant impact related to transportation if it would:

1. **Conflict with a program, plan, ordinance or policy** addressing the circulation system, including transit, roadways, bicycle and pedestrian facilities.

[11] SB 743, 2013-2014 CA State Cong. § 386 (2013)

[12] California Natural Resources Agency. *Notice of Public Availability of Modifications to Text of Proposed Regulation and Addendum to the Initial Statement of Reasons and Informative Digest: OAL Notice File No. Z-2018-0116-12.* California, 2018

2. Conflict or be inconsistent with CEQA Guidelines Section 15064.3, Subdivision (b).

a. Text of CEQA Guidelines Section 15064.3, Subdivision (b):

i. ***Land Use Projects.*** *Vehicle miles traveled exceeding an applicable threshold of significance may indicate a significant impact. Generally, projects within one-half mile of either an existing major transit stop or a stop along an existing high-quality transit corridor should be presumed to cause a less than significant transportation impact. Projects that decrease vehicle miles traveled in the project area compared to existing conditions should be presumed to have a less than significant transportation impact.*

ii. ***Transportation Projects.*** *Transportation projects that reduce, or have no impact on, vehicle miles traveled should be presumed to cause a less than significant transportation impact. For roadway capacity projects, agencies have discretion to determine the appropriate measure of transportation impact consistent with CEQA and other applicable requirements. To the extent that such impacts have already been adequately addressed at a programmatic level, such as in a regional transportation plan EIR, a lead agency may tier from that analysis as provided in Section 15152.*

iii. ***Qualitative Analysis.*** *If existing models or methods are not available to estimate the vehicle miles traveled for the particular project being considered, a lead agency may analyze the project's vehicle miles traveled qualitatively. Such a qualitative analysis would evaluate factors such as the availability of transit, proximity to other destinations, etc. For many projects, a qualitative analysis of construction traffic may be appropriate.*

iv. ***Methodology.*** *A lead agency has discretion to choose the most appropriate methodology to evaluate a project's vehicle miles traveled, including whether to express the change in absolute terms, per capita, per household or in any other measure. A lead agency may use models to estimate a project's vehicle miles traveled, and may revise those estimates to reflect professional judgment based on substantial evidence. Any assumptions used to estimate vehicle miles traveled and any revisions to model outputs should be documented and explained in the environmental document prepared for the project. The standard of adequacy in Section 15151 shall apply to the analysis described in this section.*

b. The Proposed Plan would have an impact related to transportation if it would result in VMT per service population that exceeded an applicable threshold of significance. OPR recommends that a per capita or per employee VMT that is fifteen percent below that of existing development regionally may be a reasonable threshold. However, the "region" identified for the City of Los Angeles is the six-county SCAG region, which is very large and not representative of the Plan area. Holding this Plan Area to that as a threshold would likely promote an increase in VMT. Additionally, the use of per capita and per employee is **not** as representative of all travel in the area as per service population. As "CEQA generally defers to lead agencies on the choice of methodology to analyze impacts"[13], the City of Los Angeles is choosing to use the following as part of a two-pronged threshold:

i. The Plan would result in average total VMT per service population in the plan horizon year that exceeds 15% below the regional average total VMT per service *population* from the most recent regional metric available.

[13] Governor's Office of Planning and Research. *Technical Advisory on Evaluating Transportation Impacts in CEQA*. California: 2018

ii. The Plan would result in average total VMT per service population in the plan horizon year that exceeds the average total VMT per service population for the baseline year.

3. **Substantially increase hazards** due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

4. **Result in inadequate emergency access.**

METHODOLOGY

The transportation analysis for the Proposed Plan has been developed through a process that includes the use of a Hollywood Subarea TDF Model for the analysis of Existing 2016 Conditions compared to Future 2040 With Project Conditions. For some impact areas, a comparison of Future Without Project to Future With Project is also provided for informational purposes only. This section describes the procedures used to assess impacts on the transportation system. It includes an overall discussion of methodology and assumptions, followed by a discussion of how the Proposed Plan is expected to perform for each of the thresholds described above.

STUDY AREA AND REPORTING FRAMEWORK

The Project Area is defined by the boundaries of the Hollywood CPA in the City of Los Angeles. The study area is defined by the potential impacts of the Proposed Plan to transportation and safety. The EIR studied impacts to areas within the Proposed Plan boundaries, adjacent areas in the City of Los Angeles, neighboring jurisdictions and freeways that serve the region. The extent of the study area was determined by comparing traffic volumes under Future With Project and Future Without Project Conditions using the Hollywood Subarea Model. The study area extends out from the Plan boundaries until the change in traffic volume related to the Future With Project Conditions was less than two percent, which is generally less than two miles from the Proposed Plan boundary.

VMT METHODOLOGY

In order to determine whether the socio-economic and transportation network included in the Proposed Plan would result in an impact (as outlined in the *Thresholds of Significance* section previously), VMT calculated for 2016 Baseline and 2016 SCAG Region is compared to the 2040 Proposed Plan. This is calculated using the following outputs from the City of Los Angeles, Hollywood Subarea, and SCAG TDF Models.

VEHICLE TRIPS

Vehicle Trips are defined as the number of trips undertaken in an automobile or a truck, such as in single-occupancy private automobiles, vehicles that contain two or more travelers, such as carpools, taxis, or ride-share vehicles, and trucks including light truck, medium truck, and heavy truck. While the total number of vehicle trips is expected to increase as growth occurs in the Plan Area and in the region, a reduction in vehicle trips per service population over time can be used as an indicator of reduced reliance on the automobile as well as an indicator of more travel by carpools. A reduction in the number of vehicle trips per service population also helps meet the State's goal of reducing GHG emissions, as mandated by AB 32 and SB 375. Any increase in the number of daily vehicle trips per service population would be an undesirable outcome of the Proposed Plan but would not constitute an impact.

Vehicle trips are calculated from outputs of the Hollywood TDF model and SCAG TDF model. With estimated population relevant to each model's year, household and employment values input into each model Traffic Analysis Zone (TAZ), the models develop a vehicle trip calculation for the Plan Area and SCAG Region. A Traffic Analysis Zone is a spatial unit that includes socioeconomic data.

VEHICLE MILES TRAVELED (VMT)

VMT is a measurement of miles traveled (e.g., private automobiles, trucks and buses) generated by all land uses (e.g., residential, retail, office). While the total VMT is expected to increase as growth occurs in the Plan Area and in the region, a reduction in VMT per service population over time can be used as an indicator of reduced reliance on the automobile. Reducing VMT helps meet the State's goals of reducing GHG emissions, as mandated by AB 32 and SB 375. Any increase in the total number of VMT per service population would be an undesirable outcome of the Proposed Plan and would constitute an impact. VMT was forecasted for the Plan Area with the Hollywood model.

For this analysis, VMT is reported as Total Daily VMT per Service Population. The Total Daily VMT per Service Population is the total VMT divided by the number of people living or working within the Community Plan Area. This VMT is generated by residents, employees, and visitors in Hollywood and captures their travel within Hollywood as well as travel between Hollywood and their ultimate origin/destination.

The reported VMT results include both personal vehicles and truck VMT. The VMT calculation accounts for internal (II) trip ends and trips that begin or end (IX or XI) within the Plan Area, as these trips are generated by or attracted to land uses within the Plan Area. The travel behavior effects of land use changes in Hollywood can be understood by measuring the VMT of trips originating in and/or destined for the Plan Area and comparing them to the 2016 Baseline and 2016 SCAG Region outputs.

VMT is calculated by multiplying the vehicle trips by the number of trips estimated through the Hollywood model. Due to all of the inputs in the Hollywood and SCAG TDF models, VMT is taking into consideration population, housing, and employment values, as well as travel patterns of origins and destinations.

ROADWAY SEGMENT AND FREEWAY MAINLINE LOS METHODOLOGY

In addition to the VMT methodology, the Proposed Plan was also analyzed using LOS changes on road segments, as described below. As discussed above, under SB 743, LOS as a metric for traffic congestion is not used to determine significant impacts for CEQA. However, congestion may still be considered for safety and therefore, this information is used to inform the analysis related to emergency access, as well as for informational and historical comparison purposes.

LOS is a qualitative measure used to describe the condition of traffic flow and LOS definitions for street segments are summarized in **Table 4.15-6**. LOS can be determined by dividing demand V/C, and the resulting V/C ratio is then used to obtain the corresponding LOS. The capacity values for analyzed roadway segments were obtained from the Hollywood Model.

Plans that involve large areas and are not expected to be fully implemented until Year 2040 or beyond are not analyzed effectively by detailed intersection V/C analyses. In addition, detailed roadway designs for improvements to individual intersections are not yet available. Consequently, roadway segment analysis is commonly used to determine the average service capacity of the roadway network. Street segment capacity impacts are generally evaluated in program-level analyses (such as community plans or long-range development projects) for which details regarding specific land use types, sizes, project access points, etc., are not known.

TABLE 4.15-6: ROADWAY SEGMENT LEVEL OF SERVICE (LOS) DEFINITIONS		
Level of Service (LOS)	**Volume to Capacity Ratio (V/C)**	**Description**
A	0.00 – 0.60	Excellent operation. All approaches to the intersection appear quite open, turning movements are easily made, and nearly all drivers have freedom of operation.
B	>0.60 – 0.70	Very good operation. Many drivers begin to feel somewhat restricted within platoons of vehicles. This represents stable flow. An approach to an intersection may occasionally be fully utilized and traffic queues start to form.
C	>0.70 – 0.80	Good operation. Occasionally drivers may have to wait more than 60 seconds, and back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted.
D	>0.80 – 0.90	Fair operation. Cars are sometimes required to wait more than 60 seconds during short peaks. There are no long standing traffic queues. This level is typically associated with design practice for peak periods.
E	>0.90 – 1.00	Poor operation. Some long-standing vehicular queues develop on critical approaches to intersections. Delays may be up to several minutes.
F	>1.00	Forced flow. Represents jammed conditions. Backups from locations downstream or in the cross street may restrict or prevent movement of vehicles out of the intersection approach lanes; therefore, volumes carried are not predictable. Potential for stop and go type traffic flow.
SOURCE: Transportation Research Board, *Highway Capacity Manual, Special Report 209*, Washington, D.C., 2000.		

LOS can be determined by dividing the number of vehicles (i.e., volume (V)) by roadway capacity (C), and the resulting V/C ratio is then used to obtain the corresponding LOS. The volume-weighted V/C ratio is used in order to obtain aggregate statistics regarding the transportation conditions, allowing a comparison of different scenarios and alternatives. The weighted average V/C ratio represents typical travel conditions for the roadway network in the Project Area. The volume-weighted average V/C ratio is calculated by taking the volume of each street segment and multiplying it by its corresponding V/C ratio. This is divided by the sum of the total volumes, and essentially represents the average V/C ratio for the roadway network in the Project Area.

TRAVEL DEMAND MODEL DEVELOPMENT

The City of Los Angeles TDF Model provides the ability to evaluate the transportation system, use performance indicators for land use and transportation alternatives, provide information on regional pass-through traffic versus locally generated trips, and graphically display these results. The model considers forecast growth in City of Los Angeles and surrounding areas, including special generators, such as airports and universities, and is sensitive to emerging land use trends through improved sensitivity to built environment variables. The model forecasts AM and PM peak period and daily vehicle and transit flows on the transportation network in the City. In essence, the travel demand model serves as a tool to implement, manage and monitor the City of Los Angeles' transportation plans, projects, and programs, providing a suitable starting point for additional refinement as part of a more local application, such as the Proposed Plan.

The potential impacts associated with implementation of the Proposed Plan are evaluated using a refined version of the City of Los Angeles' Travel Demand Model within the Hollywood area. The Hollywood Subregion Travel Demand Forecasting Model (referred to as the Hollywood Model) utilizes the TransCAD Version 5.0 R4 Build 2025 modeling software (consistent with the citywide model) and has been calibrated and validated for 2016 conditions. The Hollywood Model builds on the citywide model update and refines the level of detail within the Plan Area for improved sensitivity in measuring the effect of land use development and transportation network changes. The model has a future horizon year of 2040 and was designed to produce daily and AM and PM peak hour vehicle and transit flows on roadways within the Project Area based on comprehensive land use and socioeconomic data (SED) and uses a conventional 4-step process of trip generation, trip distribution, modal split and assignment. For modeling purposes, the City of Los Angeles is divided into 2,250 Transportation Analysis Zones (TAZs), each with corresponding SED and connections to the roadway and transit networks. The 46 TAZs that encompass the Hollywood Community Plan in the citywide model were subdivided into 97 TAZs for purposes of this analysis. The subdivided TAZs better reflect how and where traffic enters and exits the street network and is divided along logical transportation boundaries like major streets and topography.

The Hollywood Model is consistent with the most recent 2016-2040 RTP/SCS model's regional transportation network and regional growth forecasts and contains City of Los Angeles SED for both the existing and future conditions within the boundaries of the Hollywood Community Plan. The Hollywood Model was used to generate the Existing Conditions, Future Without Project Conditions, and Future With Project Conditions data for the transportation impact analysis. The Hollywood Community Plan Area Model Development Report is contained in Appendix J.

IMPACT ANALYSIS

The purpose of the transportation analysis is to identify potential transportation system deficiencies resulting from vehicle trips generated by the employment and population growth anticipated under the Proposed Plan and the proposed transportation network improvements, and to identify feasible mitigation measures. The Proposed Plan is a long-term plan that will be implemented over many years in conjunction with already approved development projects in the study area, and regional growth and transportation projects outlined in the 2016-2040 RTP/SCS. The Proposed Plan is represented by the 2040 Proposed Plan scenario, and is compared to 2016 Baseline and 2016 SCAG Region scenarios in order to show the potential impacts of the plan.

The Hollywood Subarea Model is built upon and includes the entirety of the City of Los Angeles Travel Demand Forecasting Model, which is consistent with the 2016-2040 SCAG RTP/SCS model and includes all reasonably foreseeable development and regional transportation improvements for the year 2040 in the City of Los Angeles as well as the adjacent Cities, such as West Hollywood, Burbank and Glendale. Thus, the Hollywood Subarea Model includes the regional growth forecast for both inside and outside of the Plan area for the purpose of the Future 2040 Without Project Conditions and for analyzing Future With Project Conditions. The Hollywood Subarea Model refines the level of detail within the Plan Area for improved sensitivity in measuring the effects of land use and transportation network changes.

The analysis tools used to forecast future travel patterns are long-range models of travel demand. Long-range travel demand models primarily focus on forecasting auto use, with limited sensitivity to other modes of travel such as transit, bicycling, and walking. This is consistent with the traffic forecasting methods used by most cities and is consistent with the state of the transportation and traffic engineering practice. Recently, new travel behavior trends have emerged that traditional travel demand models are not designed to accommodate. Transportation and traffic experts continue to evaluate the anticipated longevity of these trends and the impact they may have on travel behavior in the future. Factors that affect long-term trends in travel behavior include recessionary effects on employment, changes in younger generations' interest in driving and vehicle ownership, baby boomer retirement choices and their continued participation in the workforce, increasing preference across generations for urban living, fuel prices, increased availability of on-demand delivery of goods and services, and greater travel options through autonomous vehicles and shared use mobility (e.g., Lyft, Uber, bikeshare programs).

The transportation analysis approach used in this EIR applies established traffic forecasting tools that have been empirically proven and previously accepted under CEQA. However, these may prove to be conservative if some of the recent trends in travel persist. It is not clear what direction the trends will take at this point. VMT service population has been generally dropping since around 2004 but increased for many decades prior. If the trends toward higher levels of walking, bicycling, and transit use exceed what is forecast in the EIR, this could result in fewer driving-related impacts than the plan conservatively accounts for in the EIR. It is possible, however, that innovations in autonomous and driverless vehicles, transportation network companies (e.g., Lyft and Uber), and same-day delivery will increase future VMT service population. A variety of factors contribute to VMT, and transportation technologies along with demographic trends will influence future travel behavior. It would be speculative to make assumptions about how these new technologies and changes in transportation may affect travel behavior long-term; therefore, the methodologies and travel forecasts applied in this analysis rely on the state-of-the-practice at this time as previously accepted under CEQA.

PROPOSED PLAN MOBILITY NETWORK

MP 2035 provides the framework for future community plan updates, which take a closer look at the transportation system in specific areas of the City and recommend more detailed implementation strategies to realize MP 2035. The MP 2035 reflects policies and programs that lay the foundation for safe, accessible, and enjoyable streets for pedestrians, bicyclists, transit users, and vehicles throughout the City of Los Angeles, including the Hollywood Community Plan. MP 2035 was adopted by the City in August 2015 and is compliant with the 2008 Complete Streets Act (AB 1358), which mandates that the circulation element of a City's General Plan be modified to plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways, defined to include motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban, or urban context of the general plan.

As part of the Proposed Plan, a Transportation Impact Assessment (TIA) fee is proposed to fund transportation improvements through collecting fees associated with new development within the Plan Area. The types of transportation improvements envisioned as part of the Proposed Plan are within the framework established in MP 2035. However, the proposed TIA fee program would provide additional funding from new development that would enable transportation improvement projects to be implemented within the Plan Area sooner than they otherwise would be based on currently available funding sources. The Proposed Plan is consistent with the City's multimodal approach to transportation planning and applies such principles to the Plan Area in a more targeted manner. The improvements proposed would provide transportation options and accommodations for multiple modes of travel (i.e., transit, bicycle, pedestrian, and vehicle) as part of the transportation system.

The City has prepared a Nexus Study (contained in Appendix K) to show the relationship between the proposed fees and new development in the Plan Area in compliance with the State of California Mitigation Act (AB 1600) (Government Code Sections 66000, et seq.). The purpose of a nexus study is to establish the relationship, referred to as the "nexus," between new development expected to occur and the need for new and expanded major public facilities. After establishing the nexus, the TIA fees to be levied for each land use in the area of benefit are calculated based on the proportionate share of the total facility use for each type of development. Fee programs require new development to mitigate their project specific impacts and to contribute a fair share to complete regional improvements to mitigate the cumulative impacts. Since the fees contributed by new development only cover a portion of the project costs, LADOT has leveraged developer fees to secure outside transportation grants to help pay for the remaining project costs, primarily by submitting grant applications in the Metro Call for Projects process.

As part of the development of the proposed TIA fees, a list of transportation improvements was developed to provide an overview of the types of projects that could be funded through the collection of TIA fees from new development projects. The transportation improvements identified primarily originated from the MP 2035, the current Hollywood Community Plan, and projects that would support the goals and policies of the Proposed Plan. The enhanced network treatments envisioned through MP 2035 were reviewed and refined to complement the anticipated growth areas as well as the Proposed Plan's goals and policies. Since MP 2035 does not prescribe or mandate how the enhanced network treatments are implemented within each community plan, the refinements to the enhanced network treatments primarily consisted of developing potential implementation options within the Project Area.[14]

The Transportation Project List is presented below in **Table 4.15-7**. The Project List represents the types of improvements proposed for consideration in the Community Plan. In addition, the Proposed Plan would not, itself, entitle or otherwise approve any transportation projects. Nevertheless, potential impacts of implementing the transportation improvements contained in the Project Lists were analyzed at a programmatic level as part of the Proposed Plan under Future With Project Conditions.

TABLE 4.15-7: PROPOSED PLAN TRANSPORTATION IMPROVEMENT PROJECT LIST

Primary Mode	Project Name	Project Description
Active Modes	Mobility Hub Amenities	Encourage projects located near transit nodes and Mobility Hubs to provide people-oriented amenities such as shade trees, countdown crosswalk signals, bus shelters, bicycle racks or lockers and enhanced or decorated crosswalks.
	Pedestrian Access to Major Transit Stations	Support the development of coordinated intermodal strategies to implement linkages to future public transit services. Provide enhanced amenities at major transit stops, including widened sidewalks, where possible, pedestrian waiting areas, transit shelters, comfortable seating, enhanced lighting, information kiosks and wayfinding signage (directing pedestrians to transit stops and stations, and from transit facilities to points of interest in the surrounding neighborhood), advanced fare collection mechanisms, shade trees and landscaping, bicycle access, self-cleaning restrooms, and enhanced, ADA compliant street crossing elements adjacent to transit stops and stations (i.e., enhanced crosswalks, crossing signals, and accessible ramps).
	Path Network	Support the construction of pedestrian pathways, bicycle paths and facilities, and the reconnection of Van Ness Ave., as part of any park space built over the US-101.
		Class I Bike Path: the Los Angeles River Bike Path
	Bicycle Enhanced Network & Bike Lanes	Hollywood Blvd.: Virgil Ave. to La Brea Ave. BEN: Protected Bike Lanes
		Melrose Ave.: La Cienega Blvd. to Highland Ave. BEN: Protected Bike Lanes
		Vine St: Franklin Ave. to Melrose Ave. Tier 1 Bike Lanes
		Wilton Pl.: Franklin Ave. to Melrose Ave. Shared Vehicle/Bike Lanes
		Virgil Ave: Melrose Ave. to Los Feliz Blvd. Tier 1 Bike Lanes
	Neighborhood Enhanced Network	Amenities and improvements: • Bicycle and pedestrian friendly streets • Share the Road bike icons • Bicycle friendly drainage grates • Directional/wayfinding signage • Bicycle signals and/or push buttons • Bicycle loop detectors • Vehicle speed reduction treatments
	Bikeshare	Provide public bicycle rental in "pods" located throughout the Community Plan Area.

[14]MP 2035, page 56 states the following "The Mobility Plan will provide the framework for future community plans and specific plans that will take a closer look at the Plan's Enhanced Networks and PEDs analysis, in specific areas of the City and may recommend more-detailed implementation strategies to realize the MP 2035. More detailed land use planning may reveal the need for changes to the networks, which will be undertaken as needed to reflect these more detailed planning efforts."

TABLE 4.15-7: PROPOSED PLAN TRANSPORTATION IMPROVEMENT PROJECT LIST

Primary Mode	Project Name	Project Description
Roadways & ITS	Congestion Monitoring	Implement or enhance "Smart Corridors" to coordinate Caltrans' freeway traffic management system with the Automated Traffic Surveillance and Control (ATSAC)/Adaptive Traffic Control System (ATCS) highway and street traffic signal management system to enhance incident management and motorist information to reduce traffic delays.
	ITS Corridor & Signal Upgrades	Implement ITS and signalization improvements to facilitate traffic flow.
	Intersection Improvements	Identify intersections where congestion related to left turns can be improved, such as intersections along Hollywood Blvd. in East Hollywood, and implement improvements, taking into consideration impacts on pedestrians and bicyclists. Support evaluation and improvement of the complex five-way intersection at Sunset Blvd., Hollywood Blvd., Hillhurst Ave. and Virgil Ave. Study the addition of a second southbound right-turn lane on Highland Ave. at the intersection of Highland Ave. and Franklin Ave., while maintaining sidewalks with a minimum width of 15 feet. Implement a double left-turn lane, eastbound and westbound, on Sunset Blvd. at Western Ave.
	Access Improvements	Support the construction of a new multi-lane roadway to extend from the intersection of Barham Blvd./Forest Lawn Dr. through the NBC/Universal site to Coral Drive adjacent to the US-101. Restripe Cahuenga East south to the US-101 on-ramp near Pilgrim Bridge to provide two lanes on Cahuenga East between the US-101 on-ramp and the US-101 Barham Blvd. off-ramp and from there, three lanes northbound. Restripe Barham Blvd. to allow three southbound lanes and two eastbound lanes within the existing roadway.
	Vehicle Enhanced Network	Highland Ave & Sunset Blvd: Between US-101 Interchanges VEN Corridor/ITS Improvements
	Neighborhood Protection Program	Implement Neighborhood Traffic Management Plans, including possible speed humps, medians, directional signs, and other streetscape improvements along canyon routes and associated streets across the Hollywood Hills, as well as neighborhoods generally located between the following streets: • Franklin Ave. and Hollywood Blvd. • Sunset and Hollywood Blvd. • Sunset and Santa Monica Blvd. • Santa Monica Blvd. and Melrose Ave, including blocks south of Melrose Ave. Franklin Ave and Mulholland Dr. • Highland Ave., La Brea Ave., and Martel Ave. along the Willoughby Corridor
Transit	Transit Enhanced Network	Los Feliz Blvd.: Vermont Ave. to Riverside Dr. TEN: Comprehensive Treatments with Dedicated Bus Lane
		Hollywood Blvd.: Virgil Ave. to La Brea Ave. TEN: Moderate Treatments with Shared Vehicle/Bus Lane
		Santa Monica Blvd.: Madison Ave. to La Brea Ave. TEN: Comprehensive Treatments with Dedicated Bus Lane (cost does not include roadway widening to Modified Ave. I)
		Fairfax Ave.: Rosewood Ave. to Hollywood Blvd. TEN: Moderate Treatments with Shared Vehicle/Bus Lane
		La Brea Ave.: Rosewood Ave. to Sunset Blvd. TEN: Comprehensive Treatments with Dedicated Bus Lane
		La Brea Ave.: Sunset Blvd. to Hollywood Blvd. TEN: Comprehensive Treatments with Dedicated Bus Lane (cost does not include roadway widening to Modified Avenue I)
		Western Ave.: Melrose Ave. to Hollywood Blvd. TEN: Moderate Plus with Dedicated Bus Lane
		Vermont Ave: Melrose Ave. to Hollywood Blvd. TEN: Comprehensive Treatments with Dedicated Bus Lane
		Vermont Ave: Hollywood Blvd. to Los Feliz Blvd. TEN: Moderate Treatments with Shared Vehicle/Bus Lane

TABLE 4.15-7: PROPOSED PLAN TRANSPORTATION IMPROVEMENT PROJECT LIST		
Primary Mode	**Project Name**	**Project Description**
Auto-Trip Reduction	Strategic Parking Program	Implement a parking program and update parking requirements to reflect mixed-use developments, shared parking opportunities, and parking needs at developments adjacent to major transit stations.
	Rideshare Toolkit	Develop an online Transportation Demand Management (TDM) Toolkit with information for transit users, cyclists, and pedestrians as well as ridesharing. The Toolkit would include incentive programs for employers, schools, and residents. Additionally, it would be specific to City businesses, employees, and visitors and would integrate traveler information. It would also include carpooling/vanpooling and alternative work schedules.
	Transportation Demand Management (TDM) Program	This program would provide start-up costs for Transportation Management Organizations/Associations (TMOs/TMAs). It would also provide guidance and implementation of a TDM program.

Figure 4.15-7, Future Mobility Network, shows the following enhanced network treatments for roadways in the Hollywood Community Plan:

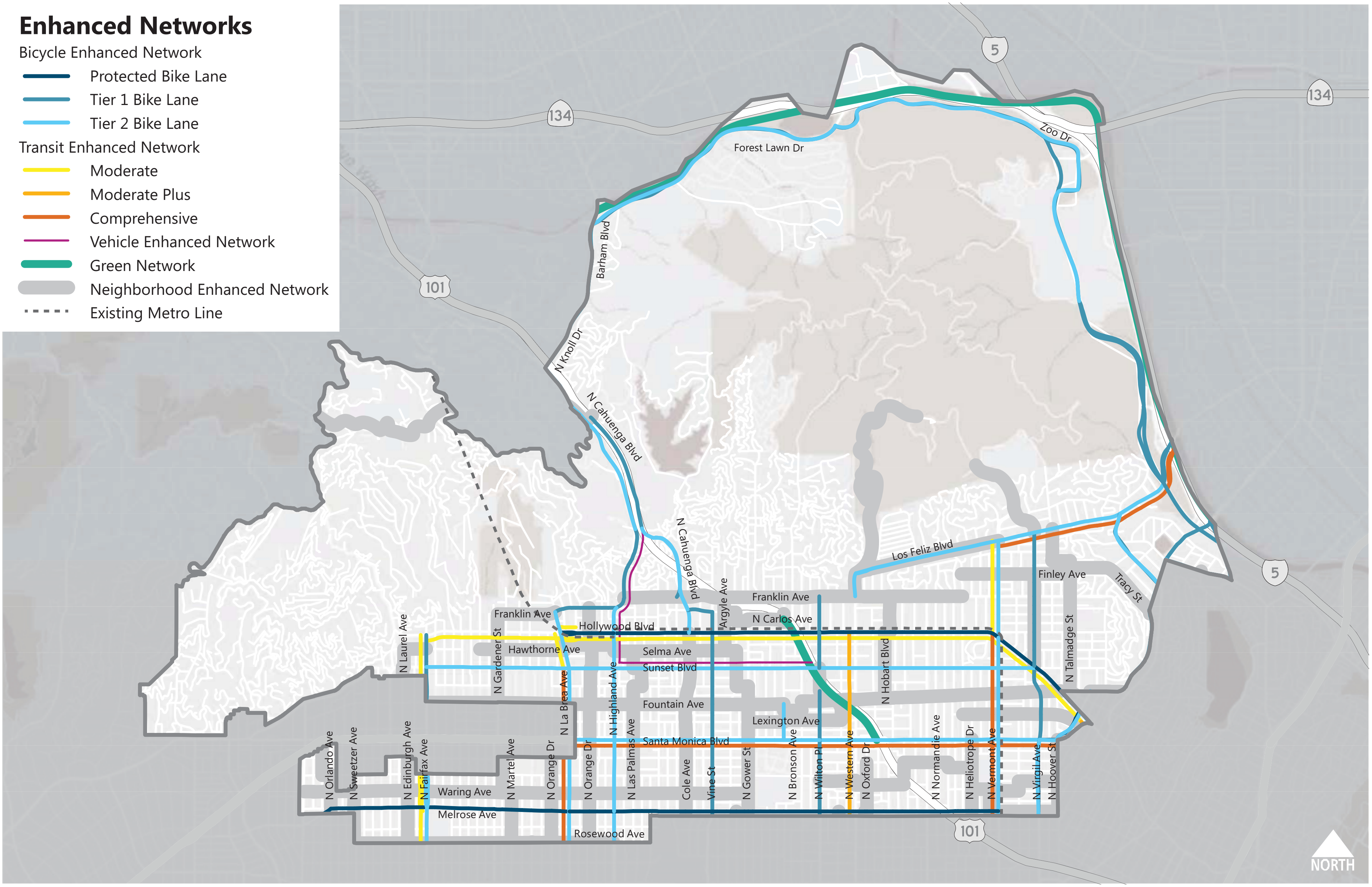
- Bicycle Enhanced Network (BEN)
- Transit Enhanced Network (TEN)
- Neighborhood Enhanced Network (NEN)
- Vehicle Enhanced Network (VEN)

The future mobility network in the Project Area reflects the following refinements to MP 2035:

- Melrose Avenue between Vermont Avenue and Hoover Street was converted from a BEN to a NEN due to the roadway width and available right-of-way along this portion of the corridor. West of Vermont Avenue and Melrose Avenue would remain as part of the BEN.
- Vermont Avenue between Los Feliz Boulevard and Hollywood Boulevard was converted from a Comprehensive TEN to a Moderate TEN due to the character of the roadway along this portion of the corridor. The Moderate TEN treatment would provide mixed-flow bus and vehicular lanes instead of a bus only lane to preserve on-street parking for the adjacent commercial uses. South of Hollywood Boulevard and Vermont Avenue would remain as part of the Comprehensive TEN.

The Proposed Plan's mobility network as described above could be implemented over time. The mobility network improvements would provide transportation options and accommodations for multiple modes of travel (i.e., transit, bicycle, pedestrian, and vehicle) in the Project Area. The Proposed Plan would not, itself, entitle or otherwise approve any transportation projects. However, the proposed TIA fee program would provide additional funding from new development that would enable transportation improvement projects to be implemented within the CPA sooner than they otherwise would be based on currently available funding sources.

To consider the range of potential impacts that could occur from the enhanced network treatments contained in the Project List, two implementation options were developed for the purpose of analyzing potential impacts. Similar to the MP 2035, the Proposed Plan does not prescribe how the enhanced network treatments will be implemented within each community plan. Therefore, the enhanced network treatments in the Plan Area were reviewed in relation to the roadway characteristics, such as roadway width, right-of-way, street designations and adjacent land uses. Treatment Option 1 generally prioritizes vehicle and transit capacity, while Option 2 generally prioritizes the preservation of on-street parking. **Table 4.15-8** presents the enhanced network treatments in the Project Area along with a description of the two implementation options.



SOURCE: MOBILITY 2035, FEHR & PEERS, 2016.

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Hollywood Community Plan Update
Draft Environmental Impact Report
CITY OF LOS ANGELES

FIGURE 4.15-7

FUTURE MOBILITY NETWORK

TABLE 4.15-8: HOLLYWOOD COMMUNITY PLAN MOBILITY TREATMENT OPTIONS

Roadway Segment	Enhanced Network Designation	Current Cross-Section	Hollywood Community Plan Update	
			Treatment Option 1 ***Prioritize Vehicle/Transit Capacity***	**Treatment Option 2** ***Prioritize On-Street Parking***
Los Feliz Blvd.: Vermont Ave. to Riverside Dr.	TEN: Comprehensive Treatments with Dedicated Bus Lane	Three vehicle lanes in each direction with peak period on-street parking restrictions (on-street parking and two vehicle lanes per direction in off-peak travel periods).	All-Day Bus Only Lanes; Two vehicle lanes in each direction	Peak Period Bus Only Lanes; On-Street Parking during off-peak travel periods; Two vehicle lanes in each direction
Hollywood Blvd.: Virgil Ave. to La Brea Ave.	BEN: Protected Bike Lanes TEN: Moderate Treatments with Shared Vehicle/Bus Lane	Two vehicle lanes in each direction with on-street parking	Protected Bike Lanes; Moderate TEN Treatments; Peak period parking restrictions with two vehicle lanes in each direction (on-street parking and one vehicle lane per direction in off-peak travel periods)	Protected Bike Lanes; Moderate TEN Treatments; All-day parking with one vehicle lane in each direction
Highland Ave. & Sunset Blvd.: Between US-101 Interchanges	VEN	Three vehicle lanes in each direction with peak period on-street parking restrictions (on-street parking and two vehicle lanes per direction in off-peak travel periods)	Three vehicle lanes in each direction with parking removal	Three vehicle lanes in each direction with peak period on-street parking restrictions (on-street parking and two vehicle lanes per direction in off-peak travel periods)
Santa Monica Blvd.: Madison Ave. to La Brea Ave.	TEN: Comprehensive Treatments with Dedicated Bus Lane (assumes roadway is widened to Modified Avenue I)	Two vehicle lanes in each direction with on-street parking	All-Day Bus Only Lanes; Two vehicle lanes in each direction	Peak Period Bus Only Lanes; On-Street Parking during off-peak travel periods; Two vehicle lanes in each direction
Melrose Ave.: La Cienega Blvd. to Highland Ave.	BEN: Protected Bike Lanes	Two vehicle lanes in each direction with on-street parking	Protected Bike Lanes; Peak period parking restrictions with two vehicle lanes in each direction (on-street parking and one vehicle lane per direction in off-peak travel periods)	Protected Bike Lanes; All-day parking with one vehicle lane in each direction
Fairfax Ave: Rosewood Ave. to Hollywood Blvd.	TEN: Moderate Treatments with Shared Vehicle/Bus Lane	Two vehicle lanes in each direction with on-street parking	Moderate TEN Treatments; Two vehicle lanes in each direction with on-street parking	*Same as Scenario 1*
La Brea Ave: Rosewood Ave. to Sunset Blvd.	TEN: Comprehensive Treatments with Dedicated Bus Lane	Three vehicle lanes in each direction with peak period on-street parking restrictions (on-street parking and two vehicle lanes per direction in off-peak travel periods)	All-Day Bus Only Lanes; Two vehicle lanes in each direction	Peak Period Bus Only Lanes; On-Street Parking during off-peak travel periods; Two vehicle lanes in each direction

TABLE 4.15-8: HOLLYWOOD COMMUNITY PLAN MOBILITY TREATMENT OPTIONS

			Hollywood Community Plan Update	
Roadway Segment	**Enhanced Network Designation**	**Current Cross-Section**	**Treatment Option 1** ***Prioritize Vehicle/Transit Capacity***	**Treatment Option 2** ***Prioritize On-Street Parking***
La Brea Ave.: Sunset Blvd. to Hollywood Blvd.	TEN: Comprehensive Treatments with Dedicated Bus Lane (assumes roadway is widened to Modified Avenue I)	Two vehicle lanes in each direction (limited on-street parking on west side).	All-Day Bus Only Lanes; Two vehicle lanes in each direction	Peak Period Bus Only Lanes; On-Street Parking during off-peak travel periods; Two vehicle lanes in each direction
Vine St.: Franklin Ave. to Melrose Ave.	Tier 1 Bike Lanes	Two vehicle lanes in each direction with on-street parking.	On-Street Bike Lanes; One vehicle lane in each direction with on-street parking	*Same as Scenario 1*
Wilton Pl.: Franklin Ave. to Melrose Ave.	Tier 1 Bike Lanes	Two vehicle lanes in each direction with peak period on-street parking restrictions (on-street parking and one vehicle lane per direction in off-peak travel periods)	Shared Vehicle/Bike Lane in each direction; All-Day on-street parking	*Same as Scenario 1*
Western Ave.: Melrose Ave. to Hollywood Blvd.	TEN: Moderate Plus with Dedicated Bus Lane	Two vehicle lanes in each direction with limited on-street parking	Peak Hour Bus Only Lanes and One vehicle lane in each direction (Shared vehicle/bus lanes during off-peak travel periods)	Shared vehicle/bus lanes all-day; Maintain existing on-street parking
Vermont Ave.: Melrose Ave. to Hollywood Blvd.	TEN: Comprehensive Treatments with Dedicated Bus Lane	Three vehicle lanes in each direction with peak period on-street parking restrictions (on-street parking and two vehicle lanes per direction in off-peak travel periods)	All-Day Bus Only Lanes; Two vehicle lanes in each direction	Peak Period Bus Only Lanes; On-Street Parking during off-peak travel periods; Two vehicle lanes in each direction
Vermont Ave.: Hollywood Blvd. to Los Feliz Blvd.	TEN: Moderate Treatments with Shared Vehicle/Bus Lane	Two vehicle lanes in each direction with on-street parking	Moderate TEN Treatments; Two vehicle lanes in each direction with on-street parking	*Same as Scenario 1*
Virgil Ave.: Melrose Ave. to Los Feliz Blvd.	Tier 1 Bike Lanes	One northbound lane and two southbound lanes with on-street parking	On-Street Bike Lanes; One vehicle lane in each direction with on-street parking *(This configuration has already been implemented between Melrose Ave and Santa Monica Blvd)*	*Same as Scenario 1*

PARKING

Parking deficits are considered to be socioeconomic effects, rather than impacts on the physical environment as defined by CEQA, but there may be secondary physical environmental impacts, such as increased air quality impacts, safety impacts, noise impacts caused by congestion, or land use impacts. According to SB 743, parking impacts of a residential, mixed-use residential, or employment center project on an infill site within a transit priority area is not considered a significant impact. A transit priority area is defined as an area within half mile of an existing or planned major transit stop; the majority of the Project Area is within a transit priority area. The Proposed Plan would have a significant impact if secondary effects related to parking contribute to other impact topics.

IMPACTS AND MITIGATION MEASURES

The impacts and mitigation discussion presented below reflects updated CEQA requirements as finalized on December 28, 2018 to implement SB 743.

IMPACT 4.15-1 Would implementation of the Proposed Plan conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadways, bicycle and pedestrian facilities? **Less than significant impact.**

The Proposed Plan seeks to enhance access to transit stations and creates new land use to encourage appropriate mixes and scales of uses as well as site design supportive of transit use. These objectives are consistent with regional plans, such as the 2016-2040 RTP/SCS, as well as numerous local plans. The types of transportation improvements envisioned as part of the Hollywood Community Plan are within the framework established in the MP 2035. The proposed updates to the Plan are consistent with the City's multimodal approach to transportation planning and apply such principles to the Hollywood Community Plan. The proposed mobility improvements would provide transportation options and accommodations for multiple modes of travel (i.e., transit, bicycle, pedestrian, and vehicle) as part of the transportation system.

In addition to MP 2035, the Proposed Plan would support the City's Plan for a Healthy LA by creating more opportunities for people to live and work in areas of the City where travel by active transportation can be part of daily life. The implementation of active transportation facilities is anticipated to improve safety and is in alignment with the City's Vision Zero Action Plan. The existing subway stations create opportunities for the City to further enhance first- and last-mile opportunities through the creation of mobility hubs. In addition, individual development projects will need to adhere to the requirements in LADOT's recently adopted Transportation Assessment Guidelines. The Proposed Plan would not conflict with adopted City and state policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities. Therefore, ***a less than significant impact without mitigation*** related to consistency with other plans with respect to transit, bicycle or pedestrian policies would occur.

Mitigation Measures

No mitigation measures are necessary.

Significance of Impacts after Mitigation

Less than significant.

IMPACT 4.15-2 Would implementation of the Proposed Plan conflict with CEQA Guidelines section 15064.3, subdivision (b) related to VMT thresholds? **Less than significant impact.**

The Proposed Plan would have an impact if the Plan's VMT exceeds either of the following:

1. The Plan results in average VMT per service population for the 2040 Proposed Plan that exceeds 15% below the regional average total VMT per service population from 2016 SCAG Region.

2. The Plan results in average total VMT per service population for the 2040 Proposed Plan that exceeds the average total VMT per service population for the Proposed Plan Area from 2016 Baseline.

The Proposed Plan would improve the link between the locations of land use and transportation in a manner that is consistent with the MP 2035 and the General Plan Framework Element. Implementation of the Proposed Plan would create new housing and employment opportunities, mostly in areas around existing transit systems, where additional mixed-use development is expected. This is in accordance with the Framework Element's guiding policy to focus growth in higher-intensity commercial centers close to transportation and services. Under the Proposed Plan, selected commercial areas near the Metro subways and along bus lines would serve as focal points and activity centers for surrounding neighborhoods by supporting new development that accommodates a variety of uses and encourages pedestrian and multi-modal transportation activity in these commercial centers. The land use changes would also serve to create consistency with future proposed land uses and foster quality development in transition areas. In some cases, the Proposed Plan would allow for increased FARs, density, and height limits. These changes would facilitate mixed-use development in targeted areas, enable opportunities for increased housing, including affordable housing, and employment, and provide for more compatible uses and development. Where and how the Proposed Plan directs anticipated growth in relation to transportation infrastructure will affect transportation use; therefore, land use patterns are factored into the analysis of the circulation system. The Proposed Plan is consistent with several regionally-adopted land use plans, policies, and regulations that also include transportation strategies. Refer to Section 4.10, Land Use and Planning, of this Draft EIR, for a consistency analysis of the Proposed Plan with respect to SCAG's regional plans, including the RTP/SCS.

To consider the range of potential impacts that could occur from implementation of the Proposed Plan with future implementation of the enhanced network treatments, two implementation options were developed for the implementation of the enhanced network treatments. Treatment Option 1 generally prioritizes vehicle and transit capacity, while Treatment Option 2 generally prioritizes the preservation of on-street parking. **Table 4.15-9** shows vehicle trips and VMT for the 2016 SCAG Region conditions and 2040 Proposed Plan conditions, and **Table 4.15-10** shows vehicle trips and VMT for the 2016 Baseline conditions and 2040 Proposed Plan conditions.

TABLE 4.15-9: FUTURE TOTAL VEHICLE MILES TRAVELED (VMT) COMPARED TO 2016 SCAG REGION

Metric	2016 SCAG Region Conditions	Future 2040 with Project Treatment Option 1	Percent Difference	Future 2040 with Project Treatment Option 2	Percent Difference
Total Daily VT	82,283,000	785,000	N/A*	785,000	N/A*
Total Daily VT per Service Population	3.1	2.0	-35%	2.0	-35%
Total Daily VMT	948,656,000	5,902,000	N/A*	5,901,000	N/A*
Total Daily VMT per Service Population	**35.4**	**15.2**	**-57%**	**15.2**	**-57%**

SOURCE: Fehr & Peers, 2019.
** Notes: Comparison here is not applicable as the conditions represented come from different geographic areas, the SCAG region and the Plan Area respectively.*

TABLE 4.15-10: FUTURE TOTAL VEHICLE MILES TRAVELED (VMT) COMPARED TO 2016 BASELINE					
Metric	**2016 Baseline Conditions**	**Future 2040 with Project Treatment Option 1**	**Percent Difference**	**Future 2040 with Project Treatment Option 2**	**Percent Difference**
Total Daily VT	706,000	785,000	+11%	785,000	+11%
Total Daily VT per Service Population	2.3	2.0	-12%	2.0	-12%
Total Daily VMT	5,624,000	5,902,000	+5%	5,901,000	+5%
Total Daily VMT per Service Population	**18.3**	**15.2**	**-17%**	**15.2**	**-17%**
SOURCE: Fehr & Peers, 2019.					

In comparison to the SCAG region (**Table 4.15-9**), the total daily VMT per service population generated by Plan Area is 57% lower under both Treatment Option 1 and Treatment Option 2. In comparison to 2016 Baseline conditions (Table 4.15-10), the total daily VMT generated by the Plan Area is 5% higher with the anticipated growth. However, the total VMT per service population generated by the Plan Area is 17% lower than the 2016 Baseline. Given that VMT per service population for the 2040 Proposed Plan exceeds 15% below the 2016 SCAG regional average total VMT per service population and the 2040 Proposed Plan's average total VMT per service population is less than the average total VMT per service population for the Plan Area's 2016 Baseline, the impact of the Proposed Plan related to VMT thresholds would be ***less than significant***.

SECONDARY IMPACTS TO TRANSPORTATION

Parking deficits are considered to be social effects, rather than impacts on the physical environment as defined by CEQA. Under CEQA Guidelines, a project's social impacts need not be treated as significant impacts on the environment. Environmental documents must address the secondary physical impacts that would be triggered by a social impact (CEQA Guidelines Section 15131). The social inconvenience of parking deficits, such as having to hunt for parking spaces, is not an environmental impact, but parking deficits may result in secondary physical environmental impacts, such as air quality, safety, or noise impacts caused by congestion from drivers seeking parking.

Some of the enhanced network treatments analyzed as part of the Proposed Plan have the potential to remove on-street parking in certain locations. To consider the range of potential impacts that could occur from the implementation of the enhanced network treatments, two implementation options were developed for the purpose of analyzing potential impacts. Treatment Option 1 generally prioritizes vehicle and transit capacity, while Option 2 generally prioritizes the preservation of on-street parking (see **Table 4.15-7**). For example, protected bike lanes are proposed on Hollywood Boulevard (Virgil Avenue to La Brea Avenue) as part of the enhanced network treatments. Under Treatment Option 1, peak period parking restrictions would be implemented on Hollywood Boulevard to accommodate the protected bike lanes and maintain two vehicle lanes in each direction during peak travel hours (on-street parking and one vehicle lane per direction would occur in off-peak travel periods). Under Treatment Option 2, all day parking would be provided along Hollywood Boulevard and the vehicle capacity would be reduced from two to one travel lane in each direction to accommodate the protected bike lanes. Through additional studies, it may be found that on-street parking should be maintained in exchange for a reduction in vehicle capacity (i.e., vehicle travel lane conversions to bike or bus-only lanes) or other off-street parking solutions required in certain locations along the corridors may be proposed. Individual projects would be studied in further detail as the Proposed Plan would not, itself, entitle or otherwise approve any transportation projects.

The Proposed Plan has a variety of policies and programs related to parking. Below is a sample of the proposed policies and programs in the Proposed Plan.

Policy M.6.1: Efficient management. Improve utilization and management of existing public parking supply. Support their use and encourage shared parking, market-driven pricing, and other parking innovations to ensure parking efficiency.

> **Program 93**: Create a parking management district or districts in areas of high parking demand.
>
> **Program 50**: Encourage projects located within the Regional Center to participate in District Valet Programs to mitigate any project-generated parking impacts. Participation in a District Valet Program should be considered as a traffic mitigation measure.
>
> **Program 51**: Consider allowing nightclub and other entertainment venues in the Regional Center to submit a private parking plan certified by the Department of Transportation to utilize underused private commercial parking areas for certification by the Department of Transportation in lieu of providing required on-site parking spaces.

Policy M.6.11: Maximize the use of on-street parking spaces in commercial areas.

> **Program 94**: Work with LADOT to implement Express Park, an intelligent parking management system that provides information on the location and pricing of available parking in current time and adjusts pricing and time limit in response to changes in supply and demand.

Policy M.6.12: New lots and structures. Support construction of new parking lots and structures located in high demand areas that share spaces with multiple uses and adhere to design standards. New parking structures should be built to be adaptive to a future non-parking use.

> **Program 95**: Develop new off-street public parking resources, including parking structures and underground parking, in accordance with design standards.

In addition to the enhanced network treatments analyzed as part the Proposed Plan, the following trip reduction programs would help to reduce the need for vehicular travel and better manage the supply of parking in the project area:

Policy M.1.8: Peak hour parking restrictions. Discourage peak hour parking restrictions on streets with high volumes of bicyclists. Consider peak hour parking restrictions or no on-street parking on designated segments of Boulevards and Avenues in the Vehicle Enhanced Network that facilitate travel for rush hour freeway commuters.

Policy M.2.5: Transportation demand management. Support implementation of transportation demand management strategies to minimize vehicle trips and improve mobility.

Policy M.2.1: Sustainable mobility options. Encourage sustainable mobility options. Support transportation options for persons who do not have cars or want to use their cars less and promote the use of taxis, rental cars, shared cars, shared bicycles, van pools, shuttles, secure bicycle parking, consolidated pick-up and drop-off areas for Transportation Network Companies (TNCs), and other short trip and first/last mile connections to transit. Encourage the location of these services and bus layovers near Metro Rail Stations and major transit nodes.

The Proposed Plan could result in a loss of on-street parking spaces that could increase VMT if people drive farther to find parking or seek an alternate destination with more convenient parking. However, this increased VMT could potentially be off-set by a reduction in vehicle trips resulting from travel options other than driving that would be available as part of the Proposed Plan and by implementing the proposed parking policies and programs.

In addition, the City's establishment of Modified Parking Requirement (MPR) Districts (Ordinance No. 182242) allows for the modification of parking requirements within the MPR District to maintain the required number of parking spaces for any permitted use in the District, to allow off-site parking within 1,500 feet of the site, to reduce parking requirements for individual projects, to establish less restrictive parking requirements by use within the District, to establish more restrictive parking requirements by use within the District, to create a commercial parking credit program, or to establish maximum parking requirements within the District.

Based on all of the above, secondary impacts to VMT from Parking would be ***less than significant***.

Mitigation Measures

No mitigation measures are necessary.

Significance of Impacts after Mitigation

Less than significant.

IMPACT 4.15-3 Would implementation of the Proposed Plan substantially increase hazards due to geometric design features (such as sharp curves or dangerous intersections) or incompatible uses? ***Less than significant impact.***

The Proposed Plan describes the reasonably expected future development for a portion of the City and does *not* constitute a commitment to any project-specific development, introduce new streets or otherwise change the overall land use pattern within the Project Area. Furthermore, none of the regulations included in the Proposed Plan would promote sharp curves, dangerous intersections, or incompatible uses that could present safety hazards. Rather, numerous policies and programs included in the Proposed Plan emphasize transportation safety for all people using the transportation system, support implementation of transportation treatments that are designed improve roadway safety and help implement other City initiatives (such as Vision Zero or Safe Routes to School) which aim to improve the safety of the City's transportation facilities.

None of the transportation system improvements envisioned in the Proposed Plan or Project List would introduce new safety hazards or incompatible uses at intersections or along roadway segments, as most would be designed to improve safe circulation and access to the transit stations for all users. The multi-modal improvements envisioned in the Proposed Plan are intended to help minimize conflicts between pedestrians and vehicles. Furthermore, design standards in the Proposed Plan are intended to limit the number, width, and location of new driveways along major streets and in areas of high pedestrian activity, thereby improving pedestrian safety.

The implementation of bicycle and pedestrian facilities identified in the Proposed Plan and Project List are anticipated to improve the safety of bicyclists and pedestrians. Automobile speed is a major factor in the severity of collisions with bicyclists and pedestrians, the most vulnerable roadway users. Collisions with a vehicle traveling at 20 miles per hour result in a five percent pedestrian fatality rate, and fatalities increase to 40, 80 and 100 percent when the vehicle speed increases to 30, 40 and 50 mph, respectively.[15] Bicycle lanes, when accompanied by travel lane reductions can help reduce overall vehicle speeds.[16] When modified from four travel lanes to two travel lanes with a two-way left-turn lane, research along 45 corridors

[15]U. S. Department of Transportation National Highway Traffic Safety Administration, *Literature Review on Vehicle Travel Speeds and Pedestrian Injuries. DOT HS 809 021*, 1999.

[16]Federal Highway Administration (FHWA), http://www.fhwa.dot.gov/publications/research/safety/10053/index.cfm, accessed on November 19, 2012

throughout the country has found a range of 19 to 47 percent reduction in all roadway crashes. The upgrade to fully protected bicycle lanes or cycle tracks has been shown to reduce the risk of injury by 90 percent.[17]

The bicyclist and pedestrian improvements associated with the Proposed Plan and Project List are also anticipated to increase the number and visibility of bicyclists and pedestrians on the City's transportation network. Of 68 cities across California with highest per capita pedestrian and bicycle collisions, per capita injury rates to pedestrians and bicyclists are shown to fall precipitously as the number of bicyclists increases, revealing a non-linear relationship between bicycle safety and the level of bicycling.[18] This study showed as much as an eight-fold variation of collisions (expressed as a percentage of those that bike or walk to work) in comparing low and high bicycling cities. The underlying reason for this pattern is that motorists drive slower when bicyclists and pedestrians are visible either in number or frequency and drive faster when few pedestrians and bicyclists are present, resulting in higher overall travel speeds. This effect of modified driving behavior is consistent with other research focused on 24 California cities that shows that higher bicycling rates among the population generally show a much lower risk of fatal crashes for all road users.[19] Comparing these low versus high bicycling communities, there was a ten-fold reduction in fatality rate for motorists, and eleven-fold reduction in fatality rate for pedestrians, and an almost fifty-fold reduction in fatality rate for bicyclists.[20]

Inclusion of protected bicycle lanes further increases the level of safety. New York City implemented the first fully protected bike lanes in the country. Protected bike lanes in New York City on 8th Avenue and 9th Avenue resulted in a 35 percent and 58 percent decrease, respectively, in injuries to all road users.[21] In the same study, implementation of bus/bike lanes on First and Second Avenues led to a 37 percent decrease in injury crashes.[22]

The Proposed Plan is responding to changing demographics, a younger population desirous of safe and accessible active transportation options (bike, walk), a growing number of residents and employees seeking alternatives to the car, and an aging population that may need to rely more and more on transportation alternatives to the automobile. In 2030, senior citizens will make up 1/5 of Los Angeles County's population. This older population (as well as children and the disabled) will benefit from longer pedestrian crossing times, shorter street crossing distances, wider, shaded sidewalks, street benches, increased transit service and separated bicycle facilities. Ultimately, there is nothing in the Proposed Plan expected to significantly reduce pedestrian mobility, including but not limited to the disabled, those with strollers, and bus riders.

Therefore, impacts related to transportation safety as a result of design features or incompatible uses would be ***less than significant without mitigation.***

Mitigation Measures

No mitigation measures are necessary.

Significance of Impacts after Mitigation

Less than significant.

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[17]Kay Teschke et al., *Route Infrastructure and the Risk of Injuries to Bicyclists: A Case-Crossover Study. American Journal of Public Health,* 2012.

[18]Jacobsen, P.L., *Safety in Numbers: More Walkers and Bicyclists, Safety Walking and Bicycling. Injury Prevention 9~3!:205–209,* 2003.

[19]Marshall, Wesley E., N. W. Garrick, *Evidence on Why Bike-Friendly Cities Are Safer For All Road Users. Environmental Practice 13 (1),* March 2011.

[20]*Ibid.*

[21]NY DOT, *Measuring the Street: New Metrics for 21st Century Streets*, 2012.

[22]*Ibid.*

IMPACT 4.15-4 Would implementation of the Proposed Plan result in inadequate emergency access? ***Less than significant impact.***

As previously discussed, State law (SB 743) replaced the metric used for evaluating transportation-related impacts from automobile delay (LOS) to VMT. The impact of traffic congestion on access for emergency response and safety was maintained and is discussed below. The impact analysis below is updated in the Recirculated Draft EIR to respond to the Secretary of Natural Resources Agency's adoption guidelines to implement SB 743 and to respond to comments made on the Draft EIR related to the associated emergency access impacts from the Proposed Plan's impacts to roadway congestion, including emergency access to wildfires in the hillsides and evacuation from hillsides during wildfires. The fuller discussion below is in the interest of providing additional information to decision makers and the public.

Within the City of Los Angeles, fire prevention and suppression and emergency medical services are provided by the LAFD. Public protection service and law enforcement are provided by LAPD. This impact analysis provides an evaluation of impacts to emergency services as they relate to transportation. (EIR Section 4.14 considers the impacts to emergency services and whether that will result in impacts to the environment from the construction of new fire or emergency service or police facilities.) For individual development projects, this impact criteria considers whether a project will have adequate access to emergency services based on the road configuration and project design. At the Proposed Plan level, individual project design level details, such as location of driveway location and design, are unknown. Therefore, the Draft EIR will not consider impacts to emergency access to particular properties in the Community Plan Area or particular streets based on roadway configurations. The Recirculated Draft EIR will consider, at the detail available, the reasonably foreseeable impacts to roadway congestion from the Proposed Plan and the associated impacts to emergency access from any forecasted congestion.

Therefore, the discussion will first consider the Proposed Plan's impacts to roadway congestion using levels of services (LOS) and volume-to-capacity (V/C) criteria when compared to existing conditions (2016) and then discuss the emergency access impacts associated with roadway congestion.

Roadway Congestion

Many factors influence the LOS and V/C analysis including, but not limited to, land use patterns, the relationship between land use and transportation, how transportation treatments are designed within the existing roadways, how and where the Proposed Plan directs anticipated growth within the Plan Area, and growth anticipated in the region surrounding the Plan Area.

Land Use Patterns. Where and how the Proposed Plan directs anticipated growth in relation to transportation will affect transportation use; therefore, land use patterns are factored into the analysis of the circulation system. The Proposed Plan would create new housing and employment opportunities, mostly in areas around existing transit systems.

Regional Background Growth. On a regional level, traffic in the Project Area is anticipated to increase in conjunction with regional population, housing, and employment growth projected to occur in the future by SCAG. This growth will occur with or without implementation of the Proposed Plan. The background growth influences the transportation analysis by accounting for the increased activity levels under Proposed Plan conditions, although those increases would occur with or without the Plan. Background growth is included in the Hollywood Subarea Model, which is built from the City of Los Angeles Model as described in the Model Development Report included in Appendix J.

Special Events. As discussed previously under Special Event Traffic Operations, special events in Hollywood frequently require partial or full closure of Hollywood Blvd. in the Project Area, including sidewalks and crosswalks, for periods of several hours to several days at a time. To the extent that event traffic occurred on a weekday (Tuesday, Wednesday or Thursday) between the months of February and May, these travel demands are accounted for when calculating the average hourly volumes within the Plan Area under Existing Conditions. This same level of special event traffic is also accounted for in the traffic forecasts and analysis of Year 2040 conditions. The Proposed Plan would not change the number or frequency of special events within the Plan Area under future Year 2040 conditions. Therefore, a separate special events analysis was not conducted for the Proposed Plan.

Level of Analysis. At the aggregate Plan scale, the traffic operation results reflect the impacts related to the Proposed Plan and the number of vehicle travel lanes. However, turn lanes, signal timings, and driveways are not accounted for in the analysis at this scale. Each of these features has the potential to affect operations, delay, VMT, and rerouting of traffic at the neighborhood level. Plans that involve large areas and are not expected to be fully implemented until Year 2040 or beyond are not analyzed effectively by detailed intersection V/C analyses. Consequently, roadway segment analysis is commonly used to determine the average service capacity of the roadway network. Street segment capacity impacts are generally evaluated in program-level analyses (such as community plans or long-range development projects) for which details regarding specific land use types, sizes, project access points, etc., are not known.[23]

Circulation System Analysis. As identified above, two criteria (weighted average V/C ratio and the number of street segments at LOS E or F) are used to evaluate the impacts of the Proposed Plan when compared to Existing conditions. To consider the range of potential impacts that could occur from implementation of the Proposed Plan with future implementation of the enhanced network treatments, two implementation options were developed for the implementation of the enhanced network treatments. Treatment Option 1 generally prioritizes vehicle and transit capacity, while Treatment Option 2 generally prioritizes the preservation of on-street parking. **Table 4.15-7** presents the enhanced network treatments in the Project Area along with a description of the two implementation options. The Proposed Plan with implementation of the enhanced networks under Treatment Option 1 and Treatment Option 2 were analyzed using the Hollywood Subarea Model. In addition, for informational purposes only, weighted average V/C ratios are provided for Future Without Project Conditions (existing plan) for comparison purposes.

Table 4.15-11 presents the volume-weighted V/C ratios and LOS results for the AM peak period. For reference, the Year 2040 without Project V/C is presented, representing anticipated growth in Year 2040 without implementation of the Proposed Plan. Under Year 2040 Without Project Conditions, the weighted V/C ratio worsens from 0.876 (LOS D) to 0.935 (LOS E). The percentage of roadway segments operating at LOS E or F increases from 37 to 42 percent. With the implementation of the Proposed Plan under both treatment options and regional growth anticipated in Year 2040, the weighted V/C ratio continues to worsen under LOS E operation, and the percentage of roadway segments operating at LOS E or F also increases.

[23]City of Los Angeles, CEQA *Thresholds Guide*, 2006, page L.2-1.

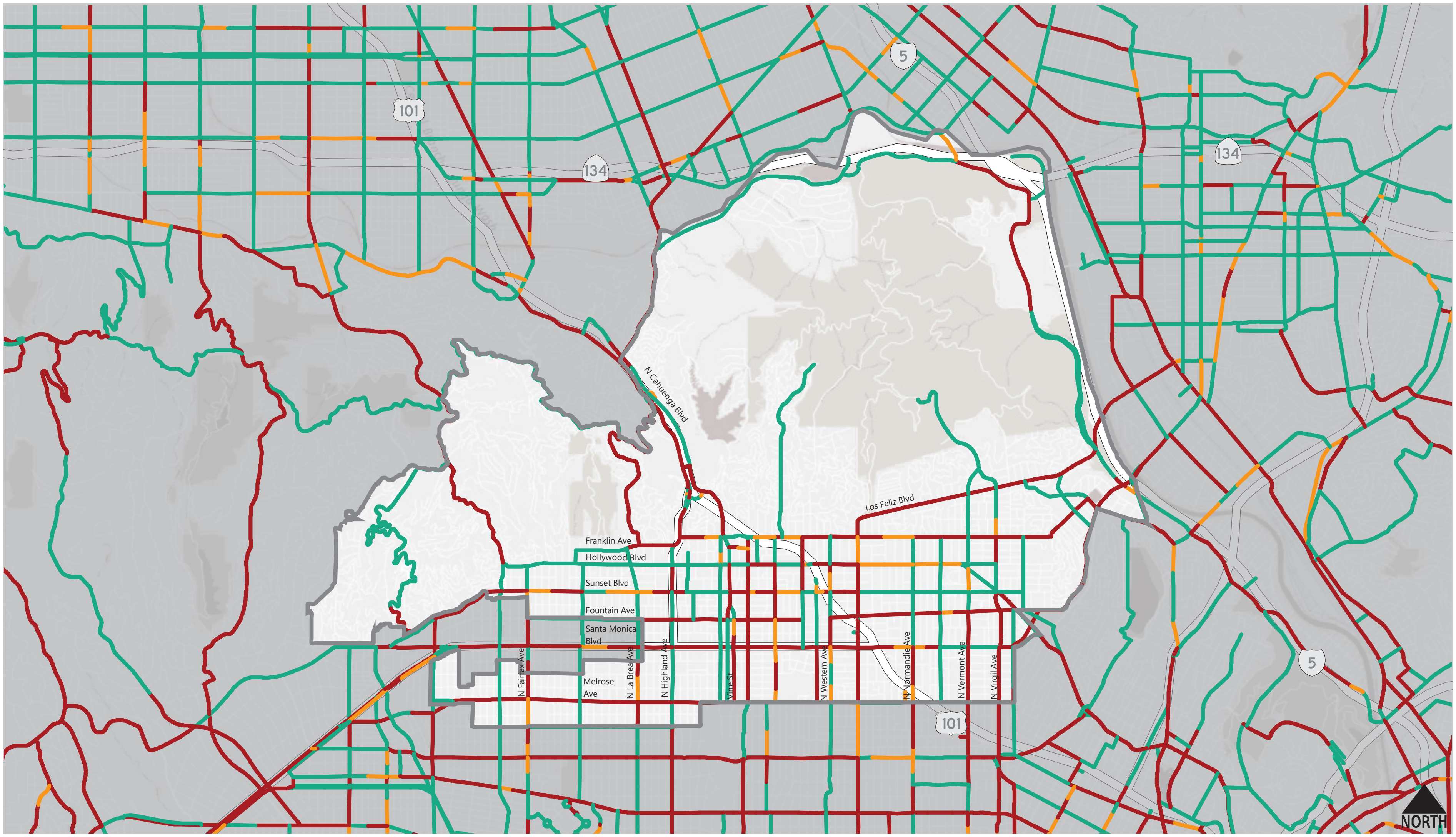
TABLE 4.15-11: AM PEAK PERIOD ROADWAY OPERATIONS				
Transportation Metrics	**Existing 2016 Conditions**	**Future 2040 Without Project**	**Future 2040 With Project Treatment Option 1**	**Future 2040 With Project Treatment Option 2**
Weighted Average V/C	0.876 (LOS D)	0.935 (LOS E)	0.959 (LOS E)	0.972 (LOS E)
Percentage (%) of Street Segments at LOS E or F	37%	42%	48%	49%
Percentage (%) of Center-Line Miles at LOS E or F	35%	40%	45%	45%
WEIGHTED AVERAGE V/C BY FACILITY TYPE				
Boulevard / Parkway	1.165 (LOS F)	1.156 (LOS F)	1.161 (LOS F)	1.161 (LOS F)
Avenue	0.862 (LOS D)	0.924 (LOS E)	0.953 (LOS E)	0.967 (LOS E)
Local / Collector	0.840 (LOS D)	0.931 (LOS E)	0.911 (LOS E)	0.920 (LOS E)
SOURCE: Fehr & Peers, 2019.				

Table 4.15-12 presents the volume-weighted V/C ratios and LOS results for the PM peak period. Under Year 2040 Without Project Conditions, the weighted V/C ratio worsens from 0.890 (LOS D) to 0.955 (LOS E). The percentage of roadway segments operating at LOS E or F increases from 37 to 43 percent. With the implementation of the Proposed Plan under both treatment options and regional growth anticipated in Year 2040, the weighted V/C ratio worsens to LOS F, and the percentage of roadway segments operating at LOS E or F also increases to 50 percent.

TABLE 4.15-12: PM PEAK PERIOD ROADWAY OPERATIONS				
Transportation Metrics	**Existing 2016 Conditions**	**Future 2040 Without Project**	**Future 2040 With Project Treatment Option 1**	**Future 2040 With Project Treatment Option 2**
Weighted Average V/C	0.890 (LOS D)	0.955 (LOS E)	1.002 (LOS F)	1.017 (LOS F)
Percentage (%) of Street Segments at LOS E or F	37%	43%	50%	50%
Percentage (%) of Center-Line Miles at LOS E or F	37%	41%	47%	47%
WEIGHTED AVERAGE V/C BY FACILITY TYPE				
Boulevard / Parkway	1.186 (LOS F)	1.200 (LOS F)	1.198 (LOS F)	1.200 (LOS F)
Avenue	0.870 (LOS D)	0.938 (LOS E)	0.993 (LOS E)	1.010 (LOS F)
Local / Collector	0.922 (LOS E)	0.999 (LOS E)	0.923 (LOS E)	0.937 (LOS E)
SOURCE: Fehr & Peers, 2019.				

The V/C ratios within the study area are presented in **Figure 4.15-8** for the AM Peak Period and in **Figure 4.15-9** for the PM Peak Period under Treatment Option 1.

The V/C ratios under Treatment Option 2 are presented in **Figure 4.15-10** and for the AM Peak Period and in **Figure 4.15-11** for the PM Peak Period.



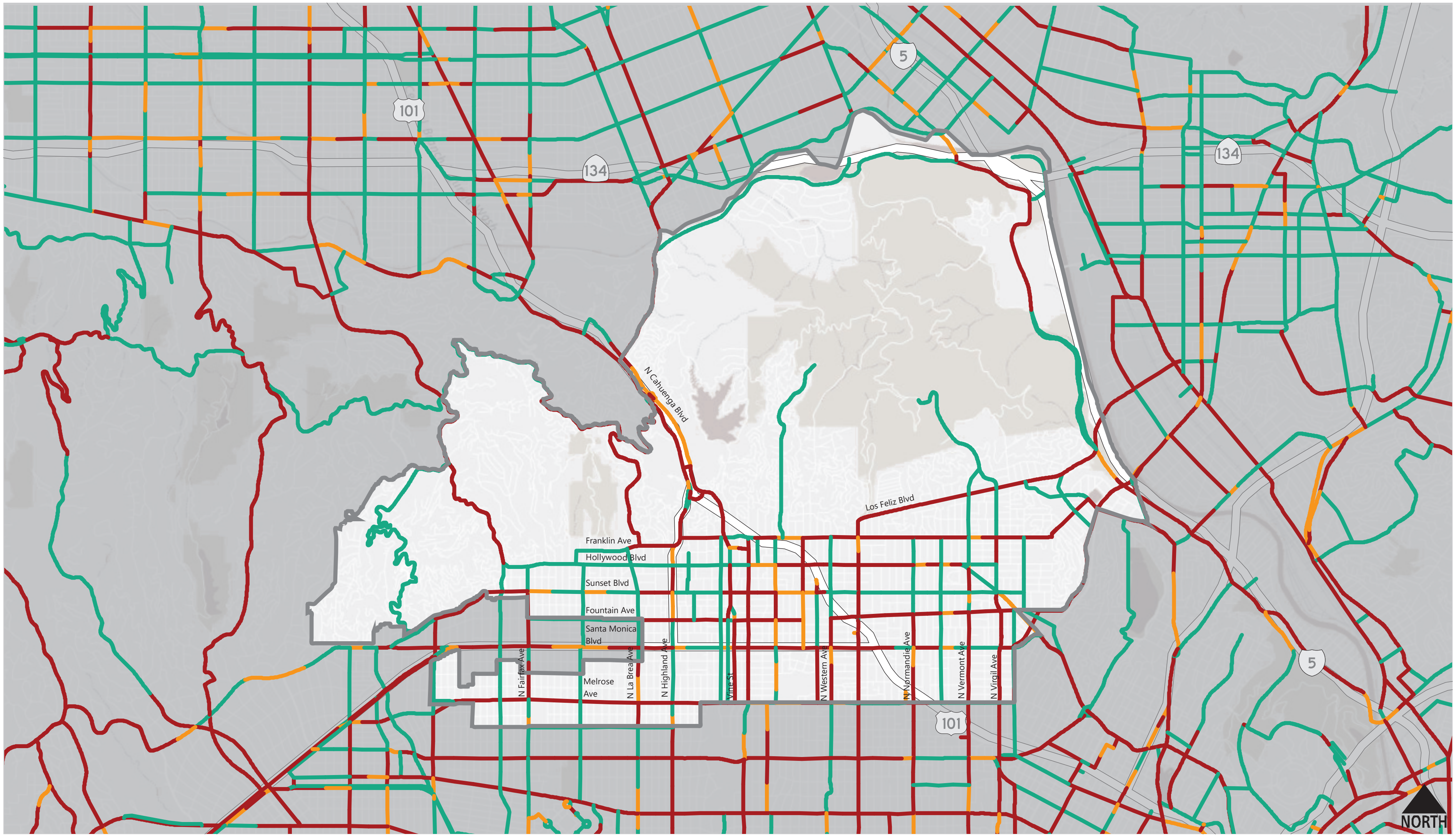
Segment Level of Service

- Acceptable Operations (V/C < 0.80)
- Approaching Capacity (V/C 0.80 - 0.90)
- Approaching or Over Capacity (V/C > 0.90)

SOURCE: Fehr & Peers, 2019.

FIGURE 4.15-8

AM PEAK PERIOD LEVEL OF SERVICE:
2040 PROJECT OPTION 1 CONDITIONS



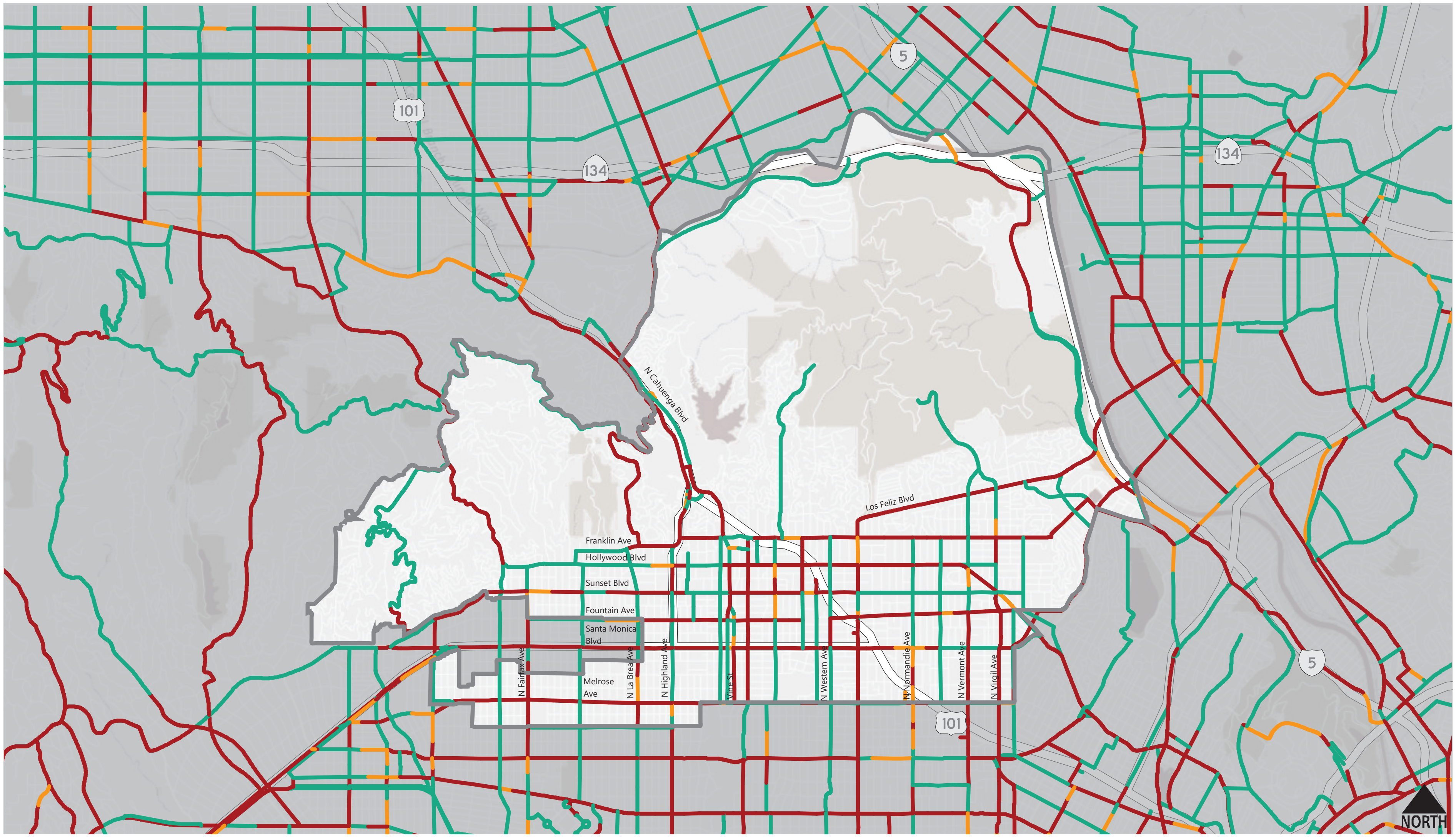
Segment Level of Service

- Acceptable Operations (V/C < 0.80)
- Approaching Capacity (V/C 0.80 - 0.90)
- Approaching or Over Capacity (V/C > 0.90)

SOURCE: Fehr & Peers, 2019.

FIGURE 4.15-9

PM PEAK PERIOD LEVEL OF SERVICE:
2040 PROJECT OPTION 1 CONDITIONS



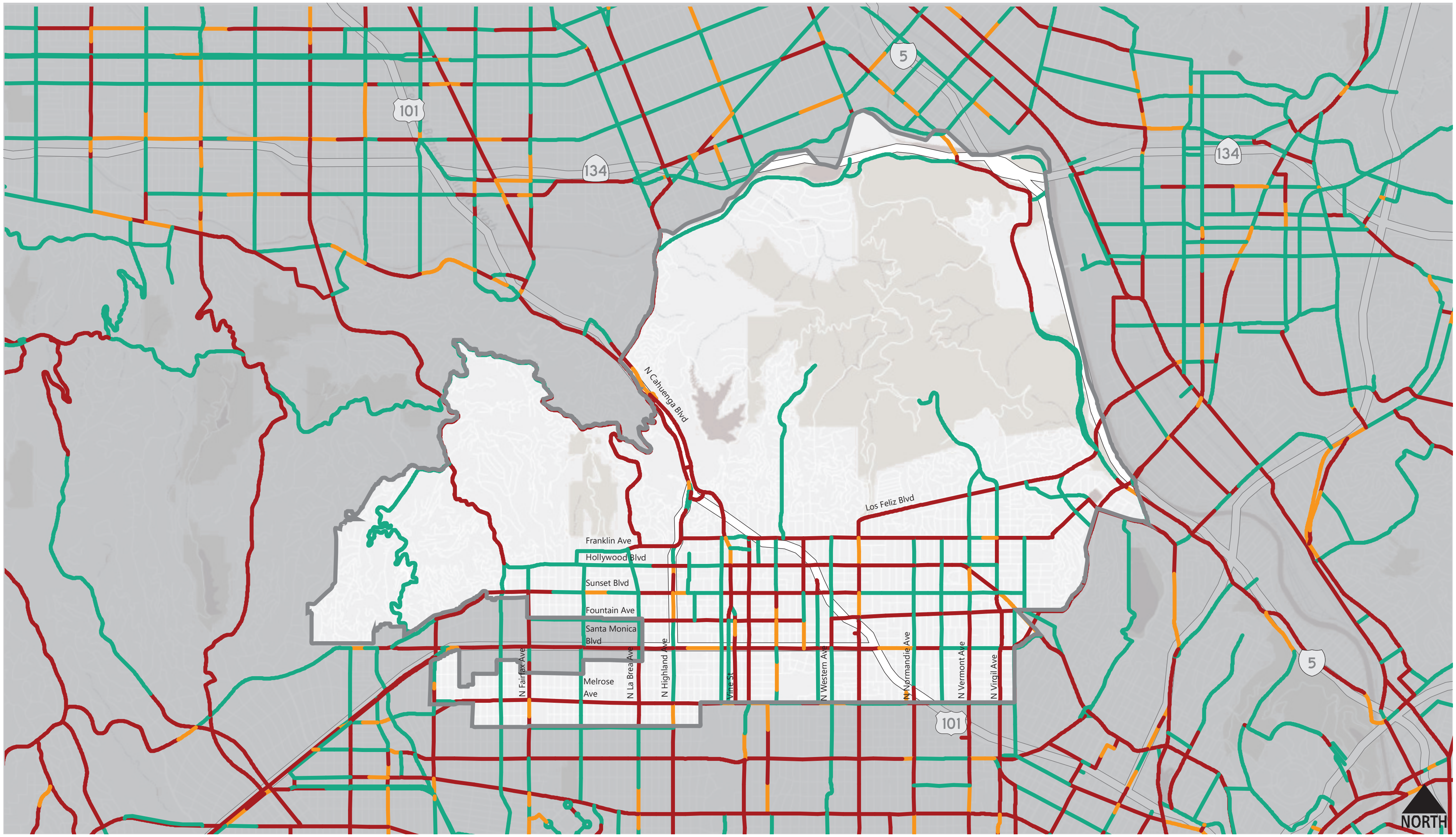
Segment Level of Service

- Acceptable Operations (V/C < 0.80)
- Approaching Capacity (V/C 0.80 - 0.90)
- Approaching or Over Capacity (V/C > 0.90)

SOURCE: Fehr & Peers, 2019.

FIGURE 4.15-10

AM PEAK PERIOD LEVEL OF SERVICE:
2040 PROJECT OPTION 2 CONDITIONS



Segment Level of Service

- Acceptable Operations (V/C < 0.80)
- Approaching Capacity (V/C 0.80 - 0.90)
- Approaching or Over Capacity (V/C > 0.90)

SOURCE: Fehr & Peers, 2019.

FIGURE 4.15-11

PM PEAK PERIOD LEVEL OF SERVICE:
2040 PROJECT OPTION 2 CONDITIONS

Neighborhood Traffic Intrusion. Similar to LOS, neighborhood traffic intrusion was also previously used to determine whether a proposed community land use and transportation network plan resulted in transportation related impacts. Though no longer used as a CEQA threshold, a discussion is included for informational purposes only.

Neighborhood traffic intrusion can be caused by traffic generated by the Proposed Plan, and/or traffic diverted or shifted due to the Proposed Plan onto local streets in residential neighborhoods. Evaluation of potential neighborhood intrusion requires details regarding site access. Therefore, because the routing of traffic to local residential streets depends on the locations of site access points for each development site and those access points cannot be known at this time, the Proposed Plan is assessed qualitatively against the potential for neighborhood traffic intrusion.

Under Future With Project Conditions, the share of roadway street segments projected to operate at LOS E or F exceeds the share for the Existing conditions in the AM and PM peak periods. Although some of this increase is offset by a reduction in vehicular traffic due to shifts to other modes and routes, congestion could increase on certain roadways in the Project Area. In addition, some drivers may divert from the major corridors in the Project Area to parallel routes.

The EIR modeling analysis accounts for potential redistribution of vehicular traffic from highly congested streets to streets that have more available capacity. The cumulative effect of cut-through traffic is accounted for in the model that includes both arterial and non-arterial roadway street segments. Along roadways where the Proposed Plan would cause significant traffic congestion, diversion of trips could occur onto adjacent parallel routes. It is anticipated that diversion would not occur on streets that operate at LOS D or better during peak periods because the average delay is not substantial. However, for the street segments where the LOS would degrade from D to E or F, some trips could divert to adjacent streets to avoid longer travel times through congested locations.

The Proposed Plan and Project List includes programs and policies to address neighborhood traffic intrusion. The Proposed Plan would require future developments to complete the required Traffic Study and Traffic Impact procedures as described in LADOT's *Transportation Assessment Guidelines*. Per the guidelines, a contribution to a traffic calming program or the development of a Neighborhood Traffic Management (NTM) Plan, may be required for future development projects.

Emergency Access Impacts Associated with Roadway Congestion

Within the City of Los Angeles, fire prevention and suppression and emergency medical services are provided by the LAFD. Public protection service and law enforcement are provided by LAPD.

While the Plan would impact segment-level LOS as shown above, there is not a direct relationship between predicted travel delay and response times as California state law does require drivers to yield the right-of-way to emergency vehicles and even permits emergency vehicles to use opposing lane of travel, the center turn lanes, or bus-only lanes. LAFD in collaboration with LADOT has developed a Fire Preemption System (FPS), a system that automatically turns traffic lights to green for emergency vehicles traveling on designated streets in the City.[24] The City of Los Angeles has over 205 miles of routes equipped with FPS. In some instances, roadway reconfigurations with the implementation of the transportation improvements as part of the enhanced network treatments could improve emergency access. For example, a roadway reconfiguration could improve emergency access where a bus-only lane or a contiguous center left-turn lane is introduced where it did not exist. Emergency vehicles are permitted to use bus-only lanes for local access to emergency destinations. People traveling by bicycle are required to pull to the side of the road to

[24] Los Angeles Fire Department, Bulletin No. 133, *Training Bulletin: Traffic Signal Preemption System for Emergency Vehicles*, October 2008.

yield access to emergency providers regardless if they are traveling in a bus-only lane or in a standard travel lane. It is more likely that when in route to an emergency incident, general traffic will be expected to merge into the bus-only lane, permitting the emergency vehicle to pass in the through lane to the left. Emergency responders also routinely use the center left-turn lanes, or even travel in opposing travel lanes if needed. Generally, multi-lane roadways allow the emergency vehicles to travel at higher speeds and permit other traffic to maneuver out of the path of the emergency vehicle.

Knowing exactly how fire and emergency service response times will be affected calls for a great deal of speculation. As explained above, it is not possible to exactly predict the Proposed Plan impacts at the street level. This is one factor as to why it is not possible to forecast response times. The other is that, as explained above, the relationship between emergency access and traffic and potential impacts associated with emergency access is complex and involves factors such as the following:

- The proximity of LAFD and LAPD (and other) facilities to those they serve.
- The staffing and equipment at fire stations.
- The opportunity for emergency responders to use alternative routes in an area.
- The specific street configuration. LAFD, in cooperation with LADOT and LADCP, actively participates in the design of specific roadway changes in order to ensure adequate fire/emergency access is maintained. LAFD, in reviewing street and right-of-way projects, comments on particular street configuration designs, and will raise concerns if roadways present particular access challenges, and can recommend no changes be done at all or alternative changes be undertaken if fire and emergency access are particularly impacted.
- As identified in the Thresholds Guide,[25] on any given project review, LAFD can implement project specific mitigation requirements, such as requiring fire retardant landscaping, prohibiting construction in fire hazard areas, requiring design features that reduce fire potential and developing emergency response plans.
- The changing demand for service is complex. For example, with increasing populations there may be more density and more construction, though new buildings are constructed in accordance with increasingly stringent building and fire codes making them safer and more resistant to fires, such as requiring fire sprinklers. The population is aging, which may increase demand for service. But it is also feasible that the population may not need additional service, as healthcare and other technologies evolve and are improved.
- Future factors that could increase efficiencies in response, including improvements in technology and management, such as changes in deployment of equipment and staff and mutual aid agreements.

Average operational response times for Non-EMS (fire and other services) are provided in **Table 4.15-13** for the fire stations in the Hollywood CPA. The structure fire average operational response times are provided in **Table 4.15-4**. Emergency Medical Services (EMS) average operational response times are provided in **Table 4.15-5**. The average citywide response times for these types of calls are fairly constant. Some stations in the CPA also show fairly constant response times. The data for 2019 is only based on the months between January and August and is subject to change once the full year ends in December.

[25] City of Los Angeles, *CEQA Thresholds Guide*, 2006, page K.2-5.

TABLE 4.15-13: LAFD NON-EMS AVERAGE OPERATIONAL RESPONSE TIMES								
Year	**Station 27** 1327 N. Cole Ave.	**Station 35** 1601 N. Hillhurst Ave.	**Station 41** 1439 N. Gardner St.	**Station 52** 4957 Melrose Ave.	**Station 56** 2759 Rowena Ave.	**Station 76** 3111 N. Cahuenga Blvd.	**Station 82** 5769 Hollywood Blvd.	**City-wide**
2016	5:40	5:56	7:11	6:04	7:28	7:38	6:31	6:16
2017	5:41	5:59	7:10	5:43	7:56	7:42	6:21	6:24
2018	5:58	5:54	7:27	6:08	7:37	7:38	6:21	6:24
2019 /a/	5:59	5:42	7:29	6:35	7:43	7:50	6:22	6:22

Note: Non-EMS = fire and other services.
/a/ Metrics for 2016, 2017, and 2018 are for January-December; for 2019, the available months were January-August in September.
SOURCE: LAFD, FIRESTATLA, 2019.

TABLE 4.15-14: LAFD STRUCTURE FIRE AVERAGE OPERATIONAL RESPONSE TIMES								
Year	**Station 27** 1327 N. Cole Ave.	**Station 35** 1601 N. Hillhurst Ave.	**Station 41** 1439 N. Gardner St.	**Station 52** 4957 Melrose Ave.	**Station 56** 2759 Rowena Ave.	**Station 76** 3111 N. Cahuenga Blvd.	**Station 82** 5769 Hollywood Blvd.	**City-wide**
2016	5:15	4:08	5:13	4:37	4:17	3:00	4:59	5:06
2017	4:46	4:53	5:37	4:58	5:00	4:29	5:24	5:09
2018	4:35	4:40	6:12	4:34	5:27	7:35	5:41	5:00
2019 /a/	5:21	4:21	5:22	5:05	5:31	5:33	4:30	4:59

Note: The structure fire call type is specifically reserved when the LAFD receives a report of a building or structure that is actively burning. Due to the low frequency, these metrics will be reported on a quarterly basis.
/a/ Metrics for 2016, 2017, and 2018 are for January-December; for 2019, the available months were January-August in September.
SOURCE: LAFD, FIRESTATLA, 2019.

TABLE 4.15-15: LAFD EMS (EMERGENCY MEDICAL SERVICES) AVERAGE OPERATIONAL RESPONSE TIMES								
Year	**Station 27** 1327 N. Cole Ave.	**Station 35** 1601 N. Hillhurst Ave.	**Station 41** 1439 N. Gardner St.	**Station 52** 4957 Melrose Ave.	**Station 56** 2759 Rowena Ave.	**Station 76** 3111 N. Cahuenga Blvd.	**Station 82** 5769 Hollywood Blvd.	**City-wide**
2016	6:23	6:02	6:45	6:18	7:29	7:46	6:11	6:30
2017	6:24	6:12	6:46	6:19	7:40	7:26	6:26	6:36
2018	6:22	6:09	7:06	6:23	7:27	7:50	6:32	6:36
2019 /a/	6:28	6:05	6:56	6:38	7:34	8:03	6:41	6:39

/a/ Metrics for 2016, 2017, and 2018 are for January-December; for 2019, the available months were January-August in September.
SOURCE: LAFD, FIRESTATLA, 2019.

As discussed in 4.14, Public Services, at 4.14-2, LAFD has a Constitutional mandate to provide fire services as, “the protection of the public safety is the first responsibility of local government.” Cal. Const. Art. XIII, Sec. 35, subd. (a)(2). LAFD “preserves life and property, promotes public safety and fosters economic growth through a commitment to prevention, preparedness, response and recovery as an all risk life safety response provider.” It is the nation’s second busiest provider of Emergency Medical Services (EMS); more than 85% of LAFD’s daily responses are related to EMS. The types of medical response calls received range from minor cuts to trauma and heart attacks. The call volume for structure and brush fires is less frequent.

There are seven fire stations located in the Hollywood CPA that serve the flatlands and hillsides communities. With the northern portion of the CPA located in a Very High Fire Hazard Severity Zone (VHFHSZ), as mapped in Figure 4.8-4 in Section 4.8 Hazards and Hazardous Materials of the EIR, the potential for brush fires and wildfires is an ongoing concern. For fire prevention in the VHFHSZ areas, LAFD has the state's strictest brush clearance regulations (year-round brush and/or vegetation clearance of 200 feet from any structure or building), and the City recently adopted additional brush clearance regulations for VHFHSZ areas (Ordinance No. 185789). Brush clearance information and a summary of the new ordinance are available on LAFD's website: https://www.lafd.org/fire-prevention/brush/brush-clearance-requirements. LAFD performs microenvironment weather analysis to check for irregular weather patterns and changes, and is on alert if there are windy days combined with low humidity. LAFD utilizes a Burning Index[26] to determine when to call a Red Flag Day, which occurs on average about eight times a year, and may pre-deploy personnel and apparatus to prepare in the event of a fire.[27] A Red Flag Day is when the potential for a fast-moving brush fire is extremely high, when wind speeds are 25 mph or more and the humidity is 15 percent or less. On those days, illegally parked cars in VHFHSZ areas may be towed because their presence would prevent roadway access needed by LAFD. For more information, https://ers.lafd.org/redflag. LAFD has a massive air response that is ready to deploy; apparatus includes five water-dropping helicopters (the most of any City in the nation).[28] LAFD also has access to additional helicopters, fixed-wing aircraft, bulldozers, and fire engines through mutual aid agreements with the state, County, and other cities in the region. In addition to attacking wildfires from the sky, LAFD also has ground resources, such as fire engines and trucks. For example, Fire Station 82 in Hollywood recently acquired a 4-wheel drive wildland fire engine.

LAFD provides many informational resources regarding fire prevention and emergency preparedness; visit https://www.lafd.org/faqs. Evacuation is a possibility, but depends on the situational nature and direction of a fire, although sheltering in place may be a better call to keep roads free for LAFD access. LAFD has resource maps of different parts of the City that are utilized when evacuation is deemed necessary. LAFD personnel analyzes these maps to strategize the best course of action based on the situation at hand, and the maps are not publicly released in order to prevent misunderstanding or misuse. Evacuation routes are updated as needed and are assessed regularly during the year for changing conditions, such as access.[29] The Hollywood CPA is located within the LAFD Operations West Bureau service area, which encompasses the western portion of the City. Evacuation exercises or drills are conducted on a periodic basis to increase the preparedness and resiliency of residents and the coordination between LAFD and other City departments, such as LAPD, Emergency Management, Transportation, Animal Services, and others, such as utilities providers and the American Red Cross, in case of a large scale emergency. In May 2019, Deputy Chief Armando Hogan, Commander of the West Bureau, led an evacuation exercise in Mandeville Canyon,[30] and is planning one for the hillside communities of Hollywood in the fall of 2019.[31] The Hollywood exercise is anticipated to end with a public safety resource fair, where the public can learn more about emergency preparedness.

In 2015, LAFD published a Strategic Plan 2015-2017, A Safer City, that focuses on nine goals and corresponding strategic actions that would guide the LAFD for the next three years.[32] The primary goals that are applicable to the Project include providing exceptional public safety and emergency service and

[26] LAFD, https://www.lafd.org/news/how-does-lafd-determine-wildfire-danger-los-angeles, accessed September 23, 2019.
[27] Meeting between Department of City Planning and LAFD staff on September 3, 2019.
[28] *Ibid*.
[29] Meeting between Department of City Planning and LAFD staff on September 17, 2019.
[30] LAFD, https://www.lafd.org/news/mandeville-canyon-evacuation-drill, accessed September 20, 2019.
[31] Hollywood Evacuation Exercise Meeting on September 10, 2019. The exercise is planned for November 2019.
[32] LAFD, *Strategic Plan 2015-2017,* http://www.lafd.org/news/lafd-chief-unveils-departments-strategic-plan.

implementing and capitalizing on advanced technologies. Some of the key priorities associated with these goals include:

- Improving response times by utilizing data and metrics to identify gaps in LAFD's response strategies and exploring response time improvements through dialogue, cognitive inquiry, innovation, and follow-up;
- Delivery of emergency medical services by expanding LAFD EMS response capabilities for special events and addressing periods of high vehicle traffic; and
- Identifying and implementing advanced technologies to support and improve performance metrics, tracking standards, data collection, analysis and reporting procedures (FireStatLA).

The LAFD Strategic Plan also focuses on the development of an even more professional workforce, promotion of a positive work environment to address risk management issues, and strengthening community relationships to improve preparedness and enhance resiliency during emergency events.

In 2018, LAFD released the new Strategic Plan 2018-2020, A Safer City 2.0, which reports that since the previous Strategic Plan was released, LAFD has hired hundreds of new firefighters, implemented the Four Bureau Reorganization, and created innovative resources such as the Advanced Provider Response Unit (APRU) and the Fast Response Vehicle program as well as other pilot programs.[33] The new Strategic Plan has updated goals that are more refined. The five goals are 1) Provide exceptional public safety and emergency service, 2) Embrace a healthy, safe and productive work environment, 3) Capitalize on Advanced Technology, 4) Enhance LAFD sustainability and community resiliency, and 5) Increase opportunities for personal growth and professional development. Goal 1 includes improving emergency response times, the delivery of EMS, resource deployment and readiness to respond to disasters. Goal 1 includes an objective to complete the Standards of Cover deployment analysis to determine the optimal distribution and concentration of resources and ensure a safe and effective response force for fire suppression, EMS and specialty response situations. The recommendations from the Standards of Cover are expected to be identified based on different geographic areas in the City; the Standards of Cover study was funded in the City's 2019-2020 budget and is expected to be completed within the next few years.[34]

In the interim, LAFD has been implementing innovative resources and pilot programs especially in relation to public health. By addressing EMS related incidents with new resources, such as specialized medical units, other resources, such as fire engines and fire trucks and associated personnel, would be able to be utilized to respond to other incidents, such as fires or other emergencies. This strategy is for better resource deployment and to help reduce response times.[35] In Hollywood, Fire Station 82 has one of the City's five APRU units, which consist of a physician's assistant or nurse practitioner working alongside a firefighter-paramedic. This unit can provide medical treatment in the field, such as stitches and lab work, and determine if patients can be treated in the field without being transported to a hospital. In other instances, such as during special events or as needed, LAFD can and has utilized medics riding bicycles to respond to incidents. For special events, LAPD and LAFD develop individual emergency action plans in coordination with the City's Department of Transportation (DOT) and the Emergency Management Department (EMD). EMD staff will support the first responders as needed during the special event. In addition to being involved with planning for special events, EMD has 45 individual plans for various emergencies, including natural disasters and terrorism, and EMD staff is regularly on call in the event LAPD or LAFD notifies them for

[33] LAFD, Strategic Plan, 2018-2020, https://issuu.com/lafd/docs/strategic_plan_final_2018.02.09?e=17034503/59029441, accessed September 23, 2019

[34] Meeting between Department of City Planning and LAFD staff on September 3, 2019; City of Los Angeles Budget Summary FY 2019-2020: http://cao.lacity.org/budget19-20/2019-20Budget_Summary.pdf, accessed September 24, 2019.

[35] Meeting between Department of City Planning and LAFD staff on September 3, 2019.

activation.[36] Summary information about hazard mitigation in the City is available online; EMD managed the comprehensive update of the City's 2018 Local Hazard Mitigation Plan.[37]

In 2015, Planning Department staff discussed the LAFD Strategic Plan and its relationship to growth and traffic with LAFD staff in order to understand how LAFD responds to growth and changes in traffic.[38] LAFD advised that although increasing congestion is a factor in how they address emergency response, their ongoing planning efforts, including the LAFD Strategic Plan take in to account such increases in congestion and LAFD continues to plan for and maintain public safety and emergency service as required. LAFD monitors any impact on-the-ground implementation of the Proposed Plan may have on response times and make adjustments as necessary. These adjustments may or may not include redeploying resources, adding staff or building new fire stations. In the summer of 2019, Planning Department staff met with LAFD staff on the same topic due to public comments received about congestion and emergency response.[39] LAFD staff indicated that there are ongoing assessments of increases in call load or types of calls throughout the City, and LAFD continuously makes resource and deployment adjustments to address these changes, such as hiring additional medical personnel, acquiring new apparatus or flex staffing of personnel during the busiest hours of the day. LAFD staff said incremental changes are currently being addressed but the pending Standards of Cover is expected to have new recommendations for the long term. The Standards would include levels of staffing of firefighters and other personnel, target response times, new facilities and apparatus needed by geography, and address a City where development is expected to become denser and taller around transit infrastructure systems.

LAFD has some adopted response times that are consistent with the response times stated in the National Fire Protection Association guidelines, including call processing, turnout for EMS and non-EMS calls, and travel. LAFD holds regular FireStat meetings to review response times throughout the City. These meetings include battalion chiefs and captains from the four Geographic Bureaus (Central, South, Valley, and West) and the Administrative Bureaus in the City, and uses the FireStat data to exercise performance management and spot trends to adjust practices, methods or identify other solutions to maintain response times. Metrics are compared between stations and even across shifts or platoons to determine if there is an issue and to continue always to work on reducing all response times to get closer to the NFPA guidelines. If response times are shown to be increasing, battalion chiefs and captains will be tasked with identifying the reason and put in place mediations to resolve the issue. For example, if it is shown that one platoon is managing a four-minute average response and another platoon at the same station in similar conditions has an average response time of four and a half minutes, the responsible officers for the station will need to determine why one platoon is doing better than another, such as whether one platoon is taking a different route, and resolve the differences to improve the slower numbers. If the factors are external to LAFD, LAFD will coordinate with other City departments, such as LADOT or ITA to adjust street light timing, or look for completely new solutions, in order to improve response times. In general, LAFD is constantly monitoring FireStat and utilizing all available resources so that appropriate and feasible response times are being maintained.

[36] Meeting between Department of City Planning and EMD staff on October 1, 2019.

[37] City of Los Angeles 2018 Local Hazard Mitigation Plan: https://emergency.lacity.org/sites/g/files/wph496/f/2018_LA_HMP_Final_2018-11-30.pdf, accessed October 8, 2019.

[38] Meeting between Department of City Planning and LAFD staff on September 8, 2015.

[39] Meetings between Department of City Planning and LAFD staff on April 29, June 13, July 2, September 3, and September 17, 2019.

Many members of the public focus on response times as operational measures to assess system performance[40] or believe that faster response times mean better patient outcome.[41] Nationwide, the most widely referenced response time standard for advanced life support (ALS) incidents in urban settings has been for emergency responders to respond within 8 minutes and 59 seconds, when including call processing time, for 90 percent of incidents. The National Fire Protection Association *1710 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments* is for an ALS unit to respond within 8 minutes to 90 percent of incidents, without including call processing time (Fitch, 2010). This response goal time has been commonly cited since Dr. Mickey Eisenberg published a study in 1979, which concluded that survival from cardiac arrest is maximized if the time between collapse to receiving CPR is four minutes and the time from collapse to receiving definitive care (e.g. defibrillation) is 8 minutes, which has led to a widespread goal of an 8-minute response for ALS units responding to life-threatening emergencies (Blanchard et al., 2012).

Newer studies have questioned the 8-minute response time goal and are concluding that additional studies are needed for several reasons. "Intuitively, reducing the response time would potentially decrease morbidity and improve survival for many categories of illness and injury. The benefit associated with a standardized, quantitative time reduction, however, remains speculative."[42] Several authors point out that more laypersons now know how to administer CPR and the availability of automated external defibrillators (AED) has increased over time. A 2002 study (Blackwell and Kaufman) concluded there is some evidence for increased survival associated with response times of less than five minutes and there was no statistically significant difference for response times between 5 and 10 minutes. A 2005 study (Pons, et al.) states that in most EMS systems cardiac arrest is less than 1% of calls, only limited studies have been published for recommended ambulance response times for non-cardiac arrest, and suggests that a response time of 4 minutes or less for patients with intermediate or high risk of mortality is correlated with increased survival.[43] The same 2005 study says the 8-minute response time should be re-evaluated because of improved EMS systems and first responder training. Both the 2002 (Blackwell and Kaufman) and 2005 (Pons, et al.) studies also point out the significant financial cost of resources that would be required to implement reduced response times of five minutes or four minutes; the 2002 study provides a cost-benefit ratio comparison. Blanchard's 2012 publication references the 2005 study and also discusses that cardiac arrest is only a small portion of ALS incidents; the optimal response time for non-cardiac arrest patients is unknown; and whether 8 minutes may be too long of a response time for cardiac arrest. Others have also questioned whether the Red Lights Siren (RLS) response is a good approach considering that motor vehicle fatality is higher for emergency medical personnel; literature review acknowledgment that CPR and early defibrillation and response times correlate with improved survival but whether the 8 minute 59 seconds response standard correlates with improved survival; and, what would be the best time window for most patients. [44]

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[40] Fitch, Jay. "Response Times: Myths, Measurement and Management." *The Journal of Emergency Medical Services*, 31 Aug. 2005. https://www.jems.com/2005/08/31/response-times-myths44-measure/, accessed September 24, 2019.

[41] Ian E. Blanchard, Christopher J. Doig, Brent E. Hagel, Andrew R. Anton, David A. Zygun, John B. Kortbeek, D. Gregory Powell, Tyler S. Williamson, Gordon H. Fick & Grant D. Innes (2012) Emergency Medical Services Response Time and Mortality in an Urban Setting, Prehospital Emergency Care, 16:1, 142151. http://www.emdac.org/docs/Blanchard_EMS%20Times%20&%20Mortality_PrehospEmergCare_2012.pdf accessed September 24, 2019.

[42] Blackwell, T. H. and Kaufman, J. S. (2002), Response Time Effectiveness: Comparison of Response Time and Survival in an Urban Emergency Medical Services System. Academic Emergency Medicine, 9: 288-295. https://onlinelibrary.wiley.com/doi/epdf/10.1197/aemj.9.4.288 accessed September 24, 2019.

[43] Peter T. Pons MD, Jason S. Haukoos, MD, MS, Whitney Bludworth MD, Thomas Cribley EMT-P, Kathryn A. Pons RN, Vincent J. Markovchick MD (2005) Paramedic Response Time: Does It Affect Patient Survival? Academic Emergency Medicine, July 2005, Vol. 12, No. 7. https://onlinelibrary.wiley.com/doi/epdf/10.1197/j.aem.2005.02.013 accessed September 24, 2019.

[44] Osama Antar MD, S. Marshal Isaacs MD, FACEP, FAEMS, Carla Cash MD, and Raymond L. Fowler MD. "The Case Against EMS Red Lights and Siren Responses." *The Journal of Emergency Medical Services,* 31 Jan. 2017. https://www.jems.com/2017/01/31/the-case-against-ems-red-lights-and-siren-responses/, accessed September 24, 2019.

LAFD publishes average operational response times citywide and by specific fire stations online through FIRESTATLA: http://www.lafd.org/fsla/stations-map, and was the first fire agency in the United States to release response times to the public.[45] ALS operational response times are provided for the full calendar year (January through December) starting with the year 2016; when this document was prepared in September 2019, the data available through FIRESTATLA online for 2019 was January through August. Operational response time is the time interval that starts when first contact is made (either through 911 or the fire dispatch center) and ends when the first Standard Unit arrives on-scene. A Standard Unit has the capacity or equipment to administer the full suite of lifesaving services.[46] Average ALS operational response times for the City and for the seven stations in the Hollywood CPA is less than the 8-minute 59 seconds standard, including call processing time. See **Table 4.15-16**.

TABLE 4.15-16: LAFD ADVANCED LIFE SUPPORT (ALS) AVERAGE OPERATIONAL RESPONSE TIMES

Year	**Station 27** 1327 N. Cole Ave.	**Station 35** 1601 N. Hillhurst Ave.	**Station 41** 1439 N. Gardner St.	**Station 52** 4957 Melrose Ave.	**Station 56** 2759 Rowena Ave.	**Station 76** 3111 N. Cahuenga Blvd.	**Station 82** 5769 Hollywood Blvd.	**City-wide**
2016	5:12	4:54	5:55	5:21	6:45	6:53	5:16	5:35
2017	5:23	5:13	5:43	5:24	6:58	6:31	5:27	5:40
2018	5:22	5:15	5:56	5:40	6:40	7:16	5:38	5:42
2019 /a/	5:32	5:19	5:55	5:43	6:47	6:59	5:54	5:44

/a/ Metrics for 2016, 2017, and 2018 are for January-December; for 2019, the available months were January-August in September.
SOURCE: LAFD, FIRESTATLA, 2019.

See **Figure 4.14-1** for a map of the fire stations in the Hollywood CPA in Section 4.14 Public Services. For general reference, Station 27 and Station 82 are in central Hollywood; Station 35 is in the Los Feliz area; Station 41 is in the western part of the CPA; Station 52 is in the southern part of Hollywood; Station 56 is in Silver Lake; and Station 76 is in the Cahuenga Pass.

From the data, the average operational response times for ALS incidents for the seven fire stations in the CPA have generally slightly increased in recent years, but remain under the 8 minutes 59 seconds standard. It would be speculative to conclude or quantify the impact of increased response times but for persons experiencing out-of-hospital cardiac arrest, every minute without life-saving CPR and defibrillation, chances of survival decrease 7% to 10% (American Heart Association).[47] There does not appear to be any universally accepted standards for quantifying survival rates and emergency response times, and more studies are needed on recommended emergency response times for cardiac arrest and other types of medical situations.

Based on all of the above, it is not reasonably foreseeable that the City will not continue to stay below the 8 minutes and 59 second standard for average emergency response times in the Plan Area in consideration of the increasing congestion in the Plan Area identified above. Moreover, it is not reasonably foreseeable that LAFD will not continue to meet its own mission statement and constitutional mandate to provide necessary fire and emergency services to the residents and visitors of the City. LAFD is currently preparing a Standards of Cover that will establish the City's response time standard and identify the facilities,

[45] Government Technology, https://www.govtech.com/data/Los-Angeles-First-in-US-to-Post-Fire-Response-Times-Online.html, accessed September 24, 2019.

[46] LAFD, F*IRESTATL*A, http://www.lafd.org/how-we-calculate-results, accessed September 23, 2019.

[47] American Heart Association Fact Sheet: *A Race Against the Clock Out of Hospital Cardiac Arrest (2014)*, https://www.heart.org/-/media/files/about-us/policy-research/fact-sheets/out-of-hospital-cardiac-arrest.pdf?la=en&hash=66774CD854D032774F5337934712865D5B1CE3DC, accessed September 24, 2019.

equipment and staff to maintain that response time, including in consideration of increasing congestion identified above. Additionally, LAFD continues to develop, obtain and innovate new methods, resources and equipment to meet the needs of the City for fire and emergency response, including in the Plan Area.

Based on the above, the impact of the Proposed Plan on emergency medical services and fire protection and police protection would be ***less than significant without mitigation***.

Mitigation Measures

No mitigation measures are necessary.

Significance of Impacts after Mitigation

Less than Significant.

CUMULATIVE IMPACTS

Cumulative impacts are those environmental effects that, on their own, may not be considered adverse, but when combined with other projects over time, result in substantial adverse effects. Cumulative effects are an important part of the environmental analysis because they allow decision makers to look not only at the impacts of an individual project, but the overall impacts to a specific area over time from many different projects. CEQA requires an analysis of cumulative impacts resulting from the implementation of the Proposed Plan along with other related projects anticipated to occur in the same geography and timeframe.

Cumulative transportation and traffic impacts consider regional population, housing and employment growth projections prepared by SCAG and found in the 2016-2040 RTP as well as growth anticipated in the Project Area. The RTP also includes a Sustainable Communities Strategy (SCS) that provides guidance on land use planning and transportation to ensure that the region meets CARBs region-specific GHG reduction goals. The RTP also includes large-scale transportation improvements to show how linking transportation and land use planning can reduce automobile trips and greenhouse gas emissions. The 2016-2040 RTP/SCS identifies transportation corridors and transit routes, High Quality Transit Areas (HQTAs), and a variety of strategies to be employed across the region.

MP 2035 AND SCAG 2016-2040 RTP/SCS CONSISTENCY

The adopted City of Los Angeles Mobility Plan 2035 (MP 2035) could have overlapping impacts with the Proposed Plan. In August 2015, the City of Los Angeles adopted MP 2035. MP 2035 (formerly the Transportation Element of the City's General Plan) is the transportation blueprint for the City of Los Angeles. MP 2035 identifies a number of changes to the City's circulation system, including policies, an Enhanced Complete Street System, an Action Plan, a Complete Streets Design Guide, and a revised Bicycle Plan, all of which will influence the network conditions in the Plan Area and adjacent areas in the City of Los Angeles.

MP 2035 provides the framework for future community plans and specific plans, which take a closer look at the transportation system in specific areas of the City and recommend more detailed implementation strategies to realize MP 2035. MP 2035 was prepared in compliance with the 2008 Complete Streets Act, which mandates that the circulation element of a city's General Plan be modified to plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways, defined to include motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban, or urban context of the general plan.

The Proposed Plan contains a Project List that reflects the vision of MP 2035 and the analysis above considers two options for implementing MP 2035 in the Project Area; however, the Future 2040 transportation impact analysis does not reflect full buildout of MP 2035 in adjacent areas of the City of Los Angeles. In the remaining portion of the City of Los Angeles outside the Plan Area, buildout of MP 2035 was not included in the Future with Proposed Plan analysis because, although MP 2035 has been adopted, the timing of implementation has not yet been identified. However, the cumulative impacts analysis considers the impacts of the Proposed Plan in conjunction with full buildout of MP 2035 throughout the City of Los Angeles.

The Proposed Plan would not make a substantial contribution to any cumulative impacts related to MP 2035 or SCAG 2016-2040 RTP/SCS consistency.

CEQA GUIDELINES SECTION 15064.3, SUBDIVISION (B) CONSISTENCY

The Proposed Plan meets the City adopted threshold of not exceeding baseline conditions and not exceeding 15% below the SCAG regional average, and therefore, does not create a transportation impact itself. While this Plan cannot be used to determine the impact of individual development projects or adjacent community plans, the inclusion of the regionally used future forecasts accounts for potential cumulative impacts in this analysis. Therefore, the Proposed Plan would not have a substantial contribution to any cumulative impacts related to the VMT projections, and would therefore maintain consistency with CEQA Guidelines Section 15064.3, Subdivision (b).

HAZARDS DUE TO A GEOMETRIC DESIGN FEATURE OR INCOMPATIBLE USES

The Proposed Plan does not include any elements that would promote sharp curves, dangerous intersections, or incompatible uses that could present safety hazards, and promotes policies and programs to encourage safety of users across all modes. Though the Proposed Plan describes a reasonably expected future and cannot constitute a commitment to any project-specific development, individual projects would be expected to align with the safety principles of the Proposed Plan as well. Therefore, the Proposed Plan would not have a cumulatively considerable contribution to any significant cumulative impact related to hazardous geometric design features or incompatible uses.

EMERGENCY ACCESS

The Proposed Plan would increase traffic in the Plan Area, which could result in potential delays for emergency vehicles. However, while the MP2035 includes proposed roadway changes, they do not provide intersection-level detail in the Plan Area. It is feasible that some of these improvements to the network would provide benefits to emergency access as well. As noted above, the Department of City Planning staff have discussed the LAFD Strategic Plan and its relationship to growth and traffic with LAFD staff. While LAFD acknowledged the possible effects of congestion on their efforts, their ongoing planning efforts and new Strategic Plan consider increased congestion and the possible adjustments necessary. These adjustments may include redeploying resources, adding staff, or building new fire stations as deemed necessary. LAFD will continue to monitor growth in the Plan Area and any impact they see will be addressed when needed. Therefore, the Proposed Plan would not have a cumulatively considerable contribution to a significant cumulative impact related to emergency access.

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5.0 ALTERNATIVES

The California Environmental Quality Act (CEQA) requires that an Environmental Impact Report (EIR) describe a range of reasonable alternatives to the project or to the location of the project that could feasibly avoid or substantially lessen significant environmental impacts while attaining most of the basic objectives of the project.[1] This chapter sets forth potential alternatives to the Proposed Plan and provides a qualitative analysis of each alternative and a comparison of each alternative to the Proposed Plan. The Proposed Plan alternatives are evaluated as to how well they achieve the goals, policies, and objectives, the extent of their environmental impacts compared to the Proposed Plan, and whether or not they reduce or eliminate significant impacts caused by the Proposed Plan.

5.1 CEQA REQUIREMENTS

CEQA Guidelines Section 15126.6 states:

> *An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives.*

Key provisions of the CEQA Guidelines pertaining to the alternatives analysis are summarized below.

- The discussion of alternatives shall focus on alternatives to the project, including alternative locations that are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly (CEQA Guidelines Section 15126.6(b)).
- The EIR shall include a brief discussion of the rationale for selecting alternatives to be discussed and should identify any alternatives that were considered but were rejected as infeasible during the scoping process and briefly explain the reason underlying the lead agency's decision. Among others, the following factors may be used to eliminate alternatives from detailed consideration in an EIR: (1) failure to meet most of the basic project objectives; (2) infeasibility, or (3) inability to avoid significant environmental impacts (CEQA Guidelines Section 15126.6(c)).
- The No Project Alternative shall be evaluated along with its impacts. The "no project" alternative analysis shall discuss the existing conditions at the time the Notice of Preparation is published, as well as what would reasonably be expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services (CEQA Guidelines Section 15126.6(e)(2)).
- When the project involves an update to an existing land use or regulatory plan, the "no project" alternative will be the continuation of the existing plan, policy or operation into the future. The projected impacts of the Proposed Plan are compared to the impacts from the continuation of the existing plan (CEQA Guidelines Section 15126.6(e)(3)(A)).

[1] *CEQA Guidelines*, California Code of Regulations (CCR), Title 14, Division 6, Chapter 3, Section 15126.6, 2005.

- The range of alternatives required in an EIR is governed by a "rule of reason." Therefore, the EIR must evaluate only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the proposed project (CEQA Guidelines Section 15126.6(f)).
- For alternative locations, only locations that are feasible and would avoid or substantially lessen any of the significant effects of the project need be considered for inclusion in the EIR. CEQA Guidelines Section 15126.6(f)(2)(A)).
- An EIR need not consider an alternative whose effects cannot be reasonably ascertained and whose implementation is remote and speculative (CEQA Guidelines Section 15126.6(f)(3)).
- The evaluation of alternatives should include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. A matrix displaying the major characteristics and significant environmental effects of each alternative may be used to summarize the comparison. If an alternative would cause one or more significant effects in addition to those that would be caused by the project as proposed, the significant effects of the alternative shall be discussed, but in less detail than the significant effects of the proposed project (CEQA Guidelines Section 15126.6(d)).
- CEQA Guidelines Section 15126.6(a) states:

  An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic project objectives but would substantially lessen any of the significant effects of the project," and specifies that, "An EIR need not consider every conceivable alternative to a project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation. An EIR is not required to consider alternatives which are not feasible.
- CEQA Guidelines Section 15126.6(f)(1) explains that

  …factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries…and whether the proponent can reasonably acquire, control or otherwise have access to the alternative sites…

  Additionally, CEQA Guidelines Section 15126.6(f)(3) clarifies that,

  Alternatives that are considered remote or speculative, or whose effects cannot be reasonably predicted do not require consideration.

Accordingly, the lead agency may make an initial determination as to which alternatives are feasible, and therefore, merit in-depth consideration. Alternatives may be eliminated from detailed consideration in the EIR if they fail to meet project objectives, are infeasible, or do not avoid any significant environmental effects.

The range of feasible alternatives is selected and discussed in a manner intended to foster meaningful public participation and informed decision making. Among the factors that may be taken into account when addressing the feasibility of alternatives (as described in CEQA Guidelines Section 15126.6(f)(1)) are environmental impacts, site suitability, economic viability, availability of infrastructure, general plan consistency, regulatory limitations, jurisdictional boundaries, and whether the proponent could reasonably acquire, control, or otherwise have access to the alternative site.

The City of Los Angeles Department of City Planning's (DCP's) effort in this process has been to identify, describe, and evaluate a reasonable range of feasible project alternatives with the same focus as the Proposed Plan, and inform the public and decision-makers of the comparative effects of alternatives that address concerns expressed by the public during the outreach process for the development of the Proposed Plan. The analysis is particularly focused on those alternatives that could achieve most of the project objectives.

5.2 PROJECT OBJECTIVES

As described in Section 3.2 in Chapter 3.0, Project Description, the underlying purpose of the Proposed Plan is to plan for and accommodate foreseeable growth in the Hollywood CPA, consistent with the growth strategies of the City as provided in the Framework Element, as well as the policies of Senate Bill 375 and the Southern California Association of Governments' (SCAG) Sustainable Communities Strategy (SCS).

The **primary objectives** of the Proposed Plan are as follows:

- Accommodate projected population, housing, and employment growth consistent with the growth strategies of the Framework Element, including:
    - Maximize development opportunities around existing transit systems to encourage sustainable land use while minimizing potential adverse impacts,
    - Direct growth to transit hubs and corridors,
    - Plan for increases to the housing supply,
    - Encourage a better balance of jobs and housing with mixed-use development,
    - Accommodate commercial uses for future employment opportunities, and
    - Focus growth into Framework identified Centers and corridors while preserving single-family neighborhoods, hillsides, and open space.
- Direct growth away from low-density neighborhoods; preserve single-family and low-density residential neighborhoods.
- Provide a range of employment opportunities; promote the vitality and expansion of Hollywood's media, entertainment, and tourism industry.
- Protect historic and cultural resources.

The **secondary objectives** of the Proposed Plan are as follows:

- Encourage and promote a variety of mobility options; make streets walkable.
- Improve the function and design of neighborhoods throughout the Project Area by preserving and strengthening the appearance of the overall Project Area to promote pedestrian-friendly environments, nurture neighborhood character, improve economic vitality, create identity, and integrate a combination of land uses to create positive visual experiences.
- Improve open space, parks and public spaces.
- Provide adequate public services and infrastructure.
- Encourage sustainable land use.
- Maintain Land Use and Zoning Consistency.

5.3 SIGNIFICANT AND UNAVOIDABLE IMPACTS

As described in Chapter 4, the following impacts related to the Proposed Plan are determined to be significant and unavoidable after implementation of all feasible mitigation measures:

- **Air Quality**: Criteria Pollutant Emissions and Violation of Air Quality Standards; Construction for NOx, $PM_{2.5}$, PM_{10}; Operational for VOC emissions; Cumulative Criteria Pollutant Emission and Cumulative Air Quality Standard Impacts; Sensitive Receptors for Construction.
- **Biological Resources:** Special Status Species Habitat, Riparian Habitat, Wetlands, Migratory Wildlife.
- **Cultural Resources**: Historical Resources; Cumulative Historical Resources.
- **Noise**: Construction Noise and Construction Vibration; Cumulative Construction Noise and Construction Vibration; Permanent Stationary Sources.
- **Public Services**: Parks – Deterioration; Cumulative Parks - Deterioration.

As described in Chapter 4.0, the following impacts are considered significant impacts that can be mitigated to less than significant with mitigation.

- **Aesthetics** (Glare)
- **Cultural Resources** (Archaeological Resources, Paleontological Resources, and Tribal Cultural Resources)
- **Hazardous and Hazardous Materials** (Hazardous Materials Upset or Accident, Hazardous Materials Upset or Accident, and Hazardous Materials Sites)

5.4 ALTERNATIVES CONSIDERED AND ELIMINATED FROM FURTHER EVALUATION

The alternatives considered and eliminated from further evaluation include:

NO DEVELOPMENT ALTERNATIVE

The No Development Alternative would permanently freeze development in the Hollywood Community Area by prohibiting all construction activity. Since the Hollywood CPA is subject to the existing 1988 Hollywood Community Plan, which allows redevelopment and future growth within specific use, density and height restrictions (see the discussion of the No Project Alternative below), the No Development Alternative does not represent a scenario that would likely occur. The City has no current mechanisms to halt development within the Project Area. In addition, this Alternative would not accommodate the projected housing, population, and job growth for the Project Area and would not accomplish the underlying purpose of the Proposed Plan and most of the primary project objectives. Therefore, the No Development Alternative is not a realistic or foreseeable option and was rejected as infeasible.

LIMITED DEVELOPMENT ALTERNATIVE

Under a Limited Development Alternative, land use changes would be limited to General Plan Amendments and zone changes necessary to adjust the existing development potential of the Project Area downward to reflect as-built conditions, therefore limiting the future development potential. While this Alternative would involve carrying the existing conditions of the Project Area forward into the future for the most part, unlike the No Development Alternative, this is an "action alternative" that would include the adoption of an updated community plan. This Alternative would reduce the Project Area's development potential, limiting and deterring new development from occurring in the future. Given this reduction in development potential, new construction would be less likely to occur under this Alternative than under the Proposed Plan or the Existing Plan, thereby reducing construction impacts (construction would be permitted to replace existing structures or vacant lots with similar structures). Similarly, because development potential of the Project Area would be reduced compared to the Existing Plan and Proposed Plan, only a limited amount of population and job growth could be accommodated, thereby reducing operational impacts compared to the Proposed Plan. However, this Alternative would not accommodate the projected housing, population, and job growth for the Project Area and would not accomplish the underlying purpose of the Proposed Plan and most of the primary project objectives, as it would not direct growth to transit hubs and corridors, balance jobs and housing growth and create employment opportunities, or have regulations to protect designated and eligible historic resources and promote the vitality and expansion of Hollywood's media, entertainment, and tourism industry. This Alternative could put pressure on lower scale neighborhoods to accommodate housing demand that is not met in the Regional Center and along commercial corridors. Based on the above, the Limited Development Alternative was rejected as infeasible.

UNIFORM CORRIDOR GROWTH ALTERNATIVE

Under the Uniform Corridor Growth Alternative, new development potential at a level consistent with the Proposed Plan would be distributed uniformly along commercial corridors within the Project Area. While this Alternative would accommodate the SCAG projected growth for the Project Area, distributing growth uniformly along the corridors of the Hollywood CPA would not reduce the significant and unavoidable impacts of the Proposed Plan. In addition, distributing growth consistently along the corridors would not achieve the City's goals of maximizing development opportunities around existing transit systems while preserving single-family and low-density residential neighborhoods. Also, there would likely be increased vehicle miles traveled (VMT), as future growth would not be concentrated at existing transit stations and bus corridors and any emerging transportation hubs where residents, employees and visitors can take advantage of existing and planned transit opportunities. Accordingly, this Alternative would likely result in greater impacts than the Proposed Plan, particularly exacerbated along corridors abutting low-density neighborhoods, and would not achieve the underlying purpose of the project to accommodate growth consistent with the City's Framework long-term growth strategy and the SCS, as well as several of the primary and secondary objectives related to preserving single-family and low-density residential neighborhoods, protecting historic and cultural resources, and promoting the vitality and expansion of Hollywood's media, entertainment, and tourism industry. Based on the above, the Uniform Corridor Growth Alternative was rejected as infeasible.

OTHER ALTERNATIVES

As discussed below there are no alternatives that the City can identify that would reduce the identified significant and unavoidable impacts identified in this EIR to less than significant that would meet the underlying purpose of the project to plan for and accommodate foreseeable City growth in the Hollywood CPA, consistent with the growth strategies of the City as provided in the Framework Element, as well as the policies of Senate Bill 375, Senate Bill 743, and SCAG's Sustainable Communities Strategy. All of the significant and unavoidable impacts and less than significant impacts with mitigation that are identified in this EIR are a result of reasonably expected development that occurs with growth, such as construction noise and vibration, potential for release of hazardous materials in the soil, or discovery of archaeological resources discovered during site preparation. That is why even the No Project alternative and the reduced growth alternative (Alternative 2) would not be expected to result in less than significant to any of the identified significant and unavoidable impacts upon analysis. As discussed above, to the extent that a no development or lower development alternative could stop or slow growth in the CPA such that it would result in turning the significant and unavoidable impacts to less than significant because little to no development would occur are rejected for not meeting the underlying purpose of the Project. Based upon the above, the range of reasonable alternatives that can meet the requirements of CEQA for the Proposed Project are significantly constrained by the need for the City to accommodate growth and the nature of the impacts identified in large part resulting from growth. To comply with CEQA, as discussed in Section 5.5 below, the City has provided a reasonable range of alternatives that would meet the requirements of Guidelines Section 15126.6 discussed above. The City finds that any variations on those alternatives that the City considered including, such as additional lower density alternatives, would not avoid any additional significant environmental impacts, and would not further foster informed decision-making or public participation beyond the alternative considered in the EIR.

5.5 ALTERNATIVES CONSIDERED IN THIS EIR

In accordance with CEQA Guidelines Section 15126.6, the feasible alternatives to the Proposed Plan are presented below.

ALTERNATIVE 1: CONTINUATION OF EXISTING PLAN (NO PROJECT ALTERNATIVE)

CEQA Guidelines Section 15126.6(e) requires that a No Project Alternative be evaluated to allow decision makers to compare the impacts of approving the project with the impacts of not approving the Proposed Plan. This legally mandated alternative is not required to meet the objectives of the Proposed Plan or to substantially lessen any of the significant effects of the Proposed Plan. The No Project Alternative reflects "no project" conditions (i.e., without the adoption of the Proposed Plan). Under the No Project Alternative, no changes to General Plan land use designations and/or zoning would occur, the CPIO District would not be established, and future development would not be subject to the Proposed Plan's development regulations, design regulations, or policies. The No Project Alternative assumes what would be reasonably expected to be developed under the Existing Plan, based on existing General Plan land use designations and zoning in the Hollywood CPA. Based on existing zoning under the Existing Plan's land use designations, the reasonably expected growth in the Hollywood CPA under the No Project Alternative would result in 113,000 to 121,000 housing units, 226,000 to 243,000 residents, and 119,000 jobs.

Table 5-1 shows the population, housing and employment that could be accommodated under the five Alternatives, including the No Project Alternative. The No Project Alternative would result in 8,000 to 11,000 fewer housing units, 17,000 to 21,000 fewer residents, and 5,000 to 8,000 fewer jobs compared to the Proposed Plan. The Transit Oriented Communities (TOC) Guidelines, along with other housing incentive programs like Density Bonus and Accessory Dwelling Units, have been accounted for in the total reasonably expected development potential of each alternative except Alternative 5 (SCAG Forecast Alternative). A range of numbers is used in Alternatives 1 through 4 to represent the potential increase in development from the optional incentive programs.

TABLE 5-1: COMPARISON OF PROJECT ALTERNATIVES

	Existing Conditions (2016)	SCAG Forecast (2040)	Proposed Plan	Alternative 1: No Project	Alternative 2: Reduced Alternative	Alternative 3: Targeted Corridors	Alternative 4: High TOD	Alternative 5: SCAG Forecast Alternative
Population (residents)	206,000	226,000	243,000 – 264,000	226,000 – 243,000	230,000 – 256,000	243,000 – 264,000	243,000 – 264,000	226,000
Housing Units	104,000	113,000	121,000 – 132,000	113,000 – 121,000	115,000 – 128,000	121,000 – 132,000	121,000 – 132,000	113,000
Employment (jobs)	101,000	119,000	124,000 - 127,000	119,000	124,000 – 127,000	124,000 – 127,000	124,000 – 127,000	119,000

The Proposed Plan and all of the Alternatives except Alternative 5 factors in additional units that can be expected from the City's housing incentives. TOC and accessory dwelling units are represented in the higher range. It assumes all units are occupied.

SOURCE: City of Los Angeles, 2018.

ALTERNATIVE 2: REDUCED TOD AND CORRIDORS ALTERNATIVE (REDUCED ALTERNATIVE)

The Reduced TOD and Corridors Alternative (Reduced Alternative) focuses development potential at selected transit stations and corridor areas of the Hollywood CPA, with less development potential for housing and population than the Proposed Plan. The proposed changes under the Reduced Alternative reflect public input on the Proposed Plan. In general, this Alternative consists of similarly-located subareas around transit stations and corridors, but this Alternative reduces development potential in selected subareas. This Alternative would reduce the allowable base floor area ratio (FAR) in selected Regional Center subareas and the allowable base FAR along selected corridors, and also could reduce the proposed density of selected High Medium subareas.

More specifically, increases in development potential primarily near the Metro Hollywood/Vine Station; subareas with High-Medium Residential land use designation; and selected corridors with mixed-use incentives would be reduced under this Alternative. The Proposed Plan increases the allowable base FAR to 4.5:1 in the Regional Center subareas surrounding the Hollywood/Vine Station. The Reduced Alternative would lower the allowable base FAR by approximately 10 percent. These subareas are generally located east of Wilcox Avenue and/or Cahuenga Boulevard, south of Yucca Street, west of Gower Street, and north of De Longpre Avenue. The Reduced Alternative would maintain the existing density of one dwelling unit per 600 square feet of lot area and/or apply this reduced density to selected High Medium subareas. The Proposed Plan incentivizes mixed-use development along selected commercial corridors near transit, which includes bus service, by increasing the allowable FAR for projects that include both housing and commercial or are hotels. The Reduced Alternative would decrease the amount of mixed-use FAR incentive proposed in the following corridors: La Brea Avenue, Western Avenue, and Santa Monica Boulevard.

The Reduced Alternative assumes that the reasonably expected development of the CPA would be reduced compared to the Proposed Plan, but would still meet SCAG's 2040 population, housing and employment projections for the CPA. As shown in **Table 5-1** above, the reasonably expected development under the Reduced Alternative would be approximately 117,000 to 128,000 housing units, 235,000 to 256,000 residents, and 124,000 to 127,000 jobs. This Alternative would result in approximately 4,000 fewer housing units, 8,000 fewer persons and a similar number of jobs compared to the Proposed Plan.

Administrative changes, the CPIO, and most Active Changes that would occur as part of the Proposed Plan would also occur under the Reduced Alternative. The reduction of FAR in selected Regional Center and corridor subareas, however, would cause the potential supply of new housing and non-residential uses to diminish because the incentive for development would be reduced.

This Alternative was included because it would reduce some identified significant impacts in some parts of the Hollywood CPA. It would reduce impacts (although likely not below levels of significance) related to air quality and noise. This Alternative was also included to meet the request of community groups. This Alternative would meet the underlying purpose and the primary and secondary project objectives in part, however, to a lesser degree than the Proposed Plan.

ALTERNATIVE 3: TARGETED CORRIDORS ALTERNATIVE

The Targeted Corridors Alternative would generally concentrate development along targeted corridors in the Hollywood CPA that could accommodate new housing, population and jobs. The amount of growth anticipated to occur under the Proposed Plan would occur under the Targeted Corridors Alternative, but it would be less concentrated in the Regional Center and would be dispersed along targeted corridors throughout the CPA. Under the Targeted Corridors Alternative, the Hollywood CPA would meet the same population, housing and employment projections anticipated in the Proposed Plan. This would be achieved through an increase in the maximum permitted FAR along corridors. Heights could range between four to eight stories and with a maximum FAR of 3:1 along targeted segments of the major commercial corridors mentioned below.

The Targeted Corridors Alternative would concentrate growth along designated corridors, including La Brea Avenue, Vine Street, Western Avenue, Vermont Avenue, Hollywood Boulevard, Sunset Boulevard, Santa Monica Boulevard, and Melrose Avenue. Proposed changes would be focused primarily on corridors with commercial land use designations such as Community Commercial, rather than being focused within the Regional Center Commercial in central Hollywood. The identified commercial corridor subareas in the Proposed Plan would be supplemented with additional corridors and corridor segments where development potential could be intensified to meet the reasonably expected housing, population, and employment.

Areas selected for increased development potential were based on the following criteria: 1) major corridors with a commercial land use designation; 2) existing Rapid or local bus service; 3) distribution of changes geographically throughout the Hollywood CPA; and 4) utilizing the development potential of larger lots and commercial intersections in areas where there is greater opportunity for development. This approach is in contrast to both the Proposed Plan, which focuses growth in the Regional Center and selected commercial corridors, and the High TOD Alternative, which focuses intensified growth within a half mile of five Metro Red Line stations.

This Alternative would not reduce the significant impacts and since it would disperse future development along selected commercial corridors instead of focusing growth in the Regional Center, it could slightly increase total daily VMT and congestion during peak travel periods. This Alternative was included to inform decision makers and foster public participation because it would result in fewer high-rises in the Regional Center, which the City is informed to be of interest to some decision-makers and members of the community. This alternative could lower building heights in the Regional Center, but could result in more mid-rise (four to eight stories) and potentially tall buildings along the targeted corridors.

ALTERNATIVE 4: HIGH TOD ALTERNATIVE

The High TOD Alternative for the Hollywood CPA would increase opportunities for TOD development around existing major rail infrastructure. This Alternative would concentrate the Proposed Plan's reasonably expected housing, population, and employment at the five Metro Red Line station areas in the Hollywood CPA, including East Hollywood. Under the High TOD Alternative, the Hollywood CPA would meet the same population, housing and employment projections anticipated in the Proposed Plan.

The development potential near the Hollywood/Highland and Hollywood/Vine Stations would be further intensified by including some additional change areas within a half-mile radius of the stations, such as parcels along Hollywood Boulevard, and increasing the base FAR of selected subareas near these two stations. Additional selected areas within the half-mile radius would expand the existing Regional Center land use designation boundary to cover the western side of La Brea Avenue and designated multi-family residential areas along and near Yucca Street and Franklin Avenue. Adding more multi-family residential areas to the Regional Center would allow for additional housing and employment opportunities through increases in residential density and commercial intensity. As a result of increased base FARs to possibly 4.5:1, high-rise buildings in the 20-story range could become more common around the Los Angeles County Metropolitan Transportation Authority (Metro) Hollywood/Highland and Hollywood/Vine Stations. Regional Centers, as described in the Framework Element, contain a mix of mid- to high-rise buildings that are generally characterized in height by six- to 20-stories or higher.

The High TOD Alternative would extend the Regional Center land use designation east of the US-101 to selected areas near the Metro Hollywood/Western, Vermont/Sunset, and Vermont/Santa Monica Stations. These three stations and their vicinity areas currently have specific development regulations such as FAR and height limits under the existing Vermont/Western Transit Oriented Specific Plan (SNAP). This

Alternative would require amending the SNAP to allow for additional development by increasing FARs and removing height restrictions. FAR caps could increase from 3:1 today to possibly up to 6:1. Existing SNAP restrictions for maximum height, generally 75 feet for mixed-use projects or 100 feet for hospital uses without discretionary approval, would be removed to allow high-rise buildings in the expanded Regional Center. The hospital core area in East Hollywood near Vermont Avenue and Sunset Boulevard, which has a Community Center land use designation, would be intensified to Regional Center as well. This Alternative was included because it concentrates housing, population, and employment in transit nodes (i.e., around heavy rail infrastructure), and less along the corridors and would result in less severe significant impacts to violations of air quality standards and would be more consistent with SCAG's sustainable communities strategy. This alternative would be expected to have the lowest daily VMT and the lowest number of daily trips among the alternatives and the Proposed Project.

ALTERNATIVE 5: SCAG FORECAST ALTERNATIVE

This alternative is growth under the SCAG 2040 forecast in the CPA under the 2016-2040 RTP/SCS. The projections are similar to the reasonably expected development at the lower range of the No Project Alternative (Alternative 1). This alternative is therefore substantially the same as Alternative 1. The difference between the No Project Alternative and Alternative 5 is that projected growth under Alternative 5 does not include reasonably expected development from use of the TOC Guidelines because TOC was not adopted before SCAG made its 2040 forecasts. Therefore, Alternative 5 does not include the high range of reasonably expected growth that Alternative 1 includes. For this reason, Alternative 5 would not be as reasonably foreseeable as Alternative 1 if the Proposed Plan were not adopted. Additionally, Alternative 5 is different from Alternative 1 in that the forecasted growth by SCAG is more spread out in the CPA and less development is expected to occur in the regional center and around transit infrastructure systems than in Alternative 1.

5.6 EVALUATION OF PROJECT OBJECTIVES

An EIR must evaluate the comparative merits of a reasonable range of alternatives to the project that could feasibly attain most of the basic objectives of the project while avoiding or lessening any adverse effects of the project. For purposes of this analysis, the five alternatives are evaluated to determine the extent to which they attain the basic objectives of the Proposed Plan. **Table 5-2** provides an evaluation of the project objectives under the five alternatives followed by a general discussion of whether the underlying purpose and basic project objectives are feasibly and substantially attained by each alternative.

ALTERNATIVE 1: NO PROJECT ALTERNATIVE

Although Alternative 1 would meet SCAG's 2040 population, housing and employment projections, it would not achieve most of the primary and secondary objectives. It would not direct growth and maximize development opportunities around existing transit systems, transit hubs, and corridors. Compared to the Proposed Plan, the No Project Alternative would result in 8,000 to 11,000 fewer housing units, 17,000 to 21,000 fewer residents and 5,000 to 8,000 fewer jobs. Under the No Project Alternative, no changes to existing zoning and General Plan land use designations would occur, regardless of the known inconsistencies between existing land uses, zoning and/or General Plan land use designations. In addition, under the No Project Alternative, future development would not be subject to the Proposed Plan's design, neighborhood compatibility, and hillside protections. The CPIO District, which would have regulatory protections for historical resources as well as pedestrian-oriented design regulations, would not be established under the No Project Alternative. The Proposed Plan's transportation and mobility network improvements would also be not implemented under the No Project Alternative.

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TABLE 5-2: EVALUATION OF PROJECT OBJECTIVES

	Alternative 1: No Project Alternative	Alternative 2: Reduced Alternative	Alternative 3: Targeted Corridors Alternative	Alternative 4: High TOD Alternative	Alternative 5: SCAG Alternative
PRIMARY OBJECTIVES					
Accommodate projected population, housing, and employment growth consistent with the growth strategies of the Framework Element, including: (1) Maximize development opportunities around existing transit systems to encourage sustainable land use while minimizing potential adverse impacts, (2) Direct growth to transit hubs and corridors, (3) Plan for increases to the housing supply, (4) Encourage balanced jobs and housing growth with mixed-use development, (5) Accommodate commercial uses for future employment opportunities, and (6) Focus growth into Framework identified Centers and corridors while preserving single-family neighborhoods, hillsides, and open space.	Partially Consistent	Partially Consistent	Partially Consistent	Partially Consistent	Partially Consistent
Direct growth away from low-density neighborhoods; preserve single-family and low-density residential neighborhoods.	Partially Consistent	Consistent	Partially Consistent	Partially Consistent	Partially Consistent
Provide a range of employment opportunities; promote the vitality and expansion of Hollywood’s media, entertainment, and tourism industry.	Not Consistent	Consistent	Consistent	Consistent	Not Consistent
Protect historical and cultural resources.	Partially Consistent	Consistent	Partially Consistent	Partially Consistent	Partially Consistent
SECONDARY OBJECTIVES					
Encourage and promote a variety of mobility options; make streets walkable.	Not Consistent	Partially Consistent	Consistent	Consistent	Not consistent
Improve the function and design of neighborhoods throughout the Project Area by preserving and strengthening the appearance of the overall Project Area to promote pedestrian-friendly environments, nurture neighborhood character, improve economic vitality, create identity, and integrate a combination of land uses to create positive visual experiences.	Not Consistent	Consistent	Partially Consistent	Consistent	Not Consistent
Improve open space, parks and public spaces.	Not Consistent	Consistent	Consistent	Consistent	Not Consistent
Provide adequate public services and infrastructure.	Not Consistent	Partially Consistent	Consistent	Consistent	Not Consistent
Encourage sustainable land use.	Not Consistent	Consistent	Partially Consistent	Partially Consistent	Not Consistent
Maintain Land Use and Zoning Consistency.	Not Consistent	Consistent	Consistent	Consistent	Not Consistent

SOURCE: TAHA, 2018.

ALTERNATIVE 2: REDUCED TOD AND CORRIDORS ALTERNATIVE (REDUCED ALTERNATIVE)

Alternative 2 would meet the underlying purpose of meeting SCAG's 2040 population, housing and employment projections and all of the primary and secondary project objectives, although to a lesser degree than the Proposed Plan because it would not maximize development opportunities around existing transit systems, which could result in more development outside of high quality transit areas. The Reduced Alternative would result in approximately 4,000 fewer housing units, 8,000 fewer residents and a similar number of jobs compared to the Proposed Plan. Similar to the Proposed Plan, the Reduced Alternative directs growth to transit stations and corridors, but to a lesser degree. Compared to the Proposed Plan, Alternative 2 would reduce the allowable FAR in selected Regional Center subareas and along selected corridors. The proposed density of selected High Medium subareas could be reduced as well. Similar to the Proposed Plan, protections to historical resources and pedestrian-oriented design regulations through the CPIO District would be established, and future development would be subject to applicable design and neighborhood compatibility protections, hillside protections, and new transportation and mobility network improvements.

ALTERNATIVE 3: TARGETED CORRIDORS ALTERNATIVE

Alternative 3 would achieve the purpose of the project by meeting SCAG's 2040 population, housing and employment projections and would partially achieve the underlying purpose and all of the project objectives although to a lesser degree than the Proposed Plan because it does not focus growth into Framework identified centers. Through an increase in the maximum permitted FAR along corridors, the Targeted Corridors Alternative would meet the same population, housing and employment projections anticipated in the Proposed Plan. However, compared to the Proposed Plan, the reasonably expected development would be less concentrated in the Regional Center and would be dispersed more along selected corridors in the Hollywood CPA. Alternative 2 would partially meet some objectives, but not to the same extent as the Proposed Project. For example, the Targeted Corridors Alternative would primarily concentrate growth along corridors with less intense commercial land use designations rather than the Regional Center area and around Metro rail transit stations. This would be inconsistent with the growth strategies of the General Plan Framework Element, which encourage a jobs/housing balance near transit centers. Although, this Alternative places development potential along corridors served by local bus lines, the many benefits of establishing TOD plans around Metro rail transit stations would not be achieved, including increasing pedestrian-friendly environments and access to transit. Also, there would likely be increased vehicle miles traveled (VMT) with this Alternative, as future growth would not be concentrated at existing transit stations where residents, employees and visitors can take advantage of existing transit opportunities. Similar to the Proposed Plan, protections to historical resources and regulations for pedestrian-oriented design through the CPIO District would be established, and future development would be subject to applicable design and neighborhood compatibility protections, hillside protections, and new transportation and mobility network improvements, although to a lesser degree than the Proposed Plan.

ALTERNATIVE 4: HIGH TOD ALTERNATIVE

Alternative 4 would achieve the purpose of the project by meeting SCAG's 2040 population, housing and employment projections and would partially achieve the underlying purpose and project objectives although to a lesser degree than the Proposed Plan because it would partially focus growth outside of Framework identified centers in East Hollywood and would maintain the low scale development along commercial corridors. The High TOD Alternative would meet the same population, housing and employment projections anticipated in the Proposed Plan, and it would be better aligned with SB743's goal of more urban infill development near transit by concentrating growth at all five Metro Red Line Station areas in the Hollywood CPA, including East Hollywood. As a result of increased base FARs, buildings 20 stories or higher could become more common around the Hollywood/Highland and Hollywood/Vine stations. But

Alternative 4 would require amending the Vermont/Western Transit Oriented District Specific Plan (SNAP) to increase allowable FAR and remove a height limit around Hollywood/Western, Vermont/Sunset, and Vermont/Santa Monica stations, which generally limit the FAR to 3:1 and height to 75 feet. Similar protections to historical resources and pedestrian-oriented design regulations through the CPIO District would be established, and future development would be subject to the Proposed Plan's applicable design and neighborhood compatibility protections, hillside protections, and new transportation and mobility network improvements, although to a lesser degree than the Proposed Plan because Alternative 4 would require amending the SNAP Specific Plan to focus growth outside of Framework identified centers.

ALTERNATIVE 5: SCAG FORECAST ALTERNATIVE

This alternative would be largely considered to be similar to the No Project Alternative (Alternative 1), in terms of meeting primary and secondary objectives and foreseeable impacts, except that because the SCAG Forecast Alternative generally assumes that foreseeable development would be more spread out in the CPA and not directed as much to the Regional Center or around transit infrastructure, it would be less consistent with the growth strategies of the City as provided in the Framework Element than the No Project Alternative

5.7 COMPARISON OF ALTERNATIVES

Per the CEQA Guidelines Section 15126.6(d), each alternative is evaluated in sufficient detail to determine whether the overall environmental impacts would be less than, similar to, or greater than the Proposed Plan.

As to Alternative 5 (SCAG 2040 Forecast Alternative), as discussed above, for comparison purposes, the No Project Alternative (Alternative 1) may serve to identify the difference expected from the Proposed Project and the SCAG Forecast Alternative.

Table 5-3 provides a summary comparison of the environmental impacts of the five alternatives as compared to the Proposed Plan. Where the net impact of the alternative would be less adverse or more beneficial than the impact of the Proposed Plan, the comparative impact is said to be "less." Where the net impact of the alternative would be more adverse or less beneficial than the Proposed Plan, the comparative impact is said to be "greater." Where the net impacts of the alternative and Proposed Plan would be roughly equivalent, the comparative impact is said to be "similar."

AESTHETICS

Alternative 1: No Project Alternative. Alternative 1 would result in similar, but reduced impacts related to scenic vistas and light compared to the Proposed Plan because of the reduced amount of development expected. There are several publicly accessible locations in the Hollywood CPA that provide scenic vistas, of which there are two publicly available scenic vista points that provide panoramic views of the Project Area. Alternative 1 would be expected to have less development than the Proposed Plan, so in general, there could be fewer taller buildings in the Regional Center that could lead to a lower skyline and lower building heights along commercial corridors compared to the Proposed Plan. There are no state scenic highways within the Hollywood CPA; however, there are City-designated scenic highways, as well as historical resources within the Project Area. The Santa Monica Mountains portion of the Hollywood CPA also contains distinct geologic and topographic features. Similar to the Proposed Plan, the No Project Alternative does not involve any components that would change the scenic features associated with the City-designated scenic highways or the undeveloped natural open space areas within the Project Area.

TABLE 5-3: COMPARISON OF IMPACTS BETWEEN THE PROPOSED PLAN AND ALTERNATIVES						
Impact	**Proposed Plan**	**Alternative 1: No Project Alternative**	**Alternative 2: Reduced Alternative**	**Alternative 3: Targeted Corridors Alternative**	**Alternative 4: High TOD Alternative**	**Alternative 5: SCAG Alternative**
AESTHETICS						
Impact 4.1-1: Scenic Vista	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.1-2: Scenic Resources within State Scenic Highway	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.1-3: Visual Character	LTS	Greater, LTS	Less, LTS	Greater, LTS	Greater, LTS	Greater, LTS
Impact 4.1-4: Light and Glare	LTS -- lighting LTS with mitigation -- glare	Less, LTS – lighting Greater, SU- glare	Less, LTS – lighting Less, LTS with mitigation – glare	Greater, LTS – lighting Greater, LTS with mitigation - glare	Greater, LTS – lighting Greater, LTS with mitigation - glare	Less, LTS – lighting Greater, SU- glare
AGRICULTURE AND FORESTRY RESOURCES						
Impact 4.2-1: Important Farmland	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.2-2: Zoning and Williamson Act	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.2-3: Timberland/Forest Land Conflict	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.2-4 and **4.2-5**: Loss of Forest Land/Conversion of Forest Land to Non-Forest Use	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
AIR QUALITY						
Impact 4.3-1: Air Quality Plan	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.3-2: Violate Air Quality Standard	SU for construction for NO_X, $PM_{2.5}$, and PM_{10} and operations for VOC	*Construction:* Less, SU	*Construction:* Less, SU	*Construction:* Similar, SU	*Construction:* Similar, SU	*Construction: Less, SU*
		Operation: Less, SU	*Operation:* Less, SU	*Operation:* Greater, SU	*Operation:* Less, SU	*Operation:* Less, SU
Impact 4.3-3: Cumulative Increase	SU	Less, SU	Less, SU	Similar, SU	Similar, SU	Less, SU
Impact 4.3-4: Sensitive Receptors	*Construction*: SU	*Construction:* Less, SU	*Construction:* Less, SU	Construction: Similar, SU	Construction: Similar, SU	*Construction:* Less, SU
	Operation: LTS	*Operation:* Similar, LTS	*Operation:* Similar, LTS	*Operation:* Similar, LTS	*Operation:* Similar, LTS	*Operation:* Similar, LTS
Impact 4.3-5: Odors	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
BIOLOGICAL RESOURCES						
Impact 4.4-1: Special Status Species Habitat	SU	Greater, SU	Similar, SU	Similar, SU	Similar, SU	Greater, SU
Impact 4.4-2: Riparian Habitat	SU	Greater, SU	Similar, SU	Similar, SU	Similar, SU	Greater, SU
Impact 4.4-3: Wetlands	SU	Greater, SU	Similar, SU	Similar, SU	Similar, SU	Greater, SU

TABLE 5-3: COMPARISON OF IMPACTS BETWEEN THE PROPOSED PLAN AND ALTERNATIVES

Impact	Proposed Plan	Alternative 1: No Project Alternative	Alternative 2: Reduced Alternative	Alternative 3: Targeted Corridors Alternative	Alternative 4: High TOD Alternative	Alternative 5: SCAG Alternative
Impact 4.4-4: Migratory Wildlife, Biological Resources Plan	SU	Greater, SU	Similar, SU	Similar, SU	Similar, SU	Greater, SU
Impact 4.4-5: Local Policies or Ordinances	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.4-6: Habitat Conservation Plan	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
CULTURAL RESOURCES						
Impact 4.5-1: Historical Resources	SU	Greater, SU	Less, SU	Greater, SU	Greater, SU	Greater, SU
Impact 4.5-2: Archaeological Resources	LTS with mitigation	Greater, SU	Less, LTS with mitigation	Similar, LTS with mitigation	Similar, LTS with mitigation	Greater, SU
Impact 4.5-3: Paleontological Resources	LTS with mitigation	Greater, SU	Less, LTS with mitigation	Similar, LTS with mitigation	Similar, LTS with mitigation	Greater, SU
Impact 4.5-4: Human Remains	LTS	Similar, LTS	Less, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.5-5: Tribal Cultural Resource	LTS with mitigation	Greater, LTS	Less, LTS with mitigation	Similar, LTS with mitigation	Similar, LTS with mitigation	Greater, LTS
GEOLOGY AND SOILS						
Impact 4.6-1: Earthquake Fault	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.6-2: Seismicity	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.6-3: Seismic-Related Ground Failure	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.6-4: Soil Erosion	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.6-5: Geologic Hazards / Unstable Soils	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.6-6: Expansive Soil	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.6-7: Septic Tanks	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
GREENHOUSE GAS EMISSIONS						
Impact 4.7-1 and 4.7-2: Greenhouse Gas Emissions and Applicable Plans, Policies or Regulations	LTS	Greater, SU	Greater, LTS	Greater, LTS	Less, LTS	Greater, SU
HAZARDS AND HAZARDOUS MATERIALS						
Impact 4.8-1: Hazardous Materials Transport, Use, Disposal	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.8-2: Hazardous Materials Upset or Accident	LTS with mitigation	Greater, LTS	Similar, LTS with mitigation	Similar, LTS with mitigation	Similar, LTS with mitigation	Greater, LTS
Impact 4.8-3: Hazards within 1/4 Mile of a School	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.8-4: Hazardous Materials Sites	LTS with mitigation	Greater, LTS	Similar, LTS with mitigation	Similar, LTS with mitigation	Similar, LTS with mitigation	Greater, LTS

TABLE 5-3: COMPARISON OF IMPACTS BETWEEN THE PROPOSED PLAN AND ALTERNATIVES						
Impact	**Proposed Plan**	**Alternative 1: No Project Alternative**	**Alternative 2: Reduced Alternative**	**Alternative 3: Targeted Corridors Alternative**	**Alternative 4: High TOD Alternative**	**Alternative 5: SCAG Alternative**
Impact 4.8-5: Public Airport or Airport Plan	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.8-6: Private Airstrip	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.8-7: Emergency Response Plans	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.8-8: Wildland Fire	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
HYDROLOGY AND WATER QUALITY						
Impact 4.9-1: Water Quality Standards/Discharge Requirements	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.9-2: Groundwater	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.9-3: Drainage - Erosion or Siltation	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.9-4: Drainage - Flooding	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.9-5: Stormwater Drainage Systems	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.9-6: Water Quality	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.9-7: Housing in Flood Hazard Area	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.9-8: Structures Impeding Flood Flows	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.9-9: Risk from Flooding	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.9-10: Risk from Inundation	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.9-11: Flooding During 100-year Event	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
LAND USE AND PLANNING						
Impact 4.10-1: Physically Divide a Community	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.10-2: Land Use Plans and Policy Consistency	LTS	Greater, SU	Greater, LTS	Greater, LTS	Greater, LTS	Greater, SU
Impact 4.10-3: Habitat Conservation Plans	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
MINERAL RESOURCES						
Impact 4.11-1: Statewide/Regional Mineral Resources	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.11-2: Local Mineral Resources (i.e. MRZ-2)	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI

TABLE 5-3: COMPARISON OF IMPACTS BETWEEN THE PROPOSED PLAN AND ALTERNATIVES						
Impact	**Proposed Plan**	**Alternative 1: No Project Alternative**	**Alternative 2: Reduced Alternative**	**Alternative 3: Targeted Corridors Alternative**	**Alternative 4: High TOD Alternative**	**Alternative 5: SCAG Alternative**
NOISE						
Impact 4.12-1: Noise Levels	NI	Less, NI	Less, NI	Similar, NI	Similar, NI	Less, NI
Impact 4.12-2: Groundborne Vibration/Noise	*Construction*: SU	Less, SU	Less, SU	Similar, SU	Similar, SU	Less, SU
	Operations LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.12-3: Permanent Increase - Noise	*Stationary Sources*: SU	Less, SU	Less, SU	Similar, SU	Similar, SU	Less, SU
	Mobile Sources: LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.12-4: Temporary Increase - Noise	SU	Less, SU	Less, SU	Similar, SU	Similar, SU	Less, SU
Impact 4.12-5: Noise Exposure – Airport Plan	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
Impact 4.12-6: Noise Exposure - Private Airstrip	NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI	Similar, NI
POPULATION, HOUSING, AND EMPLOYMENT						
Impact 4.13-1: Induce Substantial Growth	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.13-2: Displacement of Housing	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.13-3: Displacement of People	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
PUBLIC SERVICES						
Impact 4.14-1: Fire Protection & Emergency Services	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.14-2: Police Protection Facilities	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.14-3: Public Schools	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.14-4: Existing Parks and Recreational Facilities a. increased use leading to degradation of existing facilities b. construction impacts from new facilities	Less, a. SU, b. LTS	Less, a. SU, b. LTS	Less, a. SU, b. LTS	Similar, a. SU, b. LTS	Similar, a. SU, b. LTS	Less, a. SU, b. LTS
Impact 4.14-5: Libraries	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS

TABLE 5-3: COMPARISON OF IMPACTS BETWEEN THE PROPOSED PLAN AND ALTERNATIVES

Impact	Proposed Plan	Alternative 1: No Project Alternative	Alternative 2: Reduced Alternative	Alternative 3: Targeted Corridors Alternative	Alternative 4: High TOD Alternative	Alternative 5: SCAG Alternative
TRAFFIC AND TRANSPORTATION						
Impact 4.15-1: Other Transportation Plans or Policies	LTS	Greater, LTS	Similar, LTS	Greater, LTS	Similar, LTS	Greater, LTS
Impact 4.15-2: CEQA Guidelines Section 15064.3(b)	LTS	Less, LTS	Less, LTS	Greater, LTS	Greater, LTS	Less, LTS
Impact 4.15-3: Design Feature Hazard	LTS	Less, LTS	Less, LTS	Greater, LTS	Similar, LTS	Less, LTS
Impact 4.15-4: Emergency Access	LTS	Less, LTS	Less, LTS	Greater, LTS	Similar, LTS	Less, LTS
UTILITIES AND SERVICE SYSTEMS						
Impact 4.16-1: Water Treatment Facilities	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.16-2: Water Supply	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.16-3, 4.16-4 and **4-16-6:** Wastewater Treatment Facilities	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.16-5: Stormwater Drainage Facilities	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.16-7: Solid Waste Disposal	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS
Impact 4.16-8: Solid Waste Regulations	LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS	Similar, LTS
Impact 4.16-9: Energy	LTS	Less, LTS	Less, LTS	Similar, LTS	Similar, LTS	Less, LTS

NI=No Impact; LTS=Less than Significant; SU=Significant and Unavoidable; PS=Potentially Significant
SOURCE: TAHA, 2018.

However, future development within the Hollywood CPA under the No Project Alternative has the potential to occur on, or adjacent to, historical resources similar to the Proposed Plan. The Proposed Plan includes policies and programs to assist in protecting historical resources, and has applicable design and neighborhood compatibility protections contributing to visual character but these would not exist under the No Project Alternative. The No Project Alternative also would not be subject to the CPIO District, which would have regulatory protections for historical resources, and would include regulations for pedestrian-oriented design. The No Project Alternative also would not include Mitigation Measure **AE1**, which would reduce glare impacts from new construction

Therefore, even though less overall development could be accommodated, and future development would be lower in scale compared to the Proposed Plan, since the applicable design and neighborhood compatibility protections and the CPIO District would not be established, and it would not include Mitigation Measure **AE1**, the No Project Alternative would result in greater impacts related to visual character and glare compared to the Proposed Plan.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in similar, but reduced impacts related to aesthetics compared to the Proposed Plan. Compared to the Proposed Plan, the Reduced Alternative directs growth to similarly-located subareas around transit stations and corridors but provides lesser development potential in selected subareas. This Alternative would reduce the allowable base FAR in selected Regional Center subareas. These subareas are generally located east of Wilcox Avenue and/or Cahuenga Boulevard, south of Yucca Street, west of Gower Street, and north of De Longpre Avenue. In addition, compared to the Proposed Plan, the Reduced Alternative would decrease the amount of mixed-use FAR incentive proposed in the La Brea Avenue, Western Avenue, and Santa Monica Boulevard corridors and the density in selected High Medium subareas. There are several publicly accessible locations in the Hollywood CPA that provide scenic vistas, of which there are two publicly available scenic vista points that provide panoramic views of the Project Area. Compared to the Proposed Plan, the Reduced Alternative would result in less anticipated development in the Regional Center and in selected corridors, so there would be lower building heights in these areas. Similar to the Proposed Project, future development under the Reduced Alternative has the potential to create new sources of light and glare, but the impact would be less because of the reduced amount of development. If Alternative 2 is adopted with Mitigation Measure **AE1** imposed, the impact will be less than significant, but if it is not imposed, the impact will be significant and unavoidable. Similar to the Proposed Plan, the Reduced Alternative does not involve any components that would change the scenic features associated with the City-designated scenic highways or the undeveloped natural open space areas within the Project Area. However, future development within the Hollywood CPA under the Reduced Alternative has the potential to occur on, or adjacent to, eligible and designated historical resources similar to the Proposed Plan. Similar to the Proposed Plan, the CPIO District, which will have regulatory protections for historical resources and pedestrian-oriented design regulations and most Active Change Areas that would occur as part of the Proposed Plan would also occur under the Reduced Alternative. Because the maximum allowable FARs (building intensity) would be less than the Proposed Plan in certain change areas, the Reduced Alternative would result in fewer impacts related to visual character compared to the Proposed Plan.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in similar impacts related to scenic vistas and scenic resources compared to the Proposed Plan. The Targeted Corridors Alternative would generally concentrate development along targeted corridors in the Hollywood CPA that could accommodate new housing, population and jobs. Compared to the Proposed Plan, the same amount of growth that would occur under the Proposed Plan would occur under the Targeted Corridors Alternative; however, future growth would be less concentrated in the Regional Center and would be dispersed more throughout the Hollywood CPA along the selected corridors. There are several publicly accessible locations in the Hollywood CPA that provide scenic vistas, of which there are two publicly available scenic vista points that provide panoramic views of the Project Area. Compared to the Proposed Plan, the Targeted

Corridors Alternative would result in more dispersed development along commercial corridors, so there would be lower building heights in the Regional Center and taller buildings along the corridors. Similar to the Proposed Plan, the Targeted Corridors Alternative does not involve any components that would change the scenic features associated with the City-designated scenic highways or the undeveloped natural open space areas within the Project Area. Future development within the Hollywood CPA under the Targeted Corridors Alternative has the potential to occur on, or adjacent to, eligible and designated historical resources similar to the Proposed Plan. Similar to the Proposed Plan, future development under Alternative 3 would be subject to the applicable new development regulations and design standards, as well as the CPIO District's regulatory protections for historical resources and regulations for pedestrian-oriented design. However, the Targeted Corridors Alternative could result in the potential for more aesthetic impacts to lower density residential neighborhoods adjacent to certain corridors (i.e., La Brea Avenue, Vine Street, Western Avenue, Vermont Avenue, Hollywood Boulevard, Sunset Boulevard, Santa Monica Boulevard, and Melrose Avenue) since there could be more mid-rise buildings between four to eight stories and potentially tall buildings, which could also create additional sources of light and concentration of reflective surfaces. Therefore, Alternative 3 could result in greater impacts related to visual character and light and glare compared to the Proposed Plan. If the Targeted Corridors Alternative is adopted with Mitigation Measure **AE1** imposed, the impact for glare will be less than significant, but if it is not imposed, the impact will be significant and unavoidable.

Alternative 4: High TOD Alternative. Alternative 4 would result in similar impacts related to scenic vistas and scenic resources as compared to the Proposed Plan. The High TOD Alternative would increase opportunities for TOD development around heavy rail infrastructure. Specifically, Alternative 4 would concentrate reasonably foreseeable housing, population, and employment development at the five Metro Red Line station areas in the Hollywood CPA, including East Hollywood. The High TOD Alternative would also expand the Regional Center land use designation east of the US-101 to selected areas near the Hollywood/Western, Vermont/Sunset, and Vermont/Santa Monica Stations. There are several publicly accessible locations in the Hollywood CPA that provide scenic vistas, of which there are two publicly available scenic vista points that provide panoramic views of the Project Area. Compared to the Proposed Plan, the High TOD Alternative would result in taller buildings near the three Red Line stations in East Hollywood. Similar to the Proposed Plan, the High TOD Alternative would not include any components that would change the scenic features associated with the City-designated scenic highways or the undeveloped natural open space areas within the Project Area. However, future development within the Hollywood CPA under the High TOD Alternative has the potential to occur on, or adjacent to, eligible and designated historical resources similar to the Proposed Plan. Similar to the Proposed Plan, future development under Alternative 4 would also be subject to new applicable design and neighborhood compatibility protections, as well as the CPIO District's regulations to protect historical resources and pedestrian-oriented design. Compared to the Proposed Plan, the High TOD Alternative could result in the potential for more aesthetic impacts to lower density neighborhoods adjacent to Metro Red Line station areas in East Hollywood. The potential height and FAR of new construction in Change Areas would be greater than under the Proposed Plan. As a result of increasing heights in concentrated areas, which could also create additional concentration of light sources and reflective surfaces, Alternative 4 could result in greater impacts related to visual character and light and glare compared to the Proposed Plan. If the High TOD Alternative is adopted with Mitigation Measure **AE1** imposed, the impact of glare will be less than significant, but if it is not imposed, the impact will be significant and unavoidable.

AGRICULTURE AND FORESTRY RESOURCES

Alternatives 1 through 4. Alternatives 1 through 4 would result in similar impacts related to agriculture and forestry resources compared to the Proposed Plan. The Hollywood CPA is an urbanized area and does not contain prime or important farmlands, timberland, or forest land. Hollywood Forever Cemetery, Forest Lawn – Hollywood Hills, Mt. Sinai Memorial Park, and a portion of the Los Angeles River along the northern boundaries of the Project Area between Barham Boulevard and Bob Hope Drive are the only areas within the Project Area that are zoned for agricultural purposes. However, these areas are not used for agricultural purposes and are not under a Williamson Act contract. In regards to forestry resources, the hillsides in the northern portion of the Project Area contain Southern Cottonwood Willow Riparian Forest, Southern Sycamore Alder Riparian Woodland, Southern Coast Live Oak Riparian Forest, and California Walnut Woodland. These areas are zoned for open space and are not defined as forest land, timberland or zoned Timberland Production. Similar to the Proposed Plan, Alternatives 1 through 4 would not affect the existing use or zoning of these areas. Therefore, similar to the Proposed Plan, no impacts related to agriculture and forestry resources would occur under Alternatives 1 through 4.

AIR QUALITY

Alternative 1: No Project Alternative. Alternative 1 would result in similar, but reduced impacts (as a result of less anticipated new development) related to air quality compared to the Proposed Plan. During the construction of future development under the No Project Alternative, regional and localized emissions could still exceed the South Coast Air Management District (SCAQMD) daily significance thresholds, resulting in a significant and unavoidable impact, similar to the Proposed Plan. The No Project Alternative would not be subject to Mitigation Measure **AQ1** related to construction equipment and practices, therefore daily emissions at individual sites could be greater than under the Proposed Plan. Because less new development could be accommodated, overall construction emissions would be less under the No Project Alternative. Compared to the Proposed Plan, the No Project Alternative would result in approximately 8,000 to 11,000 fewer housing units, 17,000 to 21,000 fewer residents and 5,000 to 8,000 fewer jobs. In the future, with buildout under the Proposed Plan, Alternative 1 would result in lower daily vehicle trips and daily VMT than the Proposed Plan. As a result of less development under the Proposed Plan, operational emissions generated by mobile sources and area sources would be less than the Proposed Plan. When compared to existing conditions, operational volatile organic compound (VOC) emissions would increase as a result of architectural coating emissions and use of consumer products (e.g., cleaning supplies, cosmetics, and toiletries) associated with new residential land uses. Similar to the Proposed Plan, the increase in VOC emissions would be greater than the SCAQMD daily significance threshold; as a result of less new development VOC emissions would be less than under the Proposed Plan but still significant. Therefore, similar to the Proposed Plan, impacts related to construction-related regional and localized emissions and operational regional emissions under the No Project Alternative would be significant and unavoidable, and all other impacts related to air quality would be less than significant.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in similar, but reduced (as a result of less anticipated development) impacts related to air quality as compared to the Proposed Plan. During the construction of future development under the Reduced Alternative, regional and localized emissions would exceed the SCAQMD daily significance thresholds, resulting in a significant and unavoidable impact, similar to the Proposed Plan. With the adoption of Alternative 2 subject to Mitigation Measure **AQ1** related to construction equipment and practices, emissions would be reduced but could still exceed the established thresholds and would remain significant and unavoidable. Because less new development could be accommodated, overall construction emissions would be less under the Reduced Alternative compared to the Proposed Plan. The Reduced Alternative would result in approximately 4,000 fewer housing units, 8,000 fewer residents and a similar number of jobs compared to the Proposed Plan. In addition, daily vehicle trips and VMT would be lower in Alternative 2 compared to the Proposed Plan. As a result of less new development, operational emissions generated by mobile sources and area sources would be less than the Proposed Plan. When compared to existing conditions, operational VOC emissions would increase as a result of architectural coating emissions and use of consumer products (e.g., cleaning supplies, cosmetics, and toiletries) associated with new residential land uses. Similar to the Proposed Plan, the increase in VOC emissions would be greater than the SCAQMD daily significance threshold; as a result of less new development VOC emissions would be less than under the Proposed Plan but still significant. Therefore, similar to the Proposed Plan, impacts related to construction-related regional and localized emissions and operational regional emissions would be less under the Reduced Alternative but would be significant and unavoidable, and all other impacts related to air quality would be less than significant.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in similar impacts related to air quality as compared to the Proposed Plan. During the construction of future development under the Targeted Corridors Alternative, regional and localized emissions would exceed the SCAQMD daily significance thresholds, resulting in a significant and unavoidable impact, similar to the Proposed Plan. With the adoption of Alternative 3 subject to Mitigation Measure **AQ1** related to construction equipment and practices, emissions would be reduced but could still exceed the established thresholds and would be similarly significant and unavoidable. Because the same amount of development could be accommodated, overall construction emissions would be similar under the Targeted Corridors Alternative as compared to under the Proposed Plan. However, Alternative 3 results in a greater total mobile source exposure due to increased VMT. Operational emissions generated by mobile sources would be greater than the Proposed Plan. When compared to existing conditions, operational VOC emissions would increase as a result of architectural coating emissions and use of consumer products (e.g., cleaning supplies, cosmetics, and toiletries) associated with new residential land uses. Similar to the Proposed Plan, the increase in VOC emissions would be greater than the SCAQMD daily significance threshold. Therefore, similar to the Proposed Plan, impacts related to construction-related regional and localized emissions and operational regional emissions under the Targeted Corridors Alternative would be significant and unavoidable, and all other impacts related to air quality would be less than significant.

Alternative 4: High TOD Alternative. Alternative 4 would result in similar impacts related to air quality as compared to the Proposed Plan. During the construction of future development under the High TOD Alternative, regional and localized emissions would exceed the SCAQMD daily significance thresholds, resulting in a significant and unavoidable impact, similar to the Proposed Plan. With the adoption of Alternative 4 subject to Mitigation Measure **AQ1** related to construction equipment and practices, emissions would be reduced but could still exceed the established thresholds and would be similarly significant and unavoidable. Because the same amount of development could be accommodated, overall construction emissions would be similar under the High TOD Alternative as compared to the Proposed Plan. However, Alternative 4 results in a slightly lower total mobile source exposure due to decreased VMT. Operational emissions generated by mobile sources would be less than the Proposed Plan. When compared to existing conditions, operational VOC emissions would increase as a result of architectural coating emissions and use of consumer products (e.g., cleaning supplies, cosmetics, and toiletries) associated with new residential land uses. Similar to the Proposed Plan, the increase in VOC emissions would be greater than the SCAQMD daily significance threshold. Therefore, similar to the Proposed Plan, impacts related to construction-related regional and localized emissions and operational regional emissions under the High TOD Alternative would be significant and unavoidable, and all other impacts related to air quality would be less than significant.

BIOLOGICAL RESOURCES

Alternative 1: No Project Alternative. Alternative 1 would result in greater impacts related to biological resources as compared to the Proposed Plan. There are no Natural Community Conservation Plans (NCCPs) or other local, regional, or state-adopted Habitat Conservation Plans (HCPs) within or near the Project Area, so similar to the Proposed Plan the impact on local policies or ordinances would be less than significant, and there would be no impact on a habitat conservation plan. However, most of the Santa Monica Mountains east of US-101, including Griffith Park, are part of a Significant Ecological Area (SEA). Other areas within the Project Area that have the potential to support biological resources include the portion of the Los Angeles River that flows within the Project Area and various open space areas within the Project Area. Although areas that have the potential to support biological resources within the Project Area would remain unchanged under Alternative 1, it is reasonably foreseeable that properties in these areas could potentially be developed. Compared to the Proposed Plan, No Project Alternative would not include Mitigation

Measures **BR1** to **BR6**. Therefore, impacts related to biological resources under the No Project Alternative would be greater than the Proposed Plan, and would also be significant and avoidable.

Alternatives 2 through 4: Reduced Alternative, Targeted Corridor Alternative, and High TOD Alternative. Alternatives 2 through 4 would result in similar impacts related to biological resources as compared to the Proposed Plan. There are no Natural Community Conservation Plans (NCCPs) or other local, regional, or state-adopted Habitat Conservation Plans (HCPs) within or near the Project Area, so similar to the Proposed Plan the impact on local policies or ordinances would be less than significant, and there would be no impact on a habitat conservation plan. However, most of the Santa Monica Mountains east of US-101, including Griffith Park, are part of a Significant Ecological Area (SEA). Other areas within the Project Area that have the potential to support biological resources include the portion of the Los Angeles River that flows within the Project Area and various open space areas within the Project Area. Under the Proposed Plan, there are two subareas located within the SEA where consistency corrections are proposed to ensure that these areas are protected. The remaining areas of the SEA and Santa Monica Mountains are in Non-Change Areas. Although areas that have the potential to support biological resources within the Project Area would remain unchanged under Alternatives 2 through 4, it is reasonably foreseeable that properties in these areas could potentially be developed. If one of Alternatives 2 through 4 is adopted subject to Mitigation Measures **BR1** to **BR6,** it would reduce impacts to special status species, riparian habitat, wetlands, and biological resources, although not to a less-than-significant level. Therefore, similar to the Proposed Plan, impacts related to biological resources under Alternatives 2 through 4 would be significant and unavoidable.

CULTURAL RESOURCES

Alternative 1: No Project Alternative. Alternative 1 would result in greater impacts related to historical, archaeological resources, and paleontological resources compared to the Proposed Plan. Compared to the Proposed Plan, under the No Project Alternative the CPIO District, which has regulations to protect historical resources, would not be established, and future development would not be subject to the Proposed Plan's applicable design and neighborhood compatibility protections. Similar to the Proposed Plan, construction-related ground disturbing activities associated with future development under Alternative 1 could lead to the discovery of previously unknown archaeological or paleontological resources as well as tribal resources or human remains. Overall construction would be less under the No Project Alternative, which could lead to less potential to encounter these resources. However, the No Project Alternative would not include the mitigation measures included under the Proposed Plan to protect archaeological or paleontological resources, although likely project-specific environmental review would impose similar requirements on discretionary projects. Although it is a misdemeanor for anyone to remove anything of archeological or paleontological interest, it could potentially occur through negligence during grading and excavation absent monitoring and enforcement. Compliance with existing regulations, including California Health and Safety Code Section 7050.5, which states that, if human remains are unearthed during construction, then no further disturbance shall occur until the County Coroner has made the necessary findings as to the origin and disposition of the remains pursuant to Public Resources Code (PRC) Section 5097.98.[2] Therefore, similar to the Proposed Plan, impacts related to tribal resources and human remains under Alternatives 1 and 5 would be less than significant, while compared to the Proposed Plan, impacts related to archaeological and paleontological resources would be significant and unavoidable.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in similar but reduced impacts (as a result of less anticipated development) related to historical and tribal cultural resources compared to the Proposed Plan. Similar to the Proposed Plan, the Reduced Alternative focuses development at transit stations and corridors within the CPA, although with less

[2]Section 5097.98 outlines the Native American Heritage Commission notification process and the appropriate procedures if the County Coroner determines the human remains to be Native American.

development potential for housing and population. Similar to the Proposed Plan, the CPIO District, which has regulations to protect historical resources and regulations for pedestrian-oriented design, would be established, and future development would be subject to new design and neighborhood compatibility protections as applicable. However, as with the Proposed Plan, even with the CPIO, there is a risk of loss of historical resources with new development or redevelopment over a 20-year plan horizon, so the impact would be significant and unavoidable. Therefore, Alternative 2 would result in similar but reduced impacts related to historical resources compared to the Proposed Plan. Construction-related ground disturbing activities associated with future development under Alternative 2 could lead to the discovery of previously unknown archaeological or paleontological resources as well as tribal resources or human remains similar to the Proposed Plan. Overall construction would be less under Alternative 2, which could lead to less potential to encounter resources. The Reduced Alternative adopted with the same mitigation measures identified for the Proposed Plan to protect archaeological, paleontological and tribal resources would result in less than significant impacts to these resources, but without the mitigation measure the impact would be significant. Compliance with existing regulations, including California Health and Safety Code Section 7050.5, which states that, if human remains are unearthed during construction, then no further disturbance shall occur until the County Coroner has made the necessary findings as to the origin and disposition of the remains pursuant to PRC Section 5097.98[3] would result in less than significant impacts to human remains. Since overall construction would be less under Alternative 2, there would also be less impacts to human remains compared to the Proposed Plan.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in incrementally greater impacts related to historical resources as compared to the Proposed Plan. Under the Targeted Corridors Alternative, growth would be less concentrated in the Regional Center and would be dispersed more throughout the Project Area along designated corridors instead of focused around the heavy rail stations compared to the Proposed Plan. The Targeted Corridors Alternative would concentrate growth along commercial corridors such as Santa Monica Boulevard and Melrose Avenue, which are outside of the CPIO boundaries. Since the CPIO regulations to protect historical resources would apply to less of the targeted growth areas than the Proposed Plan, it could result in incrementally greater impacts related to historical resources than the Proposed Plan. As discussed in Alternative 2, even if the CPIO was expanded to include the corridors, the impacts would be significant and unavoidable. Similar to the Proposed Plan, construction-related ground disturbing activities associated with future development under Alternative 3 could lead to the discovery of previously unknown archaeological or paleontological resources as well as tribal resources or human remains. The Targeted Corridors Alternative adopted with the same mitigation measures identified for the Proposed Plan to protect archaeological, paleontological or tribal resources would result in less than significant impacts to these resources, without the mitigation measure the impact would be significant. Compliance with existing regulations, including California Health and Safety Code Section 7050.5, which states that, if human remains are unearthed during construction, then no further disturbance shall occur until the County Coroner has made the necessary findings as to the origin and disposition of the remains pursuant to PRC Section 5097.98[4] would result in less than significant impacts to human remains. Therefore, impacts to human remains would be similar to the Proposed Plan.

Alternative 4: High TOD Alternative. Alternative 4 would result in incrementally greater impacts related to historical resources as compared to the Proposed Plan. The High TOD Alternative would increase opportunities for TOD development around heavy rail infrastructure within the Project Area and would concentrate the anticipated new housing, population, and employment at the five Metro Red Line station areas in the CPA, including East Hollywood. The High TOD Alternative would also expand the Regional Center land use designation east of the US-101 to selected areas near the Hollywood/Western, Vermont/Sunset, and Vermont/Santa Monica Metro stations. Since these areas in East Hollywood are

[3]Section 5097.98 outlines the Native American Heritage Commission notification process and the appropriate procedures if the County Coroner determines the human remains to be Native American.

[4]*Ibid.*

outside of the CPIO boundaries, the CPIO District's protections for historical resources would apply to less of the targeted growth areas than the Proposed Plan. Therefore, Alternative 4 could result in incrementally greater impacts related to historical resources than the Proposed Plan. As discussed in Alternative 2, even if the CPIO was expanded to include the corridors, the impacts would be significant and unavoidable. Construction-related ground disturbing activities associated with future development under Alternative 4 could lead to the discovery of previously unknown archaeological or paleontological resources as well as human remains similar to the Proposed Plan. The High TOD Alternative adopted with the same mitigation measures identified for the Proposed Plan to protect archaeological, paleontological or tribal resources would result in less than significant impacts to these resources, without the mitigation measure the impact would be significant. Compliance with existing regulations, including California Health and Safety Code Section 7050.5, which states that, if human remains are unearthed during construction, then no further disturbance shall occur until the County Coroner has made the necessary findings as to the origin and disposition of the remains pursuant to PRC Section 5097.98[5] would result in less than significant impacts to human remains. Therefore, impacts to human remains would be similar to the Proposed Plan.

GEOLOGY AND SOILS

Alternatives 1 through 4. Alternatives 1 through 4 would result in similar impacts related to geology and soils compared to the Proposed Plan. The Project Area, like all communities in the City of Los Angeles, is in a seismically active region, and is subject to risk of damage as a result of seismic ground shaking from earthquakes originating on one or more of the active faults in the region. Similar to the Proposed Plan, Alternatives 1 through 4 would not exacerbate existing geologic conditions, and compliance with existing California Building Code (CBC) and Los Angeles Building Code (LABC) regulations would minimize the effects of seismic and geologic hazards to the maximum extent feasible. Likewise, all future construction activities that involve earthwork and grading under Alternatives 1 through 4 would be required to comply with applicable provisions of Chapter IX, Division 70 of the Los Angeles Municipal Code (LAMC), which addresses grading, excavations, and fills, and the recommendations of a site-specific geotechnical report. Similar to the Proposed Plan, site-specific projects under Alternatives 1 through 4 would also be required to comply with the City's Low Impact Development Ordinance, which would help reduce soil erosion and the loss of topsoil. Therefore, similar to the Proposed Plan, impacts related to geology and soils under Alternatives 1 through 4 would be less than significant and/or have no impact.

GREENHOUSE GAS EMISSIONS

Alternative 1: No Project Alternative. Alternative 1 would result in greater impacts related to GHG and GHG reduction plans compared to the Proposed Plan. Compared to the Proposed Plan, the decreased development under the No Project Alternative would result in less stationary source emissions in the Project Area, but regionally, the decreased development under this Alternative could result in development occurring in locations outside of Framework designated centers and corridors that are less compatible with GHG reduction policies. Similar to the Proposed Plan, estimated GHG emissions associated with transportation emissions in the Project Area would be less than existing conditions due to lower vehicle exhaust resulting from lower vehicle emissions resulting from increased engine efficiency and cleaner burning fuels. However, because the No Project Alternative is a continuation of the Existing Plan, future development would not be directed toward major transit nodes. As a result, this Alternative would not be consistent with the Framework Element, AB 32, SB 32, SB 375, 2016-2040 RTP/SCS, and other regional strategies to reduce GHG. Therefore, while overall emissions in the plan area would be reduced, impacts related to consistency with GHG reduction plans would be greater than the Proposed Plan and would be significant and unavoidable.

[5]Section 5097.98 outlines the Native American Heritage Commission notification process and the appropriate procedures if the County Coroner determines the human remains to be Native American.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in similar, but greater impacts related to GHG compared to the Proposed Plan. The Reduced Alternative would be consistent with applicable GHG plans, policies, and regulations, as a result of the concentration of future development in major transit areas under this Alternative. Similar to the Proposed Plan, Alternative 2 focuses new development at major transit nodes consistent with the Framework Element, AB 32, SB 32, SB 375, and SCAG policies, in order to increase transit ridership and reduce automobile dependence, which contributes to the reduction of GHG emissions in the long-term compared to unplanned growth that is dispersed throughout the CPA. Furthermore, estimated emissions would be less than existing conditions due to lower vehicle exhaust resulting from increased engine efficiency and cleaner burning fuels. This Alternative would not result in as much density next to transit as the Proposed Plan, which, regionally, could result in development occurring in locations less compatible with GHG reductions policies. Overall, impacts related to GHG emissions and consistency with GHG reduction plans would be greater than the Proposed Plan but would still be less than significant.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in greater impacts related to GHG compared to the Proposed Plan. Under the Targeted Corridors Alternative, future growth is concentrated along targeted corridors of the Hollywood CPA, however, in contrast to the Proposed Plan, Alternative 3 would not focus growth at heavy rail transit nodes. As a result, the Targeted Corridors Alternative would be partially consistent with GHG reduction plans (e.g., AB 32, SB 32, SB 375) compared to the Proposed Plan. Nonetheless, impacts related to consistency with applicable GHG plans, policies and regulations would remain less than significant. Similar to the Proposed Plan, estimated emissions under the Targeted Corridors Alternative would be less than existing conditions due to lower vehicle exhaust resulting from increased engine efficiency and cleaner burning fuels. Similar to the Proposed Plan, impacts related to GHG emissions and consistency with GHG reduction plans would be less than significant.

Alternative 4: High TOD Alternative. Alternative 4 would result in similar, but reduced impacts related to GHG compared to the Proposed Plan. Similar to the Proposed Plan, the High TOD Alternative focuses development potential at major transit nodes consistent with the Framework Element, AB 32, SB 32, SB 375, and SCAG policies, in order to increase transit ridership and reduce automobile dependence, which contributes to the reduction of GHG emissions in the long-term compared to unplanned growth that is dispersed throughout the CPA. Therefore, Alternative 4 would be consistent with applicable GHG plans, policies, and regulations, as a result of the concentration of future development in major transit areas under this Alternative. Furthermore, estimated emissions would be less than existing conditions due to lower vehicle exhaust resulting from increased engine efficiency and cleaner burning fuels. Therefore, similar to the Proposed Plan, impacts related to GHG emissions and consistency with GHG reduction plans would be less than significant.

HAZARDS AND HAZARDOUS MATERIALS

Alternative 1: No Project. Compared to the Proposed Plan, Alternative 1 would result in greater impacts related to hazardous materials as a result of site disturbance or redevelopment of sites that have previously used hazardous materials on site. Due to the age of development in the Project Area, some properties likely have structures that contain Asbestos-Containing Materials (ACMs) and Lead-Based Paint (LBPs). Likewise, there are some properties within the Project Area with potential hazardous concerns. Future development in the Project Area under the No Project Alternative would be required to comply with federal and state regulations regarding materials containing ACMs and LBPs similar to the Proposed Plan. Implementation of the No Project Alternative would also allow development on sites currently or historically used for industrial uses that may have used hazardous materials in their operations similar to the Proposed Plan. The use of hazardous materials is typically associated with industrial land uses, and there are several clusters of low-intensity industrial uses scattered throughout the Project Area. Therefore, because unknowns may exist with regard to existing soil or other contaminants in the areas currently or historically zoned as industrial in the Project Area, there is the possibility that future development may uncover previously undiscovered soil and other forms of contamination and since Alternative 1 would not include Mitigation Measure **HM1**, the impact related to unknown hazardous materials would be significant and unavoidable. Compliance with applicable regulations would ensure that future development under Alternative 1 would not create a significant hazard to the public, schools, or the environment through the transport, use, and disposal of hazardous materials. Similar to the Proposed Plan, Alternative 1 would not impair implementation of, or physically interfere with, the Safety Element of the City's General Plan, as it would not introduce new streets or otherwise change the overall land use pattern in the Project Area.

Alternatives 2 through 4. Alternatives 2 through 4 would result in similar impacts related to hazards and hazardous materials as compared to the Proposed Plan. Due to the age of development in the Project Area, some properties likely have structures that contain Asbestos-Containing Materials (ACMs) and Lead-Based Paint (LBPs). Likewise, there are numerous properties within the Project Area with potential hazardous concerns. Future development in the Project Area under Alternatives 2 through 4 would be required to comply with federal and state regulations regarding materials containing ACMs and LBPs similar to the Proposed Plan. Implementation of Alternatives 2 through 4 would also allow development on sites currently or historically used for industrial uses that may have used hazardous materials in their operations similar to the Proposed Plan. The use of hazardous materials is typically associated with industrial land uses, and there are several clusters of low-intensity industrial uses scattered throughout the Project Area. Therefore, because unknowns may exist with regard to existing soil or other contaminants in the areas currently or historically zoned as industrial in the Project Area, there is the possibility that future development may uncover previously undiscovered soil and other forms of contamination, including the release of hazardous materials. If one of Alternatives 2 through 4 is adopted with Mitigation Measure **HM1** imposed, the impact will be less than significant, but if the mitigation measure is not adopted the impact will be significant and unavoidable. Compliance with applicable regulations would ensure that future development under Alternatives 2 through 4 would not create a significant hazard to the public, schools, or the environment through the transport, use, or disposal of hazardous materials. Similar to the Proposed Plan, Alternatives 2 through 4 would not impair implementation of, or physically interfere with, the Safety Element of the City's General Plan, as the alternatives would not introduce new streets or otherwise change the overall land use pattern in the Project Area. Therefore, similar to the Proposed Plan, impacts related to hazards and hazardous materials under Alternatives 1 through 4 would be less than significant or have no impact similar to the Proposed Plan.

HYDROLOGY AND WATER QUALITY

Alternatives 1 through 4. Alternatives 1 through 4 would result in no impacts or less than significant impacts related to hydrology and water quality compared to the Proposed Plan. Similar to the Proposed Plan, the overall land use patterns of the Project Area would remain relatively unchanged under Alternatives 1 through 4 compared to existing conditions. The undeveloped open space areas within the Project Area would remain undeveloped under Alternatives 1 through 4. Thus, the rate and volume of stormwater runoff within the Project Area would remain relatively unchanged since only a modest amount of the remaining developable land in the Project Area is vacant or undeveloped. In addition, because the overall land use patterns of the Project Area would remain relatively unchanged, Alternatives 1 through 4, potential changes in the types of pollutants in stormwater runoff would be similar to existing conditions. Alternatives 1 through 4 do not contain any specific guidelines or changes that would violate any water quality standards or waste discharge requirements which are subject to the federal, state, and local standards and regulations. Therefore, similar to the Proposed Plan, impacts related to hydrology and water quality under Alternatives 1 through 4 would be less than significant and/or have no impact.

LAND USE AND PLANNING

Alternative 1: No Project Alternative. Alternative 1 would result in greater impacts related to land use and planning compared to the Proposed Plan. The No Project Alternative is the continuation of the existing 1988 Hollywood Community Plan (Existing Plan). Similar to the Proposed Plan, the No Project Alternative does not include any extension of roadways or other transit infrastructure through currently developed areas that could physically divide or isolate existing neighborhoods or an established community. However, under the No Project Alternative, no changes to existing zoning and General Plan land use designations would occur, regardless of the known inconsistencies between existing and surrounding land uses, zoning and/or General Plan land use designations. In addition, the CPIO District, which would have regulatory protections for historical resources as well as regulations for pedestrian-oriented design, would not be established, and future development within the Project Area would not be subject to the Proposed Plan's applicable development regulations or policies. Additionally, planning in the Project Area would not be updated to address state and regional requirements to reduce GHG emissions consistent with SB 375 and the SCAG SCS. Therefore, impacts related to land use and planning under the No Project Alternative would be greater than the Proposed Plan and significant and unavoidable.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in greater impacts related to land use and planning compared to the Proposed Plan. Similar to the Proposed Plan, the Reduced Alternative does not include any extension of roadways or other transit infrastructure through currently developed areas that could physically divide or isolate existing neighborhoods or an established community. Consistent with City's General Plan Framework Element, as well other City and SCAG policies, which call for new growth to be directed towards transit, the Reduced Alternative focuses development potential at transit stations and corridors within the Project Area with less development potential for housing and population compared to the Proposed Plan. Since Alternative 2 would not result in as much density next to transit as the Proposed Plan, regionally it could result in development occurring in locations outside of Framework identified centers and corridors. However, the Reduced Alternative would still meet SCAG's 2040 population, housing and employment projections for the Project Area. This Alternative would reduce the allowable base FAR in selected Regional Center subareas, the FAR along selected corridors and maintain and/or set a reduced residential density in selected High Medium Residential subareas. Similar to the Proposed Plan, future development would be subject to the new applicable design and neighborhood compatibility protections, as well as the CPIO District, which will have regulatory protections for historical resources and pedestrian-oriented design regulations. Therefore, impacts related to land use and planning under the Reduced Alternative would be greater than the Proposed Plan but would still be less than significant.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in greater impacts related to land use and planning compared to the Proposed Plan. Similar to the Proposed Plan, this Alternative does not include any extension of roadways or other transit infrastructure through currently developed areas that could physically divide or isolate existing neighborhoods or an established community. Under the Targeted Corridors Alternative, growth would be less concentrated in the Regional Center and would be dispersed more in the Project Area along designated corridors instead of focused around rail stations compared to the Proposed Plan. Compared to the Proposed Plan, the same amount of growth would occur under the Targeted Corridors Alternative, but it would be less concentrated in the Regional Center and would be dispersed more throughout the Hollywood CPA along the designated corridors. Similar to the Proposed Plan, future development would be subject to the new applicable design and neighborhood compatibility protections, as well as the CPIO District, which will have regulatory protections for historical resources and pedestrian-oriented design standards. Therefore, impacts related to land use and planning under the Targeted Corridors Alternative would be greater than the Proposed Plan but would still be less than significant.

Alternative 4: High TOD Alternative. Alternative 4 would result in greater impacts related to land use and planning compared to the Proposed Plan. Similar to the Proposed Plan, this Alternative does not include any extension of roadways or other transit infrastructure through currently developed areas that could physically divide or isolate existing neighborhoods or an established community. The High TOD Alternative would increase opportunities for TOD development around heavy rail infrastructure within the Project Area and concentrate new housing, population, and employment at the five Metro Red Line station areas in the CPA, including East Hollywood. The High TOD Alternative would also extend the Regional Center land use designation east of the 101 Freeway to selected areas near the Hollywood/Western, Vermont/Sunset, and Vermont/Santa Monica stations, which are outside of the Framework identified Regional Centers. Similar to the Proposed Plan, future development under Alternative 4 would be subject to applicable new design and neighborhood compatibility protections, as well as the CPIO District, which will have regulatory protections for historical resources and pedestrian-oriented design regulations. Therefore, impacts related to land use and planning under the Alternative 4 would be greater than the Proposed Plan but would still be less than significant.

MINERAL RESOURCES

Alternatives 1 through 4. Alternatives 1 through 4 would result in similar impacts related to mineral resources compared to the Proposed Plan. Portions of the Project Area are classified as MRZ-2 which indicates the presence of significant mineral resources. The MRZ-2 classified areas within the Project Area include Griffith Park, Mount Hollywood, Spring Canyon, Fern Canyon, Interstate 5, and State Route 134. Regardless of the MRZ-2 classification, the existing zoning and land use designations do not allow for the extraction of mineral resources, and resource recovery does not occur in the Project Area. Similar to the Proposed Plan, Alternatives 1 through 4 do not include provisions to reduce the availability of mineral resources or include policies that would encourage extraction of known mineral resources in the Project Area. Because of the urban nature of the Project Area, mining activities would likely be incompatible with existing uses. The Project Area is not underlain with active oil fields, and the existing oil wells located in the Project Area are inactive and designated as buried-idle, plugged or idle. Similar to the Proposed Plan, Alternatives 1 through 4 do not include provisions that would introduce new oil districts or oil producing uses and do not include provisions to reduce the availability of these resources. Therefore, similar to the Proposed Plan, there would be no impacts related to mineral resources under Alternatives 1 through 4.

NOISE

Alternative 1: No Project Alternative. Alternative 1 would result in similar, but reduced impacts (as a result of less anticipated new development) related to noise and vibration compared to the Proposed Plan. Similar to the Proposed Plan, construction activity occurring within the Hollywood CPA under the No Project Alternative would result in temporary increases in noise and vibration levels on an intermittent basis. In the absence of detailed noise analyses associated with specific projects, it is anticipated that construction noise levels at various sensitive land uses would result in significant impacts similar to the Proposed Plan. The No Project Alternative would not be subject to Mitigation Measures **N1** to **N4** that would reduce construction-related noise and vibration impacts, although likely project-specific environmental review would impose similar requirements on discretionary projects. Nonetheless, Alternative 1 would result in significant and unavoidable impacts related to construction noise and groundborne vibration similar to the Proposed Plan (although total construction would be less under Alternative 1). Total mobile source noise exposure would increase over existing conditions because of increased VMT under the No Project Alternative. However, total mobile source noise exposure would be less compared to the Proposed Plan due to Alternative 1 resulting in less VMT than the VMT of the Proposed Plan. Similar to the Proposed Plan, new development may border residential areas, leading to noise incompatibility between land uses and operational noise from stationary sources. However, mobile noise would not increase significantly on area roadways and would be less than significant, similar to the Proposed Plan. It is not anticipated that the Hollywood CPA would be developed with substantial sources of noise or vibration (e.g., certain loud industrial processes). Therefore, similar to the Proposed Plan, the No Project Alternative would result in significant and unavoidable impacts related to construction noise, groundborne vibration noise from construction, and permanent noise increase from operational stationary sources, and impacts related to operational vibration noise and permanent noise increase from mobile sources would be less than significant.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in similar, but reduced impacts (as a result of less anticipated new development) related to noise and vibration compared to the Proposed Plan. Similar to the Proposed Plan, construction activity occurring within the Hollywood CPA would result in temporary increases in noise and vibration levels on an intermittent basis, and new development could border residential areas leading to noise incompatibility between land uses. In the absence of detailed noise analyses associated with specific projects, it is anticipated that construction noise levels at various sensitive land uses would exceed the City's thresholds of significance similar to the Proposed Plan. However, because development under Alternative 2 would be generally reduced (by approximately 4,000 housing units, 8,000 residents and with a similar number of jobs) compared to the Proposed Plan, noise associated with construction of future development would be less. If the Reduced Alternative is adopted with Mitigation Measures **N1** to **N4** imposed**,** construction-related noise and vibration impacts would be reduced, although not to a less-than-significant level. Under the Reduced Alternative, total mobile source noise exposure would be less than the Proposed Plan due to Alternative 2 resulting in less VMT. Therefore, similar to the Proposed Plan, mobile noise under Alternative 2 would not generate a significant increase in ambient noise levels and would be less than significant. It is not anticipated that the Hollywood CPA would be developed with substantial sources of noise or vibration (e.g., certain loud industrial processes) under Alternative 2. Therefore, although incrementally less than the Proposed Plan as a result of less overall development, the Reduced Alternative would result in significant and unavoidable impact related to construction noise, groundborne vibration noise from construction, and permanent noise increase from operational stationary sources, and impacts related to operational vibration noise and permanent noise increase from mobile sources would be less than significant.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in similar, impacts related to noise and vibration as compared to the Proposed Plan. Similar to the Proposed Plan, construction activity occurring within the Hollywood CPA would result in temporary increases in noise and vibration levels on an intermittent basis, and new development could border residential areas leading to noise incompatibility between land uses. In the absence of detailed noise analyses associated with specific projects, it is anticipated that construction noise levels at various sensitive land uses would exceed the City's thresholds of significance similar to the Proposed Plan. The Targeted Corridors Alternative would result in the same anticipated population, housing and employment as the Proposed Plan, but it would be less concentrated in the Regional Center and would be dispersed more in the Hollywood CPA along designated corridors. Therefore, noise associated with construction of future development would be similar but more dispersed. If the Targeted Corridors Alternative is adopted with Mitigation Measures **N1** to **N4** imposed, construction-related noise and vibration impacts would be reduced, although not to a less-than-significant level. Alternative 3 results in a greater total mobile source noise exposure due to increased VMT. However, similar to the Proposed Plan, mobile noise would not generate a significant increase in ambient noise levels and would be less than significant. It is not anticipated that the Hollywood CPA would be developed with substantial sources of noise or vibration (e.g., certain loud industrial processes) under Alternative 3. Therefore, similar to the Proposed Plan, the Targeted Corridors Alternative would result in significant and unavoidable impact related to construction noise, ground borne vibration noise from construction, and permanent noise increase from operational stationary sources, and impacts related to operational vibration noise and permanent noise increase from mobile sources would be less than significant.

Alternative 4: High TOD Alternative. Alternative 4 would result in similar, impacts related to noise and vibration as compared to the Proposed Plan. Similar to the Proposed Plan, construction activity occurring within the Hollywood CPA would result in temporary increases in noise and vibration levels on an intermittent basis, and new development may border residential areas leading to noise incompatibility between land uses. In the absence of detailed noise analyses associated with specific projects, it is anticipated that construction noise levels at various sensitive land uses would exceed the City's thresholds of significance similar to the Proposed Plan. The High TOD Alternative would result in the same population, housing and employment development potential as the Proposed Plan, but would direct the growth to the five Metro Red Line station areas in the Hollywood CPA, including East Hollywood. The High TOD Alternative would also expand the Regional Center land use designation east of the 101 Freeway to selected areas near the Hollywood/Western, Vermont/Sunset, and Vermont/Santa Monica Metro stations. Therefore, noise associated with construction of future development would be similar, but concentrated near the five Metro Red Line station areas. If the High TOD Alternative is adopted with Mitigation Measures **N1** to **N4** imposed, construction-related noise and vibration impacts would be reduced, although not to a less-than-significant level. Alternative 4 would result in a less total mobile source noise exposure due to increased VMT. However, similar to the Proposed Plan, mobile noise would not generate a significant increase in ambient noise levels and would be less than significant. It is not anticipated that the Hollywood CPA would be developed with substantial sources of noise or vibration (e.g., certain loud industrial processes) under Alternative 4. Therefore, similar to the Proposed Plan, the High TOD Alternative would result in significant and unavoidable impact related to construction noise, groundborne vibration noise from construction, and permanent noise increase from operational stationary sources, and impacts related to operational vibration noise and permanent noise increase from mobile sources would be less than significant.

POPULATION, HOUSING AND EMPLOYMENT

Alternative 1: No Project Alternative. Alternative 1 would result in less impacts related to population, housing and employment compared to the Proposed Plan. Similar to the Proposed Plan, Alternative 1 would not result in the substantial displacement of housing or people as no housing units are specifically proposed to be demolished, converted to market rate, or removed through other means. Based on existing development potential under the Existing Plan's land use designations, the No Project Alternative would result in 113,000 to 121,000 housing units, 226,000 to 243,000 residents, and 119,000 jobs. Compared to the Proposed Plan, the No Project Alternative would result in 8,000 to 11,000 fewer housing units, 17,000 to 21,000 fewer persons and 5,000 to 8,000 fewer jobs. Similar to the Proposed Plan, impacts related to population, housing and employment under the No Project Alternative would be less than significant.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in less impacts related to population, housing and employment compared to the Proposed Plan. Similar to the Proposed Plan, the Reduced Alternative would not result in the substantial displacement of housing or people as no housing units are specifically proposed to be demolished, converted to market rate, or removed through other means. While the Reduced Alternative would meet SCAG's 2040 population, housing and employment projections for the Project Area, the development potential of the Project Area would be reduced compared to the Proposed Plan. The reasonably expected development potential under the Reduced Alternative would be approximately 117,000 to 128,000 housing units, 235,000 to 256,000 residents, and 124,000 to 127,000 jobs. Compared to the Proposed Plan, the Reduced Alternative would result in approximately 4,000 fewer housing units, 8,000 fewer residents and a similar number of jobs. Therefore, similar to the Proposed Plan, impacts related to population, housing and employment under the Reduced Alternative would be less than significant.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in similar impacts related to population, housing and employment compared to the Proposed Plan. Similar to the Proposed Plan, the Targeted Corridors Alternative would not result in the substantial displacement of housing or people as no housing units are specifically proposed to be demolished, converted to market rate, or removed through other means. However, compared to the Proposed Plan, the growth would be less concentrated in the Regional Center and would be dispersed more throughout the Project Area. Nonetheless, the Targeted Corridors Alternative would meet the same population, housing and employment projections anticipated in the Proposed Plan. Therefore, similar to the Proposed Plan, impacts related to population, housing and employment under the Targeted Corridors Alternative would be less than significant.

Alternative 4: High TOD Alternative. Alternative 4 would result in similar impacts related to population, housing and employment compared to the Proposed Plan. Similar to the Proposed Plan, the High TOD Alternative would not result in the substantial displacement of housing or people as no housing units are specifically proposed to be demolished, converted to market rate, or removed through other means. However, compared to the Proposed Plan, the growth would be concentrated at all five Metro Red Line station areas in the Hollywood CPA, including East Hollywood. Nonetheless, the High TOD Alternative would meet the same population, housing and employment projections anticipated in the Proposed Plan. Therefore, similar to the Proposed Plan, impacts related to population, housing and employment under the High TOD Alternative would be less than significant.

PUBLIC SERVICES

Alternatives 1 through 4. Alternatives 1 through 4 would result in similar impacts related to public services compared to the Proposed Plan. Alternatives 1 through 4 would be expected to have increased development compared to existing conditions, also increased demand for schools, police and fire services, parks, and/or library facilities. The demand for these services under Alternatives 1 and 2 would be less than the Proposed Plan. Over the 20-year Plan horizon, this increased demand could result in the need for, and construction of new or expanded police, fire, park, and library facilities. It is assumed that such facilities would occur where allowed under the designated land use. The environmental impacts of the construction and operation of new facilities, as an allowed land use, have been evaluated throughout this EIR. Therefore, similar to the Proposed Plan, impacts related to the construction of new or expanded fire, police, and library facilities under Alternatives 1 through 4 would be less than significant. However, similar to the Proposed Plan, any increase in population would exacerbate the existing deficit in parks in the Project Area, resulting in the substantial physical deterioration of existing park facilities creating a significant and unavoidable impact under Alternatives 1 through 4 (although less than the Proposed Project for Alternatives 1 and 2).

TRANSPORTATION AND TRAFFIC

The newly approved method of studying Vehicle Miles Traveled (VMT) is utilized to evaluate traffic impacts under CEQA. VMT is a measure of the number of miles being driven within a defined area, and are based on the number of vehicle trips multiplied by the average trip length (in miles) for various trip types. To obtain an average VMT per service population, the total VMT is divided by the total population and employees within the area of analysis. The metrics used are from the updated CEQA Guidelines adopted by the Natural Resources Agency in late December 2018. See the Recirculated Draft EIR Section 4.15 Transportation and Traffic for more information.

Table 5-4 provides a comparison of the 2016 SCAG Region VMT to the Proposed Plan and the five alternatives in 2040. The SCAG Region represents six counties in Southern California, including Los Angeles County. **Table 5-5** provides a comparison of the 2016 Baseline VMT for the Plan Area to the Proposed Plan and the five alternatives. Additional transportation performance metrics for the Proposed Plan and the five alternatives are presented in **Table 5-6** to inform congestion as it relates to the emergency access impact analysis.

TABLE 5-4: COMPARISON BETWEEN THE 2016 SCAG REGION VMT, THE 2040 PROPOSED PLAN AND ALTERNATIVES

Transportation Metrics	2016 SCAG Region Conditions	Proposed Plan	Alternative 1: No Project Alternative*	Alternative 2: Reduced Alternative	Alternative 3: Targeted Corridors Alternative	Alternative 4: High TOD Alternative
Daily Vehicle Miles Traveled (VMT)	948,656,000	5,901,000	5,708,000	5,876,500	5,972,600	5,876,500
Daily VMT per Service Population	35.4	15.2	16.5	15.3	15.3	15.0
Comparison to 2016 SCAG Region Conditions	--	-57%	-53%	-57%	-57%	-58%

Note: For the purpose of the Alternatives analysis, the comparison is shown here to Year 2040 Plan "Option 2" Alternative metrics estimated based on sensitivity tests conducted with Hollywood Travel Demand Model.
* Alternative 5 (SCAG Forecast Alternative) would generally have similar transportation metrics as Alternative 1, except Alternative 5 would assume less development in the Regional Center and more development in other parts of the CPA than Alternative 1.
SOURCE: Fehr & Peers, 2019.

TABLE 5-5: COMPARISON BETWEEN THE 2016 CPA BASELINE VMT, THE 2040 PROPOSED PLAN AND ALTERNATIVES

Transportation Metrics	2016 CPA Baseline Conditions	Proposed Plan	Alternative 1: No Project Alternative*	Alternative 2: Reduced Alternative	Alternative 3: Targeted Corridors Alternative	Alternative 4: High TOD Alternative
Daily Vehicle Miles Traveled (VMT)	5,624,000	5,901,000	5,708,000	5,876,500	5,972,600	5,876,500
Comparison to 2016 Baseline Conditions	--	5%	1%	4%	6%	4%
Daily VMT per Service Population	18.3	15.2	16.5	15.3	15.3	15.0
Comparison to 2016 Baseline Conditions	--	-17%	-10%	-16%	-16%	-18%

Note: For the purpose of the Alternatives analysis, the comparison is shown here to Year 2040 Plan "Option 2" Alternative metrics estimated based on sensitivity tests conducted with Hollywood Travel Demand Model.
* Alternative 5 (SCAG Forecast Alternative) would generally have similar transportation metrics as Alternative 1, except Alternative 5 would assume less development in the Regional Center and more development in other parts of the CPA than Alternative 1.
SOURCE: Fehr & Peers, 2019.

TABLE 5-6: COMPARISON OF ADDITIONAL TRANSPORTATION PERFORMANCE METRICS BETWEEN EXISTING TRAFFIC CONDITIONS, THE PROPOSED PLAN AND ALTERNATIVES

Transportation Metrics	Existing Conditions (2016)	Proposed Plan	Alternative 1: No Project Alternative*	Alternative 2: Reduced Alternative	Alternative 3: Targeted Corridors Alternative	Alternative 4: High TOD Alternative
AM Peak Period	0.876	0.972	0.935	0.971	0.975	0.971
Weighted Average V/C	(LOS D)	(LOS E)	(LOS E)	(LOS E)	(LOS E)	(LOS E)
Percentage (%) of Street Segments at LOS E or F	37%	49%	42%	49%	50%	49%
PM Peak Period	0.89	1.017	0.955	1.016	1.020	1.015
Weighted Average V/C	(LOS D)	(LOS F)	(LOS E)	(LOS F)	(LOS F)	(LOS F)
Percentage (%) of Street Segments at LOS E or F	37%	50%	43%	50%	51%	50%

Note: For the purpose of the Alternatives analysis, the comparison is shown here to Year 2040 Plan "Option 2" Alternative metrics estimated based on sensitivity tests conducted with Hollywood Travel Demand Model.
* Alternative 5 (SCAG Forecast Alternative) would generally have similar transportation metrics as Alternative 1, except Alternative 5 would assume less development in the Regional Center and more development in other parts of the CPA than Alternative 1.
SOURCE: Fehr & Peers, 2019.

Alternative 1: No Project Alternative. Alternative 1 would result in less daily VMT than the Proposed Plan. However, daily VMT per service population is higher under this Alternative than for the Proposed Plan. In contrast to the Proposed Plan, the growth in housing and jobs is more dispersed across the Hollywood CPA rather than concentrated around transit, such as the Metro Red Line stations. The No Project Alternative assumes a continuation of the Existing Plan and reasonably foreseeable planned transportation network projects.

Similar to the Proposed Plan, the No Project Alternative would not result in significant impacts related to increased hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment) or result in inadequate emergency access. Additional metrics indicate that the peak period weighted average V/C is improved under Alternative 1 compared to the Proposed Plan, but in both periods the network degrades to LOS E compared to LOS D under Existing Conditions. Therefore, it would result in similar congestion impacts but similar to the Proposed Plan, it is expected that LAFD will ensure adequate fire and emergency response and there will be less than significant impacts to emergency access. Alternative 1 would result in slightly greater but still less than significant impacts when compared to applicable transportation plans and policies as it does not contain the network enhancements identified in MP 2035 and incorporated into the Proposed Plan. Impacts to the transportation network under Alternative 1 would be less than significant as under the Proposed Plan.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in less daily VMT compared to the Proposed Plan, although daily VMT per service population would increase slightly. The Reduced Alternative assumes the same transportation network enhancements as the Proposed Plan. However, the potential development of housing would be less than the Proposed Plan. As a result of less anticipated development this alternative would result in similar but reduced impacts related to hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment), and similar but reduced impacts related to inadequate emergency access. Additional metrics indicate that the peak period weighted average V/C under this Alternative would be slightly better compared to the Proposed Plan, as would be the percentage of roadway miles operating at LOS E or worse. Therefore, it would result in slightly decreased congestion impacts but similar to the Proposed Plan, it is expected that LAFD will ensure adequate fire and emergency response and there will be less than significant impacts to emergency access. This Alternative contains the network enhancements identified in MP 2035 and incorporated into the Proposed Plan; however, the reduced densities adjacent to transit would result in similar but still less than significant impacts when compared to applicable transportation plans and policies. Impacts to the transportation network under Alternative 2 would be less than significant as under the Proposed Plan.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in more daily VMT and daily VMT per service population compared to the Proposed Plan. The Targeted Corridors Alternative assumes the same transportation network enhancements as the Proposed Plan, but instead disperses reasonably expected development along major and/or selected boulevards in the Hollywood CPA. The Targeted Corridors Alternative would disperse reasonably expected development more along targeted corridors rather than concentrated near heavy rail stations, which would result in similar but greater impacts when comparing the alternative to applicable transportation plans and policies; similar but greater impacts related to hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); and similar but greater impacts to emergency access. Additional metrics indicate that the peak period weighted average V/C in this Alternative would be slightly worse compared to the Proposed Plan, as would be the percentage of the road network operating at LOS E or worse. Therefore, it would result in slightly greater congestion impacts but similar to the Proposed Plan, it is expected that LAFD will ensure adequate fire and emergency response and there will be less than significant impacts to emergency access. This Alternative contains the network enhancements identified in MP 2035 and incorporated into the Proposed Plan. Impacts to the transportation network under Alternative 3 would be less than significant as under the Proposed Plan.

Alternative 4: High TOD Alternative. Alternative 4 would result in slightly lower daily VMT and daily VMT per service population compared to the Proposed Plan. The High TOD Alternative assumes the same transportation network enhancements as the Proposed Plan, but instead concentrates development potential for housing and employment around the five major transit stations along the Metro Red Line. The High TOD Alternative would result in similar impacts when comparing the alternative to applicable transportation plans and policies; similar impacts related to increased hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); and similar impacts to emergency access. Additional metrics indicate that peak period weighted average V/C in Alternative 4 would be expected to be slightly better than the Proposed Plan, as would be the percentage of road miles operating at LOS E or worse. Therefore, it would result in slightly decreased congestion impacts but similar to the Proposed Plan, it is expected that LAFD will ensure adequate fire and emergency response and there will be less than significant impacts to emergency access. This Alternative contains the network enhancements identified in MP 2035 and incorporated into the Proposed Plan. Impacts to the transportation network under Alternative 4 would be less than significant as under the Proposed Plan.

UTILITIES AND SERVICES SYSTEMS

Alternative 1: No Project Alternative. Alternative 1 would result in similar, but reduced impacts related to utilities and services systems as compared to the Proposed Plan. Compared to the Proposed Plan, the No Project Alternative would result in 8,000 to 11,000 fewer housing units, 17,000 to 21,000 fewer residents and 5,000 to 8,000 fewer jobs. Therefore, although new development under the Existing Plan would increase the demand for utilities and service systems, the demand under the No Project Alternative would be less than the Proposed Plan. Impacts related to utilities and service systems under Alternative 1 would be less than significant.

Alternative 2: Reduced TOD and Corridors Alternative (Reduced Alternative). Alternative 2 would result in similar, but reduced (as a result of less anticipated development) impacts related to utilities and services systems as compared to the Proposed Plan. Compared to the Proposed Plan, the Reduced Alternative would result in approximately 4,000 fewer housing units, 8,000 fewer persons and a similar number of jobs. Therefore, although new development under the Reduced Alternative would increase the demand for utilities and service systems, the demand under the Reduced Alternative would be less than the Proposed Plan. Impacts related to utilities and service systems under Alternative 2 would be less than significant.

Alternative 3: Targeted Corridors Alternative. Alternative 3 would result in similar impacts related to utilities and services systems as compared to the Proposed Plan. The Targeted Corridors Alternative would result in the same population, housing and employment development potential as for the Proposed Plan. Therefore, the demand for utilities and service systems under the Targeted Corridors Alternative would be similar to the Proposed Plan. Impacts related to utilities and service systems under Alternative 3 would be less than significant.

Alternative 4: High TOD Alternative. Alternative 4 would result in similar impacts related to utilities and services systems as compared to the Proposed Plan. The High TOD Alternative would result in the same population, housing and employment development potential as for the Proposed Plan. Therefore, the demand for utilities and service systems under the High TOD Alternative would be similar to the Proposed Plan. Impacts related to utilities and service systems under Alternative 4 would be less than significant.

5.8 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

CEQA Guidelines Section 15126.6 requires that an "environmentally superior" alternative be selected among the alternatives that are evaluated in an EIR. In general, the environmentally superior alternative is the alternative that would be expected to generate the fewest adverse impacts. If the No Project alternative is identified as environmentally superior, then another environmentally superior alternative shall be identified among the other alternatives.

Based on the ability to result in reduced environmental impacts and meet project objectives, the Reduced Alternative (Alternative 2) is the Environmentally Superior Alternative. None of the alternatives analyzed are capable of avoiding the significant and unavoidable impacts that would occur under the Proposed Plan. However, the Reduced Alternative would reduce the severity of the Proposed Plan's significant and unavoidable impacts related to air quality, historical resources, existing parks and recreational facilities, and noise.

APPENDIX N

Air Quality and Health Effects

Appendix N provides additional supporting analysis and evidence to supplement Section 4.3 Air Quality, specifically to respond to the California Supreme Court decision in *Sierra Club v. County of Fresno* (December 2018) and the need for a lead agency to "relate the expected adverse air quality impacts to likely health consequences" and if they cannot do that to explain why it is not feasible. The Draft EIR identified significant air quality impacts at Impact 4.3-2 (pp. 4.3-21 to 4.3-28), Impact 4.3-3 (pp. 4.3-28 to 4.3-29) and Impact 4.3-4 (pp. 4.3-29 to 4.3-32), and the Cumulative Impact discussion at pp. 4.3-33 to 4.3-34, which are summarized below.

The attached Air Quality and Health Effects paper, prepared by the City in consultation with a Technical Advisory Panel, dated October 2019, provides information to the public regarding health consequences associated with exposure to air pollutants and explains why direct correlation of a project's pollutant emissions and anticipated health effects is currently infeasible, as no expert agency has approved a quantitative method to reliably and meaningfully translate mass emission estimates of criteria air pollutants to specific health effects for the scale of projects typically analyzed in City EIRs, including the Proposed Plan.

Based on the attached Study, the City finds that it is not feasible to link or further relate the Proposed Plan's significant and unavoidable air quality impacts identified in the Draft EIR in Section 4.3 at Impact Section 4.3-2, 4.3-3 or 4.3-4, or Cumulative Impacts Discussion (pp. 4.3-33 to 4.3-34) to specific health effects.

SUMMARY OF DRAFT EIR AIR QUALITY IMPACTS

The impact conclusions after mitigation for Impact 4.3-2 (Draft EIR, pp. 4.3-21 to 4.3-28), Impact 4.3-3 (Draft EIR, pp. 4.3-28 to 4.3-29) Impact 4.3-4 (Draft EIR, pp. 4.3-29 to 4.3-32), and cumulative impacts are summarized below.

IMPACT 4.3-2 Would implementation of the Proposed Plan violate any air quality standard or contribute substantially to an existing or projected air quality violation? **Significant and unavoidable impact for construction for NO_X, $PM_{2.5}$, and PM_{10} and operations for VOC.**

> During construction activities under the Proposed Plan, daily emissions of NO_X from heavy-duty diesel equipment and haul trucks could exceed the SCAQMD regional and localized thresholds under reasonably expected circumstances for large projects. Additionally, fugitive dust generation from earthmoving activities could result in localized emissions of NOx, PM_{10} and $PM_{2.5}$ from on-site sources exceeding applicable SCAQMD LST values depending upon the proximity of sensitive receptors and the anticipated equipment inventory. Therefore, without mitigation, implementation of the Proposed Plan would result in a *potentially significant impact* related to regional emissions for NO_X as well as localized construction emissions for NO_X and PM_{10} and $PM_{2.5}$.
>
> For construction impacts, the imposition of Mitigation Measure **AQ1** would result in a 50 to 90 percent reduction in NOx and PM emissions from diesel-powered off-road construction equipment relative to Tier 3 engines, which are typically used as the industry standard. The requirement of engines meeting Tier 4 emissions standards is becoming more common as the equipment is more widely available. For instance, Los Angeles County Metropolitan Transportation Authority (Metro) requires the use of Tier 4 engines in all of their construction projects. However, on-road heavy-duty haul trucks are not regulated under the same off-road emissions standards, and the City cannot feasibly require all construction-related on-road trucks operating within City limits to adhere to more stringent engine emissions standards. Additionally, it is infeasible to speculate the magnitude of emissions associated with simultaneous construction of multiple projects throughout the Project area. Therefore, it is conservatively concluded that regional impacts from construction would

remain potentially *significant and unavoidable*.

During operational activities under the Proposed Plan, long term emissions of regulated air pollutants would be generated by vehicular traffic and stationary sources such as combustion of natural gas and consumer products use. While emissions from mobile sources are generally expected to decrease over time as a result of statewide emissions reductions measures, the anticipated ambient growth in residential housing and non-residential reasonably expected development under the Proposed Plan would result in increased use of consumer products and natural gas. VOC emissions would increase relative to Existing Conditions, and VOC emissions may collectively exceed SCAQMD regional thresholds throughout the Project Area. Therefore, without mitigation, implementation of the Proposed Plan would result in a *potentially significant impact* related to the combination of operational VOC emissions from mobile and stationary source emissions even when taking into account improvements in vehicle exhaust emissions restrictions.

There are no mitigation measures identified for operational impacts related to VOC, but as noted above it is anticipated that state regulations will continue to be imposed that would continue to reduce sources of VOC.

Significant and unavoidable impact (construction) – emissions exceeding the regional threshold for NO_X and related to exceeding the localized thresholds for NO_X, $PM_{2.5}$, and PM_{10}.

Significant and unavoidable impact (operation) – VOC emissions exceeding the regional threshold.

IMPACT 4.3-3 Would implementation of the Proposed Plan result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? **Significant and unavoidable impact**.

As shown in **Table 4.3-2**, the Basin is currently designated nonattainment for multiple criteria pollutants. Emissions generated by the Proposed Plan combined with past, present, and reasonably probable future projects could impede attainment efforts or result in locally significant pollutant concentrations. Therefore, the Proposed Plan combined with past, present, and reasonably probable future projects could result in a cumulative impact. SCAQMD has not established quantitative thresholds for cumulatively considerable contributions to regional emissions for criteria pollutants. SCAQMD Air Quality Handbook advises that for both construction and operational activities, if a project exceeds the identified project-level significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions. As indicated under Impact 4.3-2, the Proposed Plan could generate regional construction and operational emissions that exceed SCAQMD significance thresholds resulting in a significant impact that would also add to cumulative impacts in the region.

As shown above under Impact 4.3-2, implementation of the Proposed Plan would result in significant regional and local construction emissions. The Proposed Plan would accommodate the development of hundreds of thousands of square feet of residential and non-residential uses. Continued development in the Los Angeles Subregion, in conjunction with developments in other communities in the City of Los Angeles and in the Basin, would increase pollutant emissions and degrade air quality. The reasonably foreseeable development of the Proposed Plan could result in regionally *potentially significant impacts* during construction and operation that would add to impacts from reasonably foreseeable development in the Los Angeles Subregion. Therefore, without mitigation, implementation of the Proposed Plan would result in a *potentially significant impact* related to a cumulatively considerable net increase of any criteria pollutant for which the region is designated non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).

Mitigation Measure **AQ1** would reduce the project's contribution to the cumulative impact as a result of construction emissions but not below a level of significance. As discussed above, there are no mitigation measures to reduce operational emissions. S*ignificant and unavoidable impacts*.

IMPACT 4.3-4 Would implementation of the Proposed Plan expose sensitive receptors to substantial pollutant concentrations? **Significant and unavoidable impact for construction and less than significant impact for operation.**

The specific location of future construction activity within the Project Area was not known when the air quality analysis was completed, and therefore many variables related to characterizing potential exposures to air toxics during construction activities could not be determined, such as proximity to the emissions sources and duration of exposure. A construction health risk analysis would be speculative given the lack of a construction location and construction activities. However, it is reasonable to assume that some level of construction activity would occur adjacent to sensitive receptors (e.g., residences and schools). The significant construction emissions identified in Impact 4.3-2, above, could result in adverse health effects to sensitive receptors. As such, it is likely that intense construction activities (e.g., from development projects that involve a high volume of haul trucks) would exceed the health risk significance thresholds due to equipment and truck exhaust emissions. This is considered a *potentially significant* impact related to substantial pollutant concentrations during construction activities.

Implementation of the Proposed Plan could result in a *potentially significant impact* related to substantial pollutant concentrations during construction activities. As discussed in 4.3-2, such impacts remain *significant and unavoidable* after mitigation.

Cumulative Impacts (Draft EIR pp. 4.3-33 to 4.3-34)

Construction Emissions. As discussed in Impacts 4.3-2, construction activities could result in significant impacts related to regional and localized emissions, along with TAC concentrations. Because construction activities are of limited duration and in a limited area, it is unlikely that construction being undertaken now would overlap with construction under the Proposed Plan. However, without a specific construction schedule, timing and emission levels cannot be accurately estimated. Therefore, future construction under the Proposed Plan is considered a potentially significant impact at the project level. Implementation of Mitigation Measure **AQ1** would reduce regional and local emissions generated by various construction activities, including equipment operation, truck trips, and painting. It is possible that construction activities associated with individual development projects within the Project Area could generate emissions that would exceed the significance thresholds despite Mitigation Measure **AQ1**. Because SCAQMD indicates that projects that are significant at a project level must also be determined to be significant at a cumulative level, this would result in a significant and unavoidable cumulative impact related to regional and localized emissions for NOx, $PM_{2.5}$, and PM_{10} , along with TAC concentrations. Thus, impacts related to regional and localized emissions — along with TAC concentrations — would be significant, *cumulatively considerable* and would add to significant cumulative impacts.

The Proposed Plan would accommodate the development of hundreds of thousands of square feet of development (see **Table 4.3-8**). Future development within the Project Area, in conjunction with developments in other communities in the City of Los Angeles and in the Basin, will increase pollutant emissions and degrade air quality. The Proposed Plan could result in a regionally significant and unavoidable impact during construction that would add to impacts associated with reasonably foreseeable development in the Los Angeles County subregion of the Basin. Therefore, without mitigation, implementation of the Proposed Plan may result in a significant impact related to a net increase of NO_X localized particulate matter emissions ($PM_{2.5}$, and PM_{10}) for which the project region is currently non- attainment under applicable federal and state ambient air quality standards. In addition, although not significant for the Proposed Plan, construction activity would generate VOC emissions that would contribute to total regional O_3 precursor emissions. Therefore, NO_X emissions associated with construction activities under the Proposed Plan would be *significant, cumulatively considerable* and would add to significant cumulative impacts.

Operational Emissions. As indicated under Impact 4.3-2, the Proposed Plan would generate regional operational emissions that exceed the SCAQMD significance thresholds for VOC due to the expanded use of consumer products in household and commercial applications. Operational conditions under the Proposed Plan would exceed the SCAQMD air quality significance threshold for VOC, impacts and would add to regional emissions of these pollutants. Operational emissions of VOC under the Proposed Plan would be *significant, cumulatively considerable* and would add to significant cumulative impacts.

POLLUTANT CONCENTRATIONS ON SENSITIVE RECEPTORS

Construction Emissions. As discussed in Impacts 4.3-2 and 4.3-4, construction activities could result in significant impacts related to regional and localized emissions, along with TAC concentrations. Because construction activities are of temporary duration and confined to a limited area, it is unlikely that ongoing construction activity under existing conditions would persist into the future such that it would coincide with construction activity under the Proposed Plan. However, without a specific construction schedule, timing and emission levels cannot be accurately estimated. As construction of individual development projects within the Project Area could potentially result in emissions that exceed the SCAQMD thresholds, future construction under the Proposed Plan is considered a potentially significant impact at the project level. Implementation of Mitigation Measure **AQ1** would reduce regional and local emissions generated by various construction activities, including equipment operation, truck trips, and painting.

It is possible that construction of individual development projects within the project area could generate emissions that would exceed the significance thresholds despite implementation of Mitigation Measure **AQ1**. SCAQMD indicates that projects that are significant at a project level must also be determined to be significant at a cumulative level; this would result in a significant and unavoidable cumulative impact related to regional and localized emissions, along with TAC concentrations. Thus, impacts related to sensitive receptors exposure to substantial pollutant concentrations during construction, along with TAC concentrations, would be *significant, cumulatively considerable* and would add to significant cumulative impacts.

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AIR QUALITY AND HEALTH EFFECTS

SIERRA CLUB V. COUNTY OF FRESNO

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INTRODUCTION

In response to the California Supreme Court decision on December 24, 2018, Sierra Club v. County of Fresno (Friant Ranch), this paper provides a supplemental discussion on the potential for identifiable health impacts to result from air pollutants analyzed in City of Los Angeles (City) environmental documents prepared pursuant to the California Environmental Quality Act (CEQA). The discussion focuses on significant impacts identified in City Environmental Impact Reports (EIRs) and the feasibility of directly relating any identified significant adverse air quality impact to likely health consequences. The Supreme Court opinion in Friant Ranch requires projects with significant air quality impacts to "relate the expected adverse air quality impacts to likely health consequences or explain why it is not feasible at the time of drafting to provide such an analysis, so that the public may make informed decisions regarding the costs and benefits of the project" (Friant Ranch, page 6). The Friant Ranch decision also states that providing "only a general description of symptoms that are associated with exposure"… "fail[s] to indicate the concentrations at which such pollutants would trigger the identified symptoms…." and "the public would have no idea of the health consequences that result when more pollutants are added to a nonattainment basin". This paper provides information to the public regarding health consequences associated with exposure to air pollutants and explains why direct correlation of a project's pollutant emissions and anticipated health effects is currently infeasible, as no expert agency has approved a quantitative method to reliably and meaningfully translate mass emission estimates of criteria air pollutants to specific health effects for the scale of projects typically analyzed in City EIRs.

BACKGROUND AND METHODOLOGY

The purpose of CEQA is to inform the public as to the potential for a proposed project to result in one or more significant adverse effects on the environment (including health effects). This includes the potential for a project to result in a considerable contribution towards one or more significant cumulative impacts. CEQA does not require detailed analysis of impacts that are found to be less than significant or less than a considerable contribution to a significant cumulative impact.

In accordance with CEQA requirements and the CEQA review process, the City assesses air quality impacts of proposed local plans and development projects, requires mitigation of potentially significant air quality impacts by conditioning discretionary permits, and monitors and enforces implementation of such mitigation. The State CEQA Guidelines Section 15064.7 states that the significance criteria established by the applicable air quality management district or air pollution control district, when available, may be relied upon to make determinations of significance. The City is located within the South Coast Air Basin (Air Basin), under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The City defers to threshold guidance established by the SCAQMD and utilizes the SCAQMD's *CEQA Air Quality Handbook* (approved by the AQMD Governing Board in 1993) and subsequent guidance provided on the SCAQMD website[1]. The SCAQMD is currently in the process of developing *an Air Quality Analysis Guidance Handbook* to replace the 1993 Handbook.

In addition, when considering potential air quality impacts under CEQA, consideration is given to the location of sensitive receptors within close proximity to land uses that emit toxic air contaminants (TACs). The California Air Resources Board (CARB) has published and adopted the *Air Quality and Land Use Handbook: A Community Health Perspective* (2005), which considers impacts to sensitive receptors from facilities that emit TAC emissions. CARB has also published Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways: Technical Advisory, a supplement to the handbook that is intended to provide scientifically based strategies to reduce exposure to traffic emissions near high-volume roadways in order to protect public health and promote equity and environmental justice. The SCAQMD has also adopted land use planning guidelines in

[1] SCAQMD, *Air Quality Analysis Guidance,* http://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook#. Accessed August 2019.

the *Guidance Document for Addressing Air Quality Issues in General Plans and Local Plannin*g (2005). Together, the documents introduce land use-related policies and strategies that rely on design and distance parameters to minimize emissions and lower potential health risks.

It should also be noted that a host of other regional and local plans also generally address issues of air quality and public health. These include the Southern California Association of Governments (SCAG's) Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS), SCAQMD's Air Quality Management Plan (AQMP), City of Los Angeles' General Plan (including the Framework, Air Quality, Mobility 2035, and Health and Wellness Elements), and City of Los Angeles' Green New Deal (Sustainable pLAn 2019). These contain policies and programs for the protection of the environment and health through improved air quality and serve to provide additional critical guidance for the betterment of public health for the region and City.

CEQA THRESHOLDS OF SIGNIFICANCE

Certain air pollutants have been recognized to cause notable health problems and consequential damage to the environment either directly or in reaction with other pollutants, due to their presence in elevated concentrations in the atmosphere. Such pollutants have been identified and regulated as part of an overall endeavor to prevent further deterioration and facilitate improvement in air quality. The National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) have been set at levels considered safe to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly with a margin of safety, and to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings[2]. As the scientific methods for the study of air pollution health effects have progressed over the past decades, adverse effects have been shown to occur at lower levels of exposure. For some pollutants, no clear thresholds for effects have been demonstrated. New findings over time have, in turn, led to the revision and lowering of NAAQS which, in the judgment of the U.S. Environmental Protection Agency (EPA), are necessary to protect public health. Ongoing assessments of the scientific evidence from health studies continue to be an important part of setting and informing revisions to federal and state air quality standards[3].

The six principal pollutants for which national and state criteria and standards have been promulgated, known as "criteria pollutants", and which are most relevant to current air quality planning and regulation in the

[2] U.S. EPA, *NAAQS Table*, https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed July 2019.

[3] SCAQMD, *Final 2016 AQMP*, 2017. Appendix I-69. https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-i.pdf?sfvrsn=14. Included as Attachment 1 of this memorandum.

Air Basin include: ozone (O_3), respirable and fine particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb). The State of California has also set standards for sulfates (SO_4), which are a component of particulate matter, and a nuisance odor standard for hydrogen sulfide (H_2S). The Air Basin is currently in non-attainment and exceeds air quality standards for two criteria pollutants: ozone and particulate matter. The Los Angeles County portion of the Air Basin is also designated non-attainment for lead.

Although the SCAQMD's primary mandate is attaining the State and National Ambient Air Quality Standards for criteria pollutants within the district, SCAQMD also has a general responsibility pursuant to the Health and Safety Code §41700 to control emissions of air contaminants and prevent endangerment to public health. Additionally, state law requires the SCAQMD to implement airborne toxic control measures (ATCM) adopted by the California Air Resources Board (CARB), and to implement the Air Toxics "Hot Spots" Act. As a result, the SCAQMD has regulated pollutants other than criteria pollutants such as volatile organic compounds (VOCs), TACs, greenhouse gases, and stratospheric ozone depleting compounds. The SCAQMD has developed a number of rules to control non-criteria pollutants from both new and existing sources. These rules originated through state directives, Clean Air Act (CAA) requirements, or the SCAQMD rulemaking process.

As such, in addition to criteria pollutants, VOCs and TACs are also of concern in the Air Basin. Some VOCs are also classified by the state as TACs. While there are no specific VOC ambient air quality standards, VOCs are a prime component (along with NO_x) of the photochemical processes by which such criteria pollutants as ozone, nitrogen dioxide, and certain fine particles are formed. They are therefore regulated as "precursors" to formation of these criteria pollutants.

TACs is a term used to describe airborne pollutants that may be expected to result in an increase in mortality or serious illness or which may pose a present or potential hazard to human health, and include both carcinogens and non-carcinogens. CARB and the California Office of Environmental Health Hazard Assessment (OEHHA) determine if a substance should be formally identified, or "listed," as a TAC in California. CARB has listed approximately 200 toxic substances, including those identified by the EPA, which are identified on the California Air Toxics Program's TAC List. TACs are also not classified as "criteria" air pollutants. The effects of TACs can be diverse and their health impacts tend to be local rather than regional; consequently ambient air quality standards for these pollutants have not been established, and analysis of health effects is instead based on cancer risk and exposure levels.

To achieve and maintain air quality standards, the SCAQMD has established numerical emission indicators of significance for regional and localized air quality impacts for both construction and operational phases of a local plan or project. The SCAQMD has established the thresholds based on "scientific and factual data that is contained in the federal and state Clean Air Acts" and recommends "that these thresholds be used by lead agencies in making a determination of significance."[4] The numerical emission indicators are based on the recognition that the Air Basin is a distinct geographic area with a critical air pollution problem for which ambient air quality standards have been promulgated to protect public health[5]. SCAQMD's thresholds identified below represent the maximum emissions from a plan or project that are not expected to cause or contribute to an exceedance of the most stringent applicable national or state ambient air quality standard. By analyzing a plan or project's emissions against the thresholds, EIRs assess whether these emissions directly contribute to any regional or local exceedances of the applicable ambient air quality standards and exposure levels.

Note: In the thresholds referenced below, "emissions" refer to the actual quantity of pollutant measured in pounds per day (ppd). "Concentrations" refer to the amount of pollutant material per volumetric unit of air and are measured in parts per million (ppm), parts per billion (ppb), or micrograms per cubic meter (µg/m3).

Construction (Regional and Localized)

Given that construction impacts are temporary and limited to the construction phase, the SCAQMD has established numeric indicators of significance specific to construction activity. Based on the indicators in the SCAQMD *CEQA Air Quality Handbook*, a project would potentially cause or contribute to an exceedance of an ambient air quality standard if the following would occur:

- Regional construction emissions from both direct and indirect sources would exceed any of the following SCAQMD prescribed daily emissions thresholds:[6]
  - 75 pounds per day for VOC
  - 100 pounds per day for NO_x
  - 550 pounds per day for CO
  - 150 pounds per day for SO_2
  - 150 pounds per day for PM_{10}
  - 55 pounds per day for $PM_{2.}5$

In addition, the SCAQMD has developed a methodology to assess the potential for localized emissions to cause an exceedance of applicable ambient air quality standards or ambient concentration limits. The localized significance thresholds are only applicable to NO_x, CO, PM_{10} and $PM_{2.5}$. The SCAQMD has established conservative screening criteria that can be used to determine the maximum allowable daily emissions that would satisfy the localized significance thresholds and therefore not cause or contribute to an exceedance of the applicable

[4] SCAQMD, *CEQA Air Quality Handbook 1993,* Page 6-2.
[5] Ibid.
[6] SCAQMD, *Air Quality Significance Thresholds,* March 2015. http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2. Accessed August 2019.

ambient air quality standards without project-specific dispersion modeling. The screening criteria depend on: (1) the area in which the Project is located, (2) the size of the Project Site, and (3) the distance between the Project Site and the nearest sensitive receptor. Otherwise, impacts would be considered significant if the following would occur:

- Maximum daily localized emissions of NO_x and/or CO during construction are greater than the applicable localized significance thresholds, resulting in predicted ambient concentrations in the vicinity of the Project Site greater than the most stringent ambient air quality standards for NO_2 and/or CO.[7]
- Maximum daily localized emissions of PM_{10} and/or $PM_{2.5}$ during construction are greater than the applicable localized significance thresholds, resulting in predicted ambient concentrations in the vicinity of the Project Site to exceed 10.4 µg/m3 over 24 hours (SCAQMD Rule 403 control requirement).

Operation (Regional and Localized)

Based on the numeric indicators of significant in the SCAQMD *CEQA Air Quality Handbook*, a project would potentially cause or contribute to an exceedance of an ambient air quality standard if the following would occur:

- Operational emissions exceed any of the following SCAQMD daily regional numeric indicators:[8]
    - 55 pounds a day for VOC
    - 55 pounds per day for NO_x
    - 550 pounds per day for CO
    - 150 pounds per day for SO_2
    - 150 pounds per day for PM_{10}
    - 55 pounds per day for $PM_{2.5}$

In addition, the SCAQMD has developed a methodology to assess the potential for localized emissions to cause an exceedance of applicable ambient air quality standards. The localized significance thresholds are only applicable to NO_x, CO, PM_{10} and $PM_{2.5}$. The SCAQMD has established conservative screening criteria that can be used to determine the maximum allowable daily emissions that would satisfy the localized significance thresholds and therefore not cause or contribute to an exceedance of the applicable ambient air quality

[7] SCAQMD, *Final Localized Significance Threshold Methodology,* 2008, http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/localized-significance-thresholds. Accessed August 2019.
[8] SCAQMD, *Air Quality Significance Thresholds,* March 2015. http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2. Accessed August 2019.

standards without project-specific dispersion modeling. The screening criteria depend on: (1) the area in which the Project is located, (2) the size of the Project Site, and (3) the distance between the Project Site and the nearest sensitive receptor. Otherwise, impacts would be considered significant if the following would occur:

- Maximum daily localized emissions of NO_x and/or CO during operation are greater than the applicable localized significance thresholds, resulting in predicted ambient concentrations in the vicinity of the Project Site greater than the most stringent ambient air quality standards for NO_2 and/or CO[9].
- Maximum daily localized emissions of PM_{10} and/or $PM_{2.5}$ during operation are greater than the applicable localized significance thresholds, resulting in predicted ambient concentrations in the vicinity of the Project Site to exceed 2.5 µg/m3 over 24 hours (SCAQMD Rule 1303 allowable change in concentration).

Toxic Air Contaminants

Based on the criteria set forth by the SCAQMD, the Project would expose sensitive receptors to substantial concentrations of TACs if any of the following would occur[10]:

- The Project emits carcinogenic materials or TACs that exceed the maximum incremental cancer risk of 10 in 1 million or a cancer burden greater than 0.5 excess cancer cases (in areas greater than or equal to 1 in 1 million) or an acute or chronic hazard index of 1.0.

AVAILABLE MODELS

Current models used in CEQA in air quality analyses are designed to calculate and disclose the mass emissions expected from the construction and operation of a proposed project. The estimated emissions are then compared to significance thresholds, which are in turn, keyed to reducing emissions to levels that will not interfere with the region's ability to attain the health-based standards. While this serves to protect public health in the overall region, there is currently no methodology to determine the impact of emissions (e.g., pounds per

[9] SCAQMD, *Final Localized Significance Threshold Methodology*, 2008, http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/localized-significance-thresholds. Accessed August 2019.
[10] SCAQMD, *CEQA Air Quality Handbook*, Chapter 6 (Determining the Air Quality Significance of a Project) and Chapter 10 (Assessing Toxic Air Pollutants), 1993; *South Coast Air Quality Management District Air Quality Significance Thresholds*, March 2015, http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2. Accessed August 2019.

day) on concentration levels (e.g., parts per million or micrograms per cubic meter) in specific geographic areas.[11]

Based on SCAQMD guidance, the City utilizes the California Emissions Estimator Model (CalEEMod) to quantify construction and operational air quality impacts from land use projects. Potential TAC impacts are evaluated by conducting a qualitative analysis consistent with CARB and SCAQMD guidance, and may be followed by a more detailed analysis utilizing CARB's Hotspots Analysis and Reporting Program (HARP model) where the project results in a substantial source of TACs or if a project would site sensitive land uses in proximity to TAC sources. However, although CARB and SCAQMD provide guidance for TAC analysis, most land use projects analyzed in City EIRs do not contain substantial on-site sources of TACs, and siting new sensitive uses near existing TAC sources is generally not considered a CEQA impact.

The following table provides a summary of other common available air quality models and identifies their general purposes as well as limitations in quantifying emissions and health effects. Although there are a number of other models available (e.g. models to quantify emissions, dispersion models to determine pollutant concentrations, and regional-scale models which estimate health impacts), this suite of tools is currently not designed to meet the City's need to accurately analyze project-level health effects:

MODEL	SOURCE	PURPOSE	LIMITATIONS
CalEEMod California Emissions Estimator Model	SCAQMD	CalEEMod is a statewide land use **emissions computer model** designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and greenhouse gas (GHG) emissions associated with both construction and operational from a variety of land use projects.	The model can quantify emissions, but is not able to model concentrations or dispersion of pollutants or related health effects.
AERMOD	USEPA / American Meteorological Society	AERMOD models the **dispersion** of criteria air pollutant emissions over a period of time from discrete emission sources across a defined spatial boundary and can help inform exceedance of pollutant concentration standards. AERMOD provides more refined modeling than AERSCREEN, since it uses actual meteorological data (rather than simulated data) for the vicinity of the project site. *NOTE:* The U.S. EPA has adopted the	AERMOD can estimate pollutant concentrations of NO_x, NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, total suspended particulates, lead, and other pollutants. However, AERMOD cannot estimate concentrations of VOCs, O_3 or secondary PM. While AERMOD can estimate concentrations for certain pollutants, no methods have been demonstrated to reliably and meaningfully connect pollutant concentrations to specific health effects.

[11] SMAQMD, *Friant Ranch Interim Recommendation*, 2019. http://www.airquality.org/LandUseTransportation/Documents/FriantInterimRecommendation.pdf. Accessed August 2019. Included as Attachment 4 of this memorandum.

MODEL	SOURCE	PURPOSE	LIMITATIONS
		AERMOD air dispersion model into its list of regulatory approved models in place of the previously used ISCST3 (Industrial Source Complex Short Term) model and CARB recommends AERMOD, instead of ISCST3, for Hot Spots risk assessments.	
AERSCREEN	USEPA	AERSCREEN is a screening version of the AERMOD **dispersion model,** intended to produce concentration estimates that are equal to or greater than the estimates produced by AERMOD with a fully developed set of meteorological and terrain data, but the degree of conservatism will vary depending on the application. This program is useful as a screening Health Risk Assessment (HRA) for minor or temporary sources such as construction-only projects.	As with AERMOD, AERSCREEN can estimate concentrations for certain pollutants; however, AERSCREEN does not connect pollutant concentrations to specific health effects.
BenMAP-CE Environmental Benefits Mapping and Analysis Program - Community Edition	USEPA	BenMAP-CE is a **regional-scale model** that can be used to estimate the resulting **health impacts** from change in ambient $PM_{2.5}$ concentrations for related health endpoints such as premature mortality, hospital admissions, and emergency room visits. The USEPA CMAQ model can be used to predict changes in the ambient air concentration of ozone, the results of which can be used in BenMAP-CE to estimate the resulting health impacts.	The model is used for assessing impacts over large areas and populations and is not intended to be used for individual projects, as it would not provide meaningful or reliable results at the smaller scale.
CalEnviroScreen California Communities Environmental Health Screening Tool	OEHHA & CalEPA	CalEnviroScreen is a **mapping tool** that helps identify California communities that are most affected by many sources of pollution, identified by a data-driven scoring system.	While the tool is useful to identify communities disproportionately burdened by certain pollutants, the tool is not used to track or model dispersal of project emissions.
CALINE-4	Caltrans	CALINE-4 is a **line-source dispersion model** for predicting air pollutant concentrations at receptors near highways and arterial streets, specifically for CO, NO_2, and PM. Caltrans guidance recommends only utilizing the tool for CO hot-spot analysis, and does not recommend using CALINE-4 to analyze any other pollutant.	CALINE-4 is limited to estimating concentrations of CO, NO_2, and PM from line sources such as roadways. CALINE-4 does not have the capability to evaluate concentrations of O_3 or secondary PM, or concentrations from other types of emissions sources (e.g., point, volume, or area sources). CALINE-4 is also not able to connect pollutant concentrations to specific health effects.

MODEL	SOURCE	PURPOSE	LIMITATIONS
CAMx Compressive Air Quality Model	Ramboll & Environ	CAMx is a **grid-based dispersion model** that simulates the chemical interactions and three-dimensional dispersion patterns on a regional, statewide, and national scale.	Since CAMx is designed to model emissions on a regional, statewide, and national scale, it is unsuitable for project-level analysis.
CMAQ Community Multiscale Air Quality Modeling System	USEPA	CMAQ is an atmospheric **dispersion model** consisting of a suite of programs for conducting air quality model simulations. CMAQ combines current knowledge in atmospheric science and air quality modeling, multi-processor computing techniques, and an open-source framework to deliver estimates of ozone, particulates, toxics and acid deposition. The program can be used to predict the concentration and deposition of both criteria pollutants and TACs.	There are limitations on the minimum modeling domain at which the model is still reasonably accurate. (e.g. the EPA recommends nesting a local regional model within a larger regional domain. However, the EPA recognized that expanding to a larger regional domain needs more data, which currently may not be available to the public. In addition, the minimum resolution of the CMAQ model is 1 sq. km., meaning that it would have difficulty in modeling impact areas that are less than 247 acres with meaningful or reliable results.)
EMFAC EMissions FACtor	CARB	EMFAC2017 is used to estimate **emissions** from on-road vehicles in California.	The model can quantify emissions, but is not able to model concentrations or dispersion of pollutants or related health effects.
HARP Hotspots Analysis and Reporting Program	CARB	HARP is a software suite that addresses the programmatic requirements of the Air Toxics "Hot Spots" Program (Assembly Bill 2588) and can perform air **dispersion** runs and **health risk assessments**, as well as can create and manage facility and emissions data. HARP is useful for determining how increases in specific TAC concentrations could affect receptors in terms of the increased cancer risks, chronic hazards, and acute hazards.	The tool is not used for evaluation of criteria air pollutants and related health effects.
OFFROAD	CARB	OFFROAD calculates **emissions** from off-road sources. The OFFROAD model is now being replaced by category specific methods and inventory models that are being developed for specific regulatory support projects.	The model can quantify emissions, but is not able to model concentrations or dispersion of pollutants or related health effects. In addition, the model is not comprehensive and lacks emissions forecasts for certain types of equipment.
Roadway Construction Emissions Model	SMAQMD	The model can be used to assist roadway project proponents with determining the **emission** impacts of their projects.	The Roadway Construction Emissions Model can quantify emissions, but is not able to model concentrations or dispersion of pollutants or related health effects.

As demonstrated above, while a number of models and tools are available to quantify emissions and pollutant concentrations, these models are limited by a number of factors in determining health impacts of individual development and infrastructure projects as well as local plan-level projects. The USEPA currently performs health impact assessments (HIAs) using the CMAQ model for pollutant transport modeling and BENMAP for health impact calculations. However, as described in further detail below, these models are designed to estimate health impacts over a large scale (e.g. city-wide, state-wide). In addition, the CMAQ model requires inputs such as regional sources of pollutants and global meteorological data, which are generally not accessible. In addition to the unsuitability of regional models in providing reliable results for local-level plans or individual projects, other general limitations of the current suite of models include limitations on the ability of certain tools to model concentrations or the dispersion of pollutants for all types of sources, other models only addressing a partial and incomplete range of pollutants and secondary pollutants, and limitations on being able to correlate identified concentrations to related health effects.

As such, neither the SCAQMD, CARB, "nor any air district currently have methodologies that would provide Lead Agencies and CEQA practitioners with a consistent, reliable, and meaningful analysis to correlate specific health impacts that may result from a proposed project's mass emissions".[12]

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[12] SMAQMD, *Friant Ranch Interim Recommendation*, 2019. http://www.airquality.org/LandUseTransportation/Documents/FriantInterimRecommendation.pdf. Accessed August 2019. Included as Attachment 4 of this memorandum.

AIR QUALITY AND HEALTH EFFECTS

The following information and analysis of health effects is relevant where a City EIR concludes that regional or localized air pollutant emissions would exceed the SCAQMD's thresholds of significance identified above and such impacts are deemed significant and unavoidable.

Ambient air pollution is a general public health concern, and in particular, Southern California has a long and well-documented history in battling poor air quality. Since the mid-20th century, the greater Los Angeles region has been at the forefront of air pollution science, low-emissions technology development, and innovative air quality regulation. These efforts have led to substantial and noticeable improvements in air quality and public health within the South Coast Air Basin, all during a period of dramatic increases in economic activity, population, and vehicle miles traveled. Despite these successes, the health of the region's residents continues to be seriously affected by the poor air quality that confronts the region.[13] Ambient air pollution continues to be linked to increases in respiratory illness (morbidity) and increases in death rates (mortality).[14]

Air pollution has many effects on the health of both adults and children. Adverse health outcomes linked to air pollution include asthma, cardiovascular effects, premature mortality, respiratory effects, cancer, reproductive effects, neurological effects, and other health outcomes.

The evidence linking these effects to air pollutants is derived from population based (i.e., large-scale) observational and field studies (epidemiological) as well as controlled laboratory studies involving human subjects and animals. There have been an increasing number of studies focusing on the mechanisms (that is, on learning how specific organs, cell types, and biochemicals are involved in the human body's response to air pollution) and specific pollutants responsible for individual effects. Yet the underlying biological pathways for these effects are not always clearly understood.

[13] SCAQMD, *Final 2016 AQMP*, 2017, Page Preface. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp. Accessed August 2019.
[14] SCAQMD, *Final 2016 AQMP*, 2017, Page Appendix I-1. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp. Accessed August 2019. Included as Attachment 1 of this memorandum.

Although individuals inhale pollutants as a mixture under ambient conditions, the regulatory framework and the control measures developed are mostly pollutant-specific. Individual pollutants usually differ in their sources, their times and places of occurrence, the kinds of health effects they may cause, and their overall levels of health risk. To meet the air quality standards, comprehensive plans are developed, including the Air Quality Management Plan (AQMP) and Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). These plans examine multiple pollutants, cumulative effects, and transport issues related to attaining healthful air quality in the region. In addition, a host of regulatory standards function to identify and limit exposure of air pollutants and toxic air contaminants.

HEALTH EFFECTS ADDRESSED IN PLANS AND REGULATORY STANDARDS

As previously stated, the NAAQS and CAAQS have been set at levels considered safe to protect public health. These standards are informed by and revised based on evolving scientific evidence of air pollution health effects. The SCAQMD (together with SCAG) has the responsibility for ensuring that national and state ambient air quality standards are achieved and maintained throughout the Air Basin. Failure to comply with these standards puts state and local agencies at risk for penalties such as: lawsuits, fines, a federal takeover of state implementation plans, and a loss of funds from federal agencies such as the Federal Highway Administration and Federal Transit Administration.

Criteria Pollutants

To meet the standards, the SCAQMD has adopted a series of AQMPs, which serve as a regional blueprint to develop and implement an emission reduction strategy that will bring the area into attainment with the standards in a timely manner. The 2016 AQMP includes strategies to ensure that rapidly approaching attainment deadlines for ozone and $PM_{2.5}$ are met and that public health is protected to the maximum extent feasible. The most significant air quality challenge in the Air Basin is to reduce NO_X emissions[15] sufficiently to meet the upcoming ozone standard deadlines, as NO_X plays a critical role in the creation of ozone. The AQMP's strategy to meet the 8-hour ozone standard in 2023 should lead to sufficient NO_X emission reductions to attain the 1-hour

[15] NOx emissions are a precursor to the formation of both ozone and secondary $PM_{2.5}$.

ozone standard by 2022. Since NO_X emissions also lead to the formation of $PM_{2.5}$, the NO_X reductions needed to meet the ozone standards will likewise lead to improvement of $PM_{2.5}$ levels and attainment of $PM_{2.5}$ standards.[16][17]

The SCAQMD's strategy to meet national and state standards distributes the responsibility for emission reductions across federal, state and local levels and industries. The 2016 AQMP is composed of stationary and mobile source emission reductions from traditional regulatory control measures, incentive-based programs, co-benefits from climate programs, mobile source strategies, and reductions from federal sources, which include aircraft, locomotives and ocean-going vessels. These strategies are to be implemented in partnership with the CARB and U.S. EPA. In addition, SCAG recently approved their 2016-2040 Regional Transportation Plan/Sustainable Communities Strategies (2016-2040 RTP/SCS) Plan[18] which includes transportation programs, measures, and strategies generally designed to reduce vehicle miles traveled (VMT), which are contained in the AQMP.

Pursuant to California Health and Safety Code Section 40460, SCAG has the responsibility of preparing and approving the portions of the AQMP relating to the regional demographic projections and integrated regional land use, housing, employment, and transportation programs, measures, and strategies. The SCAQMD combines its portion of the Plan with those prepared by SCAG.[19] The RTP/SCS and Transportation Control Measures, included as Appendix IV-C of the 2016 AQMP for the Air Basin, are based on SCAG's 2016-2040 RTP/SCS.

The 2016 AQMP forecasts the 2031 emissions inventories "with growth" based on SCAG's 2016-2040 RTP/SCS. The region is projected to see a 12 percent growth in population, 16 percent growth in housing units, 23 percent growth in employment, and 8 percent growth in vehicle miles traveled between 2012 and 2031. Despite this regional growth, air quality has improved substantially over the years, primarily due to the effects of air quality control programs at the local, state and federal levels. Figure 1, provided below, shows the trends since 1990 of the 8-hour ozone levels, the 1-hour ozone levels, and annual average $PM_{2.5}$ concentrations (since 1999), compared to the regional gross domestic product, total employment and population. Human activity in the region has an impact on achieving reductions in emissions. However, the ozone and particulate matter levels continue

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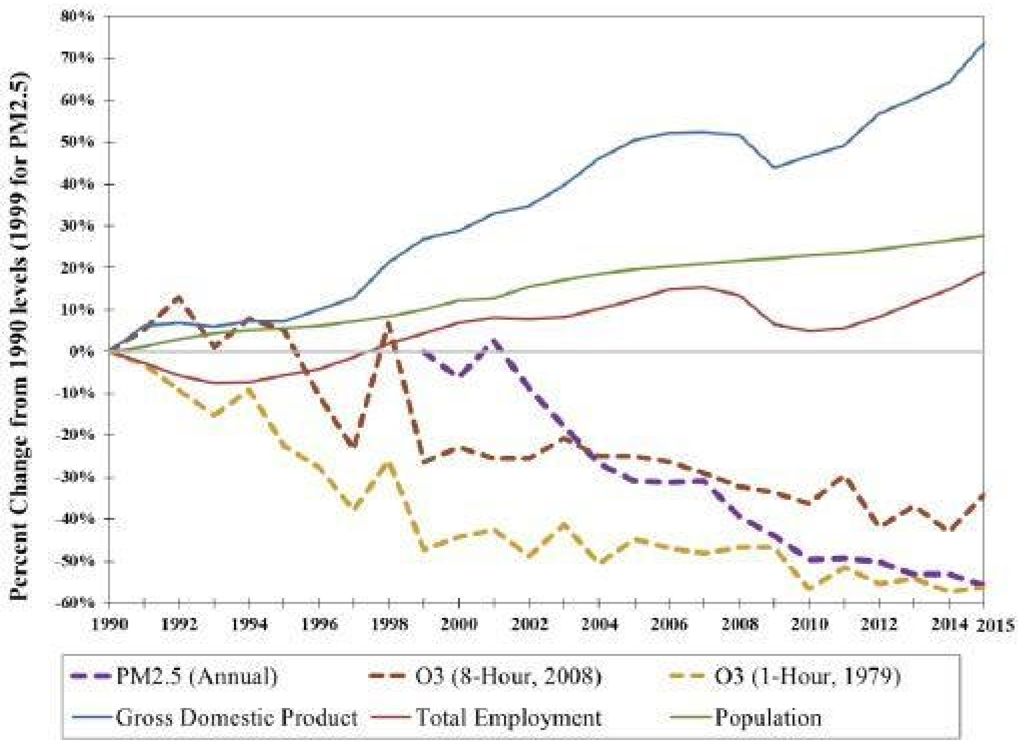
[16] Estimates are based on the inventory and modeling results and are relative to the baseline emission levels for each attainment year (see Final 2016 AQMP for detailed discussion).
[17] SCAQMD, *Final 2016 AQMP*, 2017. Page ES-2. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp. Accessed August 2019.
[18] SCAG, *Final 2016 RTP/SCP*, 2016 http://scagrtpscs.net/Pages/FINAL2016RTPSCS.aspx. Accessed August 2019.
[19] SCAQMD, *Final 2016 AQMP*, 2017. Page ES-2. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp. Accessed August 2019.

to trend downward as the economy and population increase, demonstrating that it is possible to maintain a healthy economy while improving public health through air quality improvements.[20]

Figure 1:
Percent Change in Air Quality Along with
Demographic Data for the 4-County Region (1990-2015)



Source: SCAQMD, Figure 1-4 of the Final 2016 AQMP.

Consistency with AQMP and 2016-2040 RTP/SCS Growth Assumptions

As discussed above, the 2016 AQMP incorporates the SCAG 2016–2040 RTP/SCS and updated emission inventory methodologies for various source categories to demonstrate attainment with applicable state and federal standards. With regard to land use, the 2016-2040 RTP/SCS land use control measures (i.e., goals and policies) focus on the reduction of vehicle trips and VMT.

The City's EIRs provide an analysis of a project's consistency with both the AQMP and the 2016-2040 RTP/SCS. The 2016-2040 RTP/SCS is expected to help SCAG reduce VMT, with reductions in per capita transportation emissions of 18 percent by 2035 and 21-percent by 2040. In addition, the 2016-2040 RTP/SCS provides a 2012 Base Year projected daily Total VMT per capita of 21.5 and 18.4 daily Total VMT per capita for the

[20] SCAQMD, *Final 2016 AQMP*, 2017. Page 1-6. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp. Accessed August 2019.

2040 Plan Year. As the AQMP control strategy is based on projections from local General Plans, projects which are consistent with local General Plans are considered consistent with the growth assumptions of the air quality related regional plans and their emissions are assumed to be accounted for in the AQMP emissions inventory. Projects which include amendments to General or Specific Plans, or are considered significant projects, undergo further scrutiny for AQMP consistency.

Toxic Air Contaminants

In addition, the state's California Air Toxics Program is an established two-step process of risk identification and risk management to address potential health effects from exposure to toxic substances in the air. In the risk identification step, CARB and OEHHA determine if a substance should be formally identified, or "listed," as a TAC in California. In the risk management step, CARB reviews emission sources of an identified TAC to determine whether regulatory action is needed to reduce risk. Based on results of that review, CARB has promulgated a number of ATCMs, both for mobile and stationary sources. These ATCMs include measures such as limits on heavy-duty diesel motor vehicle idling and emission standards for off-road diesel construction equipment in order to reduce public exposure to diesel PM and other TACs. These actions are also supplemented by the AB 2588 Air Toxics "Hot Spots" program and SB 1731, which require facilities to report their air toxics emissions, assess health risks, notify nearby residents and workers of significant risks if present, and reduce their risk through implementation of a risk management plan. SCAQMD has further adopted two rules to limit cancer and non-cancer health risks from facilities located within its jurisdiction. Rule 1401 (New Source Review of Toxic Air Contaminants) regulates new or modified facilities, and Rule 1402 (Control of Toxic Air Contaminants from Existing Sources) regulates facilities that are already operating. Rule 1402 incorporates requirements of the AB 2588 program, including implementation of risk reduction plans for significant risk facilities.

City EIRs acknowledge that these plans and regulatory standards have been set at levels considered safe to protect public health and are part of the regulatory environment when considering local plan and project-level impacts.

HEALTH EFFECTS OF CRITERIA POLLUTANTS AND TOXIC AIR CONTAMINANTS

A summary discussion of the health effects due to exposure of pollutants exceeding SCAQMD's significance thresholds is provided in City EIRs and an expanded discussion is provided below (substantially drawn from reviews presented in the SCAQMD's Final 2016 Air Quality Management Plan, Chapter 2 (Air Quality and Health Effects), March 2017). A more detailed discussion of the health effects of these pollutants is provided in Attachment 1 to this memorandum (SCAQMD Final 2016 Air Quality Management Plan, Appendix I: Health Effects)

Ozone (O_3)

Ozone is a gas that is formed when volatile organic compounds (VOCs) and NO_X—both byproducts of internal combustion engine exhaust—undergo slow photochemical reactions in the presence of sunlight. Ozone concentrations are generally highest during the summer months when direct sunlight, light wind, and warm temperature conditions are favorable. Ozone is one of the most important air pollutants affecting human health in regions like Southern California. Ozone is a molecule built of three atoms of oxygen linked together in a very energetic combination. When ozone comes into contact with a surface it rapidly releases this extra force in the form of chemical energy. When this happens in biological systems, such as the respiratory tract, this energy can cause damage to sensitive tissues in the upper and lower airways.

The major subgroups of the population considered to be at increased risk from ozone exposure are outdoor exercising individuals including children and people with preexisting respiratory disease(s) such as asthma. The database identifying the former group as being at increased risk to ozone exposure is much stronger and more quantitative than that for the latter group, probably because of a larger number of studies conducted were with healthy individuals. The adverse effects reported with short-term ozone exposure are greater with increased activity because activity increases the breathing rate and the volume of air reaching the lungs, resulting in an increased amount of ozone reaching the lungs. Children may be a particularly vulnerable population to air pollution effects because they spend more time outdoors, are generally more active, and have a higher ventilation rate than adults. A number of adverse health effects associated with ambient ozone levels have been identified from laboratory and epidemiological studies. These include increased respiratory symptoms, damage to cells of the respiratory tract, decreases in lung function, increased susceptibility to respiratory infection, and increased risk of hospitalization.

The Children's Health Study, conducted by researchers at the University of Southern California, followed a cohort of children that live in 12 communities in southern California with differing levels of air pollution for several years. A publication from this study found that school absences in fourth graders for respiratory illnesses were associated with ambient ozone levels. An increase of 20 ppb ozone was associated with an 83 percent increase in illness related absence rates.[21] However, it is not recommended to base assumptions of health impacts off of a single example or study. It should also be noted that the study is based on one specific subgroup and may not apply to the general population. Furthermore, the study analyzed changes in regional air quality, and these region-wide changes could not be reasonably attributable to a single project or local plan based on existing science and models.

The number of hospital admissions and emergency room visits for all respiratory causes (infections, respiratory failure, chronic bronchitis, etc.) including asthma show a consistent increase as ambient ozone levels increase in a community. These excess hospital admissions and emergency room visits are observed when hourly ozone concentrations are as low as 0.08 to 0.10 ppm.

Numerous recent studies have found positive associations between increases in ozone levels and excess risk of mortality. These associations persist even when other variables including season and levels of particulate matter are accounted for. This indicates that ozone mortality effects are independent of other pollutants.[22]

Several population-based studies suggest that asthmatics are more adversely affected by ambient ozone levels, as evidenced by increased hospitalizations and emergency room visits. Laboratory studies have attempted to compare the degree of lung function change seen in age and gender-matched healthy individuals versus asthmatics and those with chronic obstructive pulmonary disease. While the degree of change evidenced did not differ significantly, that finding may not accurately reflect the true impact of exposure on these respiration-compromised individuals. Since the respiration-compromised group may have lower lung function to begin with, the same degree of change may represent a substantially greater adverse effect overall.

A publication from the Children's Health Study focused on children and outdoor exercise. In communities with high ozone concentrations, the relative risk of developing asthma in children playing three or more sports was found to be over three times higher than in children playing no sports.[23] These findings indicate that new cases of asthma in children are associated with heavy exercise in communities with high levels of ozone. While

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[21] Gilliland FD, Berhane K, Rappaport EB, Thomas DC, Avol E, Gauderman WJ, London SJ, Margolis HG, McConnell R, Islam KT, Peters JM. *The Effects of Ambient Air Pollution on School Absenteeism Due to Respiratory Illnesses*. Epidemiology, 2001. 12(1):43-54.

[22] Bell ML, McDermott A, Zeger SL, Samet, JM, Dominici, F. *Ozone and Short-Term Mortality in 95 US Urban Communities, 1987-2000.* 2004. JAMA 292:2372-2378.

[23] McConnell R, Berhane K, Gilliland F, London SJ, Islam T, Gauderman WJ, Avol E, Margolis HG, Peters JM. *Asthma in exercising children exposed to ozone: a cohort study.* 2002. Lancet, 359:386-91.

it has long been known that air pollution can exacerbate symptoms in individuals with respiratory disease, this is among the first studies that indicate ozone exposure may be causally linked to asthma.

Some lung function responses (volume and airway resistance changes) observed after a single exposure to ozone exhibit attenuation or a reduction in magnitude with repeated exposures. Although it has been argued that the observed shift in response is evidence of a probable adaptation phenomenon, it appears that while functional changes may exhibit adaptation, biochemical and cellular changes which may be associated with episodic and chronic exposure effects may not exhibit similar adaptation. That is, internal damage to the respiratory system may continue with repeated ozone exposures, even if externally observable effects (chest symptoms and reduced lung function) disappear.

In a laboratory, exposure of human subjects to low levels of ozone causes reversible decrease in lung function as assessed by various measures such as respiratory volumes, airway resistance and reactivity, irritative cough and chest discomfort. Lung function changes have been observed with ozone exposure as low as 0.08 to 0.12 ppm for 6-8 hours under moderate exercising conditions. Similar lung volume changes have also been observed in adults and children under ambient exposure conditions (0.10 - 0.15 ppm). The responses reported are indicative of decreased breathing capacity and are reversible.

In laboratory studies, cellular and biochemical changes associated with respiratory tract inflammation have also been consistently reported in the airway lining after low level exposure to ozone. These changes include an increase in specific cell types and in the concentration of biochemical mediators of inflammation and injury such as cytokines and fibronectin. These inflammatory changes can be observed in healthy adults exposed to ozone in the range of 0.08 to 0.10 ppm.

The susceptibility to ozone observed under ambient conditions could be due to the combination of pollutants that coexist in the atmosphere or ozone may actually sensitize these subgroups to the effects of other pollutants. Some animal studies show results that indicate possible chronic effects including functional and structural changes of the lung. These changes indicate that repeated inflammation associated with ozone exposure over a lifetime may result in sufficient damage to respiratory tissue such that individuals later in life may experience a reduced quality of life in terms of respiratory function and activity level achievable. An autopsy study involving Los Angeles County residents provided supportive evidence of lung tissue damage (structural changes) attributable to air pollution. A study of birth outcomes in southern California found an increased risk for birth defects in the aortic and pulmonary arteries associated with ozone exposure in the second month of pregnancy.[24] This is the first study linking ambient air pollutants to birth defects in humans. Confirmation by further studies is needed. In summary, acute adverse effects associated with ozone exposures have been well

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[24] Ritz B, Yu F, Chapa G, Fruin S. *Effect of Air Pollution on Preterm Birth Among Children Born in Southern California between 1989 and 1993.* 2002. Epidemiology, 11(5)502-11.

documented, although the specific causal mechanism is still somewhat unclear. Additional research efforts are required to evaluate the long-term effects of air pollution and to determine the role of ozone in influencing chronic effects.

Particulate Matter (PM_{10} and $PM_{2.5}$)

The human body naturally prevents the entry of larger particles into the body. However, small particles, with an aerodynamic diameter equal to or less than ten microns (PM_{10}) and even smaller particles with an aerodynamic diameter equal to or less than 2.5 microns ($PM_{2.5}$), can enter the body and are trapped in the nose, throat, and upper respiratory tract. These small particulates could potentially aggravate existing heart and lung diseases, change the body's defenses against inhaled materials, and damage lung tissue. The elderly, children, and those with chronic lung or heart disease are most sensitive to PM_{10} and $PM_{2.5}$. Lung impairment can persist for two to three weeks after exposure to high levels of particulate matter. Some types of particulates could become toxic after inhalation due to the presence of certain chemicals and their reaction with internal body fluids. The U.S. Environmental Protection Agency and the California Air Resources Board have recognized adverse health effects that may be associated with exposure to PM_{10} and $PM_{2.5}$, including:[25] (1) Increased respiratory symptoms, such as the irritation of the airways; (2) Coughing, or difficulty breathing; (3) Decreased lung function, particularly in children; (4) Aggravated asthma; (5) Development of chronic bronchitis; (6) Irregular heartbeat; (7) Increased respiratory and cardiovascular hospitalizations; and (8) Premature death in people with heart or lung disease.

Epidemiological studies have provided continued and consistent evidence for most of the effects listed above. An association between increased daily or several-day-average concentrations of PM_{10} and excess mortality and morbidity is consistently reported from studies involving communities across the U.S. as well as in Europe, Asia, and South America.

A number of studies have evaluated the association between particulate matter exposure and indices of morbidity such as hospital admissions, emergency room visits or physician office visits for respiratory and cardiovascular diseases. The effects estimates are generally higher than the effects for mortality. The effects are associated with measures of PM_{10} and $PM_{2.5}$. Thus, it appears that when a relatively small number of people experience severe effects, larger numbers experience milder effects, which may relate either to the coarse or to the fine fraction of airborne particulate matter.

[25] See, e.g., U.S. Environmental Protection Agency, *Health and the Environment*, www.epa.gov/air/particlepollution/health.html. Accessed July 30, 2008; U.S. Environmental Protection Agency, *Particle Pollution and Your Health*, www.epa.gov/airnow/particles-bw.pdf. Accessed July 30, 2008.; California Air Resources Board, *Health Effects of Particulate Matter and Ozone Air Pollution*, January 2004.

In the National Morbidity, Mortality, and Air Pollution Study (NMMAPS), hospital admissions for those 65 years or older were assessed in 14 cities. Hospital admissions for these individuals showed an increase of 6 percent for cardiovascular diseases and a 10 percent increase for respiratory disease admissions, per 50 μg/m^3 increase in PM_{10}. The excess risk for cardiovascular disease ranges from 3-10 percent per 50 μg/m^3 PM_{10}. However, as noted below, this study analyzed indirect indicators of health impacts rather than direct health impacts, and other studies have demonstrated greater variability of the effects of PM increases in terms of number of medical visits.

Similarly, school absences, lost workdays and restricted activity days have also been used in some studies as indirect indicators of acute respiratory conditions. The results are suggestive of both immediate and delayed impact on these parameters following elevated particulate matter exposures. These observations are consistent with the hypothesis that increased susceptibility to infection follows particulate matter exposures.

Some studies have reported that short-term particulate matter exposure is associated with changes in lung function (lung capacity and breathing volume); upper respiratory symptoms (hoarseness and sore throat); and lower respiratory symptoms (increased sputum, chest pain and wheeze). The severity of these effects is widely varied and is dependent on the population studied, such as adults or children with and without asthma. Sensitive individuals, such as those with asthma or pre-existing respiratory disease, may have increased or aggravated symptoms associated with short-term particulate matter exposures. Several studies have followed the number of medical visits associated with pollutant exposures. A range of increases from 3 to 42 percent for medical visits for respiratory illnesses was found corresponding to a 50 μg/m^3 change in PM_{10}. A limited number of studies also looked at levels of $PM_{2.5}$. The findings suggest that both the fine and coarse fractions may have associations with some respiratory symptoms.

While most studies have evaluated the acute effects, some studies specifically focused on evaluating the effects of chronic exposure to PM_{10} and $PM_{2.5}$. Studies have analyzed the mortality of adults living in different U.S. cities. After adjusting for important risk factors, these studies found a consistent positive association of deaths and exposure to particulate matter. A similar association was observable in both total number of deaths and deaths due to cardiorespiratory causes. A shortening of lifespan was also reported in these studies.

Significant associations for $PM_{2.5}$ for both total mortality and cardiorespiratory mortality were reported in a study using data from the American Cancer Society. A re-analysis of the data from this study confirmed the finding.[26] The Harvard Six Cities Study evaluated several size ranges of particulate matter and reported significant associations with PM_{15}, $PM_{2.5}$, sulfates, and non-sulfate particles, but not with coarse particles (PM_{15}–

[26] Krewski D, Burnett RT, Goldberg MS, Hoover K, Siemiatycki J, Abrahamowicz M, White WH, et al. *Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Air Pollution and Mortality. A Special Report of the Institute's Particle Epidemiology Reanalysis Project.* 2000. Health Effects Institute.

$PM_{2.5}$). An extension of the Harvard Six Cities Cohort confirmed the association of mortality with $PM_{2.5}$ levels.[27] These studies provide evidence that the fine particles, as measured by $PM_{2.5}$, may be more strongly associated with mortality effects from long-term particulate matter exposures than are coarse compounds.

A follow-up study of the American Cancer Society cohort confirmed and extended the findings in the initial study. The researchers estimated that, on average, a 10 µg/m^3 increase in fine particulates was associated with an approximately 4 percent increase in total mortality, a 6 percent increase in cardiopulmonary mortality, and an 8 percent increase risk of lung cancer mortality.[28] The magnitude of effects is larger in the long-term studies than in the short-term investigations, and therefore demonstrates variability and unreliability of a specific numeric indicator (as indicated above) for the general population. Furthermore, an analysis of the American Cancer Society Cohort from the Los Angeles area used a more detailed estimate of long-term $PM_{2.5}$ exposures and found that the risk of mortality was up to three times higher than estimated with the national cohort.[29] These findings indicate that long-term exposures may be more important in terms of overall health effects.

Despite data gaps, the extensive body of epidemiological studies has both qualitative and quantitative consistency suggestive of causality. A considerable body of evidence from these studies suggests that ambient particulate matter, alone or in combination with other coexisting pollutants, is associated with significant increases in mortality and morbidity in a community.

In summary, the scientific literature indicates that an increased risk of mortality and morbidity is associated with particulate matter at ambient levels. The evidence for particulate matter effects is mostly derived from population studies with supportive evidence from clinical and animal studies. Although most of the effects are attributable to particulate matter, co-pollutant effects cannot be ruled out on the basis of existing studies. The difficulty of separating the effects may be due to the fact that particulate levels co-vary with other combustion source pollutants. That is, the particle measurements serve as an index of overall exposure to combustion-related pollution, and some component(s) of combustion pollution other than particles might be at least partly responsible for the observed health effects. In addition, limitations of applying the results of a singular study to determine a specific project's health effects are described above, as well as subsequent discussion (see "Relating Adverse Air Quality Impacts and Health Effects" on page 27). Therefore, at this time, there is no specific numeric indicator that can reliably indicate specific health effects from particulate matter.

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[27] Laden F, Schwartz J, Speizer FE, Dockery DW. *Reduction in Fine Particulate Air Pollution and Mortality*. 2006. Am J Respir Crit Care Med, 173:667-672.
[28] Pope III CA, Burnett RT, Thun MJ, Calle E, Krewski D, Kazuhiko I, Thurston G. *Lung Cancer, Cardiopulmonary Mortality, and Long-Term Exposure to Fine Particulate Air Pollution*. 2002. JAMA, 287:1132-1141.
[29] Jerrett M, Burnett RT, Ma R, Pope CA III, Krewski D, Newbold KB, Thurston G, Shi Y, Finkelstein N, Calle EE, Thun MJ. *Spatial Analysis of Air Pollution and Mortality in Los Angele*s. 2005. Epidemiology, 15(6):727-736.

Carbon Monoxide (CO)

Carbon monoxide is primarily emitted from combustion processes and motor vehicles due to incomplete combustion of fuel. Elevated concentrations of CO weaken the heart's contractions and lower the amount of oxygen carried by the blood. It is especially dangerous for people with chronic heart disease. Inhalation of CO can cause nausea, dizziness, and headaches at moderate concentrations and can be fatal at high concentrations.

Individuals with a deficient blood supply to the heart are the most susceptible to the adverse effects of CO exposure. The effects observed include earlier onset of chest pain with exercise, and electrocardiograph changes indicative of worsening oxygen supply delivery to the heart. Inhaled CO has no known direct toxic effect on the lungs, but exerts its effect on tissues by interfering with oxygen transport, by competing with oxygen to combine with hemoglobin present in the blood to form carboxyhemoglobin (COHb). Hence, people with conditions requiring an increased oxygen supply can be adversely affected by exposure to CO. Individuals most at risk include patients with diseases involving heart and blood vessels, fetuses, and patients with chronic hypoxemia (oxygen deficiency), such as is seen at high altitudes. Reductions in birth weight and impaired neurobehavioral development have been observed in animals chronically exposed to CO resulting in COHb levels similar to those observed in smokers. Recent studies have found increased risks for adverse birth outcomes with exposure to elevated CO levels, including preterm births and heart abnormalities. The U.S. EPA concluded in their most recent review that the evidence linking long-term CO exposures with reproductive health outcomes was suggestive of a causal relationship[30].

Nitrogen Dioxide (NO_2)

NO_2 is a byproduct of fuel combustion and major sources include power plants, large industrial facilities, and motor vehicles. NO_2 is a gaseous air pollutant that serves as an indicator of gaseous oxides of nitrogen, such as nitric oxide (NO) and other related compounds (NO_X). NO_2 absorbs blue light and results in a brownish-red cast to the atmosphere and reduced visibility. NO_2 also contributes to the formation of PM_{10}. Nitrogen oxides irritate the nose and throat, and increase one's susceptibility to respiratory infections, especially in people with asthma. NO_X is also a precursor to the formation of ozone.

The adverse effects of ambient nitrogen dioxide air pollution exposure on health were reviewed in the 2008 U.S. EPA Integrated Science Assessment for Oxides of Nitrogen—Health Criteria[31], and more recently in the

[30] U.S. EPA. *Integrated Science Assessment for Carbon Monoxide (Final Report)*. 2010. https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=218686. Accessed August 2019.
[31] U.S. EPA. *Integrated Science Assessment for Oxides of Nitrogen—Health Criteria (Final Report).* 2008. http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=194645. Accessed August 2019.

2016 U.S. EPA Integrated Science Assessment for Oxides of Nitrogen—Health Criteria.[32] The 2016 U.S. EPA review noted the respiratory effects of NO_2, and evidence suggestive of effects on cardiovascular health, mortality and cancer.

Experimental studies have found that NO_2 exposures increase responsiveness of airways, pulmonary inflammation, and oxidative stress, and can lead to the development of allergic responses. These biological responses provide evidence of a plausible mechanism for NO_2 to cause asthma. Additionally, results from controlled exposure studies of asthmatics demonstrate an increase in the tendency of airways to contract in response to a chemical stimulus (airway responsiveness) or after inhaled allergens. Animal studies also provide evidence that NO_2 exposures have negative effects on the immune system, and therefore increase the host's susceptibility to respiratory infections. Epidemiological studies showing associations between NO_2 levels and hospital admissions for respiratory infections support such a link, although the studies examining respiratory infections in children are less consistent.

The Children's Health Study in Southern California found associations of NO_2 with respiratory symptoms in asthmatics.[33] Particles and NO_2 were correlated, and it was determined that NO_2 plays a stronger role. Ambient levels of NO_2 were also associated with a decrease in lung function growth in a group of children followed for eight years. In addition to NO_2, the decreased growth was also associated with particulate matter and airborne acids. The study authors postulated that these may be a measure of a package of pollutants from traffic sources.

Results from controlled exposure studies of asthmatics demonstrated an increase in the tendency of airways to contract in response to a chemical stimulus (bronchial reactivity). Effects were observed with an exposure to 0.3 parts per million (ppm) NO_2 for a period ranging from 30 minutes to 3 hours. A similar response is reported in some studies with healthy subjects at higher levels of exposure (1.5 - 2.0 ppm). Mixed results have been reported when people with chronic obstructive lung disease are exposed to low levels of NO_2.

Toxic Air Contaminants

In addition to criteria pollutants, a number of TACs have the potential to impact human health, including diesel particulate matter (DPM), a pollutant associated with heavy equipment and truck traffic. TACs refer to a diverse group of "non-criteria" air pollutants that can affect human health, but have not had ambient air quality standards established for them. This is not because they are fundamentally different from the pollutants

[32] U.S. EPA. *Integrated Science Assessment for Oxides of Nitrogen—Health Criteria (Final Report)*. 2016. https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310879. Accessed August 2019.
[33] McConnell R, Berhane K, Gilliland F, London SJ, Islam T, Gauderman WJ, Avol E, Margolis HG, Peters JM. *Asthma in exercising children exposed to ozone: a cohort study*. 2002. Lancet, 359:386-91.

discussed above, but because their effects tend to be local rather than regional. TACs are classified as carcinogenic and non-carcinogenic, where carcinogenic TACs can cause cancer and non-carcinogenic TAC can cause acute and chronic impacts to different target organ systems (e.g., eyes, respiratory, reproductive, developmental, nervous, and cardiovascular).

DPM, which is emitted in the exhaust from diesel engines, was listed by the state as a TAC in 1998. DPM has historically been used as a surrogate measure of exposure for all diesel exhaust emissions. DPM consists of fine particles (fine particles have a diameter less than 2.5 micrometer (µm)), including a subgroup of ultrafine particles (ultrafine particles have a diameter less than 0.1 µm). Collectively, these particles have a large surface area which makes them an excellent medium for absorbing organics. The visible emissions in diesel exhaust include carbon particles or “soot.” Diesel exhaust also contains a variety of harmful gases and cancer-causing substances.

Exposure to DPM may be a health hazard, particularly to children whose lungs are still developing and the elderly who may have other serious health problems. DPM levels and resultant potential health effects may be higher in close proximity to heavily traveled roadways with substantial truck traffic or near industrial facilities. According to CARB, DPM exposure may lead to the following adverse health effects: (1) aggravated asthma; (2) chronic bronchitis; (3) increased respiratory and cardiovascular hospitalizations; (4) decreased lung function in children; (5) lung cancer; and (6) premature deaths for people with heart or lung disease.[34] [35] OEHHA’s HARP model and Air Toxics Hot Spots Program Guidance Manual (Guidance Manual) for the Preparation of Health Risk Assessments includes an ability to link certain TACs with metrics for cancer-rates or non-cancer effects on certain organ groups.

RELATING ADVERSE AIR QUALITY IMPACTS AND HEALTH EFFECTS

The feasibility of determining a connection between air pollutant emissions and human health is different for a site-specific project, such as for a development project or local area plan, than it is for a larger regional scale analysis of an area-wide project, such as an analysis for a regulation change for the entire Air Coast Basin. As discussed below, directly correlating a single project’s emissions in a typical City EIR to quantifiable human

[34] CARB, *Diesel Exhaust and Health*, www.arb.ca.gov/research/diesel/diesel-health.htm, Accessed August 2019.
[35] CARB, *Fact Sheet: Diesel Particulate Matter Health Risk Assessment Study for the West Oakland Community: Preliminary Summary of Results,* March 2008.

health consequences is currently not scientifically feasible, as it is not possible to conduct such an analysis that would provide reliable or meaningful results. As further discussed below, it is also infeasible to correlate regional emissions from local area-wide projects or plans identified in City EIRs to quantified human health consequences in any reliable or meaningful way, for many of the same reasons, and with additional challenges associated with separating and anticipating reasonably foreseeable emissions from other sources.

It should also be noted that in April 2019, the Sacramento Metropolitan Air Quality Management District (SMAQMD) published an Interim Recommendation on implementing the Friant Ranch decision in the review and analysis of proposed projects under CEQA in Sacramento County (Attachment 4). The SMAQMD is to date the only California air district to formally release, as guidance, an Interim Recommendation (April 2019) for lead agencies and practitioners preparing CEQA documents for projects within Sacramento County to comply with the Friant Ranch decision. Consistent with the expert opinions submitted to the Court in Friant Ranch by the San Joaquin Valley Air Pollution Control District (SJVAPCD) (Attachment 3) and SCAQMD (Attachment 2), the SMAQMD guidance confirms the absence of an acceptable or reliable quantitative methodology that would correlate the expected criteria air pollutant emissions of projects to the likely health consequences to people of project-generated criteria air pollutant emissions. The SMAQMD guidance explains that while it is in the process of developing a methodology to assess these impacts, lead agencies should follow the Friant Court's advice to explain in meaningful detail why this analysis is not yet feasible.

The following information is therefore provided to explain that for most projects and local level plans analyzed in City EIRs, it is currently not scientifically feasible to provide a reliable quantitative analysis directly correlating a project's significant pollutant emissions and human health.

Existing Models and Tools

As previously described, a number of existing models and tools exist for quantifying both project emissions and pollutant concentrations. Certain federal and state public health standards for air quality are set in terms of acceptable regional concentration levels of pollutants. The SCAQMD demonstrates attainment of these concentration standards, in part, by setting CEQA thresholds for amounts of construction and operational emissions produced by individual projects or plans. In compliance with CEQA and the identified thresholds, City EIRs for individual development projects and local-level plans disclose and analyze project *emissions* for criteria pollutants and pollutant concentrations for TACs. For CEQA purposes, *concentrations* of criteria pollutants are typically not calculated. While it may be possible to utilize a project's emission data to determine concentration amounts, this would hinge the analysis on an additive range of assumptions and uncertainties, thus contributing to a higher margin of error. In addition, an accurate model of the data would also require a complex set of input data which may not be readily available or would otherwise contribute further to the unreliability of the results. Furthermore, additional limitations exist for utilizing both regional and local models for this purpose. As such, modeling these concentrations of criteria pollutants utilizing existing tools would result in unreliable data, as discussed in further detail below.

Modeling Concentrations v. Emissions

In order to relate a project's emissions to human health effects, it would first be necessary to model the air pollutant concentrations resulting from a project. As discussed above, studies which link health effects with exposure to pollutants are primarily based on the ultimate ambient or regional concentrations of pollutants. This is especially true for secondary pollutants such as ozone and PM. The lack of correlation between the direct *quantity* of precursor pollutants and the *concentration* of ozone or secondary PM formed is important because it is not necessarily the *quantity* of precursor pollutants (such as NO_X, SO_2, VOCs, etc.) that causes human health effects; rather, it is the *concentration* of resulting ozone and secondary PM that causes these effects. Indeed, the ambient air quality standards for ozone, which are statutorily required to be set by USEPA (at levels that are requisite to protect the public health with a margin of safety) and by CARB (at levels that are requisite to protect the health of the most sensitive groups) are established as concentrations of ozone and not as quantity (i.e., tonnages) of ozone precursor pollutants.[36] [37] Furthermore, since the ambient air quality standards are focused on achieving a particular concentration region-wide, the regional models and health impact analysis tools (i.e., BenMAP-CE, CAMx, CMAQ) and plans for attaining the ambient air quality standards are also regional in nature. However, as further described below (pages 31-32), these regional models are not useful for analysis of the health impacts of specific projects on any given geographic location.

Complexities of Modeling Concentrations

In requiring a health risk type analysis for criteria air pollutants, it is important to understand how criteria pollutants are formed, dispersed, and regulated. As an example, ground level ozone (smog) is not directly emitted into the air, but is instead formed when precursor pollutants such as NO_X and VOC are emitted into the atmosphere and undergo complex chemical reactions in the process of sunlight.[38] Once formed, ozone can be transported long distances by wind.[39] Due to the complexity of ozone formation, a specific tonnage amount of NO_X

[36] U.S. EPA, *Table of Ozone National Ambient Air Quality Standards,* https://www.epa.gov/ground-level-ozone-pollution/table-historical-ozone-national-ambient-air-quality-standards-naaqs. Accessed August 2019.
[37] CARB, *California Ambient Air Quality Standards*, https://ww2.arb.ca.gov/resources/california-ambient-air-quality-standards. Accessed August 2019.
[38] SJVAPCD, *Application for Leave to File Amicus Curiae Brief of SJVAPCD in Support of Defendant and Respondent, County of Fresno and Real Party in Interest and Respondent, Friant Ranch, L.P,* April 13, 2015. Page 4. Included as Attachment 2 of this memorandum.
[39] U.S. EPA, *Ground-level Ozone: Basic Information*, www.epa.gov/airquality/ozonepollution/basic.html. Accessed August 2019.

or VOCs emitted in a particular area does not equate to a particular concentration of ozone in that area.[40] In fact, even rural areas that have relatively low emissions of NO_X or VOCs can have high ozone concentrations simply due to wind transport and other meteorological conditions such as temperature inversion and high pressure systems. Conversely, areas that have substantially more NO_X and VOC emissions could experience lower concentrations of ozone simply because sea breezes disperse the emissions.[41]

For those projects where regional construction and operational emissions exceed the SCAQMD's recommended daily significance thresholds, this does not mean that one can determine with accuracy the concentration of ozone that will be created at or near the Project Site on a particular day or month of the year, or the specific human health effects that may occur. Meteorology, the presence of sunlight, geographical distribution of emissions, and other complex photochemical factors all combine to determine the ultimate concentrations and locations of ozone. This is especially true for the typical development project where most of the criteria pollutant emissions derive not from a single "point source," but from area wide sources (consumer products, paint, etc.) or mobile sources (cars and trucks) driving to, from and around the Project Site.

As another example, particulate matter can be divided into two categories: directly emitted PM and secondary PM. While directly emitted PM can have a localized impact, the tonnage emitted does not always equate to a specific local PM concentration because it can be transported long distances by wind.[42] Secondary PM, like ozone, is formed via complex chemical reactions in the atmosphere between precursor chemicals such as sulfur dioxide and NO_X. Due to the complexity of secondary PM formation, the tonnage of PM-forming precursor emissions in an area does not necessarily result in an equivalent concentration of secondary PM in that area.

Furthermore, for modeling to produce reliable results, it is necessary to have data regarding the sources and types of toxic air contaminants, location of emission points, velocity of emissions, the meteorology and topography of the area, and the location of receptors (worker and residence).[43] Not all of these specific details or factors may be known at the time that a project or plan is undergoing CEQA review. For example, it may not be

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[40] SJVAPCD, *Application for Leave to File Amicus Curiae Brief of SJVAPCD in Support of Defendant and Respondent, County of Fresno and Real Party in Interest and Respondent, Friant Ranch, L.P.*, April 13, 2015. Page 4. Included as Attachment 2 of this memorandum.

[41] SJVAPCD, *2007 Ozone Plan, Executive Summary.* Page ES-6. www.valleyair.org/Air_Quality_Plans/AQ_Final_Adopted_Ozone2007.htm. Accessed August 2019.

[42] U.S. EPA, *Particulate Matter: Basic Information*, www.epa.gov/airquality/particlepollution/basic.html. Accessed August 2019.

[43] SCAQMD, *Application of the SCAQMD for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae,* April 6, 2015. Pages 9, 10. Included as Attachment 2 of this memorandum.

feasible to perform a health risk assessment for airborne toxics that will be emitted by a generic industrial building that was built on "speculation" (i.e., without knowing the future tenant(s)).[44]

Purposes and Limitations of Regional Models

As described above, local, state, and federal standards are set with the purpose of attaining ambient air quality standards within the region for the protection of public health. In part to meet these ambient standards, the SCAQMD has set numeric thresholds for land-use projects to determine significant air quality impacts. These thresholds are based on regional project emissions, which refer to the actual *quantity* of pollutants generated by the project, and are measured in pounds per day. These pollutant sources (e.g., onsite natural gas usage and offsite vehicular exhaust across the regional roadway network) can be estimated, measured, and quantified. However, once a project's emissions enter the environment, these emissions are subject to a number of complex factors and variables, including chemical changes, dispersal, and weather variation, and ultimately combine with other existing conditions to result in the regional ambient air quality and concentrations of pollutants.

The SCAQMD (and other regional air quality management and air pollution control districts) conducts regional-scale modeling in order to evaluate regional-scale air pollution, including modeling for the AQMP, modeling attainment demonstrations, and the Multiple Air Toxics Exposure Study (MATES) studies. This involves a regional scale photochemical model such as CAMx and CMAQ, which have a modeling domain on the order of hundreds of kilometers. Mobile source emissions are estimated using EMFAC and SCAG RTP/SCS VMT data and traffic data obtained from Caltrans for the entire basin. The effort, resources, and availability of necessary input data required to perform this type of analysis is complex and extensive, and is infeasible for smaller projects.

Unreliability of Using Regional Models at Smaller Scale

As noted in the Brief of Amicus Curiae by the South Coast Air Quality Management District in the Friant Ranch case (Attachment 2), SCAQMD has among the most sophisticated air quality modeling and health impact evaluation capability of any of the air districts in the State, and thus it is uniquely situated to express an opinion on how lead agencies should correlate air quality impacts with specific health outcomes.[45] The computer models (e.g., CMAQ modeling platform)[46] used to simulate and predict an attainment date for ozone are based on regional inventories of precursor pollutants and meteorology within an air basin. At a very basic level, based on

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[44] SCAQMD, *Application of the SCAQMD for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae,* April 6, 2015. Page 10. Included as Attachment 2 of this memorandum.

[45] SCAQMD, *Application of the SCAQMD for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae,* April 6, 2015. Pages 9, 10. Included as Attachment 2 of this memorandum.

[46] The SCAQMD 2016 AQMP ozone attainment demonstration was developed using the U.S. EPA recommended CMAQ (version 5.0.2) modeling platform with SAPRC07 chemistry, and the Weather Research and Forecasting Model (WRF) (version 3.6) meteorological fields.

gross assumptions appropriate for regional-scale analyses, the models simulate future ozone levels based on predicted changes in precursor emissions basin wide. It should be noted that it takes a large amount of additional precursor emissions to cause a modeled increase in ambient ozone levels over an entire region.[47] The computer models are not designed to determine whether the emissions generated by an individual development project, or even emissions from most relatively small-scale areas such as specific plan areas or community plan areas, will affect the date that the air basin attains the ambient air quality standards. Instead, the models help inform regional planning strategies based on the extent all of the emission-generating sources within the air basin must be controlled in order to reach attainment.[48]

In addition, this modeling is inappropriate for project-level or local plan-level analysis, as small changes in modeling results could be well within the normal gross margin of error of the CMAQ model performance. For example, SCAQMD states the expected margin of error for comparing CMAQ modeled daily maximum air pollutant concentrations to monitored concentrations is 20 percent.[49] However, even the expected 20 percent margin of error is exceeded in regional scale analyses. SCAQMD found that when maximum values equal or exceed 60 ppb, the normalized gross maximum error ranges from 15.7 to 19.8 percent for the coastal region, 11.5 to 22.3 percent for the San Fernando region, 12.1 to 25.2 for the foothills region, 14.7 to 18.2 for the urban source region, 12.5 to 20.9 percent for the urban receptor region, and 9.6 to 16.8 for the Coachella Valley.[50] The quarterly error statistic for $PM_{2.5}$ ranges from 54 percent to 95.7 percent for the coastal region, 30.1 to 60.6 percent for the San Fernando region, 30.7 to 81.6 percent for the foothills region, 41.1 to 81.6 percent for the urban source region, 23.5 to 53 percent for the urban receptor region, and 38 to 59.6 percent for the Coachella Valley region.[51]

Therefore, using these regional models at the project-level or local plan-level scale would not yield reliable results, as the emissions from a localized project would be small in comparison, falling within margins of error of the regional models. Therefore, results regarding project or local plan-level emissions would not be meaningful or statistically significant.

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[47] SCAQMD, *Final 2012 AQMP*, February 2013, https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/final-2012-aqmp-(february-2013)/appendix-v-final-2012.pdf, Appendix V. pages v-4-2, v-7-4, v-7-24. Accessed August 2019.

[48] SJVAPCD, *Application for Leave to File Amicus Curiae Brief of SJVAPCD in Support of Defendant and Respondent, County of Fresno and Real Party in Interest and Respondent, Friant Ranch, L.P.,* April 13, 2015. Page 6-7. Included as Attachment 2 of this memorandum.

[49] SCAQMD, *Final 2016 AQMP,* 2017. Appendix V-2-3. https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-v.pdf?sfvrsn=10. Accessed August 2019.

[50] SCAQMD, *Final 2016 AQMP,* 2017. Appendix V, Tables V-5-3 through V-5-8. https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/appendix-v.pdf?sfvrsn=10. Accessed August 2019.

[51] Ibid. Table V-6-3

Purposes and Limitations of Localized Models

Certain models (such as AERMOD and HARP) may be able to direct certain pollutant concentrations locally with reliable accuracy. However, these are used to prepare project-level health risk assessments (HRAs) for pollutants like DPM and other TACs, and do not address secondary pollutants such as ozone. Regarding the use of other potential localized models such as CALINE-4, the City's CEQA documents currently provide CO hotspot analyses where appropriate. However, per guidance from the SCAQMD and Caltrans, further modeling of other pollutants would be inappropriate using CALINE-4.[52] In addition, while these models are able to estimate concentrations for certain pollutants, no methods have been demonstrated to reliably and meaningfully connect these pollutant concentrations to specific health effects.

If an attempt were made to potentially utilize a localized model to determine a project's resulting pollutant concentrations, most likely an analysis would follow a methodology similar to how localized air quality analyses are currently performed for CEQA (e.g., freeway HRAs). For example, a project's vehicle emissions could be determined using CalEEMod or EMFAC. The project-related traffic emissions within a ¼ mile of the project site could then be combined with project-related emissions from on-site sources and analyzed for receptors in the vicinity using AERMOD on a microscale basis. The analysis could load traffic emissions along the roadway network consistent with the traffic study. This approach could be used for CO, NO_2, PM_{10}, and $PM_{2.5}$; however, this would not address other pollutants, these models include additional limitations, and a number of uncertainties would be included in the modeling assumptions. Some of the limitations and uncertainties of this approach would include:

Pollutant Emissions. CalEEMod generates total daily regional-wide emissions from a project. These emissions account for different trip lengths based on the trip generation (residential vs. commercial, commute vs. delivery, etc.) and trip type (primary, diverted, pass-by). It would be speculative to assume on a regional basis where these emissions were to occur. It would also be speculative to assume which types of vehicles would use specific roadways (e.g., diesel delivery trips associated with a Project would likely use different routes than commuter trips).

Spatial and temporal data. It would be speculative to assume when and where vehicles would be travelling. AERMOD assumes steady state conditions and may not be able to account for variations in meteorology as well as seasonal variations.

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[52] Caltrans, *Project-Level Air Quality Analysis*. https://dot.ca.gov/programs/environmental-analysis/air-quality/project-level-air-quality-analysis. Accessed August 2019.

Ambient data. Health impacts are highly dependent on ambient air quality levels. While data at ambient monitoring stations may be available, nearby localized sources (e.g.; stationary emissions and major roadways) are not known and are not accounted for.

Chemistry. AERMOD is unable to process chemical reactions related to secondary PM and ozone formation.

The combination and compounding of the uncertainties from each component and step of the modeling analysis, particularly in the context of the very small increment of change in regional ambient air pollutant concentrations that a single project would be predicted to cause, would likely result in large margins of error for the overall modeled outcomes. That is, even if a model reports a certain outcome, the actual outcome may be in a relatively broad range surrounding the reported outcome. When these uncertainties are factored into the modeling analysis, the results would not be able to provide a meaningful estimate of health impacts. Furthermore, as described in further detail below, even if reliable pollutant concentration data were available, the concentration information could not be reliably and directly related to a health impact at this time.

Metrics for Determining Health Effects

CEQA Thresholds and Relationship to Specific Health Effects

As one of the many paths that the SCAQMD has established to lead the district towards achieving acceptable levels of pollutant concentrations region-wide, the agency has set CEQA thresholds of significance for project emission quantities. These SCAQMD thresholds are related to basin-wide emissions, are cumulative in nature, and do not indicate thresholds for project-specific concentrations related to particular health effects. Therefore, it should be noted that the SCAQMD regional significance thresholds are not direct indicators of specific health effects.

For example, with respect to ozone precursor emissions, the SCAQMD has set its operational CEQA significance threshold for NO_X and VOC at 10 tons per year (expressed as 55 pounds per day). This is based on the federal Clean Air Act, which defines a major stationary source for extreme ozone nonattainment areas such as the SCAQMD as one emitting 10 tons per year. Under the federal Clean Air Act, such sources are subject to enhanced control requirements, thus SCAQMD determined that 55 pounds (less than .03 tons) per day was an appropriate threshold for making a CEQA significance finding and requiring feasible mitigation. For context, according to the most recent EPA-approved SCAQMD basin-wide emissions inventory, the VOC inventory for emissions is 500 tons per day and for NO_X emissions is 522 tons per day for the baseline year of 2012.[53] The

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[53] SCAQMD, *Final 2016 AQMP*, 2017. Figure 3-3. http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp. Accessed August 2019.

threshold quantity of 55 pounds per day therefore represents a very small percentage (approximately .005 percent) of total daily basin-wide emissions. It should also be noted that from a scientific standpoint, it takes a large amount of additional precursor emissions to cause a statistically significant increase in ambient ozone levels over an entire region. In the case of ozone, the SCAQMD's 2012 AQMP showed that reducing baseline year 2008 NO_X by 432 tons per day and reducing VOC by 187 tons per day would only reduce ozone levels at the SCAQMD's monitor site with the highest levels by 9 parts per billion.[54] Therefore, the SCAQMD has stated that "…a project source that emits 10 tons/year of NO_X or VOC is small enough that its regional impact on ambient ozone levels may not be detected in the regional air quality models that are currently used to determine ozone levels. Thus, in this case it would not be feasible to directly correlate project emissions of VOC or NO_X with specific health impacts from ozone."[55] Therefore, the SCAQMD has stated that the agency does not currently know of a way to accurately quantify ozone-related health impacts caused by VOC or NO_X emissions from relatively small projects[56], although this type of analysis may potentially be feasible for regional-scaled projects with very high emissions of ozone precursors.

Lack of Established Metrics by Expert Agencies

Furthermore, both the SCAQMD and SJVAPCD have indicated that it is not feasible to quantify project-level health effects from ozone and secondary-formed pollutants based on available modeling techniques.[57] [58] The SCAQMD Brief also cites the author of the CARB methodology, which reported that a $PM_{2.5}$ methodology is not suited for small projects and may yield unreliable results.[59] In addition, it would be infeasible to determine, with any degree of reliability, the impact on attainment of the ambient air quality standards and the number of nonattainment days that may result when a Project exceeds regional thresholds, and any findings would be speculative. As discussed above, the currently available regional models and health impact analysis tools (i.e., BenMAP-CE, CAMx, CMAQ) are equipped to model the impact of all emission sources in an air basin to demonstrate attainment.

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[54] SCAQMD, *Final 2012 AQMP*, February 2013, https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/final-2012-aqmp-(february-2013)/appendix-v-final-2012.pdf, Appendix V. pages v-4-2, v-7-4, v-7-24. Accessed August 2019.

[55] SCAQMD, *Application of the SCAQMD for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae,* April 6, 2015. Page 12. Included as Attachment 2 of this memorandum.

[56] SCAQMD, *Application of the SCAQMD for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae,* April 6, 2015. Page 12. Included as Attachment 2 of this memorandum.

[57] SCAQMD, *Application of the SCAQMD for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae,* April 6, 2015. Included as Attachment 2 of this memorandum.

[58] SJVAPCD, *Application for Leave to File Amicus Curiae Brief of SJVAPCD in Support of Defendant and Respondent, County of Fresno and Real Party in Interest and Respondent, Friant Ranch, L.P.,* April 13, 2015. Included as Attachment 2 of this memorandum.

[59] SCAQMD, *Application of the SCAQMD for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae,* April 6, 2015. Page 14. Included as Attachment 2 of this memorandum.

Even if a metric could be calculated, it would not be reliable because the models attempt to evaluate the impact of all emission sources in an air basin on attainment and would likely not yield information with sufficient statistical certainty or a measurable increase in ozone concentrations sufficient to quantify health effects for an individual project. The SCAQMD Brief concludes, with respect to the Friant Ranch EIR, that although it may have been technically possible to plug the data into a methodology, the results would not have been reliable or meaningful.[60] No expert agency, including the SCAQMD and CARB, have approved a quantitative method to reliably and meaningfully translate mass emission estimates of criteria pollutants to specific health effects.

Limitations of Extrapolating Metrics from Health Impact Assessments

Current HRA tools are able to provide some insight into potential health effects from project TACs and these tools have been specifically designed to evaluate how toxic emissions are released, how they disperse throughout an area, and the potential for those toxic pollutants to impact human health. However, these tools for TAC analysis do not address criteria pollutants and their related specific health effects, and also present their own limitations. HRAs typically include three separate components: an emissions inventory, dispersion modeling, and health risk calculations. OEHHA's HARP model and Air Toxics Hot Spots Program Guidance Manual (Guidance Manual) for the Preparation of Health Risk Assessments includes an ability to link certain air quality compounds with metrics for cancer-rates or non-cancer effects on certain organ groups.

The Guidance Manual identifies Response Exposure Levels (RELs) for various pollutants, which are concentration levels at (or below) which no adverse non-cancer health effects are anticipated for a specific exposure duration, usually specific to certain target organs. Exceeding the REL does not automatically indicate an adverse health impact, as the REL is not the threshold where population health effects would first be seen. However, increasing concentrations above the REL value increases, with an undefined probability, the likelihood that the health effect will occur.[61] These RELs are developed by OEHHA based on a highly technical and robust research process, including data gathering, modeling, determining appropriate parameters, making extrapolation adjustments, addressing variables and factors of uncertainty, consulting with expert agencies and the public, and undergoing scientific review. As such, the HARP model has become an accepted industry standard in evaluating health impacts from TACs and providing reliable and meaningful analysis, although the limitations of this analysis is also disclosed in HRA documents.

It should also be noted that the process of assessing health risks and impacts itself includes a degree of uncertainty, dependent on the availability of data and the extent to which assumptions are relied upon in cases

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[60] SCAQMD, *Application of the SCAQMD for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae,* April 6, 2015. Page 15. Included as Attachment 2 of this memorandum.
[61] OEHHA. *Air Toxics Hot Spots Program Guidance Manual.* February 2015. page 6-2. https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf. Accessed August 2019.

where the data are incomplete or unknown. In general, sources of uncertainty that may lead to an overestimation or an underestimation of the risk include: extrapolation of toxicity data in animals to humans, uncertainty in the estimation of the emissions, uncertainty in the air dispersion models, and uncertainty in the exposure estimates.[62] In addition to uncertainty, there is a natural range or variability in measured parameters defining the exposure scenario, including variation among the human population. Risk estimates generated by an HRA should therefore not be interpreted as the *expected* rates of disease in the exposed population but rather as *estimates* of potential for disease, based on current knowledge and a number of assumptions.[63]

For criteria pollutants, OEHHA guidance for health risk has only been identified for short-term one-hour peak exposures (acute inhalation) for CO, H_2S, NO_2. Ozone, SO_x, and SO_2, and otherwise the guidance lacks cancer potency factors or RELs for any longer-term exposure of any criteria pollutant. Even so, the HARP model which utilizes these factors or RELs is utilized for stationary sources and does analyze health impacts from mobile source emissions. As emissions from projects analyzed in City local-plan or project EIRs are usually heavily comprised of mobile source emissions, utilization of the HARP model for this analysis would not be useful to provide meaningful information regarding health impacts. Therefore, existing models utilizing these RELs for acute inhalation are not able to provide sufficient information about direct health impacts or probability of specific adverse health effects from criteria pollutants for City EIR projects.

In general, health impact assessments also use Concentration-Response (C-R) functions. C-R functions determine the relationship between the change in pollutant concentration and change in health impacts (baseline vs. project). It should be noted that not all C-R functions are linear. Using AERMOD or Cal3QHC/CALINE4, there is no reliable method to estimate baseline conditions at a project's buildout. While ambient monitoring data is available throughout the air basin, this does not account for nearby related projects or other stationary sources.

There are also many C-R functions based on pollutants, specific health impacts, age, race, pollutant uptake rates, sensitivity to specific pollutants, and other criteria. When calculating health impacts, the appropriate C-R functions would need to be selected. Due to the level of speculation required to make these assumptions, this could expose a project to potential challenges, as experts may debate about the correct C-R function used for analyses. As discussed above, while a microscale model could be used for some aspects of projects to address localized roadway impacts, linking specific health effect to concentrations would be speculative under CEQA due to the uncertainties in such an analysis, as discussed above.

[62] Ibid. page I-5.
[63] Ibid. page I-6.

Limitations on Extrapolating Metrics from Existing Health Studies

In the absence of an adopted metric by an expert agency identifying emission or concentration levels with a particular health effect, there is information on this topic available within a body of health research and series of independent studies, as generally described in previous sections and in Attachment 1 (SCAQMD Final 2016 AQMP, Appendix I: Health Effects). However, utilizing this body of work can also be problematic if attempting to make reliable or meaningful conclusions relating project emissions to specific health impacts, For example, many of the health studies rely on specific population subgroups or provide limited sample sizes, and therefore have conclusions which would not apply to health effects on the general public. In addition, within the universe of these studies, there exists a broad range of findings and at times, inconsistent conclusions between studies. Research in this field is also subject to other limitations, including the scientific infeasibility of parsing out specific pollutants from other variables with an acceptable degree of certainty, which results in weak causal relationships between particular pollutants and specific health effects. Therefore, it would be speculative to use a limited study to relate concentrations of any specific pollutant to specific health impacts for a number of reasons. While pollutant increments could be compared to relevant data identified from a specific study, it is not recommended to base findings of a specific health-related impact on any single limited study. Therefore, even if a project's pollutant concentrations could be determined with an acceptable degree of accuracy, existing available information could still only provide a range or general idea of health impacts to the population at large.

Health Effects from Regional Emissions Generated by Local Plans or Projects are Likely Nominal

The SCAQMD also conducted pollutant modeling for proposed Rule 1315 in which the CEQA analysis accounted for essentially all of the increases in emissions due to new or modified sources in the District between 2010 and 2030, or an approximate increase of 6,620 pounds per day of NO_X and 89,947 pounds per day of VOC. At this regional scale, the SCAQMD was able to correlate this very large emissions increase to expected health outcomes from ozone and particulate matter. The results of the analysis showed that this increase of regional pollutant emissions would contribute to only a small increase in the air basin wide ozone concentrations in 2030 of 2.6 ppb and less than 1 ppb of NO_2.[64]

Comparatively, a typical City project emits much lower amounts of pollutant emissions. For City projects that generate emissions exceeding SCAQMD's operational significance thresholds, (e.g., peak daily regional

[64] SCAQMD, *Final Program Environmental Assessment for Re-Adoption of Proposed Rule 1315,* 2011. Page 1-11. https://www.aqmd.gov/home/research/documents-reports/lead-agency-scaqmd-projects/aqmd-projects---year-2011/re-adoption-of-proposed-rule-1315.

emissions of 150 pounds per day of PM_{10} and 55 pounds per day of NO_X, VOC or $PM_{2.5}$), these projects also typically represent relatively small amounts of pollutant emissions, with regional impacts which may not even be detected by current regional air quality models. For example, when comparing the Rule 1315 analysis to a large City project, such as the Olympia Project (a mixed-use development with 1.8 million square feet of floor area on a 3.3-acre site), Olympia's regional operational emissions would result in approximately 2 pounds of VOC and 12 pounds of NO_X over the SCAQMD's significance thresholds, or approximately 0.06 and 1.0 percent of the emissions analyzed by SCAQMD related to Rule 1315, respectively.

As a further comparison to a local plan or community plan-level City project, such as the Hollywood Community Plan Update (which anticipates an approximate 27 percent increase for both housing/population and employment within a 22 square mile regional center within the City), the plan's regional operational emissions would result in an increase of 472 lbs. per day in VOCs and a decrease of 2,763 lbs. per day of NO_X, or approximately 0.5 percent of the VOC emissions analyzed by SCAQMD related to Rule 1315. NO_X emissions would decrease under the Community Plan and would therefore not exceed any significant thresholds. This demonstrates that most City projects studied in project and plan-level EIRs would result in emissions at much lower rates than those necessary to be able to correlate project emissions with specific health effects. Furthermore, construction and operational emissions are typically more regional (e.g., emitted by mobile sources distributed across region's roadway network) and different than the identified stationary sources as modeled in SCAQMD's analysis of Rule 1315, which would add to the difficulties of modeling project-related emissions.

Running the regional-scale photochemical grid model used for predicting ozone attainment with the emissions from any individual project or even a relatively small-scale area project would not yield reliable information regarding a measurable increase in ozone concentrations sufficient to accurately quantify ozone-related health effects. Any modeled increase in ozone concentrations would not be useful for a meaningful analysis, as the increase would be so comparatively small that it would be well within the margin of error of such models. Similarly, it would also not be feasible to identify a Project's impact on the days of nonattainment per year. Based on this information, a general description of the adverse health effects resulting from the pollutants at issue is all that can be feasibly provided at this time.

CONCLUSION

Federal and state ambient air quality standards are designed to prevent the harmful effects of air pollution. These standards are continually updated based on evolving research, including research which relates air quality impacts with health effects. At the regional level, plans such as the SCAQMD's AQMP and SCAG's RTP/SCS work to ensure that the South Coast Air Basin reaches and maintains attainment with these federal and state standards. Locally, the City's EIRs evaluate a plan or project's consistency with applicable policies identified in the SCAQMD's AQMP and SCAG's RTP/SCS. City EIRs also identify regulatory compliance measures which work to limit risk and exposure to TACs. In addition, in evaluating air quality impacts on a plan- or project-level, the City's EIRs utilize thresholds guidance and air quality models established by the SCAQMD, which have been developed to implement these regional plans for attainment and protection of public health. Improvements to air quality in the region attest to the efficacy of these plans and local implementation practices.

For local plans or projects that exceed any identified SCAQMD air quality threshold, City EIR documents typically identify and disclose generalized health effects of certain air pollutants but are currently unable to establish a reliable connection between any local plan or project and a particular health effect. In addition, no expert agency has yet to approve a quantitative method to reliably and meaningfully do so. A number of factors contribute to this uncertainty, including the regional scope of air quality monitoring and planning, technological limitations for modeling at a local plan- or project-level, and the intrinsically complex nature between air pollutants and health effects in conjunction with local environmental variables. Therefore, at the time, it is infeasible for City EIRs to directly link a plan's or project's significant air quality impacts with a specific health effect. However, as air quality modeling and research on health effects advances over time, the City will continue to seek the latest guidance from local air quality agencies and experts and refine its approach based on future information as it becomes available.

ATTACHMENT 1

SCAQMD FINAL 2016 AQMP -

APPENDIX I

HEALTH EFFECTS

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

South Coast AQMD

Appendix I

Health Effects

2016 AIR QUALITY MANAGEMENT PLAN

March 2017

FINAL 2016 AQMP
APPENDIX I

HEALTH EFFECTS

MARCH 2017

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INTRODUCTION

This document presents a summary of scientific findings on the health effects of ambient air pollutants. The California Health and Safety Code Section 40471(b) requires that the South Coast Air Quality Management District (SCAQMD) prepare a report on the health impacts of particulate matter in the South Coast Air Basin (SCAB) in conjunction with the preparation of the Air Quality Management Plan (AQMP) revisions. This document, which was prepared to satisfy that requirement, also includes sections discussing the health effects of the other major pollutants. The intention of this document is to provide a brief summary of the conclusions of scientific reviews conducted by U.S. EPA and other scientific agencies, with some additional information from more recently published studies.

In addition to the air pollutant health effects summaries, there is an Attachment to this Appendix, which is a list of publications that have resulted from health-related research projects sponsored by SCAQMD over the past several years. Some of these studies are discussed in this Appendix, as appropriate, although there are many other studies referenced here. The studies funded by SCAQMD also help inform the SCAQMD's work in characterizing the air pollution and its effects in our local region and the influences of sources of air pollution in the Basin.

While information on ambient air quality statistics, attainment status, spatial distribution of air pollutants, environmental justice, socioeconomic impacts, control strategies, and cost-effectiveness are important issues that may relate to health effects, these issues are not the focus of this Appendix, and are instead discussed in detail in other chapters and appendices of the AQMP, or in the AQMP Socioeconomic Report.

HEALTH EFFECTS OF AIR POLLUTION

Ambient air pollution is a major public health concern. Excess deaths and increases in illnesses associated with high air pollution levels have been documented in several episodes as early as 1930 in Meuse Valley, Belgium; 1948 in Donora, Pennsylvania; and 1952 in London. Although levels of pollutants that occurred during these acute episodes are now unlikely in the United States, ambient air pollution continues to be linked to increases in illness and other health effects (morbidity) and increases in death rates (mortality).

Adverse health outcomes linked to air pollution include cardiovascular effects, premature mortality, respiratory effects, cancer, reproductive effects, neurological effects, and other health outcomes. The evidence linking these effects to air pollutants is derived from population-based observational and field studies (epidemiological), toxicological studies, as well as controlled laboratory studies involving human subjects and animals. There have been an increasing number of studies focusing on the mechanisms (that is, on learning how specific organs, cell types, and biomarkers are involved in the human body's response to air pollution). Yet the underlying biological pathways for these effects are not always clearly understood.

Although individuals inhale pollutants as a mixture under ambient conditions, the regulatory framework and the control measures developed are pollutant-specific for six major outdoor pollutants covered under Sections 108 and 109 of the Clean Air Act. This is appropriate, in that different pollutants can differ in their sources, their times and places of occurrence, the kinds of health effects they may cause, and their overall levels of health risk. Different pollutants, from the same or different sources, oftentimes occur together. While the combined effects of multiple air pollutants that occur simultaneously may be important, the air quality standards address each criteria pollutant separately, and thus, this Appendix is divided into sections by pollutant. To meet the air quality standards, comprehensive plans are developed such as the Air Quality Management Plan (AQMP); and to minimize exposure to toxic air contaminants in the South Coast AQMD, a local air toxics control plan is also prepared. These plans examine multiple pollutants, cumulative impacts, and transport issues related to attaining healthful air quality. A brief overview of the effects observed and attributed to various air pollutants is presented in this Appendix. Because the SCAB exceeds the federal standards for ozone and PM2.5, this Appendix focuses more attention in the discussion of these two pollutants, since the health impacts within the SCAB are potentially greater for these two pollutants compared to the health impacts of the other criteria pollutants. For the other pollutants, a brief summary of the associated health effects is provided.

This summary is drawn substantially from reviews presented previously (South Coast Air Quality Management District 1996; South Coast Air Quality Management District 2003; South Coast Air Quality Management District 2007; South Coast Air Quality Management District 2013b), and from the most recent U.S. EPA Integrated Science Assessment (ISA) reviews for Ozone (U.S. EPA 2013b), Carbon Monoxide (U.S. EPA 2010), Particulate Matter (U.S. EPA 2009), Nitrogen Oxides (U.S. EPA 2016), Sulfur Dioxide (U.S. EPA 2008), and Lead (U.S. EPA 2013a). Additional reviews prepared by the California Air Resources Board and the California EPA Office of Environmental Health Hazard Assessment for Particulate Matter (California Air Resources Board and Office of Environmental Health Hazard Assessment 2002), for Ozone (California Air Resources Board and Office of Environmental Health Hazard Assessment 2005) and for Nitrogen Dioxide (California Air Resources Board and Office of Environmental Health Hazard Assessment 2007) were included in the summary. In addition, several large review articles on the health effects of air pollution also helped inform this Appendix (American Thoracic Society 1996a; Brunekreef et al. 2002). More detailed citations and discussions on air pollution health effects can be found in these references.[1] Additionally, a supplemental literature review of mortality and morbidity impacts of PM2.5, ozone, NO_2, and SO_2 was conducted for the AQMP Socioeconomic Evaluation to identify more recent studies (Industrial Economics Inc. 2016b; Industrial Economics Inc. 2016a); this health effects summary also draws upon this literature review to discuss these more recent studies, particularly those published since the

[1] Most of the studies referred to in this Appendix are cited in the above sources. Only specific selected references to provide examples of the types of health effects are cited in this summary.

most recent ISA's. This summary highlights studies that were conducted in the South Coast Air Basin or in Southern California, or alternatively, in California, if few studies from our local region are available on the specific topic. Studies conducted in Southern California give an important "local perspective" in understanding and evaluating the health effects of air pollution. However, studies conducted in other locations also provide critical information that is pertinent to advancing the scientific understanding of the health effects of air pollution, including effects on our local population. As such, this summary also discusses key studies that were conducted in other locations.

Over the decades of national reviews of outdoor air pollution and their health impacts, the U.S. EPA has developed a list of five criteria by which the strength and credibility of data can be judged. This five-tier weight-of-evidence approach provides an objective basis for assessing the breadth, specificity, and consistency of evidence concerning a particular health outcome. Table I-1 shows the five descriptors used by the U.S. EPA for assessing causality, using a weight-of-evidence approach. Within each section discussing a specific pollutant are tables showing summaries of the U.S. EPA conclusions regarding the causality of air pollution health effects, which are the conclusions of their scientific evaluation of the research studies they have reviewed. For the criteria pollutants, the discussion in this Appendix will focus only on those categories of health effects for which the U.S. EPA has determined there is a causal or likely causal relationship with the pollutant, while other health effects may be discussed briefly. In particular, because of the relatively long time gap since the latest U.S. EPA ISA for PM (in 2009), and because the SCAB currently exceeds the federal standards for PM2.5, some additional health endpoints that are emerging as areas of interest with regard to PM exposure are discussed briefly in this Appendix.

It is important to note that the U.S. EPA is tasked with assessing new and emerging air quality science, including health studies, as part of the process of setting the federal air quality standards. In other words, the U.S. EPA's role is to assess the causal relationships between the pollutants and the different types of health endpoints. It is SCAQMD's role to describe the public health impacts of poor air quality in our region, as well as to develop and implement an emission reduction strategy to attain the federal and state ambient air quality standards. Therefore, it is not the intention of this Appendix to assess whether there is or is not an effect of a specific air pollutant on any particular health endpoint, but rather to summarize the health effects and causal determinations as assessed by U.S. EPA and other scientific agencies, to discuss some recent studies published since the latest U.S. EPA reviews, to give some quantitative estimates of the health impacts of particulate matter air pollution in the South Coast Air Basin, and to present a "local perspective" by highlighting studies conducted in the South Coast Air Basin, Southern California, or California.

TABLE I-1

U.S. EPA's Weight of Evidence Descriptions for Causal Determination of Health Effects

DETERMINATION	WEIGHT OF EVIDENCE
Causal Relationship	Evidence is sufficient to conclude that there is a causal relationship with relevant pollutant exposures. That is, the pollutant has been shown to result in health effects in studies in which chance, bias, and confounding could be ruled out with reasonable confidence. For example: (a) controlled human exposure studies that demonstrate consistent effects; or (b) observational studies that cannot be explained by plausible alternatives or are supported by other lines of evidence (e.g., animal studies or mode of action information). Evidence includes replicated and consistent high-quality studies by multiple investigators.
Likely To Be A Causal Relationship	Evidence is sufficient to conclude that a causal relationship is likely to exist with relevant pollutant exposures, but important uncertainties remain. That is, the pollutant has been shown to result in health effects in studies in which chance and bias can be ruled out with reasonable confidence but potential issues remain. For example: (a) observational studies show an association, but co-pollutant exposures are difficult to address and/or other lines of evidence (controlled human exposure, animal, or mode of action information) are limited or inconsistent; or (b) animal toxicological evidence from multiple studies from different laboratories that demonstrate effects, but limited or no human data are available. Evidence generally includes replicated and high-quality studies by multiple investigators.
Suggestive Of A Causal Relationship	Evidence is suggestive of a causal relationship with relevant pollutant exposures, but is limited because chance, bias, and confounding cannot be ruled out. For example, at least one high-quality epidemiologic study shows an association with a given health outcome but the results of other studies are inconsistent.
Inadequate To Infer A Causal Relationship	Evidence is inadequate to determine that a causal relationship exists with relevant pollutant exposures. The available studies are of insufficient quantity, quality, consistency or statistical power to permit a conclusion regarding the presence or absence of an effect.
Not Likely To Be A Causal Relationship	Evidence is suggestive of no causal relationship with relevant pollutant exposures. Several adequate studies, covering the full range of levels of exposure that human beings are known to encounter and considering susceptible populations, are mutually consistent in not showing an effect at any level of exposure.

(Adapted from U.S. EPA, 2009)

OZONE

Ozone is a gaseous air pollutant that is a highly reactive compound and a strong oxidizing agent. When ozone comes into contact with the respiratory tract, it can react with tissues and cause damage in the airways. Ozone, or its reaction products, can penetrate into the gas exchange region of the deep lung. Both short-term and long-term exposures to ozone have been linked to respiratory effects. Ozone from man-made sources is formed by photochemical reactions when pollutants such as volatile organic compounds, nitrogen oxides, and carbon monoxide react with sunlight. The main sources of such ozone precursors are discussed in detail in the draft 2016 AQMP Chapter 3. Additionally, a discussion of the spatial distribution of ozone is provided in the draft 2016 AQMP Chapter 2.

In 1997, the U.S. EPA established the first federal standard for ozone averaged over 8 hours, at 0.08 ppm. In 2005, the California Air Resources Board (CARB) established standards of 0.09 ppm averaged over one hour and at 0.070 ppm averaged over eight hours. In 2008, the U.S. EPA lowered the federal standard for ozone to 0.075 ppm averaged over eight hours. On the basis of recent evaluations of ozone health effects, U.S. EPA's Clean Air Scientific Advisory Committee recommended in 2015 that the National Ambient Air Quality Standard (NAAQS) for ozone be reduced and recommended a range in which 0.070 ppm would be the upper limit. In 2015, the U.S. EPA concluded that the current national standard was not adequate to protect public health and lowered the 8-hour ozone standard to 0.070 ppm (U.S. EPA 2015b). While the federal standards must be attained within a specified time frame, the California standards do not have specific defined deadlines, but must be attained by the earliest practicable date.

The table below provides the overall U.S. EPA staff conclusions on the causality of short-term (i.e. hours, days, weeks) and long-term (i.e. months, years) ozone health effects for the health outcomes evaluated (U.S. EPA 2013b).

TABLE I-2

Summary of U.S. EPA's Causal Determinations for Health Effects of Ozone

SHORT-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Respiratory Effects	Causal relationship
Cardiovascular Effects	Likely to be a causal relationship
Central Nervous System Effects	Suggestive of a causal relationship
Effects on Liver and Xenobiotic Metabolism	Inadequate to infer a causal relationship
Effects on Cutaneous and Ocular Tissues	Inadequate to infer a causal relationship
Mortality	Likely to be a causal relationship
LONG-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Respiratory Effects	Likely to be a causal relationship
Cardiovascular Effects	Suggestive of a causal relationship
Reproductive and Developmental Effects	Suggestive of a causal relationship
Central Nervous System Effects	Suggestive of a causal relationship
Cancer	Inadequate to infer a causal relationship
Mortality	Suggestive of a causal relationship

(From U.S. EPA, 2013a Table 1-1)

Short-Term Exposure Effects of Ozone

The adverse effects reported with short-term ozone exposure are greater with increased activity because activity increases the breathing rate, the depth of the breaths, and the volume of air reaching the lungs, resulting in an increased amount of ozone reaching deeper into the lungs. Children are considered to be a particularly vulnerable population to air pollution effects because their lungs are still growing, they typically spend more time outdoors, are generally more physically active, and have a higher ventilation rate relative to their body weight, compared to adults (U.S. EPA 2013b).

A number of adverse health effects associated with ambient ozone levels have been identified from laboratory and epidemiological studies (American Thoracic Society 1996b; U.S. EPA 2006; U.S. EPA 2013b). These include increased respiratory symptoms, damage to cells of the respiratory tract, decrease in lung function, increased susceptibility to respiratory infection, an increased risk of hospitalization, and increased risk of mortality. For short-term ozone exposures, the U.S. EPA determined in the most recent ISA that the evidence supports a causal relationship for respiratory effects, and a likely causal relationship for cardiovascular effects and mortality.

In the laboratory, exposure of human subjects to low levels of ozone causes reversible decreases in lung function as assessed by various measures such as respiratory volumes, airway resistance and reactivity, irritative cough and chest discomfort. The results of several studies where human volunteers were exposed to ozone for 6.6 hours at levels between 0.04 and 0.12 ppm were summarized by Brown (Brown et al. 2008). As shown in Figure I-1, there is an increasing response on lung function with increasing exposure levels in moderately exercising subjects. A study published after the analysis by Brown et al. exposed healthy young adults for 6.6 hours under intermittent moderate exercise to each of the following: filtered air, and ozone at 0.06, 0.07, 0.08, and 0.087 ppm (Schelegle et al. 2009). The study found decreases in lung function (forced expiratory volume in 1 second, or FEV1) with each of the different levels of ozone exposure, although the decrease in lung function at 0.06 ppm was not statistically different from exposure to filtered air. Lung function (FEV1) decreases were approximately 5 percent, 7 percent, and 11 percent at ozone exposure levels of 0.07, 0.08, and 0.087 ppm. A more recent study (Kim et al. 2011) exposed young healthy adults to ozone in the range of 0.06 to 0.10 ppm for 6.6 hours while engaging in intermittent moderate exercise, and found that the study participants exhibited an approximately 2 percent reduction in lung function (FEV1) and an increase in pulmonary inflammation after exposure to ozone at the 0.06 ppm concentration.

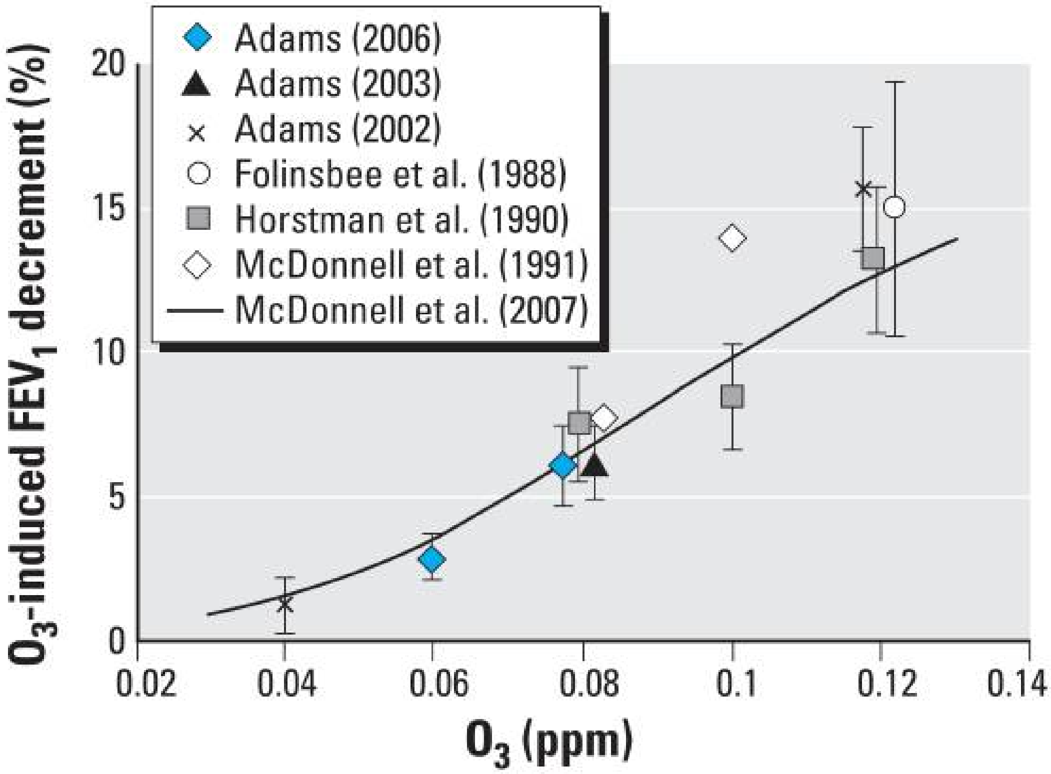


FIGURE I-1

Comparison of mean ozone-induced decrements in lung function following 6.6 hours of ozone exposure. Error bars represent the standard error. McDonnell et al. (2007) was a summary of results from several studies, and is represented by the line in the graph. (From: (Brown et al. 2008))

Some changes in lung function (volume and airway resistance changes) observed after study participants were exposed to ozone only once exhibit attenuated responses or a reduction in magnitude of responses when exposures are repeated, although there were a range of individual human responses observed, including some non-responders (Linn et al. 1988). Although it has been argued that the observed shift in response is evidence of a probable development of tolerance, it appears that while functional changes may exhibit attenuation, biochemical and cellular changes which may be associated with episodic and chronic exposure effects may not exhibit an attenuation. That is, internal damage to the respiratory system may continue with repeated ozone exposures, even if externally observable effects (chest symptoms and reduced lung function) disappear. An additional argument against toleration is that after several days or weeks without ozone exposures, the responsiveness (in terms of lung function as well as symptoms) returns, which is evidence that any tolerance developed is relatively short-lived (U.S. EPA 2013b).

Laboratory studies have also compared the degree of lung function change seen in healthy individuals versus asthmatics and those with chronic obstructive pulmonary disease (COPD). In several laboratory studies of individuals with COPD, the percent decreases in lung function from short-term ozone exposures ≤0.30ppm among patients with COPD generally did not differ from the lung function decrements experienced by healthy patients (Linn et al. 1982; Solic et al. 1982; Linn et al. 1983; Kehrl et al. 1985). That finding, however, may not accurately reflect the true impact of exposure on these respiration-compromised individuals. Since the respiration-compromised group may have lower lung function to begin with, the same total percent change in lung function may represent a substantially greater relative adverse effect overall. Other studies have found that subjects with asthma are more sensitive to the short-term effects of ozone in terms of lung function and inflammatory response, as evidenced by measuring changes in lung function, increased hospitalizations, and emergency room visits for respiratory conditions (U.S. EPA 2013b). This evidence supports the hypothesis that asthmatics are a particularly sensitive population to the health effects of ozone.

In laboratory studies of animals, cellular and biochemical changes associated with respiratory tract inflammation have also been consistently found in the airway lining after low- level exposure to ozone. These changes include an increase in specific cell types and in the concentration of biochemical mediators of inflammation and injury such as Interleukin-1, Interleukin-6, Interleukin-8, Tumor Necrosis Factor α (TNF-α), and fibronectin (Van Bree et al. 2002; Johnston et al. 2007; U.S. EPA 2013b).

In addition to controlled laboratory conditions, epidemiological studies of individuals exercising outdoors, including children attending summer camp, have shown associations of reduced lung function with ozone exposure. There were wide ranges in responses among individuals. U.S. EPA's 2013 ISA indicated that most studies found reductions in lung function (FEV_1) in the range of approximately <1 to 2 percent when standardized to an increase of 0.04 ppm for a 1-hour maximum, an increase of 0.03 ppm for an 8-hour maximum, and an increase of 0.02 ppm for a 24-hour average (U.S. EPA 2013b). Somewhat greater decrements in lung function (4.9 to 7.3 percent) were found in children with asthma who had respiratory infections or were using corticosteroid medication.

Epidemiologic studies have found that increases in short-term ozone levels are associated with impacts on children's respiratory health, including increases in respiratory symptoms in children with asthma, and increased numbers of absences from school. Studies conducted in various cities in the U.S. and in other countries have reported increased respiratory symptoms among children with asthma, including wheeze, cough, difficulty breathing, and chest symptoms/tightness (U.S. EPA 2013b). The Children's Health Study, conducted by researchers at the University of Southern California, followed for several years a cohort of children that live in 12 communities in Southern California with differing levels of air pollution. A publication from this study reported that school absences in fourth graders for respiratory illnesses were positively associated with short-term increases in ambient ozone levels. An increase of 20 ppb (0.02 ppm) ozone was associated with a 63 percent increase in illness-related absence rates and an 83 percent increase in respiratory illnesses (Gilliland et al. 2001). A small panel study of Hispanic children with asthma living in the Huntington Park neighborhood of Los Angeles, California reported that a 10.8 ppb increase in ozone averaged over 8 hours nearly doubled the odds of having asthma symptoms that interfered with daily activities (Delfino et al. 2003). Despite these studies, and some others linking ozone exposures with school absences, the U.S. EPA concluded that only limited evidence is currently available linking these ozone exposures to respiratory-related school absences (U.S. EPA 2013b).

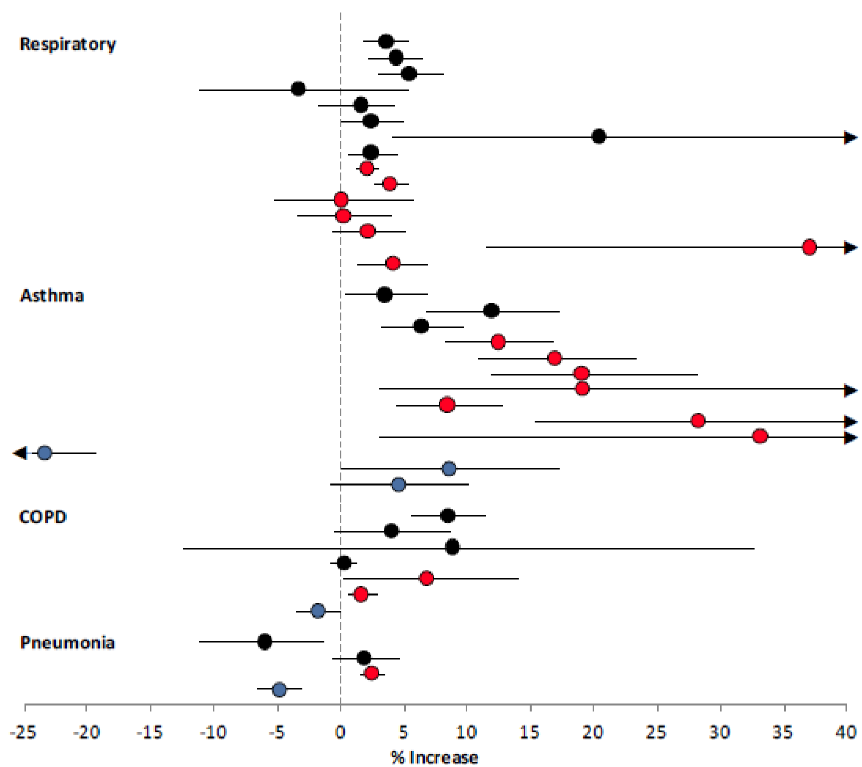
Numerous studies have found associations of short-term ozone levels and hospital admissions and emergency department admissions for respiratory conditions, and the U.S. EPA concluded in the latest ISA that the most recent epidemiological studies conducted in both single cities and multiple cities continue to provide evidence supporting a causal relationship between short-term ozone exposures and respiratory effects (U.S. EPA 2013b). The studies generally found stronger associations for asthma and COPD in the warm season or in the summer months, compared to the cold season, and also provided evidence that children are at greatest risk of ozone-related respiratory health effects. Several of these studies reviewed in the ISA had average ozone concentrations well below 60 ppb averaged over 8 hours and still reported associations with respiratory outcomes. One study of asthma emergency department visits reported ozone effects at concentrations as low as 30 ppb (Strickland et al. 2010). Figure I-2 presents examples of studies regarding all-year and seasonal analysis of ozone exposure and hospital admissions or emergency department visits. This figure illustrates the associations found between ambient ozone exposure and key respiratory outcomes (asthma, COPD and pneumonia), and shows the stronger effects with summertime ozone exposures. Recently, a study in California reported that short-term ozone exposures were associated with emergency department visits for asthma, acute respiratory infections, pneumonia, COPD, and upper respiratory tract infections, with more consistent associations during the warm season (Malig et al. 2016). This California study provides additional supporting evidence for ozone-related respiratory effects.

The potential cardiovascular effects of short-term ozone exposure have been studied in toxicological, human exposure, and epidemiological studies. Controlled human exposure studies have found that ozone exposures produce changes in heart function (as measured by heart rate variability) and increases in biomarkers in the blood for systemic inflammation and oxidative stress. The limited number of toxicological studies on this topic provide evidence of cardiovascular effects. The effects observed include increased heart rate variability, arrhythmias, vascular disease, and inflammation and oxidative stress leading to atherosclerosis, which can lead to tissue damage due to ischemia and reperfusion (i.e. having the blood supply cut off and then restored to the tissues) (U.S. EPA 2013b). The controlled human exposure and toxicological studies provide evidence of cardiovascular effects of ozone, and some plausible mechanisms for these effects. Epidemiological studies, including some recent multi-city studies show relatively consistent associations between short-term ozone exposures and cardiovascular mortality (these studies are discussed further below). However, epidemiological studies do not provide consistent evidence of cardiovascular morbidity with short-term ozone exposures. Studies conducted in the Los Angeles area or in California also do not provide consistent evidence of short-term ozone effects on cardiovascular morbidity. A study of elderly non-smokers in the Los Angeles area with a history of heart disease found no associations between ozone exposure and blood pressure nor ST-segment depression, a measure of cardiac ischemia (Delfino et al. 2010; Delfino et al. 2011). A Los Angeles-based study of cardiovascular hospital admissions did not find increased risk with ozone exposures (Linn et al. 2000). However, a biomarker study of students at UC Berkeley who spent their summer vacation in either the Los Angeles or San Francisco Bay Area found that ozone exposures over a period of 2 weeks or 1 month were associated with increases in a biomarker of lipid peroxidation, but no association was found for a biomarker of antioxidant capacity (Chen et al. 2007). Lipid peroxidation is an indicator of oxidative stress, which may be triggered by pulmonary inflammation caused by ozone exposure. Given the strong evidence of cardiovascular morbidity from experimental studies and the consistent positive associations reported in epidemiological studies of cardiovascular mortality, but the lack of consistent evidence from epidemiological studies of cardiovascular morbidity, the U.S. EPA determined that there is a likely causal relationship between short-term ozone exposures and cardiovascular effects (U.S. EPA 2013b).

For mortality effects, the U.S. EPA 2013 ISA concluded that there was a likely causal relationship for short-term ozone exposures. This determination is supported by numerous studies have found positive associations between short-term increases in ozone levels and excess risk of mortality from all non-accidental causes, cardiovascular causes, and respiratory causes (Bell et al. 2004; Bell et al. 2005; Huang et al. 2005; Ito et al. 2005; Levy et al. 2005; Bell et al. 2008; Zanobetti et al. 2008). Studies conducted across multiple cities in the U.S. Canada, Europe and Asia reported increased cardiovascular and respiratory mortality risks with increased short-term ozone exposures, and several studies additionally reported increased mortality risk for summer season ozone exposures (Katsouyanni et al. 2009; Samoli et al. 2009; Stafoggia et al. 2010; Wong et al. 2010). Some studies have also demonstrated that these associations persist even when other variables including season and levels of particulate matter are accounted for, indicating that ozone mortality effects may be independent of other pollutants, although there is some variability across studies with regard to the sensitivity of the ozone associations to adjustment for PM (Bell et al. 2004; Huang et al. 2005; Katsouyanni et al. 2009; Stafoggia et al. 2010). With regard to respiratory effects, the substantial evidence supporting a causal relationship between short-term ozone exposures and respiratory morbidity provides strong support for the recent evidence from epidemiological studies linking such exposures to respiratory mortality. For cardiovascular effects, while there is strong evidence linking cardiovascular mortality with short-term ozone exposures, the epidemiological studies of non-fatal outcomes do not provide consistent evidence for a coherent mechanism linking ozone exposures to cardiovascular mortality (U.S. EPA 2013b).

Examples of studies showing the relative change in mortality risks for all-year and summer-only analyses are shown in Figure I-3.

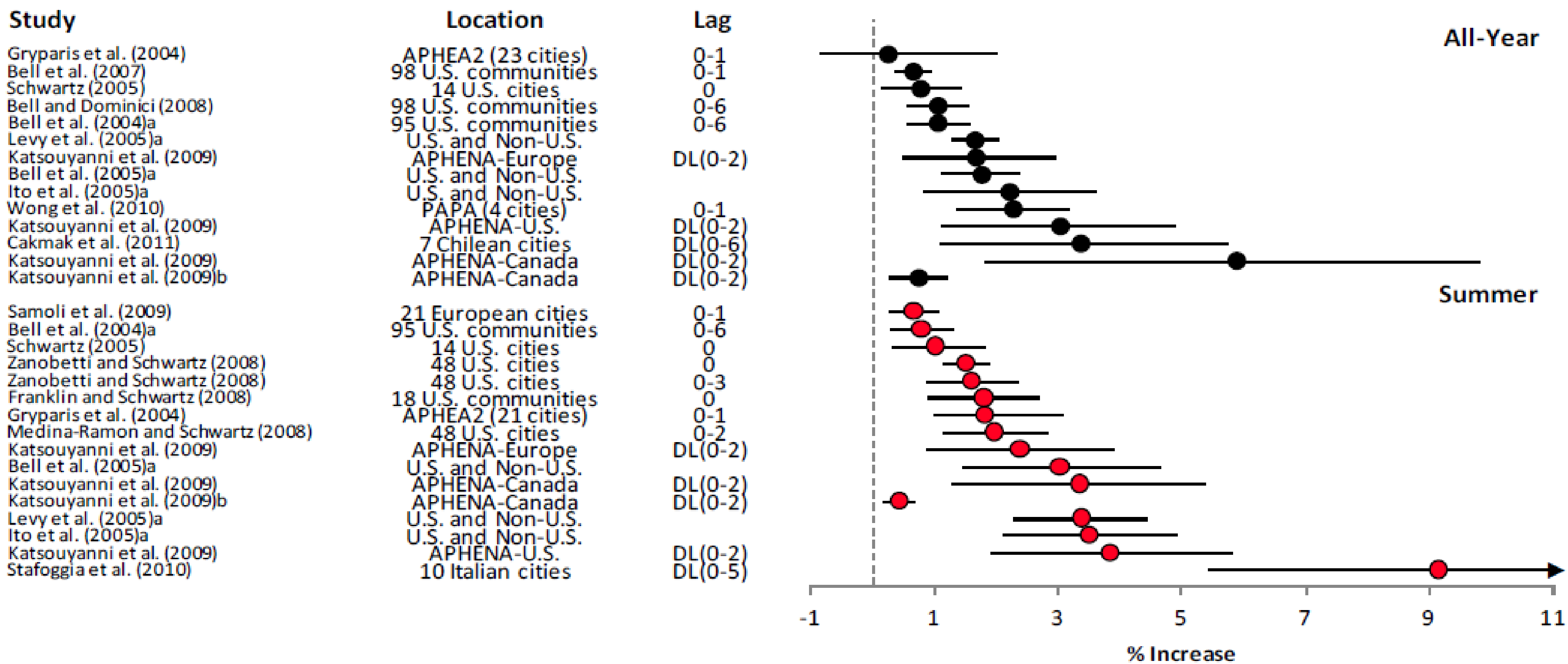
Study	Location	Visit Type	Age	Lag
Wong et al. (2009)	Hong Kong	HA	All	0-1
Cakmak et al. (2006)	10 Canadian cities	HA	All	1,2
Dales et al. (2006)	11 Canadian cities	HA	0-27 days	2
Orazzo et al. (2009)a	6 Italian cities	ED	0-2	0-6
Katsouyanni et al. (2009)	APHENA-Europe	HA	65+	0-1
	APHENA-U.S.	HA	65+	0-1
	APHENA-Canada	HA	65+	DL (0-2)
	APHENA-Canada	HA	65+	DL (0-2)b
Darrow et al. (2009)	Atlanta	ED	All	1
Tolbert et al. (2007)	Atlanta	ED	All	0-2
Biggeri et al. (2005)c	8 Italian cities	HA	All	0-3
Katsouyanni et al. (2009)	APHENA-Europe	HA	65+	0-1
	APHENA-U.S.	HA	65+	0-1
	APHENA-Canada	HA	65+	DL (0-2)
	APHENA-Canada	HA	65+	DL (0-2)b
Stieb et al. (2009)	7 Canadian Cities	ED	All	2
Villeneuve et al. (2007)	Alberta, CAN	ED	> 2	0-2
Strickland et al. (2010)	Atlanta	ED	Children	0-2
Silverman and Ito (2010)d	New York	HA	All	0-1
Ito et al. (2007)	New York	ED	All	0-1
Villeneuve et al. (2007)	Alberta, CAN	ED	> 2	0-2
Mar and Koenig (2009)	Seattle, WA	ED	18+	2
Strickland et al. (2010)	Atlanta	ED	Children	0-2
Silverman and Ito (2010)d	New York	HA	6-18	0-1
Mar and Koenig (2009)	Seattle, WA	ED	<18	0
Ito et al. (2007)	New York	ED	All	0-1
Villeneuve et al. (2007)	Alberta, CAN	ED	> 2	0-2
Strickland et al. (2010)	Atlanta	ED	Children	0-2
Wong et al. (2009)	Hong Kong	HA	All	0-1
Stieb et al. (2009)	7 Canadian Cities	ED	All	2
Yang et al. (2006)	Vancouver	HA	65+	0-3
Medina-Ramon et al. (2006)	36 U.S. cities	HA	65+	DL (0-1)
Stieb et al. (2009)e	7 Canadian Cities	ED	All	NR
Medina-Ramon et al. (2006)	36 U.S. cities	HA	65+	DL (0-1)
	36 U.S. cities	HA	65+	DL (0-1)
Zanobetti and Schwartz (2006)	Boston	HA	65+	0-1
Medina-Ramon et al. (2006)	36 U.S. cities	HA	65+	DL (0-1)
	36 U.S. cities	HA	65+	DL (0-1)
	36 U.S. cities	HA	65+	DL (0-1)



Note: Effect estimates are for a 20 ppb increase in 24-hour; 30 ppb increase in 8-hour max; and 40 ppb increase in 1-hour max O_3 concentrations. HA=hospital admission; ED=emergency department. Black=All-year analysis; Red=Summer only analysis; Blue=Winter only analysis. (From (U.S. EPA 2013b) Figure 6-19)

FIGURE I-2

Change in respiratory-related hospital admission and emergency department visits in studies that presented all-year and/or seasonal results.



Note: Effect estimates are for a 40 ppb increase in 1-hr max, 30 ppb increase in 8-hr max, and 20 ppb increase in 24-hr average O_3 concentrations. (From (U.S. EPA 2013b) Figure 6-27)

FIGURE I-3

Summary of mortality risk estimates for short-term O_3 exposure and all-cause (nonaccidental) mortality.

Long-Term Exposure Effects of Ozone

The U.S. EPA 2013 ISA for Ozone concluded that there was a likely causal relationship between long-term ozone exposure and respiratory effects (U.S. EPA 2013b). Evidence supporting this determination comes from epidemiological and toxicological studies, particularly studies of asthma and related symptoms, asthma-related hospital admissions, lung function, lung inflammation and oxidative stress. Other health effects of long-term ozone exposure were determined to have “suggestive” or “inadequate” evidence of causality, although the few studies of respiratory mortality provide support to the respiratory health effects of ozone.

The Adventist Health and Smog Study (AHSMOG) and Children’s Health Study cohorts are two large long-term studies conducted in California that examined several aspects of long-term ozone effects in adults and children, respectively. Several of these studies focused on asthma development and exacerbation. The AHSMOG study included adult, non-smoking, non-Hispanic white Seventh Day Adventists living in California. The 10-year follow-up AHSMOG study reported that a 10 ppb increase in annual mean ozone exposures increased the risk of asthma development in males by three-fold (relative risk 3.12, 95 percent confidence interval: 1.16, 5.85), but no effect was seen among females (relative risk 0.94, 95 percent confidence interval: 0.65, 1.34) (Greer et al. 1993). The 15-year follow-up AHSMOG study used an ozone metric focusing on 8-hour average exposures, and reported that a 10 ppb increase was associated with a 30 percent increased risk of developing asthma in males (relative risk 1.31, 95 percent confidence interval: 1.01, 1.71), and these effects persisted even after accounting for other pollutants (McDonnell et al. 1999). The latter study also found no effect in females, although this may reflect a greater potential for misclassification of air pollution exposure in females compared to males, due to different time-activity patterns resulting in greater time spent outdoors among males (U.S. EPA 2013b). In the Children’s Health Study, among children living in 12 Southern California communities with high ozone concentrations, the relative risk of developing asthma in children playing three or more sports was found to be over three times higher than in children playing no sports (McConnell et al. 2002). The high ozone communities had a 4-year mean daytime ozone concentration of 59.6 ppb, compared to 40.0 ppb for the low-ozone communities. These findings indicate that new cases of asthma in children may be associated with performance of heavy exercise in communities with high levels of ozone. While it has long been known that air pollution can exacerbate symptoms in individuals with preexisting respiratory disease, this is among the first studies that indicate ozone exposure may contribute to asthma onset. However, three more recent Southern California studies did not find an association between ozone exposures and childhood asthma incidence, but did report increased risks of asthma onset with higher exposures to particulate matter or NO_2 (Islam et al. 2007; McConnell et al. 2010; Nishimura et al. 2013). These studies did not examine whether genetic factors may have played a role in making some people more susceptible than others to the respiratory effects of ozone exposure. Some analyses from the Children’s Health Study identified specific genetic variants that, when combined with ambient ozone exposure, either increase or decrease the risk of developing asthma (Islam et al. 2008; Islam et al. 2009; Salam et al. 2009). These genetic variants are involved with antioxidant and/or antiinflammatory pathways, and are likely involved in key elements of asthma development (U.S. EPA 2013b).

Other studies examined the impact of long-term ozone exposures and respiratory symptoms, particularly among asthmatics. Studies have linked long-term ozone exposures to increased risk of having poorly-controlled asthma, increased asthma symptoms, and respiratory-related school absences (Gilliland et al. 2001; Akinbami et al. 2010; Jacquemin et al. 2012). An analysis from the CHS found no association between long-term ozone exposures and chronic lower respiratory tract symptoms, and another found an increased risk of bronchitic symptoms within a community, although the association was reduced when accounting for other pollutants (McConnell et al. 1999; McConnell et al. 2003). However, two studies from the CHS demonstrated gene-environment interactions for genes that are involved in inflammation or antioxidant pathways. One study found that asthmatic children with a particular genetic variant that reduces expression of the cytokine TNF-α (as part of an inflammatory response) had reduced risk of bronchitic symptoms for children in low-ozone communities, but not for children in high-ozone communities (Lee et al. 2009). A second study found that a particular genetic variant reduced the risk of respiratory-related school absences among children living in communities with high levels of ozone (defined in this study as being above the median value of 46.9 ppb) (Wenten et al. 2009).

Results of epidemiologic studies of hospital admissions and emergency department visits support the relationship between ozone exposure and respiratory effects. In a 2007 study conducted in Southern California, an increased risk of having poorly-controlled asthma was associated with living in areas above the 90^{th} percentile ozone level (28.7 ppb, annual average) among men and elderly individuals (Meng et al. 2007). A study in the South Coast Air Basin found that ozone was associated with increased hospital discharges for asthma among children (Moore et al. 2008). Another study in the South Coast Air Basin looked at infants hospitalized for bronchiolitis. This study found a reduced risk of infant bronchiolitis hospitalization with increased ozone exposure, although there was no association for ozone when accounting for the effect of PM2.5, which was positively associated with this respiratory outcome (Karr et al. 2007). A study of people with asthma was conducted in the San Joaquin Valley of California, and found that a 10 ppb increase in ozone exposures averaged over one year increased the odds of asthma-related hospital admissions and emergency department visits by approximately 50 percent, and the odds of asthma symptoms among adults by about 40 percent (Meng et al. 2010). Studies conducted in other locations have also reported increases in asthma hospitalizations (U.S. EPA 2013b).

Some animal studies show results that indicate possible chronic effects including functional and structural changes of the lung. However, morphological, developmental, and immunological differences make it difficult to apply these results to humans experiencing ambient exposures. These changes observed in airway responsiveness provide support for the long-term effects of ozone in asthma development or exacerbation (U.S. EPA 2013b). However, epidemiologic studies examining long-term ozone exposures and lung function deficits have reported mixed results. For example, an analysis of the first CHS cohort found that PM2.5 and NO_2 exposures were associated with decreased lung function, but did not find an association for ozone (Gauderman et al. 2004). An autopsy study involving Los Angeles County residents who died between ages 14 and 25 years due to violent death, although conducted many years ago when pollutant levels were higher than currently measured, provided supportive evidence of lung tissue damage (structural changes), which the authors suggested were attributable to air pollution (Sherwin 1991), although many uncertainties remain about the extent to which air pollution explains the findings.

Unlike short-term ozone exposures, there is limited evidence linking long-term ozone exposures with mortality. A large study based on the American Cancer Society Cancer Prevention Study II (CPS-II) cohort included 96 metropolitan statistical areas in the U.S., and reported that a 10 ppb increase in daily maximum 1-hour ozone concentrations averaged between April and September (warm season) was associated with a relative risk of 1.040 (95 percent confidence interval: 1.010, 1.067) for respiratory deaths, but no association with cardiovascular deaths (Jerrett et al. 2009). A U.S. study of Medicare enrollees reported increased risk of mortality with higher ozone exposures averaged over the warm season, among patients who had previously been hospitalized for congestive heart failure, myocardial infarction, COPD and diabetes (Zanobetti et al. 2011). A recent large-scale study found increased risk of all-cause, cardiovascular, and respiratory mortality with long-term ozone exposures, even after accounting for the effects of PM2.5 and NO_2, as well as other behavioral and demographic factors, including smoking (Turner et al. 2016). Other studies have found temperature to be an important potential risk factor for mortality, and may confound or modify the associations between air pollution exposure and mortality (Basu et al. 2002; Cheng et al. 2008). The Turner 2016 study examined the role of temperature, and found that the associations between ozone and mortality differed based on average daily maximum temperatures (Turner et al. 2016). While the U.S. EPA determination in the latest ISA was that the evidence was suggestive of long-term ozone exposure causing mortality, the studies of respiratory mortality support the evidence for the respiratory effects of ozone exposure, for which U.S. EPA has concluded there is a causal relationship.

For non-respiratory health endpoints, the U.S. EPA causal determinations were “suggestive of a causal relationship” (for cardiovascular, reproductive and developmental, central nervous system and mortality effects) or “inadequate to infer a causal relationship” (for cancer). Some studies conducted in California have examined reproductive or developmental effects, including birth defects, low birth weight or birth weight reductions, stillbirth and autism (Ritz et al. 2002; Ritz et al. 2007; Morello-Frosch et al. 2010; Becerra et al. 2013; Mobasher et al. 2013; Trasande et al. 2013; Laurent et al. 2014; Green et al. 2015; Symanski et al. 2016). Other recent studies have examined cardiovascular effects (Koken et al. 2003; Ensor et al. 2013; Rodopoulou et al. 2014). While many of these studies have reported associations with ambient ozone levels, the most recent U.S. EPA determination in 2013 was that the evidence was suggestive of a causal determination, but did not yet rise to a higher level.

Sensitive Populations for Ozone-Related Health Effects

A number of population groups are potentially at increased risk for ozone exposure effects. In the most recent ISA for ozone in 2013, the U.S. EPA has identified several populations as having adequate evidence for increased risk from ozone exposures. These include children, older adults, outdoor workers, and individuals with asthma, certain variations in genes related to oxidative metabolism or inflammation, or reduced intake of certain nutrients such as Vitamins C and E (Kreit et al. 1989; Horstman et al. 1995; Sienra-Monge et al. 2004; Romieu et al. 2012; U.S. EPA 2013b; Bell et al. 2014). There is suggestive evidence for other potential factors, such as a person's sex, socioeconomic status, and obesity (U.S. EPA 2013b). Some other factors that could affect sensitivity to ozone have also been studied; however, there was inadequate evidence to conclude whether these were risk factors for ozone sensitivity. The table below summarizes the evidence for factors affecting sensitivity to ozone from the 2013 ISA for ozone.

TABLE I-3

Summary of Evidence for Potential Increased Susceptibility to Ozone-Related Health Effects

Evidence Classification	Potential At Risk Factor
Adequate evidence	Genetic factors Asthma Children Older adults Diet Outdoor worker
Suggestive evidence	Sex SES Obesity
Inadequate evidence	Influenza/infection COPD Cardiovascular disease Diabetes Hyperthyroidism Race/ethnicity Smoking Air conditioning use
Evidence of no effect	--

From (U.S. EPA 2013b) Table 8-6

As previously mentioned, one group that has been recognized as being particularly sensitive to the effects of ozone is young children with asthma, because their lungs are still developing, their potential for increased exposure due to time spent exercising outdoors, and their high ventilation rates relative to body weight (U.S. EPA 2013b). Some factors that may contribute to the increased sensitivity among people with asthma include having an altered innate immune function and factors that decrease their antioxidant defenses (Alexis et al. 2014). Ozone creates secondary oxidation products that are electrophilic, and certain genetic factors influence a person's ability to metabolize these electrophiles, which can affect respiratory function (U.S. EPA 2013b). Asthma exacerbations are more prevalent and severe in young boys than in girls, but the evidence on whether boys are more susceptible than girls to the effects of air pollution on asthma symptoms is not consistent (Guarnieri et al. 2014).

Summary – Ozone Health Effects

In summary, outdoor ozone exposures have been associated with a range of negative human health effects. The strongest evidence for negative health impacts are on the respiratory system, and are measured by decreased lung function performance and increased cell injury. In addition, the 2013 ISA also concluded that there was a likely causal relationship between short-term ozone exposures and cardiovascular effects (such as changes in heart function, and increased systemic inflammation and oxidative stress) as well as respiratory mortality. Although the specific mechanisms of action for ozone effects on the various health endpoints have not been fully identified, there is evidence of the important roles of oxidation of key enzymes and proteins, inflammatory responses, changes in immune response, and modification and activation of neural reflex pathways (U.S. EPA 2013b).

The previous U.S. EPA review of ozone in the 2006 Air Quality Criteria Document (AQCD) had already concluded that there was clear, consistent evidence that acute ozone exposure is causally associated with respiratory effects (U.S. EPA 2006). Additionally, the 2006 AQCD for ozone concluded that the evidence was highly suggestive of ozone causing mortality, but that there was limited evidence for ozone causing cardiovascular effects. In the 2013 ISA, the U.S. EPA cited that several lines of evidence provide support for the respiratory effects of ozone, including human exposure studies, epidemiology and toxicology, which led to the conclusion that there was a causal relationship with short-term ozone exposures, and a likely causal relationship with long-term ozone exposures. In humans, respiratory effects were detected in laboratory studies at 0.06 ppm ozone concentrations, and in epidemiological studies with average ozone concentrations as low as 0.03 ppm (Strickland et al. 2010; Kim et al. 2011). Some populations are more sensitive to the health effects of ozone than others, including elderly persons, children, outdoor workers and persons with asthma.

PARTICULATE MATTER

Airborne particulates are a complex group of pollutants that vary in physical, chemical, and biological dimensions. Physically, particles can vary by size, surface area and roughness, shape, and mass. Chemically, they vary by chemical composition. Biologically, they can vary by toxicity. In addition, particles vary by source, and can come from anthropogenic (man-made, such as from combustion of fuels, or frictional abrasion) or “natural” (plants – for example, pollens and spores) origins. The composition of particulate matter can vary across sub-regions, and a description of the spatial differences in PM composition can be found in the draft 2016 AQMP Chapter 2 and Appendix II.

The National Ambient Air Quality Standard for particulate matter was established in 1971, and set limits on the ambient level of Total Suspended Particulates (TSP). In 1987, the national particulate matter standards were revised to focus on particles sized 10 µm (micrometers) aerodynamic diameter and smaller. These can be inhaled and deposited throughout the upper and lower respiratory system, depositing in both airways and gas-exchange areas of the lung. These particles are referred to as PM10. U.S. EPA initially promulgated ambient air quality standards for PM10 of 150 µg/m^3 averaged over a 24-hour period, and 50 µg/m^3 for an annual average. U.S. EPA has since rescinded the annual PM10 standard, but kept the 24-hour standard.

As more health research data has become available, concerns have centered on smaller and smaller particles. Additional focus has been placed on particles having an aerodynamic diameter of 2.5 µm or less (PM2.5). A greater fraction of particles in this size range can penetrate and deposit deep in the lungs. The U.S. EPA established standards for PM2.5 in 1997 and in 2006 lowered the air quality standards for PM2.5 to 35 µg/m^3 for a 24-hour average and reaffirmed 15 µg/m^3 for an annual average standard. There was considerable controversy and debate surrounding the review of particulate matter health effects and the consideration of ambient air quality standards (Kaiser 1997; Vedal 1997) when the U.S. EPA promulgated the initial PM2.5 standards in 1997. In 2002, the California Air Resources Board adopted an air quality standard for PM2.5 at a level of 12 µg/m^3, in the form of an annual average.

Since that time, additional studies have been published and some of the key studies were closely scrutinized and the data reanalyzed by additional investigators. The reanalyses confirmed the original findings, and there are now additional data confirming and extending the range of the adverse health effects of PM2.5 exposures. In 2012, the U.S. EPA revised the PM2.5 annual average standard to 12.0 µg/m^3 (U.S. EPA 2013c). This federal standard is set at same level as the current California PM2.5 annual standard, although the California standard does not have a specified attainment date. In 2014, the U.S. EPA announced it is preparing an ISA as part of the review of the federal PM standards (the process is described briefly in the draft AQMP Chapter 8). The draft AQMP Chapter 2 and Appendix II provide additional information about how PM levels in the South Coast Air Basin compare to the federal and state standards.

There have been several reviews of the health effects of ambient particulate matter (American Thoracic Society 1996a; Brunekreef et al. 2002; U.S. EPA 2004; U.S. EPA 2009; Brook et al. 2010). In addition, the California Air Resources Board (CARB) and the Office of Environmental Health and Hazard Assessment (OEHHA) have reviewed the adequacy of the California Air Quality Standards for Particulate Matter (California Air Resources Board and Office of Environmental Health Hazard Assessment 2002).

The major types of health effects associated with particulate matter include:

- Increased mortality
- Exacerbation of respiratory disease and of cardiovascular disease as evidenced by increases in:
    - Respiratory symptoms, exacerbation of asthma
    - Cardiovascular symptoms, non-fatal myocardial infarction
    - Hospital admissions and emergency room visits

- Physician office visits
- School absences

- Adverse birth outcomes
- Effects on lung function
- Changes in lung morphology

In the 2009 Integrated Science Assessment for Particulate Matter, the U.S. EPA presented conclusions on the particulate matter causal determination of several health effects based on an updated review of scientific studies (U.S. EPA 2009). The conclusions are presented separately for particulates in the size range of 2.5 to 10 micrometers (µm) in aerodynamic diameter (PM10-2.5, often referred to as the coarse fraction) and those ≤2.5 µm (PM2.5, or fine particles). Of note, there is currently no federal or California standard for PM10-2.5, although a PM10 standard remains in effect. These conclusions are depicted in the following tables.

TABLE I-4

Summary of U.S. EPA's Causal Determinations for Health Effects of PM10-2.5

SHORT-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Cardiovascular effects	Suggestive of a causal relationship
Respiratory effects	Suggestive of a causal relationship
Mortality	Suggestive of a causal relationship
LONG-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Cardiovascular effects	Inadequate to infer a causal relationship
Respiratory effects	Inadequate to infer a causal relationship
Mortality	Inadequate to infer a causal relationship
Reproductive and developmental	Inadequate to infer a causal relationship

(From (U.S. EPA 2009) Table 2-3 and Section 2.3.4)

There are also differences in the composition and sources of particles in the different size ranges that may have implications for health effects. The particles in the coarse fraction (PM10-2.5) are mostly produced by mechanical processes. These include automobile tire wear, industrial processes such as cutting and grinding, and resuspension of particles from the ground or road surfaces by wind and human activities, such as agricultural, mining, and construction operations, which may be particularly important in rural areas.

TABLE I-5

Summary of U.S. EPA's Causal Determinations for Health Effects of PM2.5

SHORT-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Cardiovascular effects	Causal relationship
Respiratory effects	Likely to be a causal relationship
Central nervous system	Inadequate to infer a causal relationship
Mortality	Causal relationship
LONG-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Cardiovascular effects	Causal relationship
Respiratory effects	Likely to be a causal relationship
Mortality	Causal relationship
Reproductive and developmental	Suggestive of a causal relationship
Cancer, Mutagenicity, Genotoxicity	Suggestive of a causal relationship

(From (U.S. EPA 2009) Tables 2-1 and 2-2)

In contrast, particles smaller than 2.5 µm are mostly derived from combustion sources, such as automobiles, trucks, and other vehicle exhaust, as well as from stationary combustion sources. The particles are either directly emitted or are formed in the atmosphere from gases that are emitted. Components from material in the earth's crust, such as dust, are also present, with the amount varying in different locations.

Attention to another range of very small particles has been increasing over the last several years. These are generally referred to as "ultrafine" particles, with diameters of 0.1 µm or less. Ultrafine particles are mainly composed of particles from fresh emissions of combustion sources, but are also formed in the atmosphere by condensation of vapors that are emitted or by chemical or photochemical reactions with other contaminants in the air.

Ultrafine particles have relatively short half-lives (minutes to hours) and the particle size rapidly grows through condensation and coagulation processes into particles within the PM2.5 size range. Ultrafine particles are garnering interest since a limited number of epidemiological and some laboratory studies, though not all, indicate that their toxicity may be higher on a mass basis than larger particles. There is also evidence that these small particles, or toxic components carried on their surface, can translocate from the lung to the blood and to other organs of the body, or through the olfactory bulb into the brain (U.S. EPA 2009). Currently, there are no federal or California standards for ultrafine particles. As such, the health effects of ultrafine particles is discussed in a separate section following the discussion of PM10 and PM2.5.

The current federal and California standards for particulate matter are listed in Table I-6.

TABLE I-6

Ambient Air Quality Standards for Particulate Matter

STANDARD	FEDERAL	CALIFORNIA
PM10 24-Hour average	150 $\mu g/m^3$	50 $\mu g/m^3$
PM10 Annual Average	--	20 $\mu g/m^3$
PM2.5 24-Hour Average	35 $\mu g/m^3$	--
PM2.5 Annual Average	12 $\mu g/m^3$	12 $\mu g/m^3$

Short-Term Exposure Effects of PM

Epidemiological studies have provided evidence for most of the effects listed above. In an extensive report focusing on the history of particulate matter research, the U.S. EPA reviewed several well-conducted studies that reported an association between mortality and increased daily or several-day-average concentrations of PM10 (U.S. EPA 2004). In addition, excess mortality and morbidity are reported in many studies involving communities across the U.S. as well as in Europe, Asia, and South America (U.S. EPA 2009; Lu et al. 2015; Shah et al. 2015; Cai et al. 2016), although there are some studies that show no effect for the specific exposures and outcomes evaluated (Milojevic et al. 2014; Wang et al. 2015; Zu et al. 2016). While there were some studies conducted in California, the importance of assessing results from studies from many different locations around the world should not be understated. The repeatability and consistency of results across many locations strengthens the weight of evidence in the determination of causality.

A review and analysis of epidemiological literature for acute adverse effects of particulate matter was published by the American Thoracic Society in 1996, where several adverse effects were listed as associated with daily PM10 exposures (Table I-7). The review also reported that individuals who are elderly or have preexisting lung or heart disease are more susceptible than others to the adverse effects of PM10 (American Thoracic Society 1996a).

TABLE I-7

Combined Effect Estimates of Daily Mean Particulate Pollution (PM10)

	% CHANGE IN HEALTH INDICATOR PER EACH 10 μg/m^3 INCREASE IN PM10
Increase in Daily Mortality	
Total deaths	1.0
Respiratory deaths	3.4
Cardiovascular deaths	1.4
Increase in Hospital Usage (all respiratory diagnoses)	
Admissions	1.4
Emergency department visits	0.9
Exacerbation of Asthma	
Asthmatic attacks	3.0
Bronchodilator use	12.2
Emergency department visits*	3.4
Hospital admissions	1.9
Increase in Respiratory Symptom Reports	
Lower respiratory	3.0
Upper respiratory	0.7
Cough	2.5
Decrease in Lung Function	
Forced expiratory volume	0.15
Peak expiratory flow	0.08

* One study only
(From: (American Thoracic Society 1996a))

Since then, many more recent studies have provided additional evidence that excess mortality and morbidity are associated with short-term exposure to PM10 and PM2.5 (Pope et al. 2006).

Estimates of mortality effects from studies of PM10 exposures range from 0.3 to 1.7 percent increase for a 10 μg/m^3 increase in PM10 levels. The National Morbidity, Mortality, and Air Pollution Study (NMMAPS), a study of 20 of the largest U.S. cities, determined a combined risk estimate of about a 0.5 percent increase in total mortality for a 10 μg/m^3 increase in PM10 (Samet et al. 2000a). This study also analyzed the effects of gaseous co-pollutants. When the gaseous pollutants were included in the analyses, the estimated associations between PM10 and mortality remained, though they were somewhat reduced. These results suggest that the effects reported in the study are likely due to the particulate exposures; they cannot readily be explained by coexisting weather stresses or other pollutants.

An expansion of the NMMAPS study to 90 U.S. cities also reported association with PM10 levels and mortality (Samet et al. 2000b; Health Effects Institute 2003). After the study was published, it was discovered that some of the study analyses had been performed with incorrect default values. The strong positive association between acute PM10 exposure and mortality remained, both upon reanalysis using revised software and using alternative modeling approaches (Dominici et al. 2002; Health Effects Institute 2003).

Studies of short-term exposures to PM2.5 have also found associations with increases in mortality. The NMMAPS study conducted a national analysis of PM2.5 mortality association for 1999-2000. The risk estimates were 0.29 percent for all-cause mortality and 0.38 percent for cardio-respiratory mortality (Dominici et al. 2007). In its 2009 review, U.S. EPA determined that estimates for PM2.5 generally are in the range of 0.29 to 1.21 percent increase in total deaths per 10 $\mu g/m^3$ increase in 24-hour PM2.5 levels. The estimates for cardiovascular related mortality range from 0.03 to 1.03 percent per 10 $\mu g/m^3$, and for respiratory mortality estimates range from 1.01 to 2.2 percent per 10 $\mu g/m^3$ 24-hour PM2.5 (U.S. EPA 2009). Figure I-4 shows a summary of U.S. and Canadian studies of mortality and short-term PM2.5 exposures, which shows that the most consistent positive associations were seen with cardiovascular and all-cause deaths. Positive associations for respiratory deaths were also seen in several of these studies, although the precision of the estimates for respiratory deaths was lower relative to that of all-cause or cardiovascular deaths.

Several studies have attempted to assess the relative importance of particles smaller than 2.5 µm and those between 2.5 µm and 10 µm (PM10-2.5). While some studies report that PM2.5 levels are better predictors of mortality effects, others suggest that PM10-2.5 is also important. Most of the studies found higher mortality associated with PM2.5 levels than with PM10-2.5. For example, a study of six cities in the U.S. found that particulate matter less than 2.5 µm was associated with increased mortality, but that the larger particles were not. In the U.S. EPA review (U.S. EPA 2009), several studies were presented that found associations of PM10-2.5 and mortality. Some of the studies showed differences by region of the U.S. In one study of 47 U.S. cities that had both PM2.5 and PM10 data available to calculate PM10-2.5 as a difference, overall, the study found a significant association between the computed PM10-2.5 and all-cause, cardiovascular, and respiratory mortality. The study also reported differences by season and climate area (Zanobetti et al. 2009).

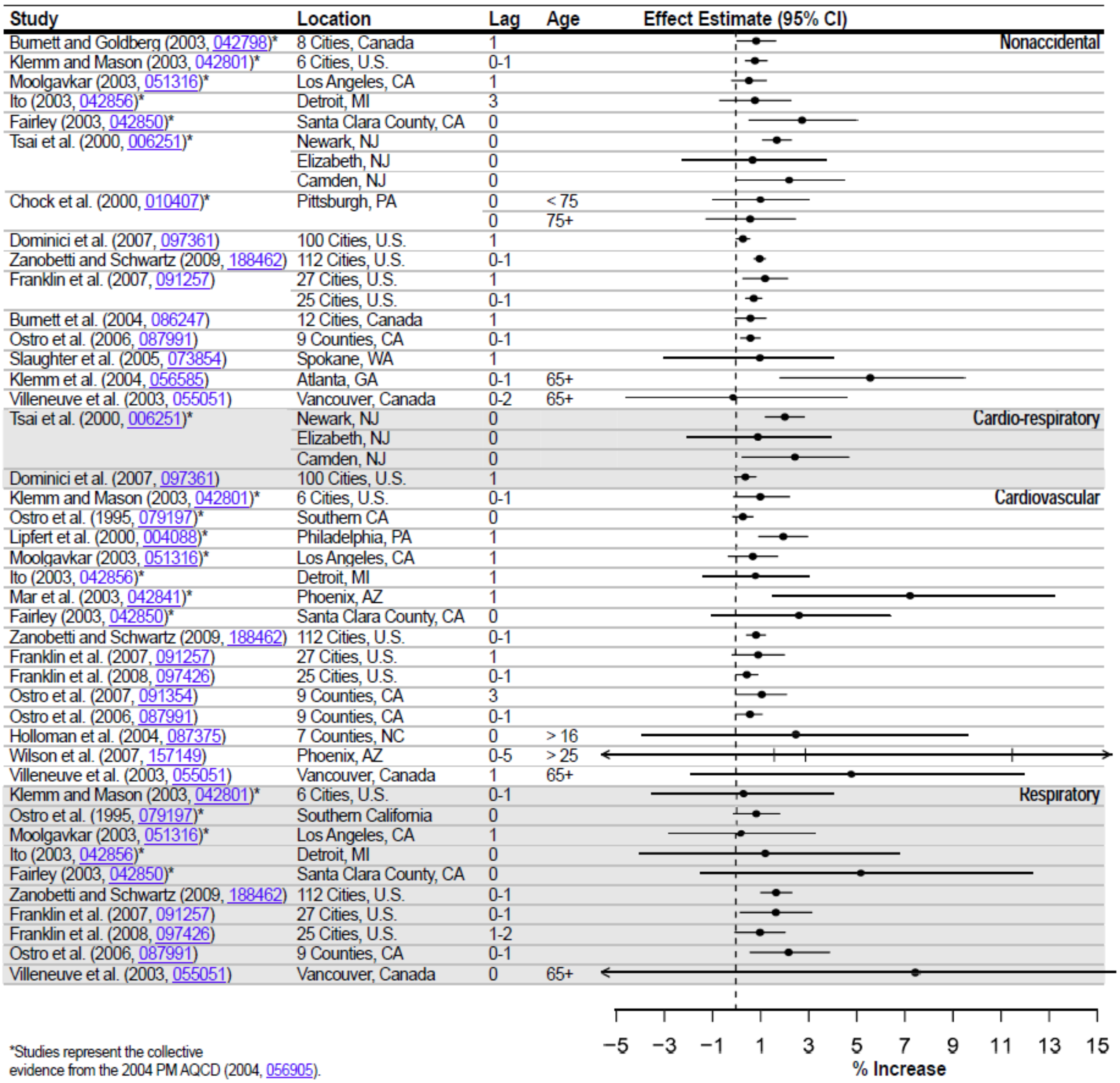


FIGURE I-4

Summary of Non-accidental All-Cause and Cause-Specific Mortality per 10 µg/m3 Increase in PM2.5 Short-term Exposures, for U.S.- and Canadian-based studies (from (U.S. EPA 2009), Figure 6-27). “Lag” indicates the number of days between the exposure and the outcome assessed.

A major knowledge gap in understanding the relative importance of “fine” PM (PM2.5) and “coarse” PM (PM10-2.5) is the relative lack of direct measurements of PM10-2.5. Most estimates are made by subtracting PM2.5 from PM10 measured at co-located samplers, a process that is subject to errors that are inherent in the subtracting of one relatively large number from another. More research is needed to better assess the relative effects of coarse (PM10-2.5) fractions of particulate matter on mortality. A graph from the U.S. EPA review is included in the figure below to demonstrate ranges of mortality findings associated with coarse particulates. Consistent positive associations are seen, particularly for cardiovascular and nonaccidental all-cause mortality, with varying degrees of precision across the different studies.

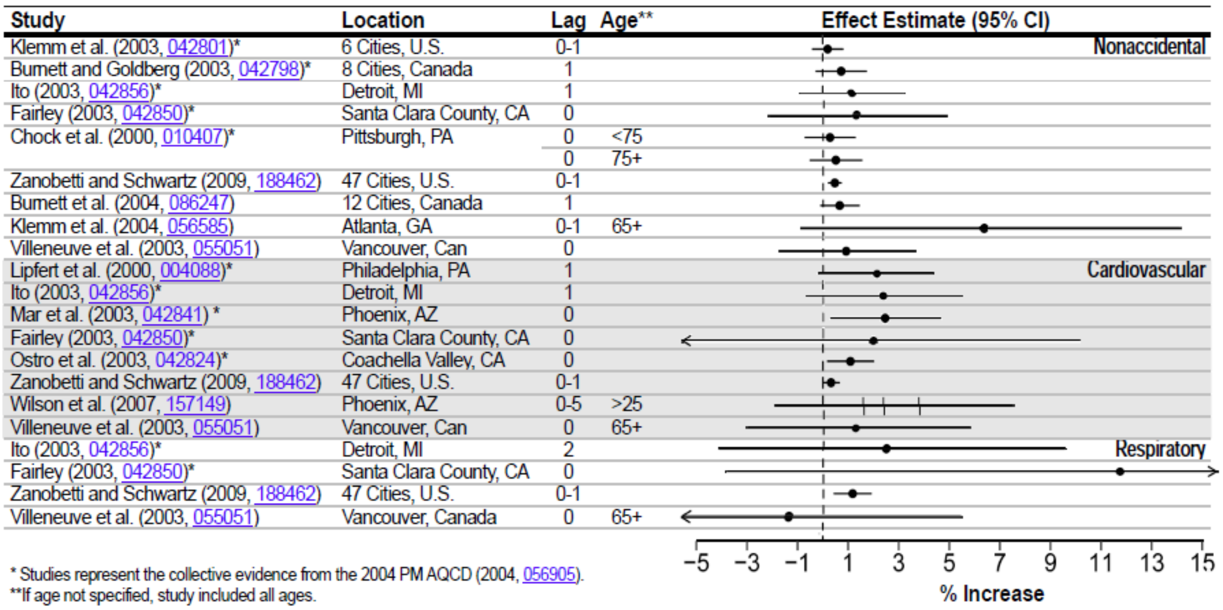


FIGURE I-5

Summary of Percent Increase in Total (Nonaccidental) and Cause-Specific Mortality Per 10 µg/m3 Increase in PM10-2.5 Short-term Exposure (from (U.S. EPA 2009), Figure 6-30). "Lag" indicates the number of days between the exposure and the outcome assessed.

A number of studies have evaluated the association between particulate matter exposure and indices of morbidity such as hospital admissions, emergency room visits or physician office visits for respiratory and cardiovascular diseases. The effect estimates for these various morbidities are generally higher than the estimates for mortality. Observed effects have been associated with PM10, PM2.5 and PM10-2.5.

In the NMMAPS study, hospital admissions for those 65 years or older were assessed in 14 U.S. cities. Several models were compared to estimate associations of hospital admissions for specific disease categories and short-term PM10 levels. Hospital admissions showed an increase ranging from 0.68 – 1.47 percent for cardiovascular diseases, a range of 1.46 – 2.88 percent increase for COPD, and a range of 1.31 – 2.86 percent increase for pneumonia per 10 µg/m^3 increase in PM_{10} (Samet et al. 2000b). In the reanalysis of the study (Health Effects Institute 2003), it was found that when using different models, the pollution coefficients were generally lower. However, the authors note that most of the conclusions of associations with PM10 exposures and hospital admissions held. Two recent Southern California studies evaluated associations between short-term PM2.5 levels and asthma-related hospital or emergency admissions. One study, based in Orange County, reported increased risk of asthma-related hospital encounters with increased ozone and PM2.5 in the warm seasons, and with CO, NO_x, and PM2.5 in the cool seasons (Delfino et al. 2014). The second study, conducted in Los Angeles County, reported monthly average PM2.5, CO, and NO_2 levels were positively associated with asthma hospitalization rates (Delamater et al. 2012).

Similarly, school absences, lost workdays, and restricted activity days have also been used in some studies as indirect indicators of acute respiratory conditions (Ostro 1987; Ostro 1990; Ransom et al. 1992; Gilliland et al. 2001; Park et al. 2002; Hales et al. 2016). These observations help support the hypotheses that particulate matter exposures increase inflammation in the respiratory tissues and may also increase susceptibility to infection (U.S. EPA 2009).

Some studies have reported that short-term particulate matter exposure is associated with changes in lung function (lung capacity and breathing volume); upper respiratory symptoms (hoarseness and sore throat); and lower respiratory symptoms (increased sputum, chest pain and wheeze). The severity of these effects is widely varied and is dependent on the population studied, such as adults or children with and without asthma. Sensitive individuals, such as those with asthma or pre-existing respiratory disease, may have increased or aggravated symptoms associated with short-term particulate matter exposures. Several studies have followed the number of medical visits associated with pollutant exposures. A range of increases from 1 to 4 percent for medical visits for respiratory illnesses was found corresponding to a 10 $\mu g/m^3$ change in PM10. A number of studies also looked at levels of PM2.5 or PM10-2.5. The findings suggest that both the fine and coarse fractions may have associations with some respiratory symptoms (U.S. EPA 2009). Among the newer health endpoints evaluated in recent studies of short-term effects of PM2.5 is stroke. One recent meta-analysis evaluated 16 studies of short-term PM2.5 exposures and estimated a 5 percent increased risk of stroke for each 10 $\mu g/m^3$ increase in PM2.5 (Shin et al. 2014).

The biological mechanisms by which particulate matter can produce health effects have been investigated in laboratory studies. Brook et al. (Brook et al. 2010) summarized three likely pathways by which PM exerts it effects on cardiovascular health outcomes: (1) PM can activate inflammatory pathways and cause systemic oxidative stress, leading to the production of pro-inflammatory cytokines; (2) PM can disrupt the autonomic nervous system leading to increased blood pressure, increased arrhythmic potential, and decreased heart rate variability; and (3) PM, particularly UFPs or particle constituents such as organic compounds and metals, can enter the bloodstream and cause increased constriction of the blood vessels and increased blood pressure. Each of these pathways may also lead to the formation of reactive oxygenated species (ROS, or free radicals) that can cause DNA oxidation and systemic inflammation. Inflammatory responses in the respiratory system in humans and animals can lead to inflammation in fat tissues and in the liver, which can lead to vascular dysfunction (e.g. atherosclerosis), changes in metabolic function (e.g. insulin resistance), and increased thrombotic potential (Brook et al. 2010). Several reviews discuss mechanistic studies in detail (Brunekreef et al. 2002; Brook et al. 2004; Brook et al. 2010). A study in cells using ambient air samples in communities near railyards in the South Coast Air Basin found that the PM2.5 phase of ambient air pollution contains prooxidant components, primarily metals, which can trigger an inflammatory response in the cells (Eiguren-Fernandez et al. 2015; Cho 2016). The same study noted that vapor phase pollutants, which contain most of the electrophiles, may trigger a different biological response in the cells, suppressing inflammatory responses and could result in a reduced ability to fight off infections.

Some studies have examined the health effects of short-term exposures to specific PM constituents and sources (Lippmann 2014; Basagana et al. 2015; Atkinson et al. 2016). While there is some evidence suggesting possible links with specific constituents or sources, such as diesel exhaust, sulfates (related to coal combustion), and certain metals, the U.S. EPA determined that there were not enough studies evaluating short-term constituent- or source-specific exposures at the time of the previous Integrated Science Assessment to be able to make a causal determination (U.S. EPA 2009).

Long-Term Exposure Effects of PM

Numerous studies have evaluated the health effects of long-term (months to years) or chronic exposure to particulate matter, with the largest number of studies examining cardiovascular and respiratory health endpoints, as well as mortality. Other health outcomes that have been linked to long-term PM exposures include reproductive effects, cancer outcomes, and, more recently, metabolic syndromes and neurological effects. The U.S. EPA 2009 Integrated Science Assessment for Particulate Matter (ISA for PM) concluded that sufficient evidence is available to support a causal determination for long-term PM2.5 exposures and cardiovascular and mortality effects, and a likely causal relationship for respiratory effects. A summary of the evidence is presented below, focusing on the long-term effects of PM2.5 exposures.

Many research studies, including some recent studies, have evaluated the health effects of exposures to air pollutants from traffic emissions using a variety of exposure modeling techniques (Hart et al. 2014; Harris et al. 2015; Kingsley et al. 2015; Rice et al. 2015; Danysh et al. 2016). In general, these articles are not discussed in detail here, because of the difficulty in attributing the observed effects to a specific pollutant or combination of pollutants. However, these studies do provide supporting evidence that air pollutants from traffic exhaust are linked to health effects in humans.

Long-Term Particulate Matter Exposures and Mortality

Since the initial promulgation by U.S. EPA of the National Ambient Air Quality Standards for PM2.5, controversy has remained over the association of mortality and exposures to PM2.5. Several large, prospective cohort studies conducted in the U.S. and Canada were used to evaluate long-term PM exposures and mortality, including total number of deaths and deaths due to specific causes. The strongest and most consistent evidence of long-term PM2.5 effects are for cardiovascular mortality, particularly ischemic heart disease, and there is evidence that ambient PM2.5 exposure is associated with and lung cancer mortality (Dominici et al. 2006; Krewski et al. 2009; Jerrett et al. 2013; International Agency for Research on Cancer 2015). Below is a brief discussion of the evidence linking

PM and mortality reviewed in the U.S. EPA 2009 ISA along with more recently published studies, with a focus on large prospective studies and studies conducted in California or Southern California.

In the assessment of evidence for mortality outcomes linked to long-term PM exposures, the 2009 U.S. EPA ISA for PM reviewed 15 studies evaluating PM2.5 exposures, 2 studies evaluating PM10-2.5 exposures, and 5 studies evaluating PM10 exposure. The majority of these studies were conducted in the United States, and 3 of the studies of PM2.5 exposures were conducted in California or Southern California. Previous reviews conducted in 1996 and 2004 by U.S. EPA assessed evidence primarily from large prospective cohort studies, such as the Harvard Six Cities Study (Dockery et al. 1993), the American Cancer Society (ACS) Study (Pope et al. 1995; Pope et al. 2002), and the Seventh-Day Adventist Health Air Pollution (AHSMOG) Study (Abbey et al. 1999; McDonnell et al. 2000). The U.S. EPA 2004 PM Air Quality Criteria Document concluded that there was strong evidence linking long-term PM2.5 exposures to all-cause and cardiopulmonary mortality, but not enough evidence for a link with PM10-2.5. The 2009 U.S. EPA ISA for PM similarly concluded that the newer studies provide additional evidence to support a causal determination for long-term PM2.5 exposures and increased mortality risk, but there continues to be insufficient evidence supporting such a link with particles in the coarse fraction. This most recent U.S. EPA review evaluated the additional updated analyses of the previously-established large cohort studies (Harvard Six Cities, ACS, AHSMOG, and Veterans studies), and noted two new major cohorts that provide further evidence linking PM2.5 and mortality: the Women's Health Initiative (WHI) study (Miller et al. 2007) and the Medicare Cohort Studies (Eftim et al. 2008).

The American Cancer Society Cancer Prevention Study II (ACS) is a large, prospective national cohort study of over one million participants in the U.S. recruited from all 50 states, the District of Columbia and Puerto Rico, and followed over many years. Over the past two decades, studies using data from this cohort have reported associations for PM2.5 for both total mortality and cardiorespiratory mortality (Pope et al. 1995; Krewski 2000; Pope et al. 2002; Jerrett et al. 2005; Krewski et al. 2009; Jerrett et al. 2013; Pope et al. 2015). The survey included several measures of smoking and exposure to second-hand smoke, which were included in the statistical models to account for the potential confounding effects of smoking. The original study reported that long-term exposures to fine particulate air pollution were associated with cardiopulmonary and lung cancer mortality (Pope et al. 1995). In a reanalysis of the data (Krewski 2000), mortality rates and PM2.5 levels were analyzed for 50 metropolitan areas of the U.S. Average (median) levels from monitors in each metropolitan area were used to estimate PM2.5 exposures. At these levels of aggregation, regional differences in the association of PM2.5 and mortality were noted, with higher mortality risks in the Northeast and Midwest, and more moderate mortality risks in the West.

Another follow-up study of the American Cancer Society cohort confirmed and extended the findings in the initial study. The researchers estimated that, on average, a 10 $\mu g/m^3$ increase in fine particulates was associated with approximately a 4 percent increase in total mortality, a 6 percent increase in cardiopulmonary mortality, and an 8 percent increase in risk of lung cancer mortality (Pope et al. 2002). In an additional reanalysis and extension of the American Cancer Society cohort from 1982 to 2000 (Krewski et al. 2009), and including additional metropolitan areas for the most recent years, effects estimates on mortality were similar, though somewhat higher than those reported previously. The extended analyses included an additional 11 years of cohort follow-up compared to the original study. The authors reported positive and significant association between a 10 μg/m^3 change in PM2.5 level and all-cause, cardiopulmonary disease, and ischemic heart disease deaths. Mortality from ischemic heart disease was associated with the largest risk estimates.

Subsets of the ACS study data have also been evaluated to estimate effects in California and the metropolitan Los Angeles area (Jerrett et al. 2005; Jerrett et al. 2013). These results are discussed further below, along with results of other California or Southern California-based studies.

The Harvard Six Cities Study is a large prospective cohort study of adults in six U.S. cities, and began in the year 1974. The original analysis and a subsequent reanalysis found positive associations between particulate matter and sulfate in relation to mortality, after controlling for potential confounding factors such as smoking status, sex, age, and other factors (Dockery et al. 1993)(Krewski 2000). An extension of the Harvard Six Cities Cohort confirmed the association of mortality with PM2.5 levels, and reported that improvements in PM2.5 levels over the study time period were associated with decreased mortality risk (Laden et al. 2006). An update to this study covering the years 1974 to 2009 found a linear relationship of PM2.5 levels and mortality from all causes, cardiovascular causes, and from lung cancer (Lepeule et al. 2012). According to the authors, the PM2.5 levels decreased over time, but no evidence of a threshold for these effects was found.

AHSMOG is a cohort study of non-Hispanic white Seventh-day Adventists in California, with participants followed starting from the late 1970's. Confounding due to smoking in this study is unlikely due to very low smoking rates in this population; however, the study is limited in its the ability to apply the findings to other population groups. The study has linked long-term PM10 exposures and other air pollutants to deaths from all natural causes and deaths due to lung cancer among males (Abbey et al. 1999), although the authors concluded that these associations were likely due to exposures to fine particles rather than the coarse fraction of PM10 (McDonnell et al. 2000). In a re-analysis of the data, the study found PM2.5 was associated with an increased risk of coronary heart disease mortality among females but not among males (Chen et al. 2005). Similar associations among females only were found for coarse particles and PM10.

Other cohort studies include an analysis of mortality and PM2.5 exposures in a Medicare enrollee population. Zeger et al. (Zeger et al. 2008) assembled a Medicare enrollee cohort by including all Medicare enrollees residing in over 4,500 zip codes with centroids within six miles of a PM2.5 monitor. PM2.5 data was obtained from the monitoring stations, and mean annual levels were calculated for the zip codes within six miles of each monitor. The authors found that long-term exposures to PM2.5 was associated with all-cause mortality for the eastern and central portions of the U.S., and these mortality risk estimates were similar to those previously published in the Six Cities Study and the American Cancer Society cohorts. The authors reported that there were no statistically significant associations between zip code levels of PM2.5 and all-cause mortality rates in the western region of the U.S. This finding was attributed largely to the higher PM2.5 levels in Los Angeles area counties compared to other western urban areas, but there were not higher mortality rates in the Los Angeles area counties. Several factors could explain this finding. The authors note that the toxicity of the PM mixture may differ by location, e.g. with higher PM2.5 sulfate levels in the eastern region. In addition, the use of ecological data rather than individual-level data for exposure assessment and some confounding factors, and the assessment of all-cause mortality rather than cause-specific mortality may have impacted the results of this study. For example, the authors used county-level COPD risk as an estimate of smoking prevalence, because individual-level measures of smoking were not available. The authors further reported that they found no associations of PM2.5 with all-cause mortality in persons aged 85 years or higher, which may reflect other competing causes of death in this age group not related to air pollution exposures.

The Women's Health Initiative (WHI) Study is a nationwide cohort of post-menopausal women in 36 metropolitan areas of the U.S. who had no history of cardiovascular disease (Miller et al. 2007). The study found that long-term exposure to PM2.5 was associated with a 24 percent increased risk of cardiovascular disease and a 76 percent increased risk of death from cardiovascular causes for each additional 10 $\mu g/m^3$ of PM2.5; these relative risk estimates are larger than those reported in the ACS and Six Cities Studies, but differences in health status, PM composition, and overall mortality risk in these distinct populations may account for such differences in the effect estimates. The WHI study results accounted for the potential confounding effects of several factors, including medical risk factors for cardiovascular disease, measures of socioeconomic status, and cigarette smoking. Another large cohort study focusing on women is the Nurses' Health Study, which found that PM10 exposures were associated with all-cause mortality and fatal coronary heart disease, with exposures 24 months prior to death having the strongest effects (Puett et al. 2008). These results accounted for several potential confounders, including smoking status and history, medical risk factors for cardiovascular disease, and area-level measures of socioeconomic status. This study did not evaluate PM2.5 exposures.

A recent pooled analysis of 22 European cohorts and including over 350,000 participants evaluated long-term air pollution exposures and exposure to PM2.5, PM10, and nitrogen oxides, using land use regression models to estimate exposures (Beelen et al. 2014). The authors reported that a 5 $\mu g/m^3$ increase in PM2.5 was associated with approximately a 7 percent increase in mortality from natural causes.

Estimates of mortality risks associated with long-term PM2.5 levels from recent studies are shown in the figure below. The recent evidence is consistent with past studies, showing increased risk of premature death with increased PM2.5 exposures. For cause-specific mortality, consistent positive associations are seen with cardiovascular mortality endpoints and with lung cancer deaths, but weak associations are seen with overall respiratory mortality.

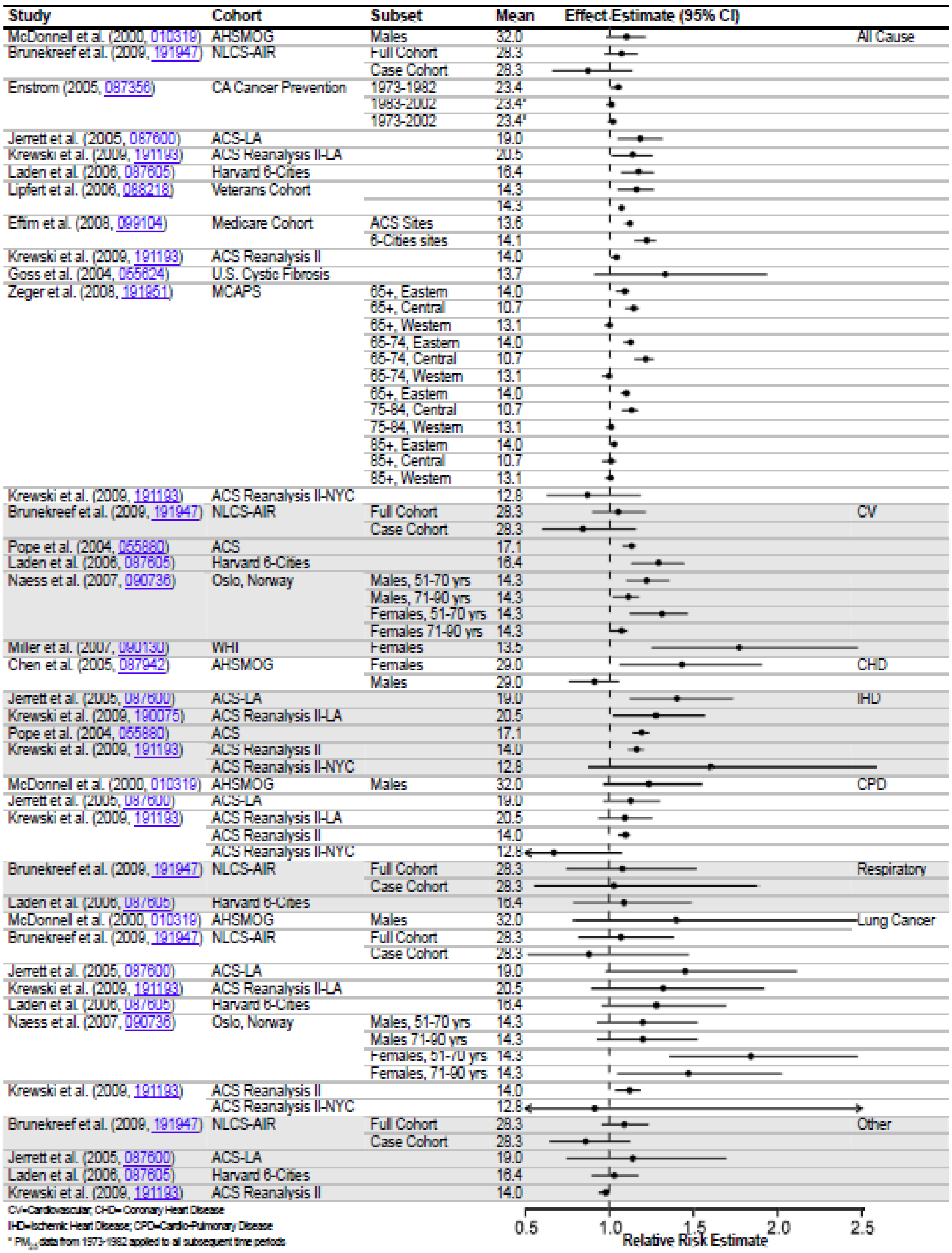


FIGURE I-6

Mortality Risk Estimates, Long-Term Exposure to PM2.5 in Cohort Studies (From (U.S. EPA 2009), Figure 7-7). “Mean”=mean PM2.5 exposure estimates in the study. CV=cardiovascular, CHD=coronary heart disease, IHD=ischemic heart disease, CPD=cardiopulmonary disease.

In addition to the AHSMOG study, other analyses of mortality and PM2.5 levels specific to California have also been reported, including an analysis of a subset of the ACS II data. An analysis of the ACS II study (Jerrett et al. 2013) followed individuals in California from that cohort recruited starting in 1982, with follow-up to 2000. PM2.5 levels at subject residences were estimated using land use regression models. Over 40 potential confounders were included in the statistical models, and included individual-level variables (e.g. smoking, diet, demographic, and other factors) and neighborhood-level variables (e.g. unemployment, poverty, income inequality, racial composition). The authors noted that mortality rates differ in urban areas compared to non-urban areas, and adjusted for urban/rural status in the model to estimate pollution effects on mortality. All-cause mortality, mortality from cardiovascular disease, and mortality from ischemic heart disease were positively associated with PM2.5 levels in single-pollutant models. These associations with PM2.5 remained after additional adjustment for ozone levels. Because of moderate correlations across pollutants, it may not be possible to draw conclusions about which pollutant(s) in this mixture cause the observed effects. Positive associations of all-cause and certain cause-specific mortality rates with estimated NO_2 and ozone levels were also found. The authors concluded that these results indicate that several components of combustion-related pollutant mixture are associated with mortality.

A study analyzed data from the California Teachers Study cohort of over 100,000 active and retired school teachers recruited in 1995, and followed through 2005 (Lipsett et al. 2011). Pollutant exposures at the subject residences were estimated using data from ambient monitors, and extrapolated using a distance-weighted method. The authors reported that a 10 $\mu g/m^3$ increase in PM2.5 was associated with a 20 percent risk increase in mortality from ischemic heart disease, but no associations were found with all-cause, cardiovascular, or lung cancer mortality. A 10 $\mu g/m^3$ increase in PM10 was associated with increased risk of ischemic heart disease and incident stroke. These results accounted for several individual- and neighborhood-level factors, including smoking, second-hand smoke, medical risk factors for cardiovascular disease, and indicators of socioeconomic status.

A more recent analysis of the California Teachers Study cohort from 2001 through 2007 estimated the association between particulate pollutants and all-cause, cardiovascular, ischemic heart disease, and respiratory mortality (Ostro et al. 2015). Exposure data at the residential level were estimated by a chemical transport model that computed pollutant concentrations from over 900 sources in California. Besides particle mass, monthly concentrations of 11 species and 8 sources or primary particles were generated at 4-km grids. The results were reported as finding statistically significant associations of ischemic heart disease mortality with PM2.5 mass and several of its components (Figure I-7). The study also found significant positive associations between ischemic heart disease mortality and ultrafine particle mass as well as several ultrafine particulate components including elemental carbon, organic carbon, copper, metals, meat cooking, and mobile source derived components. An earlier study using data from the same cohort had used monitoring data to estimate mortality risk, and similarly reported increased risk of all-cause, cardiopulmonary, and ischemic heart disease mortality with higher exposures to PM2.5 mass. This study also reported increased ischemic heart disease risk with higher exposures to PM2.5 constituents such as organic carbon, sulfates, and nitrates (Ostro et al. 2010). Both studies adjusted for several individual- and neighborhood-level covariates, including smoking status and indicators of socioeconomic status.

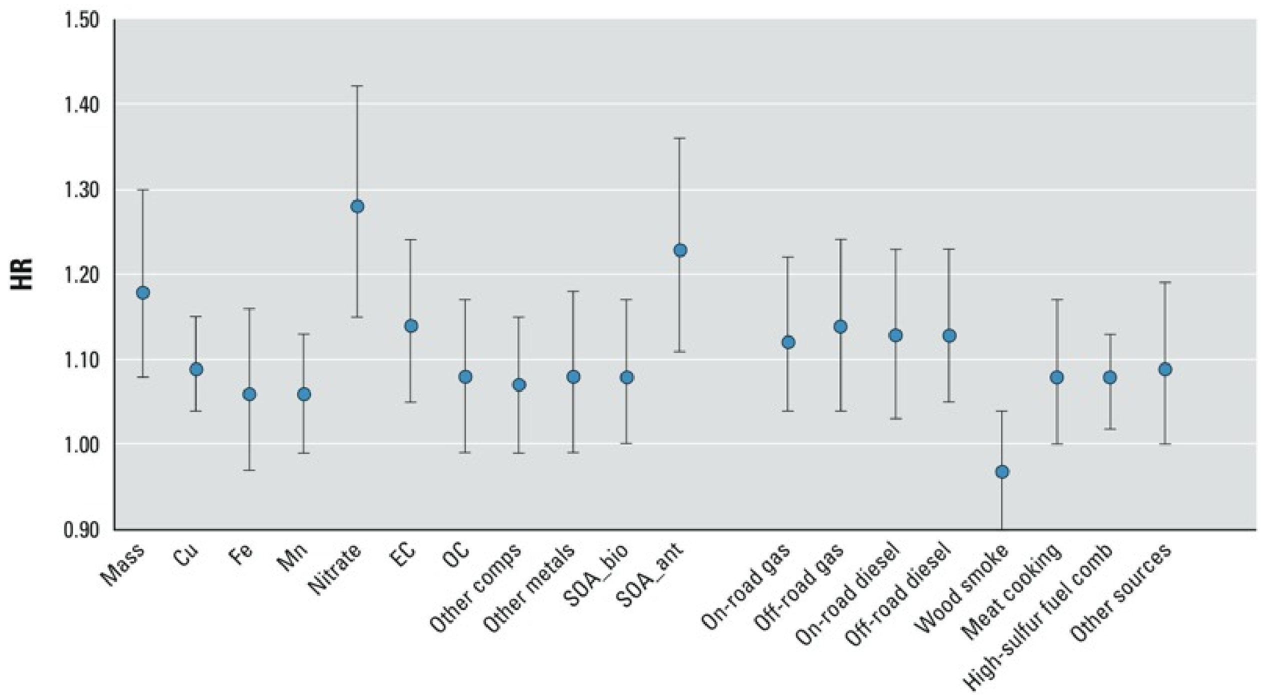


FIGURE I-7

Association of PM2.5 constituents and sources with Ischemic Heart Disease mortality (Hazard Ratios and 95 percent Confidence Intervals) using interquartile range. Abbreviations: comb = combustion; comps = components; SOA_bio= secondary organic aerosols from biogenic sources (derived from long-chain alkanes, xylenes, toluenes, and benzene and their oligomers); SOA_ant=secondary organic aerosols from biogenic sources (derived from isoprenes, monoterpenes, and sesiquiterpenes and their oligomers). (From (Ostro et al. 2015))

A cohort of elderly individuals (average age of 65 years in 1973) recruited from 11 California counties was followed over several years (Enstrom 2005). A positive association for long-term PM2.5 exposure with all-cause deaths was reported from 1973–1982. However, no significant association was found in the later time period of 1983–2002. PM2.5 levels were obtained from measurements made during 1979- 1983 by the EPA as part of the Inhalable Particle Monitoring Network and the cohort was confined to those participants in the American Cancer Society Cancer Prevention Study I who were living in the 11 counties that had one of the monitors. Pollutant levels were estimated using data from these monitors and averaged over each county, which may lead to exposure misclassification and bias toward finding no effect. The study adjusted for several potential confounding factors, including demographic factors, smoking, body mass index, and other factors.

The California Air Resources Board recently conducted a cross-sectional study of long-term PM2.5 exposures in rural and urban areas within California, using ambient monitoring data from 116 stations in the monitoring network, and calculating zip code-level exposure estimates (Garcia et al. 2016). The study observed larger effect sizes for increased PM2.5-related mortality risk in rural compared to urban areas from all causes, cardiovascular disease and cardiopulmonary disease. In urban areas, the study found PM2.5 exposures to be associated with increased risk of cardiovascular disease, ischemic heart disease, and cardiopulmonary disease; however, for all-cause non-accidental mortality risk, only an exposure model restricted to people living within 10 km of a monitoring station in urban areas showed an association with PM2.5. This study did not control for the potential confounding effects of smoking.

A recent study analyzed data from the National Institutes of Health AARP Diet and Health cohort, including about 160,000 participants in California (Thurston et al. 2016). Census tract-level PM2.5 exposures were estimated based on land use regression models. For the California cohort, PM2.5 levels were associated with an approximately 10 percent increase in cardiovascular disease mortality risk for each additional 10 µg/m^3 of PM2.5. A small but positive effect estimate was found for all-cause mortality in California, and no association was found for respiratory mortality in the California cohort, although the estimates indicated uncertainty in the magnitude and direction of these effects. This study adjusted for several potential confounders, including demographic factors, smoking, and indicators of socioeconomic status.

A few studies have focused on particulate matter exposure and health effects in residents of Southern California. Two analyses of the American Cancer Society II cohort, for example, focused specifically on the Los Angeles Metropolitan area using methods to estimate exposures on a finer geographical scale than previous studies that used geographic scales at the county or metropolitan area. Improved exposure estimation methods reduce potential bias from exposure misclassification. Using data from monitoring stations in the Los Angeles area, one study applied interpolation methods (Jerrett et al. 2005) and another applied land use regression techniques (Krewski et al. 2009) to estimate PM2.5 exposures to the study participants. Significant associations of PM2.5 with mortality from all causes and cardiopulmonary disease were reported, with the magnitude of risks being higher than those from the national studies of the American Cancer Society II cohort. Such improved exposure estimation techniques can reduce misclassification bias in epidemiological studies. It should be noted that various analyses were presented in these as well as other studies to estimate the influence of various individual-level and ecologic variables that might also be related to health effects risks. Including such variables helps control for potential confounding, but generally reduces the estimated association between PM2.5 and all-cause mortality. It may be illustrative to describe some of the estimates from the various calculations as presented by the authors of the Los Angeles area cohort (Krewski et al. 2009). In the descriptions in Table I-9, HR refers to the “hazard ratio” expressed for a 10 µg/m^3 change in PM2.5 exposure, followed by the 95 percent Confidence Interval. For example, if the hazard ratio is 2, the risk would be twice as high; and, conversely if the hazard ratio is 0.5, the risk would be one-half of that of the reference group. Several of the analyses results follow as excerpted from Krewski, 2009. Table I-8 includes PM2.5, plus various additional individual and ecological variables. Similar effects of covariate adjustment were seen for hazard ratios for mortality from ischemic heart disease, although effect estimates were stronger for ischemic heart disease mortality compared to those for all-cause mortality.

TABLE I-8

Influence of Adding Confounding Variables on All-Cause Mortality

VARIABLE INCLUDED	HAZARD RATIO per 10 µg/m^3 change in PM2.5 exposure
PM2.5 alone (stratified for age, sex, and race)	1.197 (95% CI, 1.082–1.325);
PM2.5 with 44 individual-level covariates*	1.143 (95% CI, 1.033–1.266)
PM2.5 with 44 individual-level covariates and the ecologic covariate of unemployment	1.127 (95% CI, 1.015–1.252)
PM2.5 with 44 individual-level covariates and social factors extracted from the principal component analysis (which account for 81% of the total variance in the social variables)	1.142 (95% CI, 1.026–1.272).
PM2.5 with 44 individual-level covariates and all ecologic covariates that were individually associated with mortality in bivariate models with PM2.5 exposure	1.115 (95% CI, 1.003–1.239)
PM2.5 parsimonious model that included 44 individual-level covariates and ecologic confounder variables that both reduced the pollution coefficient and had associations with mortality	1.126 (95% CI, 1.014–1.251)

*These covariates included several measures of smoking.
(From Krewski, 2009)

U.S. EPA also released a Regulatory Impact Analysis (U.S. EPA 2012) which looked at the costs and benefits of alternate PM2.5 standard levels. As part of the analysis, U.S. EPA looked at California-specific studies regarding PM2.5 and mortality published in the scientific literature. The U.S. EPA analysis concluded "most of the cohort studies conducted in California report central effect estimates similar to the (nation-wide) all-cause mortality risk estimate we applied from Krewski et al. (2009) and Laden et al. (2006) albeit with wider confidence intervals. A couple of cohort studies conducted in California indicate higher risks than the risk estimates we applied." Thus, in U.S. EPA's judgment, the California-related studies provided estimates of mortality consistent with or higher than those from the national studies.

At the time of the 2009 ISA, few studies had examined long-term exposures to chemical-specific PM constituents or compared source-specific PM effects on mortality (U.S. EPA 2009). The 2009 ISA discussed only two studies that used direct measurements of PM constituents other than sulfates: the Veteran's Cohort (Lipfert et al. 2006) and the Netherlands Cohort Study (Beelen et al. 2008). These studies found mortality associations with long-term exposures to traffic pollutants, nitrates and sulfates.

With measures adopted to control emissions of air pollutants, ambient levels of PM2.5 have been decreasing. These reductions in particulate matter have been associated with reductions in mortality. For example, studies have found that increases in life expectancy are associated with reductions in air pollution levels, and that a portion of this increase can be attributed to reductions in PM2.5 exposures (Correia et al. 2013; Pope et al. 2013).

Long-Term Particulate Matter Exposures and Cardiovascular Effects

Studies of cardiovascular mortality provide the strongest evidence of an association between PM2.5 exposures and cardiovascular effects. The U.S. EPA 2009 ISA review determined that the evidence is sufficient to infer a causal relationship between long-term PM2.5 exposures and cardiovascular effects. In addition to the studies of mortality, other epidemiological studies provide additional evidence of sub-clinical and clinical cardiovascular effects, while toxicological studies suggest a plausible biological mechanism for such effects (Fanning et al. 2009; U.S. EPA 2009).

Epidemiological studies of subclinical effects typically have used subclinical measures of atherosclerosis, which is an underlying disease contributing to many clinical cardiovascular outcomes such as myocardial infarction, sudden cardiac death, stroke, and vascular aneurysms (U.S. EPA 2009). A study in Southern California residents used the carotid intima-media thickness (CIMT) as a measure of subclinical atherosclerosis (Kunzli et al. 2005). The subjects' residential areas were geocoded and a geospatial extrapolation of ambient monitoring data was used to assign annual mean concentrations of ambient PM2.5. The authors report results of an association between atherosclerosis and ambient air pollution as measured by PM2.5. The associations of PM2.5 and CIMT were strongest in women ≥ 60 years of age. The Multi-Ethnic Study of Atherosclerosis (MESA) is a population-based study of people living in 6 U.S. cities or counties, including Los Angeles, CA (Diez Roux et al. 2008). The MESA study reported that 20-year average PM2.5 exposures corresponded to a small increase in CIMT, although the magnitude of the increase was much smaller than the Kunzli 2005 study. The study accounted for the potential influence of sociodemographic factors, lipid status, smoking, diabetes, body mass index, and geographical location. Such differences may be attributable to differences in the study populations. Other sub-clinical outcome measures for atherosclerosis in the MESA study were weakly associated or not associated with PM exposures.

Clinical cardiovascular outcomes have also been examined in several epidemiological studies, including two that were based on prospective cohort studies: the Women's Health Initiative (WHI) Observational Study (Miller et al. 2007) and the Nurses' Health Study (Puett et al. 2008). Both these studies also examined cardiovascular mortality, and found links with long-term particulate matter exposures. The WHI study included only women who were free of cardiovascular disease at enrollment, and estimated PM2.5 exposures using a nearest monitor approach. The study found PM2.5 exposures to be associated with cardiovascular disease outcomes, including myocardial infarction, revascularization, stroke, coronary heart disease death, and cerebrovascular disease, and accounted for the several potential confounding factors, such as sociodemographic factors, medical risk factors for cardiovascular disease, and cigarette smoking (Miller et al. 2007). An analysis of the Nurses' Health Study included women without a history of myocardial infarction and who lived in certain metropolitan areas in the northeastern U.S. (Puett et al. 2008). Long-term PM10 exposures were estimated using land use regression models as well as air pollution monitoring data, and the results accounted for potential confounding by smoking status and history, medical risk factors for cardiovascular disease, and area-level measures of socioeconomic status. This study found positive associations with the risk of all-cause and coronary heart disease mortality, and the results were suggestive of a link to coronary heart disease events although there was a great deal of uncertainty in this result. Other studies conducted in the U.S. and Europe have examined clinical cardiovascular outcomes with varying results (U.S. EPA 2009).

The U.S. EPA 2009 ISA concluded that epidemiologic studies, along with toxicological evidence linking PM exposures to atherosclerosis and other cardiovascular outcomes, provides evidence linking PM to cardiovascular effects and mortality. While the associations between PM and subclinical and clinical measures have inconsistent results, the consistency of the studies linking PM exposures to cardiovascular mortality and the coherence of the toxicological studies provide support for U.S. EPA's causal determination.

Long-Term Particulate Matter Exposures and Respiratory Effects

The U.S. EPA 2009 ISA review determined that the evidence for long-term particulate matter exposures on respiratory effects is likely to be causal. Several studies, including prospective cohort studies, have assessed the effects of long-term particulate matter exposure on respiratory symptoms and lung function changes. Consistent, positive associations have been found with respiratory symptoms, such as bronchitis, poorly controlled asthma, and decreased lung function in children (U.S. EPA 2009; Guarnieri et al. 2014). Since many of the studies of children included survey measures, these studies typically controlled for the potential confounding effect of tobacco smoking by the child and exposure to second-hand smoke at home, and some studies were also able to account for exposure to maternal smoking *in utero*.

The Southern California Children's Health Study established cohorts of school children from 12 Southern California communities, and followed these participants over time. One of the early studies from this cohort reported positive associations of particulate matter with prevalent bronchitis or phlegm among children with asthma. These effects were also associated with NO_2 and acid vapor levels (McConnell et al. 1999). Another study based on this cohort reported a lower rate of growth in lung function in children living in areas with higher levels of particulate pollution (Gauderman et al. 2000). Decreases in lung function growth were associated with PM10, PM2.5, PM10-2.5, acid vapor, and NO_2. There was no association with ozone levels. The investigators were not able to identify independent effects of the pollutants but noted that motor vehicle emissions are a major source of the pollutants.

A follow-up study on a second cohort of children confirmed the findings that decreased lung function growth was associated with particulates, nitric oxides, and elemental carbon levels (Gauderman et al. 2002). Elemental carbon is often used as a measure for diesel particulate. Additionally, children who moved to areas with less air pollution were found to show improvement in lung function growth rate, while those who moved to areas with higher PM10 and NO_2 showed declines in lung function growth rates (Avol et al. 2001). By the time the fourth graders graduated from high school, a significant number showed lower lung function. The risk of lower lung function was about four times higher in children with the highest PM2.5 exposure when compared to the lowest exposure communities (Gauderman et al. 2004).

A follow-up report from the Children's Health Study assessed whether improving air quality in Southern California over the past decade has led to beneficial changes in health (Gauderman et al. 2015). It was reported that as the levels of nitrogen oxide and fine particulates were reduced as the result of reductions in air pollution emissions, the deficits in lung function growth were also of a smaller magnitude. Recently, the Children's Health Study cohort data were also used to evaluate associations with bronchitic symptoms in children (Berhane et al. 2016). The study found that reductions in NOx, ozone, and PM10 and PM2.5 were associated with decreases in bronchitic symptoms, with stronger effects observed in children with asthma. These results indicate that improvements in air quality, as measured by fine particulate and nitrogen oxides, are associated with improvements in children's health in Southern California.

A limited number of studies have linked PM exposures to asthma incidence. In an analysis of the Children's Health Study in Southern California, Islam et al. found that while children with better lung function are generally at lower risk of developing asthma, living in an area with long-term average PM2.5 levels ≥13.7 μg/m^3 offset this protective characteristic; in other words, this study related high PM2.5 levels with new-onset asthma in children (Islam et al. 2007). The U.S. EPA 2009 ISA report also reviewed two European studies that linked PM2.5 with asthma onset in children (Brauer et al. 2007) and adults (Kunzli et al. 2009). Two recent studies were identified in our literature search: the first study used the Sister Study national cohort and found that a 3.6 μg/m^3 increase in PM2.5 was associated with a 20 percent increased risk of incident asthma and a 14 percent increase in incident wheeze among adult females (Young et al. 2014); the second study was a study of Medicaid-enrolled children in Harris County, Texas, and found PM2.5 was associated with new-onset asthma in single-pollutant models (Wendt et al. 2014). However, accounting for the potential effects of other pollutants added substantial uncertainty in the overall effect estimates for PM2.5, meaning that it is difficult to distinguish in this study whether the effects are due to PM2.5 or other pollutant exposures.

The U.S. EPA 2009 ISA also noted that studies from many different locations, including Mexico City, Sweden, and a national cohort in the U.S. provide additional coherent and consistent evidence of respiratory effects associated with PM exposures.

Long-Term Particulate Matter Exposures and Emerging Areas of Interest

Beyond cardiovascular, respiratory and mortality effects, the U.S. EPA 2009 ISA review concluded that the evidence available at the time was suggestive of a causal relationship between long-term exposures to PM and reproductive/developmental effects, as well as cancer. Since the 2009 ISA, there have been several studies conducted that evaluated these health endpoints in relation to PM exposures, as well as studies of metabolic syndrome and neurological health outcomes. Because of the relatively long time gap since the latest ISA for PM, and because the SCAB exceeds the federal standards for PM2.5, these health endpoints are discussed briefly here, with a focus on studies conducted since the 2009 ISA, and studies conducted in California or in the SCAB.

Cancer

The U.S. EPA 2009 ISA review concluded that existing evidence is suggestive of a link between PM2.5 and cancer, with studies of lung cancer providing the strongest evidence. More recently, the International Agency for Research on Cancer (IARC) recently designated outdoor air pollution and particulate matter as carcinogenic to humans (Group 1 carcinogens), and a meta-analysis provided quantitative evidence for the associations between particulate matter and lung cancer risk (Hamra et al. 2014; International Agency for Research on Cancer 2015). The IARC review included studies evaluating associations between outdoor air pollution and lung cancer, urinary bladder cancer, breast cancer, leukemia and lymphoma, childhood cancers, and total cancers. Among these cancers, the IARC Working Group concluded that outdoor air pollution and particulate matter cause lung cancer, and that positive associations were observed between outdoor air pollution and urinary bladder cancer. The IARC Working Group also noted that associations with childhood leukemia were suggestive of an association, and, while there were some inconsistencies across studies, an association could not be ruled out. To estimate overall lung cancer risk, the meta-analysis included 14 studies reporting on PM2.5 and 9 studies reporting on PM10; the vast majority of these were cohort studies from North America and Europe. The meta-analysis found positive associations for both PM10 and PM2.5 and lung cancer risk, with the PM2.5 results being more consistent. Additionally, the study analyzed whether the association between PM2.5 and lung cancer differed by smoking status, and found positive associations for each smoking status group (current smokers, former smokers, and never-smokers).

A recent study from the Adventist Health and Smog Study-2 (AHSMOG-2) cohort in the U.S. and Canada reported that a 10 ug/m^3 increase in ambient PM2.5 increased the risk of lung cancer incidence by about 40 percent, after accounting for ozone exposures (Gharibvand et al. 2016). Because all participants are non-smokers, with over 80 percent never having smoked, and with the former smokers having an average of 24 years between quitting smoking and being diagnosed with lung cancer, the likelihood of confounding by smoking in this cohort is much lower than in most other populations. Another recent study conducted in California evaluated air pollution in relation to survival after being diagnosed with lung cancer, and found that patients living in areas with higher NO_2, PM2.5 and PM10 had shorter survival times, particularly for those patients who were diagnosed at earlier stages of lung cancer (Eckel et al. 2016). Few other studies have evaluated air pollution effects on lung cancer survival, so this study represents a relatively newer area of research.

Reproductive Health Outcomes

The U.S. EPA 2009 ISA review concluded that existing evidence is suggestive of a link between PM2.5 and reproductive health effects. Numerous studies report evidence indicating that particulate matter exposure during pregnancy may be associated with adverse birth outcomes, with relatively consistent evidence linking PM2.5 and PM10 exposures to low birth weight or decreases in birth weight (Bobak et al. 1999; Sram et al. 2005; Stieb et al. 2012). Among the studies reviewed in the 2009 U.S. EPA ISA for particulate matter or in the literature search for more recent and/or local studies, several studies of low birth weight (defined as <2,500g or approximately 5.5 pounds at birth) or reductions in birth weight were conducted in California or in the Southern California region (Basu et al. 2004; Parker et al. 2005; Salam et al. 2005; Wilhelm et al. 2005; Morello-Frosch et al. 2010; Wilhelm et al. 2012; Basu et al. 2014; Laurent et al. 2014). Two of these studies were conducted in Los Angeles County and were published since the last AQMP in 2012, and both examined low birth weight among full-term babies ("term low birth weight"). Laurent et al. reported that a 5.82 $\mu g/m^3$ increase in PM2.5 exposures during pregnancy was linked to a 2.5 percent increased risk of term low birth weight (Laurent et al. 2014). The second study evaluated PM2.5 exposures by source, and found increased odds of term low birth weight with increased exposure to PM2.5 from diesel sources, gasoline, geological sources, as well as elemental carbon (Wilhelm et al. 2012). Studies from the U.S., Brazil, Mexico, the Czech Republic, South Korea, Japan, and Taiwan have reported that neonatal and early postnatal exposure to particulate matter may lead to increased infant mortality (U.S. EPA 2009). Among these studies, one was conducted in Southern California, and found increased risks for deaths among infants between one and 12 months old associated with exposures to particulates and other pollutants; however, no effect was seen for neonatal mortality (defined as mortality in the first month after birth) (Ritz et al. 2006). Some newer research has also linked particulate matter exposures to risk of certain birth defects and stillbirth. A California-based study used monitoring station data and traffic density measures to evaluate potential associations with a variety of birth defects in the San Joaquin Valley (Padula et al. 2013a; Padula et al. 2013b; Padula et al. 2013c; Padula et al. 2015). One of these studies reported evidence suggesting that PM10 and PM2.5 may increase the risk of certain congenital heart defects (Padula et al. 2013b). For neural tube defects, increased risks were linked to higher exposures to carbon monoxide and nitrogen oxide (Padula et al. 2013a), but higher risks for spina bifida with PM10 exposures were found only among mothers living in lower socioeconomic status neighborhoods (Padula et al. 2015). An earlier study conducted in Los Angeles County used ambient monitoring data to estimate exposures, and reported increased risk of certain congenital heart defects with higher exposures to carbon monoxide, but not for PM10; PM2.5 was not evaluated in this study (Ritz et al. 2002). A couple of recent studies evaluated PM2.5 exposures during gestation and risk of stillbirth. A recent study conducted in Ohio used monitoring station data to evaluate stillbirth risk, and found that higher levels of PM2.5 exposure in the third trimester was linked to a 42 percent increased risk of stillbirth (DeFranco et al. 2015). A California-based study similarly found an increased risk of stillbirth with higher PM2.5 exposures averaged over the entire pregnancy, but the association may have been confounded by co-occurring nitrogen dioxide exposures (Green et al. 2015). A third study, conducted in Taiwan, found that higher PM10 and sulfur dioxide exposures in the first trimester were associated with increased risk of stillbirth among babies who were born preterm; PM2.5 was not assessed in this study (Hwang et al. 2011).

In the U.S. EPA review, it was noted that stronger associations with birth weight reductions are observed with PM2.5 compared to PM10, and animal toxicological studies provide supportive evidence, although a specific mechanism is not known (U.S. EPA 2009). These results and many other studies provide evidence that fetuses and infants are subgroups affected by particulate matter exposures.

Neurological Health Outcomes

A 2012 review conducted by a panel of research scientists convened by the National Institute of Environmental Health Sciences identified several studies that reported links between outdoor air pollution and central nervous system effects, such as decreased cognitive function, Alzheimer's disease, Parkinson's disease, and impacts on behavioral testing and development in childhood (Block et al. 2012). Toxicological studies suggest that the damage may be caused through an oxidative stress pathway, and demonstrate that PM can be inhaled into the lungs and translocated to the brain, and that ultrafine particles to reach the brain through the olfactory nerve (Peters et al. 2006). Some more recent studies have evaluated neurological impacts of PM, ranging from studies of older adults to prenatal exposures. The Normative Aging Study evaluated older men in Boston, MA, and reported an association between black carbon (a marker of traffic exhaust) and cognitive function, as measured through cognitive tests (Power et al. 2011). A study conducted in the Los Angeles Basin used monitoring data to evaluate long-term exposures in a middle-aged and older adult population, and reported PM2.5 exposure was associated with decreased verbal learning (Gatto et al. 2014). A study of school children in Spain reported that children attending schools with higher levels of air pollution, as measured by elemental carbon (a marker of diesel exhaust), NO_2, and ultrafine particles, experienced smaller growth in several cognitive measures (Sunyer et al. 2015). Three recent studies reported that PM2.5 exposures during the prenatal period were associated with autism in childhood. One study was conducted in Los Angeles County, and reported that 7 percent increased odds of autism with a 4.68 $\mu g/m^3$ increase in PM2.5; the effect estimate increased to 15 percent when accounting for ozone in the statistical models (Becerra et al. 2013). A California-based study found that an 8.7 $\mu g/m^3$ increase in PM2.5 during the prenatal period or in the first year of life doubled the odds of autism (Volk et al. 2013). The third study was based on the Nurses' Health Study II cohort, and reported an increased risk of autism with prenatal PM2.5 exposures, but not with exposures before pregnancy or after delivery (Raz et al. 2015). These studies provide emerging evidence of health effects of air pollution on neurological health outcomes.

Metabolic Syndrome

Metabolic syndrome, which is the clustering of several known risk factors for cardiovascular disease (Huang 2009), is a relatively new health outcome to be studied in relation to air pollution exposure. The U.S. EPA 2009 ISA reviewed only one epidemiological study and one toxicological study. These studies provided some evidence that particulate matter exposures may be linked to markers of metabolic syndrome, such as insulin resistance, hypertension, high cholesterol, or obesity, or that having a metabolic syndrome may increase susceptibility to the effects of PM10 exposures on cardiovascular outcomes (U.S. EPA 2009). More recently, a Swiss epidemiological study reported that long-term PM10 exposures were associated with increased risk of metabolic syndrome (Eze et al. 2015). Two other human studies found that people with metabolic syndrome exposed to particulate matter air pollution experienced cardiovascular effects and worsening insulin resistance (Devlin et al. 2014; Brook et al. 2016). Some recent animal studies have also reported impacts of PM on the development of obesity and metabolic syndrome, and that animals with pre-existing metabolic syndrome may be more sensitive to the cardiovascular effects of PM exposure (Brocato et al. 2014; Wagner et al. 2014; Wei et al. 2016).

Ultrafine Particles

As noted above, numerous studies have found associations between particulate matter levels and adverse health effects, including mortality, hospital admissions, and respiratory disease symptoms. The vast majority of these studies used particle mass of PM10, PM2.5, or PM10-2.5 as the measure of exposure. Some researchers have postulated, however, that ultrafine particles may be responsible for some of the observed associations of particulate matter and health outcomes (Oberdorster et al. 1995; Seaton et al. 1995). Ultrafine particles are typically defined as particles with aerodynamic diameters of less than 0.1 µm or 100 nm. Ultrafine particles are formed as a result of combustion processes as well as secondary atmospheric transformations. Vehicle emissions, especially diesel exhaust, are major sources of ultrafine particles; therefore, proximity to a major roadway is an important factor that affects an individual's exposure to ultrafine particles (Zhu et al. 2002; HEI Review Panel on Ultrafine Particles 2013). There is currently no federal or California standard for ultrafine particles.

U.S. EPA staff has presented conclusions on causal determination of several health effects of ultrafine PM based on a recent review of the available scientific studies (U.S. EPA 2009). These causal determinations are depicted in Table I-9.

TABLE I-9

Summary of U.S. EPA's Causal Determination of Ultrafine PM by Exposure Duration and Health Outcome

SHORT-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Cardiovascular effects	Suggestive of a causal relationship
Respiratory effects	Suggestive of a causal relationship
Central nervous system	Inadequate to infer a causal relationship
Mortality	Inadequate to infer a causal relationship
LONG-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Cardiovascular effects	Inadequate to infer a causal relationship
Respiratory effects	Inadequate to infer a causal relationship
Mortality	Inadequate to infer a causal relationship
Reproductive and developmental	Inadequate to infer a causal relationship
Cancer, Mutagenicity, Genotoxicity	Inadequate to infer a causal relationship

(From (U.S. EPA 2009) Table 2-4 and Chapters 6 and 7)

In 2013, a review of the health effects of ultrafine particles concluded that current available evidence does not support that exposures to ultrafine particles alone account for the adverse health effects that have been associated with other ambient pollutants such as PM2.5, although the report noted several limitations in the exposure data relating to ultrafine particles (HEI Review Panel on Ultrafine Particles 2013). However, a more recent assessment of the studies published since that time suggest that UFP's may be more harmful compared to health compared to PM10 and PM2.5 (Li et al. 2016). Several potential mechanisms have been brought forward to suggest that the ultrafine portion may be important in determining the toxicity of ambient particulates, some of which are discussed below.

Smaller particles can also be inhaled deeper into the lungs, although the relationship between deposition fraction and particle size is complex. The ultrafine particles between 20-30 nm generally have higher fractional deposition in the alveolar region of the lung, where air exchange takes place. Because ultrafine particles are cleared from the lung more slowly compared to larger particles, the ultrafine particles can accumulate in the lung tissue where they can also translocate into the blood and to other organs (HEI Review Panel on Ultrafine Particles 2013). Ultrafine particles can also enter the brain tissues through the olfactory nerve (Peters et al. 2006). For a given mass concentration, ultrafine particles have much higher numbers of particles and surface area compared to larger particles. Particles can act as carriers for other adsorbed agents, such as trace metals and organic compounds; and the larger surface area may transport more of such toxic agents than larger particles. Combined with the slower clearance of UFP's from the alveolar region of the lung, these small particles can deliver a greater amount of toxics to this part of the lung, causing increased inflammation (Li et al. 2016).

Exposures of laboratory animals to ultrafine particles have found cardiovascular and respiratory effects. Using an animal model of atherosclerotic disease, mice exposed to concentrated ultrafine particles (defined as less than 0.18 µm) near a roadway in Southern California showed larger early atherosclerotic lesions than mice exposed to concentrated PM2.5 or to filtered air (Araujo et al. 2008). In a mouse allergy model, exposures to concentrated ultrafine particles (less than 0.18 µm) resulted in a greater response to antigen challenge to ovalbumin (Li et al. 2010), indicating that vehicular traffic exposure could exacerbate allergic inflammation in already-sensitized animals. More specifically, ambient UFP's with a higher polycyclic aromatic hydrocarbon (PAH) content and higher oxidant potential triggered greater allergic inflammation in mice compared to a mixture of fine and ultrafine particles (Li et al. 2009). A related study identified specific proteins that are up-regulated among the exposed mice, which were proteins involved in allergic airway inflammation and immune system response (Kang et al. 2010). These results suggest that UFP's may play a role in the development or exacerbation of asthma, and point to an oxidative stress pathway. Additionally, some experiments using engineered nanoparticles found that the particle exposure led to a suppressed immune response to infections (Li et al. 2016).

Controlled exposures of human volunteers to ultrafine particles either laboratory-generated or as products of combustion, such as diesel exhaust containing particles, have found physiological changes related to vascular effects. Mills et al., for example found exposure to diesel exhaust particulate at 300 µg/m^3 attenuated both acetylcholine and sodium-nitroprusside-induced vasorelaxation (Mills et al. 2011). These exposures were higher than typical ambient concentrations, although the authors state that such concentrations can be found regularly in heavy traffic, occupational settings, and in some of the most polluted cities in the world. This study showed that diesel exhaust particulates had impacts on vascular function while carbon nanoparticles did not change vascular function, providing evidence that is complementary to the epidemiological studies linking particulate matter exposure to cardiovascular outcomes. Several other human exposures studies have reported effects of UFP's on inflammatory markers, lung function, heart rate and heart rate variability, including effects on people with asthma, diabetes, or metabolic syndrome (Li et al. 2016).

There is a lack of long-term studies of human population exposure to ultrafine particles, as there is currently no ultrafine monitoring network in the U.S. As noted above, however, a recent study from California estimated exposures to PM2.5 and ultrafine particles among members of the California Teachers Study cohort. Positive, statistically significant associations of ischemic heart disease mortality were observed with modeled PM2.5 and with ultrafine particle mass concentrations derived from chemical transport models using California emissions inventories (Ostro et al. 2015). Other epidemiological studies have reported links between UFP exposures both indoors and outdoors with decreased microvascular function and increased systemic inflammation in adults (Karottki et al. 2014; Olsen et al. 2014), and with oxidative DNA damage in children (Song et al. 2013).

There have been several cross-sectional epidemiological studies of ultrafine particles, mainly from Europe. Some of these studies found effects on hospital admissions and emergency department visits for respiratory and cardiovascular effects, whereas other studies did not find such effects (U.S. EPA 2009). A recent study conducted in Rochester, NY reported that ambient UFP exposures in the prior week were associated with increased risk of asthma-related medical visits indicative of asthma exacerbation; the study did not find associations with accumulation mode PM, PM2.5, black carbon, or sulfur dioxide (Evans et al. 2014). Concentrations of ultrafine particles can vary geographically, and it is not clear how well the central-site monitors used in these studies reflect actual exposures.

Additional discussion on the sources and health effects of ultrafine particles can be found in Chapter 9 of the 2012 AQMP.

Sensitive Populations for PM-Related Health Effects

Certain populations may be more sensitive to the health effects of particulate air pollution, and evidence to assess susceptibility comes from epidemiological, controlled human exposure, and toxicological studies of PM2.5 and PM10 exposures. The U.S. EPA 2009 ISA for PM concluded that there is evidence supporting increased susceptibility to the effects of PM among children (for respiratory effects) and older adults (for cardiovascular effects), individuals with pre-existing cardiovascular or respiratory conditions, individuals with lower socioeconomic status (sometimes assessed using proxy measures such as educational attainment or residential location), and individuals with certain genetic polymorphisms that control antioxidant response, regulate enzyme activity, or regulate procoagulants (U.S. EPA 2009). In addition, there is some limited evidence that additional factors may increase a person's susceptibility to PM health effects, including chronic inflammatory conditions (e.g. diabetes, obesity) and life stage, with pregnant women and fetuses *in utero* being potentially more susceptible. Table I-10 summarizes the U.S. EPA's 2009 ISA assessment of susceptibility factors for particulate matter.

TABLE I-10

Summary of Evidence for Potential Increased Susceptibility to PM-Related Health Effects

Assessment of Evidence	Potential At Risk Factor
Increased susceptibility to PM	Older Adults (≥65 years) Children (<18 years) Genetic factors Cardiovascular diseases Respiratory illnesses Socioeconomic status (SES) Educational attainment (surrogate of SES) Residential location (surrogate of SES)
Increased susceptibility to PM, but limited studies available	Pregnancy and developmental effects Diabetes Obesity Health status, e.g. nutrition (surrogate of SES)
Did not increase susceptibility to PM	Gender Race/ethnicity
Did not increase susceptibility to PM, but limited studies available	Respiratory contributions to cardiovascular effects

Adapted From (U.S. EPA 2009) Table 8-2

Summary - Particulate Matter Health Effects

A considerable body of scientific evidence from epidemiologic, controlled human exposure and toxicological studies support the causal determinations for particulate matter and several categories of health endpoints, with the strongest evidence supporting a causal relationship for PM2.5 exposures with cardiovascular effects and mortality. Specific cardiovascular effects include cardiovascular deaths, hospital admissions for ischemic heart disease and congestive heart failure, changes in heart rate variability and markers of oxidative stress, and markers of atherosclerosis. The scientific evidence also supported a likely causal relationship for PM2.5 exposure with respiratory effects, such as hospital admissions for COPD or respiratory infections, asthma development, asthma or allergy exacerbation, lung cancer, impacts on lung function, lung inflammation, oxidative stress, and airway hyperresponsiveness. Both short-term and long-term particulate matter exposures are linked to health effects in humans. Young children, older adults, and people with pre-existing respiratory or cardiovascular health conditions are among those who may be more susceptible to the adverse effects of PM.

Estimates of the Health Burden of Particulate Matter in the South Coast Air Basin

In terms of estimating health burdens of air pollution exposure, CARB has conducted analyses in the past estimating exposures and quantitative health effects from exposures to particulate matter as well as other pollutants. A recent assessment focused on premature mortality and PM2.5, and estimated the deaths associated with exposures above 5.8 µg/m^3, which is an estimate of background PM2.5 (California Air Resources Board 2010a). The analysis used the U.S. EPA's risk assessment methodology for calculating premature mortality and used ambient air quality measurements averaged over a three-year period of 2006-2008. An update to this analysis using ambient air quality data from 2009-2011 indicated that PM2.5-related premature deaths in California due to cardiopulmonary causes as 7,200 deaths per year with an uncertainty range of 5,600 – 8,700. Estimates were also made for the California Air Basins. For the South Coast Air Basin, the estimate was 4,000 cardiopulmonary deaths per year with an uncertainty range of 3,200–4,900. These estimates were calculated using the associations of cardiopulmonary mortality and PM2.5 from the second exposure period from Krewski (Krewski et al. 2009).

Another analysis of health impacts in the South Coast was conducted as part of the Socioeconomic Report for the 2012 AQMP. The analysis estimated the anticipated costs and benefits of adopting the measures in the Final 2012 AQMP, which included the projected public health benefits associated with lower PM2.5 concentrations as a result of the 2012 plan (South Coast Air Quality Management District 2012). Based on that analysis, the projected annual number of averted deaths due to PM2.5 reductions from the 2012 AQMP was 668 deaths in year 2014, and 275 deaths in year 2023. In addition, estimated numbers of health conditions prevented per year due to the 2012 AQMP were shown for several other health endpoints, including respiratory and cardiovascular outcomes. The estimates of cases averted in year 2014 were 597 cases of acute bronchitis, 29 to 261 non-fatal heart attacks, 18,384 person-days for lower and upper respiratory symptoms, 153 respiratory emergency room visits, 151 hospital admissions, 287,447 person-days of minor restricted activity, 48,805 work loss days, and 26,910 person-days of asthma attacks. Importantly, these estimates of prevented mortality and morbidity should not be compared to the estimates of deaths attributable to PM2.5 conducted by CARB, because these analyses are intended to answer different questions. The SCAQMD estimates address the question of "how many cases are averted due to the adoption of the 2012 AQMP?" while the CARB estimates address the question of "how many deaths are attributable to PM2.5 exposures above 5.8 µg/m3?". Both analyses provide important information regarding the health impacts of PM2.5.

NITROGEN DIOXIDE

Nitrogen dioxide (NO_2) is a gaseous air pollutant that serves as an indicator of gaseous oxides of nitrogen, such as nitric oxide (NO) and other related compounds (NO_x). These gases can undergo photochemical reactions to form ground-level ozone, and are important contributors to ozone pollution levels in the SCAB. Evidence of the health effects of NO_2 is derived from human and animal studies, which link NO_2 with respiratory effects such as decreased lung function and increases in airway responsiveness and pulmonary inflammation (U.S. EPA 2016). The U.S. EPA in 2010 retained the existing standards of 53 ppb for NO_2 averaged over one year, and adopted a new short-term standard of 100 ppb (0.1 ppm) averaged over one hour. The standard was designed to protect against increases in airway reactivity in individuals with asthma based on controlled exposure studies, as well as respiratory symptoms observed in epidemiological studies. The revised standard also requires additional monitoring for NO_2 near roadways.

In the current U.S. EPA Integrated Science Assessment for Nitrogen Oxides (U.S. EPA 2016), the staff conclusion for causal relationships between exposures and health effects are shown in the following table.

TABLE I-11

Summary of U.S. EPA's Causal Determination for Health Effects of Nitrogen Dioxide

SHORT-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Respiratory effects	Causal relationship
Cardiovascular and related metabolic effects	Suggestive of a causal relationship
Total mortality	Suggestive of a causal relationship
LONG-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Respiratory effects	Likely to be a causal relationship
Cardiovascular and related metabolic effects	Suggestive of a causal relationship
Reproductive and developmental effects	Fertility, Reproduction, and Pregnancy: Inadequate to infer a causal relationship Birth Outcomes: Suggestive of a causal relationship Postnatal Development: Inadequate to infer a causal relationship
Total Mortality	Suggestive of a causal relationship
Cancer	Suggestive of a causal relationship

(From (U.S. EPA 2016), Table ES-1)

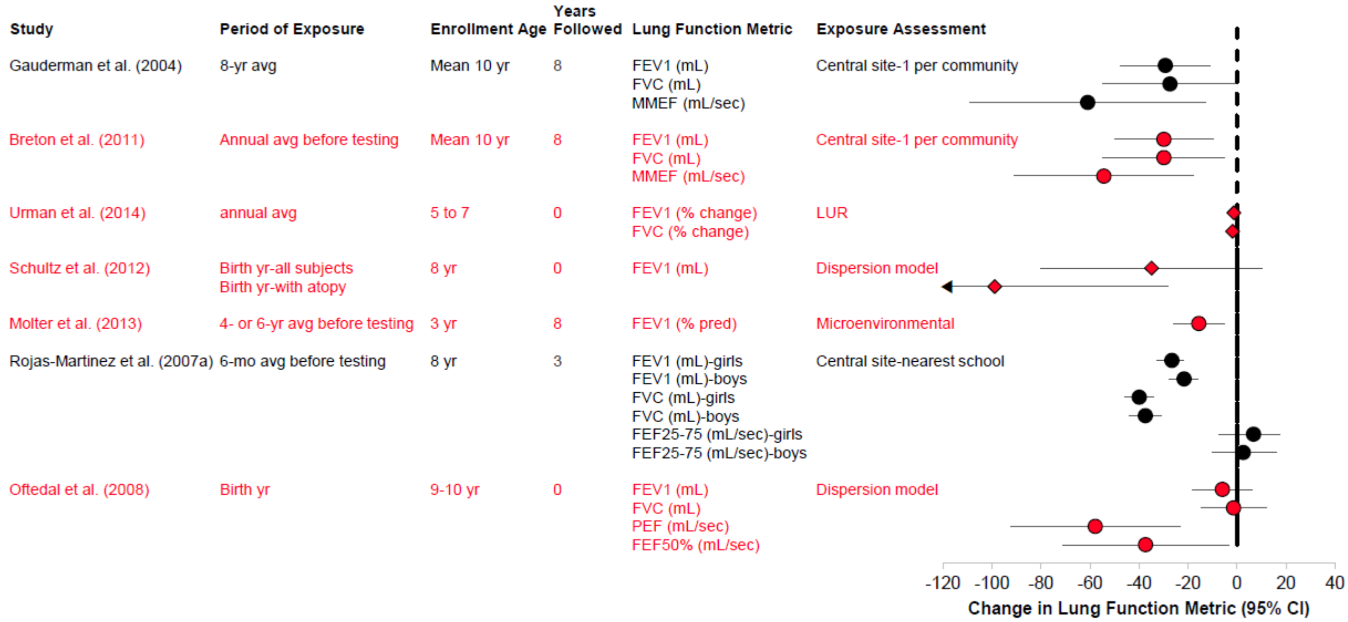
Since the previous U.S. EPA Integrated Science Assessment (ISA) for Nitrogen Oxides from 2008, the causal determination for short-term and long-term respiratory effects have been updated in the 2016 ISA to reflect the stronger evidence now available pointing to a causal or likely causal relationship. For non-respiratory outcomes, the U.S. EPA also updated their assessment of the weight of evidence to show that the evidence for several short- and long-term outcomes is suggestive, but not sufficient to infer a causal relationship. Evidence for low-level nitrogen dioxide (NO_2) exposure effects is derived from laboratory studies of asthmatics and from epidemiological studies. Additional evidence is derived from animal studies. In the 2016 ISA, the U.S. EPA cited the coherence of the results from a variety of studies, and a plausible biological mechanism (whereby NO_2 reacts with the respiratory lining and forms secondary oxidation products that increase airway responsiveness and allergic inflammation) to support the determination of a causal relationship between short-term NO_2 exposures and asthma exacerbations ("asthma attacks"). The long-term link with respiratory outcomes was strengthened by recent experimental and epidemiological studies, and the strongest evidence available is from studies of asthma development.

Several studies related to outdoor exposure have found health effects associated with ambient NO_2 levels, including respiratory symptoms, respiratory illness, decreased lung function, pulmonary inflammation, increased emergency room visits for asthma, and cardiopulmonary mortality. However, since traffic exhaust is an important source of NO_2 and several other pollutants, such as particulate matter, exposure generally occurs in the presence of other pollutants, making it more difficult for these studies to distinguish the specific role of NO_2 in causing effects independent of other pollutants. However, studies linking NO_2 to asthma exacerbations and human experimental studies provided support for the U.S. EPA determination that this causal relationship exists for short-term NO_2 exposures independent of other traffic-related pollutants (U.S. EPA 2016). The report also concludes that epidemiological studies do not rule out the possible influence of other traffic-related pollutants on the observed health effects.

The Children's Health Study in Southern California has evaluated a variety of health endpoints in relation to air pollution exposures, including lung function, lung development, school absences, and asthma. The study found associations between long-term exposure to air pollution, including NO_2, PM10, and PM2.5, and respiratory symptoms in asthmatic children (McConnell et al. 1999). Particles and NO_2 levels were correlated, and independent effects of individual pollutants could not be discerned. A subsequent analysis using more refined exposure estimation methods indicated consistent associations between long-term NO_2 exposures and respiratory symptoms in children with asthma (McConnell et al. 2003).

Ambient levels of NO_2 were also associated with a decrease in lung function growth in a group of children followed for eight years, including children with no history of asthma. In addition to NO_2, the decreased growth was also associated with particulate matter and airborne acids. The study authors postulated this may be a result of a package of pollutants from traffic sources (Gauderman et al. 2004).

A number of studies have since reported deficits in lung function associated with nitrogen oxides exposures. Examples are shown in Figure I-8.



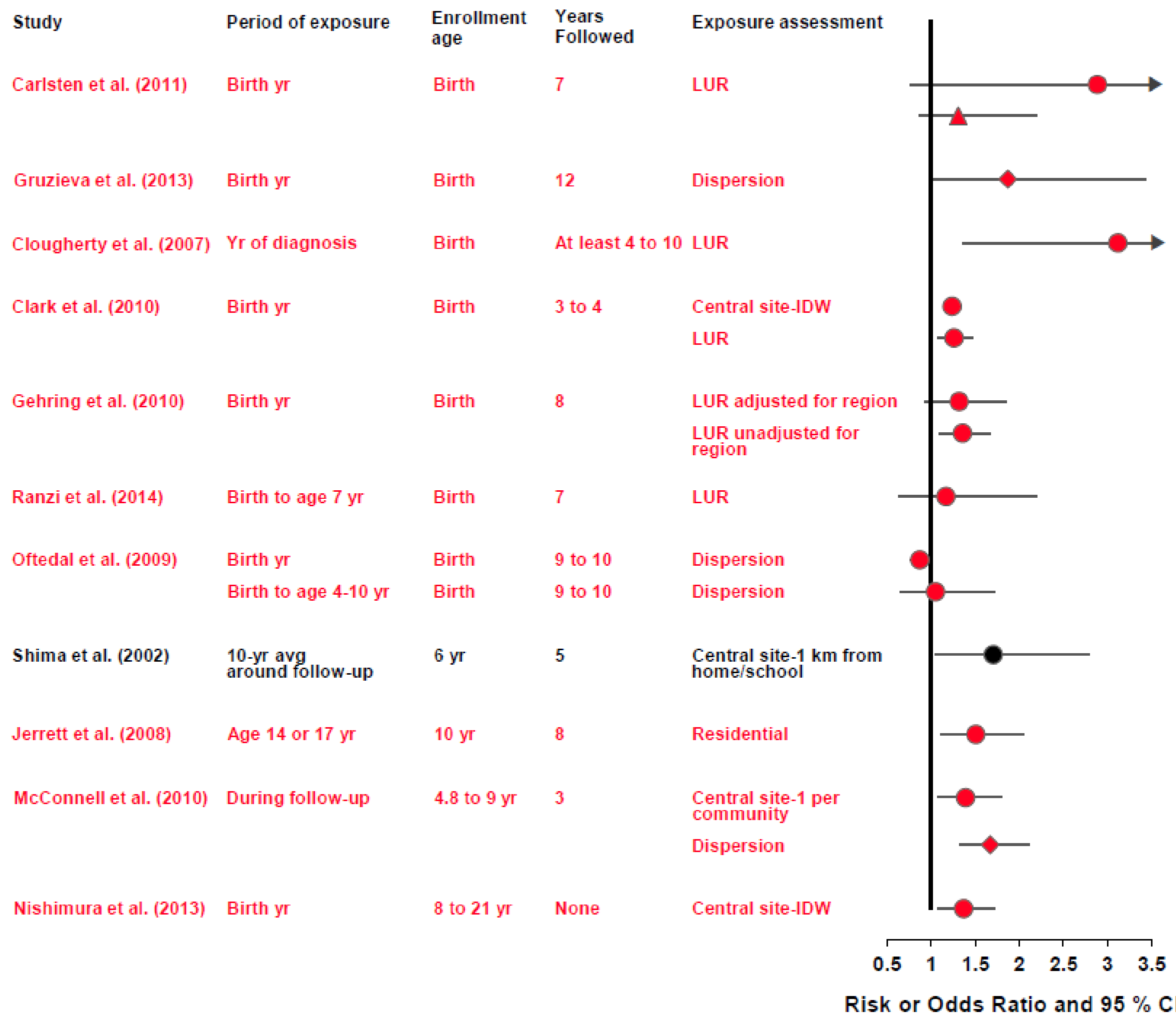
Note: Studies in red are recent studies. Studies in black were included in the 2008 ISA for Oxides of Nitrogen. Circles = NO_2; Diamonds = NO_x. All mean changes in this plot are standardized to a 10-ppb increase in NO_2 and a 20-ppb increase in NO_x concentration. Effect estimates from studies measuring NO_x in µg/m3 (Schultz et al., 2012) have not been standardized.

FIGURE I-8

Associations of nitrogen dioxide (NO_2) or the sum of nitric oxide and NO_2 (NO_x) with lung function indices from prospective studies of children (From (U.S. EPA 2016), Figure 6-5).

A follow-up report from the Children's Health Study has assessed whether improving air quality in Southern California over the past several decades has led to beneficial changes in health among children (Gauderman et al. 2015). It was reported that as the levels of nitrogen oxide and fine particulates came down as the result of air pollution emissions reductions, the deficits in lung function growth were also of a smaller magnitude. Such improvements were observed in children with asthma as well as in those without asthma. These results indicate that improvements in air quality are associated with improvements in children's health.

In recent years, the most compelling evidence of long-term effects of NO_2 has been from prospective cohort studies that link NO_2 exposures to the development of asthma, primarily in children. The U.S. EPA included several recent studies in their review, as shown in the Figure I-9. The vast majority of these studies found that higher NO_2 exposures were linked to an increased risk or odds of developing asthma among children.



Effect estimates are standardized to a 10-ppb increase in NO_2, with the exception of Gruzieva et al. (2013) who examined NOx in µg/m3 and Oftedal et al (2009) who did not report increments for the effect estimates for the birth to age 4 years or birth to age 10 years exposure periods. Note: Black symbols = studies evaluated in the 2008 Integrated Science Assessment for Oxides of Nitrogen; Red symbols = recent studies. Circles=NO_2; triangles=NO; diamonds=NOx.

FIGURE I-9

Associations of ambient nitrogen dioxide (NO_2) concentrations with asthma incidence in longitudinal cohort studies of children (From (U.S. EPA 2016), Figure 6-1).

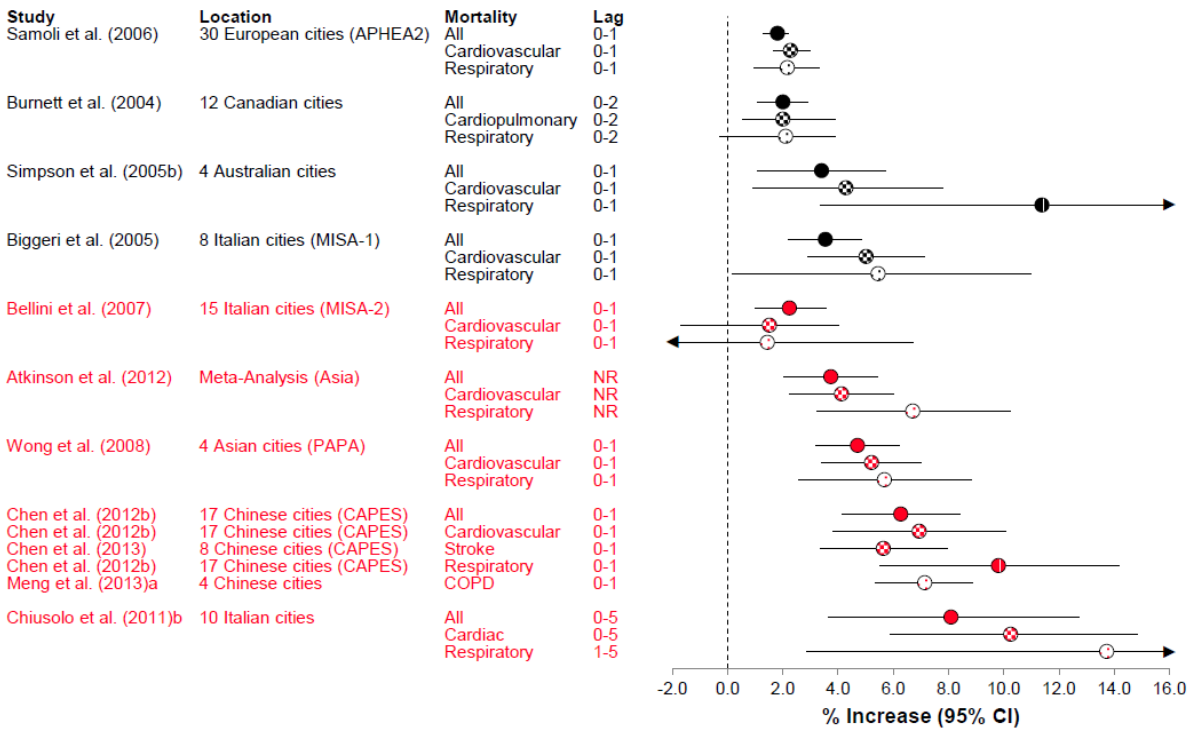
Among the studies of childhood asthma incidence reviewed in the 2016 U.S. EPA ISA for Oxides of Nitrogen, two studies were conducted in Southern California. Both studies were based on the Children's Health Study cohort, but one study used a smaller subset of the cohort and estimated NO_2 exposures using monitors at the children's homes (Jerrett et al. 2008). The second study examined over 2000 children and used data from air monitoring stations as well as modeled NO_2 levels to estimate exposures (McConnell et al. 2010). Both studies found a positive association between NO_2 exposures and the onset of asthma in these children, however, because NO_2 is often strongly correlated with PM2.5 and other components of traffic-related air pollution, it is possible that the effects observed are due to some other component of traffic exhaust for which NO_2 serves as a proxy measure. The consistency of the effects found linking NO_2 exposure and asthma development in children, the use of prospective longitudinal study designs following children for several years, and the use of several different methods to estimate exposures are noted strengths of such studies. Experimental studies have found that NO_2 exposures increase responsiveness of airways, pulmonary inflammation, and oxidative stress, and can lead to the development of allergic responses. These biological responses provide evidence of a plausible mechanism for NO_2 to cause asthma.

Results from controlled exposure studies of asthmatics demonstrate an increase in the tendency of airways to contract in response to a chemical stimulus (airway responsiveness) or after inhaled allergens (U.S. EPA 2016). Effects were observed among adult volunteers with asthma when exposed to 100 ppb NO_2 for 60 minutes and to 200-300 ppb for 30 minutes, with approximately 70 percent of study participants experiencing an increase in airway responsiveness. A similar response was reported in some studies with healthy subjects at higher levels of exposure (1.5 - 2.0 ppm), although these changes in healthy adults are likely of little or no clinical significance. Increased airway responsiveness among people with asthma can lead to worse symptoms and reduced lung function. Mixed results have been reported from controlled human exposure studies of people with chronic obstructive lung disease, with some studies reporting no change in symptom score while other studies reporting increased symptom scores when participants were exposed to NO_2 while exercising (U.S. EPA 2016).

Short-term controlled studies of rats exposed to NO_2 over a period of several hours indicate cellular changes associated with allergic and inflammatory responses that can lead to liver damage and reduced hepatic function. Rodent models exposed to NO_2 repeatedly for 4 to 14 days demonstrated increased airway responsiveness with high levels of exposure (4000 ppb). Animal studies also provide evidence that NO_2 exposures have negative effects on the immune system, and therefore increase the host's susceptibility to respiratory infections. Epidemiological studies showing associations between NO_2 levels and hospital admissions for respiratory infections also support such a link (U.S. EPA 2016).

Several epidemiological studies conducted in California have examined associations between NO_2 exposures and other health effects, including some recent studies evaluating cardiovascular effects (Coogan et al. 2012; Bartell et al. 2013; Wittkopp et al. 2013), mortality (Lipsett et al. 2011; Bartell et al. 2013; Jerrett et al. 2013), birth outcomes (Ghosh et al. 2012; Laurent et al. 2014; Padula et al. 2014; Ritz et al. 2014; Green et al. 2015), and cancer (Ghosh et al. 2013). Many studies conducted in other geographic areas have also found links with these health outcomes, and the latest assessment by U.S. EPA is that the existing studies are suggestive of a causal relationship for some of these endpoints or inadequate to infer a causal relationship for other endpoints (U.S. EPA 2016). In addition, some of the newer outcomes evaluated in relation to NO_2 exposures include neurological outcomes such as Parkinson's disease (Ritz et al. 2016), Alzheimer's disease (Oudin et al. 2016), and autism (Becerra et al. 2013; Volk et al. 2013), as well as metabolic diseases such as diabetes and obesity (Coogan et al. 2012; Robledo et al. 2015; White et al. 2016). However, many of these studies use NO_2 exposures as a proxy measure for traffic-related air pollutants, and do not aim to identify a specific pollutant within the mix of pollutants from this source. Thus, there is uncertainty on whether NO_2 exposure has independent relationships with non-respiratory related health effects, or whether NO_2 is simply a marker of near-road air pollution exposure, which includes a mixture of air pollutants, including some air toxics.

Examples of studies reporting an association of mortality with short-term NO_2 exposures are shown in the figure below.



Note: Black symbols = multicity studies evaluated in the 2008 Integrated Science Assessment for Oxides of Nitrogen; Red symbols = recent studies. Filled circle = total mortality; Crosshatch = cardiovascular mortality; Vertical lines = respiratory mortality.

FIGURE I-10

Percentage increase in total, cardiovascular, and respiratory mortality from multi-city studies for a 20-ppb increase in 24-hour average or 30-ppb increase in one-hour maximum nitrogen dioxide concentrations (From (U.S. EPA 2016), Figure 5-23).

SULFUR DIOXIDE

Sulfur dioxide (SO_2) is a gaseous air pollutant that has been linked to a variety of respiratory effects, such as decreased lung function and increased airway resistance. Controlled laboratory studies involving human volunteers have clearly identified asthmatics as a very sensitive group to the effects of ambient sulfur dioxide (SO_2) exposures. Healthy subjects have failed to demonstrate any short-term respiratory functional changes at exposure levels up to 1.0 ppm over 1-3 hours. In exercising asthmatics, brief exposure (5-10 minutes) to SO_2 at levels between 0.2-0.6 ppm can result in increases in airway resistance and decreases in breathing capacity. The response to SO_2 inhalation is observable within two minutes of exposure, increases further with continuing exposure up to five minutes, then remains relatively steady as exposure continues. SO_2 exposure is generally not associated with any delayed reactions or repetitive asthmatic attacks (U.S. EPA 2008). In 2010, the U.S. EPA SO_2 air quality standard was set at 75 ppb (0.075 ppm) averaged over one hour to protect against acute asthma attacks in sensitive individuals.

The EPA assessment based on the 2008 Integrated Science Assessment for Sulfur Oxides is shown in the table below (U.S. EPA 2008). The U.S. EPA recently released a draft of the revised ISA for SO2 (U.S. EPA 2015a) which evaluates recent evidence assessing links to mortality and cardiovascular, respiratory, carcinogenic, and reproductive effects (Brunekreef et al. 2009; Hart et al. 2011; Pascal et al. 2013; Chen et al. 2014; Gianicolo et al. 2014; Milojevic et al. 2014; Moridi et al. 2014; Stingone et al. 2014; Straney et al. 2014; Wang et al. 2014; Winquist et al. 2014; Yang et al. 2014; Ancona et al. 2015; Green et al. 2015; Rich et al. 2015; Shah et al. 2015; Yorifuji et al. 2015).

TABLE I-12

Summary of U.S. EPA's Causal Determinations for Health Effects of Sulfur Oxides

SHORT-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Respiratory morbidity	Causal relationship
Cardiovascular morbidity	Inadequate to infer a causal relationship
Mortality	Suggestive of a causal relationship
LONG-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Respiratory morbidity	Inadequate to infer a causal relationship
Carcinogenic effects	Inadequate to infer a causal relationship
Prenatal and neonatal outcomes	Inadequate to infer a causal relationship
Mortality	Inadequate to infer a causal relationship

(From (U.S. EPA 2008) Chapter 3)

In epidemiologic studies of children and adults, associations of short-term variations in SO_2 levels with increases in respiratory symptoms, emergency department visits, and hospital admissions for respiratory-related causes have been reported. There is uncertainty as to whether SO_2 is associated with the effects or whether other co-occurring pollutants may explain the observed effects, although some studies indicated that the SO_2 effects remained even after accounting for the effects of other pollutants, including PM2.5. Coupled with the human clinical studies, these data suggest that SO_2 can trigger asthmatic episodes in individuals with pre-existing asthma (U.S. EPA 2008).

Animal studies have shown SO_2 effects on pulmonary inflammation with acute exposure at concentrations consistent with ambient SO_2 levels. Toxicological studies using animals found that repeated exposures to concentrations of SO_2 as low as 0.1 ppm promoted allergic sensitization and airway inflammation. Such evidence, combined with human clinical studies and epidemiological studies in people with asthma support the U.S. EPA determination of a causal relationship between short-term SO_2 exposure and respiratory morbidity. One of these studies was conducted in the Los Angeles area, and found that higher ambient SO_2 levels were associated with increased odds of asthma symptoms among Hispanic children with asthma (Delfino et al. 2003).

Some epidemiological studies indicate that the cardiovascular mortality effects associated with short-term exposures to ambient SO_2 were generally reduced when accounting for other pollutants, although the evidence is still suggestive of a causal relationship. Few epidemiological studies are available to assess the potential confounding effects of other co-occurring pollutants in studies of long-term effects. For example, there is some evidence that sulfates, which are formed when SO_2 oxidizes rapidly in the atmosphere, may be associated with lung function changes, although the evidence is not consistent (Reiss et al. 2007). Sulfates are positively correlated with SO_2 levels, so it is difficult to distinguish the effect of one individual pollutant. Based on a level determined necessary to protect the most sensitive individuals, the California Air Resources Board (CARB) in 1976 adopted a standard of 25 $\mu g/m^3$ (24-hour average) for sulfates. There is no federal air quality standard for sulfates.

CARBON MONOXIDE

Carbon monoxide (CO) is a gaseous air pollutant that has a high affinity to bond with oxygen-carrying proteins (hemoglobin and myoglobin). The resulting reduction in oxygen supply in the bloodstream is responsible for the toxic effects of CO, which are typically manifested in the oxygen-sensitive organ systems. The effects have been studied in controlled laboratory environments involving exposure of humans and animals to CO, as well as in population-based studies of ambient CO exposure effects. People with deficient blood supply to the heart (ischemic heart disease) are known to be susceptible to the effects of CO. Protection of this group is the basis of the existing National Ambient Air Quality Standards for CO at 35 ppm for one hour and 9 ppm averaged over eight hours. The health effects of ambient CO have been recently reviewed by U.S. EPA, with the strongest evidence supporting a likely causal link between short-term CO exposures and cardiovascular outcomes, although studies have linked both short-term and long-term CO exposures to several other health outcomes (Table I-13) (U.S. EPA 2010).

TABLE I-13

Summary of U.S. EPA's Causal Determinations for Health Effects of Carbon Monoxide

SHORT-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Cardiovascular morbidity	Likely to be a causal relationship
Central nervous system	Suggestive of a causal relationship
Respiratory morbidity	Suggestive of a causal relationship
Mortality	Suggestive of a causal relationship
LONG-TERM EXPOSURES	
Health Outcome	**Causality Determination**
Cardiovascular morbidity	Inadequate to infer a causal relationship
Central nervous system	Suggestive of a causal relationship
Birth outcomes and developmental effects	Suggestive of a causal relationship
Respiratory morbidity	Inadequate to infer a causal relationship
Mortality	Not likely to be a causal relationship

(From (U.S. EPA 2010) Table 2-1)

Inhaled CO has no known direct toxic effect on lungs but rather exerts its effects by interfering with oxygen transport—through the formation of carboxyhemoglobin (COHb, a chemical complex of CO and hemoglobin)), which reduces the amount of oxygen the blood can carry to the tissues. Exposure to CO is often evaluated in terms of COHb levels in blood, measured as percentage of total hemoglobin bound to CO. Endogenous COHb is estimated to be <1 percent in healthy individuals, but COHb levels are sensitive to health status and metabolic state, with higher levels among smokers and persons with inflammatory diseases. Estimates based on a large prospective study of adults conducted in the 1970s showed a dose-response relationship between the average number of cigarettes smoked per day and the COHb concentrations (never smokers: 1.59±1.72 percent, former smokers: 1.96±1.87 percent, 1-5 cigarettes/day: 2.31±1.94 percent, 6–14 cigarettes/day: 4.39±2.48 percent, 15–24 cigarettes/day: 5.68±2.64 percent, >=25 cigarettes/day: 6.02±2.86 percent) (Hart et al. 2006).

Under controlled laboratory conditions, healthy subjects exposed to CO sufficient to result in 5 percent COHb levels exhibited reduced duration of maximal exercise performance due to the inability to deliver sufficient oxygen to the heart and other muscles. Studies involving subjects with coronary artery disease who engaged in exercise during CO exposures have shown that COHb levels as low as

2.4 percent can lead to earlier onset of electrocardiograph changes indicative of deficiency of oxygen supply to the heart. Other effects of inadequate oxygen delivery to the body tissues include earlier onset of chest pain, increase in the duration of chest pain, headache, confusion and drowsiness (U.S. EPA 2000).

A number of epidemiological studies have found associations between short-term ambient CO levels and increased hospital admissions and emergency department visits for ischemic heart disease, including myocardial infarction (U.S. EPA 2010). In studies reporting results stratified by age and sex, larger effects were generally observed among older adults and among males. Examples of such studies, including information on number of days of lag time between exposure and hospital admissions for key cardiovascular outcomes, are shown in the figure below.

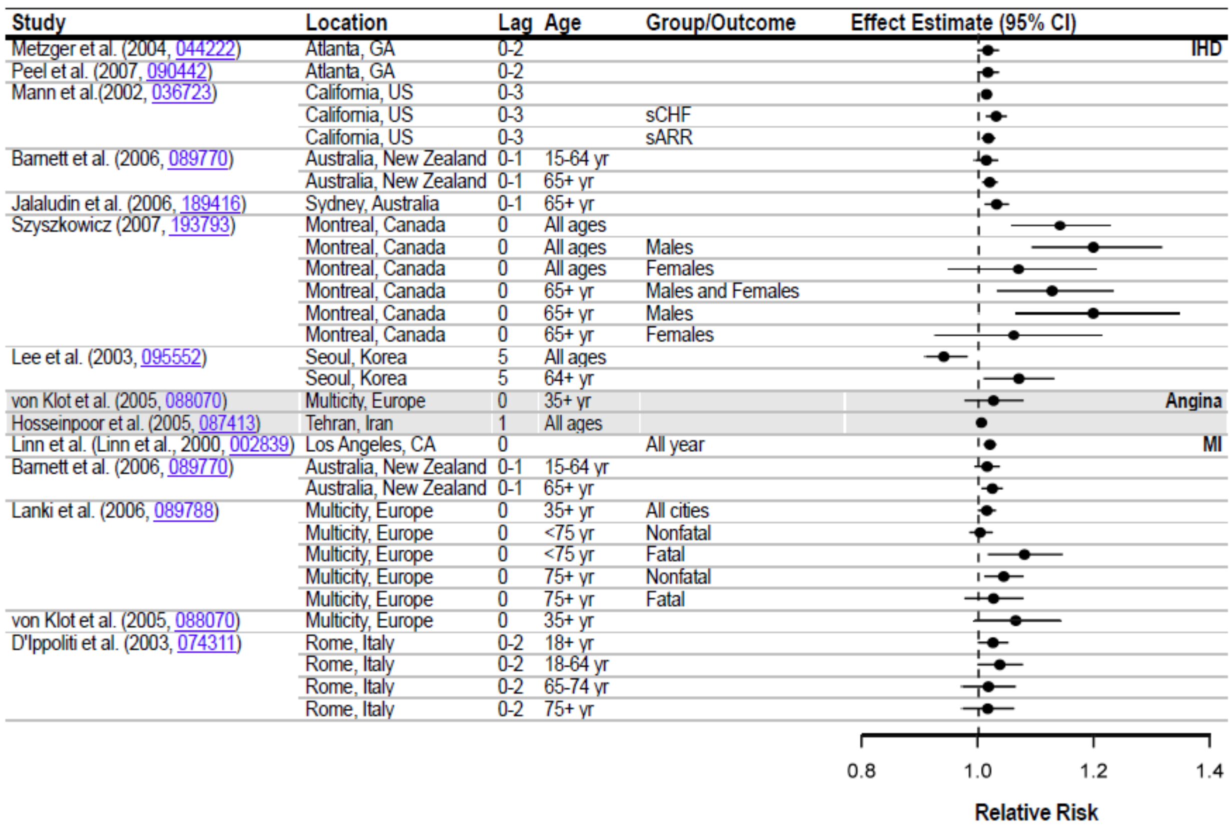


FIGURE I-11

Effect estimates (95 percent confidence intervals) associated with hospital admissions for various forms of heart disease. Effect estimates have been standardized to a 1 ppm increase in ambient CO for 1-h max CO concentrations, 0.75 ppm for 8-h max CO concentrations, and 0.5 ppm for 24-h average CO concentrations (From (U.S. EPA 2010), Figure 5-2). Lag time is the time between the exposure and the outcome measured. The closed circle on the diagram indicates the effect estimate, while the bar indicates the 95 percent confidence interval.

Research studies have also evaluated ambient CO exposures in relation to reproductive health outcomes. Epidemiological studies conducted in Southern California have reported an association between with CO exposure during pregnancy and increases in pre-term births (Ritz et al. 2000; Wilhelm et al. 2005; Ritz et al. 2007). The increases in the pre-term births were also associated with PM10 or PM2.5 levels. There are very few studies examining CO exposure and birth defects, but one Southern California study found increased risks for cardiac-related birth defects with carbon monoxide exposure in the second month of pregnancy (Ritz et al. 2002). Toxicological studies in laboratory animals with higher than ambient levels of CO have also reported decrements in birth weight and prenatal growth, as well as impaired neurobehavior in the offspring of exposed animals (U.S. EPA 2010). The U.S. EPA concluded in their most recent review that the evidence linking long-term CO exposures with reproductive health outcomes was suggestive of a causal relationship.

LEAD

Lead (Pb) is a toxic air contaminant that is recognized to exert an array of deleterious effects on multiple organ systems. There are a number of potential public health effects at low level exposures, and there is no recognized lower threshold for health effects (U.S. EPA 2013a). The health implications are generally indexed by blood lead levels which are related to lead exposures both from inhalation as well as from ingestion. Effects include impacts on population IQ as well as heart disease and kidney disease. The initial air quality standard for lead was established by U.S. EPA in 1978 at a level of 1.5 µg /m^3 averaged over a calendar quarter. U.S. EPA revised the NAAQS for lead in 2008 to a level of 0.15 µg/m^3 averaged over a rolling three-month period to protect against lead toxicity. The SCAB's attainment status for lead is described in the draft 2016 AQMP Chapter 2.

The U.S. EPA has recently reviewed the health effects of ambient lead exposures in conjunction with an Integrated Science Assessment and a review of the NAAQS for lead (U.S. EPA 2013a; U.S. EPA 2015c). Lead can accumulate and be stored in the bone, and this lead in bone can be released into the blood when the bone is metabolized, which happens naturally and continuously. Blood lead is the most common measure of lead exposure, and it represents recent exposure and may be an indicator of total body burden of lead (U.S. EPA 2013a). The following table gives the summary of causality conclusions from the U.S. EPA review, which illustrates the wide range of health effects associated with lead exposure.

TABLE I-14

Summary of U.S. EPA's Causal Determinations for Health Effects of Lead

HEALTH OUTCOME	CAUSALITY DETERMINATION
Children - Nervous System Effects	
Cognitive Function Decrements	Causal relationship
Externalizing Behaviors: Attention, Impulsivity and Hyperactivity	Causal relationship
Externalizing Behaviors: Conduct Disorders in Children and Young Adults	Likely to be a causal relationship
Internalizing Behaviors	Likely to be a causal relationship
Auditory Function Decrements	Likely to be a causal relationship
Visual Function Decrements	Inadequate to infer a causal relationship
Motor Function Deficits	Likely to be a causal relationship
Adults – Nervous System Effects	
Cognitive Function Decrements	Likely to be a causal relationship
Psychopathological Effects	Likely to be a causal relationship
Cardiovascular effects	
Hypertension	Causal relationship
Subclinical Atherosclerosis	Suggestive of a causal relationship
Coronary Heart Disease	Causal relationship
Cerebrovascular Disease	Inadequate to infer a causal relationship
Renal Effects	
Reduced Kidney Function	Suggestive of a causal relationship
Immune System Effects	
Atopic and Inflammatory Response	Likely to be a causal relationship
Decreased Host Resistance	Likely to be a causal relationship
Autoimmunity	Inadequate to infer a causal relationship
Hemotologic Effects	
Decreased Red Blood Cell Survival and Function	Causal relationship
Altered Heme Synthesis	Causal relationship
Reproductive and Developmental Effects	
Development	Causal relationship
Birth Outcomes (low birth weight, spontaneous abortion)	Suggestive of a causal relationship
Male Reproductive Function	Causal relationship
Female Reproductive Function	Suggestive of a causal relationship
Cancer	
Cancer	Likely to be a causal relationship

(From (U.S. EPA 2013a) Table ES-1)

Children appear to be sensitive to the neurological toxicity of lead, with effects observed at blood lead concentration ranges of 2–8 µg/dL. No clear threshold has been established for such effects. According to the U.S. EPA review, the most important effects observed are neurotoxic effects in children and cardiovascular effects in adults. The effects in children include impacts on intellectual attainment and school performance. Figure I-12 provides a summary of the lowest levels of blood lead that have been associated with certain neurological, hematological and immune effects in children.

Lowest Observed Effect Blood Lead Level	Neurological Effects	Hematological Effects	Immune Effects
30 µg/dL		Increased urinary δ-aminolevulinic acid	
15 µg/dL	Behavioral disturbances (e.g., inattention, delinquency) Altered electrophysiological responses	Erythrocyte protoporphyrin (EP) elevation	
10 µg/dL	Effects on neuromotor function CNS cognitive effects (e.g., IQ deficits) ↓	Inhibition of δ-aminolevulinic acid dehydratase (ALAD) | Pyrimidine-5′-nuclotidase (Py5N) activity inhibition ↓	Effects on humoral (↑ serum IgE) and cell-mediated (↓ T-cell abundance) immunity
5 µg/dL			
	(???)	(???)	
0 µg/dL			

Note: Arrows depict cases where weight of overall evidence strongly substantiates likely occurrence of type of effect in association with blood-Pb concentrations in range of 5-10 µg/dL, or possibly lower, as implied by (???). Although no evident threshold has yet been clearly established for those effects, the existence of such effects at still lower blood-Pb levels cannot be ruled out based on available data.

Source: Adapted/updated from Table 1-17 of U.S. Environmental Protection Agency (1986a).

FIGURE I-12

Summary of Lowest Observed Effect Levels for Key Lead-Induced Health Effects in Children (From (U.S. EPA 2007), Table 3-1)

Figures I-12 and I-13, taken from the U.S. EPA review (U.S. EPA 2007), depict the health effects of lead in relation to blood levels. In the figure, the question marks indicate that there are no demonstrated threshold blood lead levels for health effects. The Centers for Disease Control (CDC) has recently revised their lead hazard information and replaced their level of concern for adverse effects of 10 µg/dL blood lead level with a childhood blood lead level reference value of 5 µg/dL to identify children and environments associated with lead-exposure hazards (Centers for Disease Control and Prevention 2016).

Figure I-13 provides a summary of the lowest levels of blood lead that have been associated with key health effects in adults. For adults, evidence supports a causal relationship between lead and increased blood pressure and hypertension, as well as coronary heart disease (myocardial infarction, ischemic heart disease, and heart rate variability). Other health effects among adults are also relatively high on the causal scale, including neurological, hematological, and renal effects.

Lowest Observed Effect Blood Lead Level	Neurological Effects	Hematological Effects	Cardiovascular Effects	Renal Effects
30 µg/dL	Peripheral sensory nerve impairment	Erythrocyte protoporphyrin (EP) elevation in males		Impaired Renal Tubular Function
20 µg/dL	Cognitive impairment			
15 µg/dL	Postural sway	Erythrocyte protoporphyrin (EP) elevation in females Increased urinary δ-aminolevulinic acid		
10 µg/dL		Inhibition of δ-aminolevulinic acid dehydratase (ALAD)	Elevated blood pressure ↓	
5 µg/dL			(???)	Elevated serum creatine (↓ creatine clearance)
0 µg/dL				

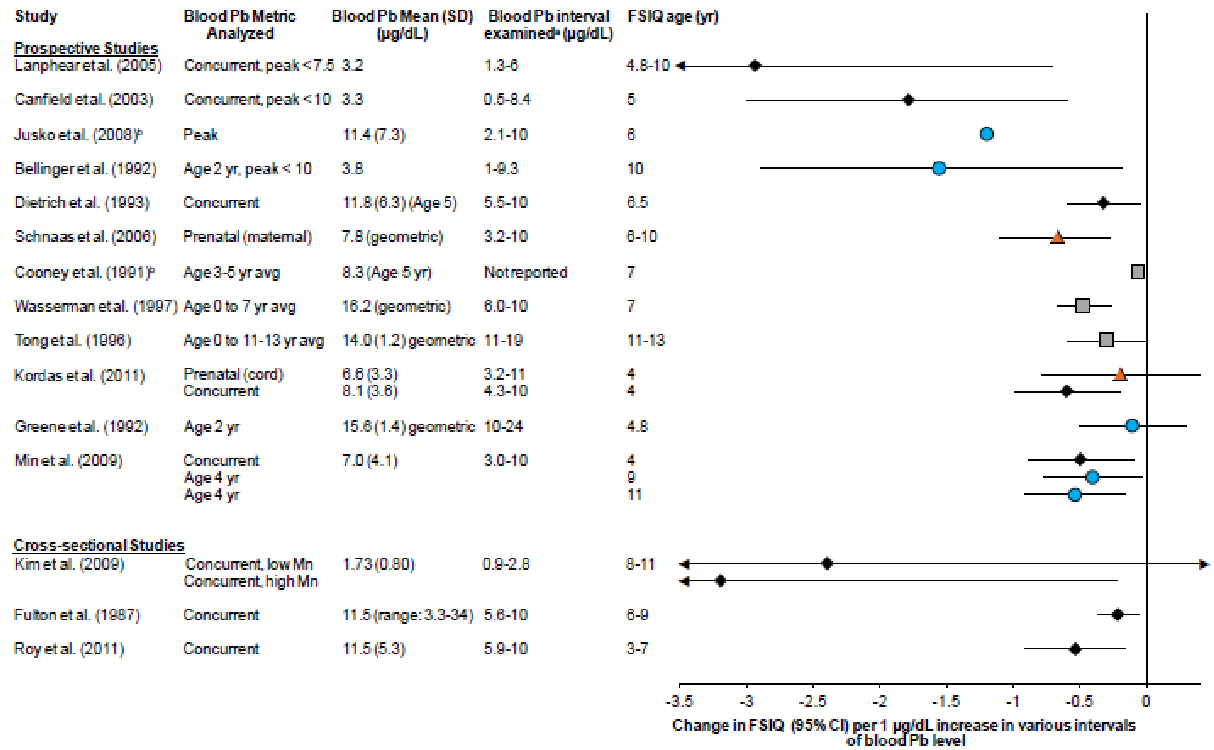
Note: Arrows depict cases where weight of overall evidence strongly substantiates likely occurrence of type of effect in association with blood-Pb concentrations in range of 5-10 µg/dL, or possibly lower, as implied by (???). Although no evident threshold has yet been clearly established for those effects, the existence of such effects at still lower blood-Pb levels cannot be ruled out based on available data.

Source: Adapted/updated from Table 1-16 of U.S. Environmental Protection Agency (1986a).

FIGURE I-13

Summary of Lowest Observed Effect Levels for Key Lead-Induced Health Effects in Adults (From (U.S. EPA 2007), Table 3-2)

In its most recent review of lead health effects, the U.S. EPA confirmed its previous conclusion regarding the cognitive decline in children as the most sensitive adverse effect associated with lead exposures. The effects as measured by a reduction in IQ from a number of studies are shown in the following figure. According to the review, the currently available evidence supports a median estimate of -1.75 IQ points for a change of 1 µg/dL blood lead to describe the neurocognitive impacts on young children (U.S. EPA 2015c).



[a]See Table 4-3 for explanation of the blood Pb level interval examined. Effect estimates were calculated for the lowest range examined in the study or the 10th percentile of blood Pb level to a blood Pb level of 10 µg/dL.
[b]Sufficient data were not available to calculate 95% CI.

Note: Mn = manganese. Results are presented for most of the cohorts examined in the literature and generally are grouped according to strength of study design, representativeness of the study population characteristics and blood Pb levels examined, and extent of consideration for potential confounding. There is not necessarily a continuum of decreasing strength across studies. Results usually are presented for the oldest age examined in cohorts. Multiple results from a cohort are grouped together. To facilitate comparisons among effect estimates across studies with different distributions of blood Pb levels and model structures (e.g., linear, log-linear), effect estimates are standardized to a 1 µg/dL increase for the lowest range of blood Pb levels examined in the study or the interval from the 10th percentile of blood Pb level to 10 µg/dL. For populations with 10th percentiles near or above 10 µg/dL, the effect estimate was calculated for the 10th to 90th percentile of blood Pb level. The percentiles are estimated using various methods and are only approximate values. Effect estimates are assumed to be linear within the blood Pb level interval evaluated. The various tests used to measure FSIQ are scored on a similar scale (approximately 40-160 FSIQ points). Black diamonds, blue circles, orange triangles, and gray squares represent effect estimates for concurrent, earlier childhood, prenatal, and lifetime average blood Pb levels, respectively. The horizontal lines associated with point estimates represent 95% confidence intervals (CI).

FIGURE I-14

Associations of Blood Pb Levels with Full-Scale IQ (FSIQ) in Children (From (U.S. EPA 2013a), Figure 4-2)

TOXIC AIR CONTAMINANTS

Toxic air contaminants are pollutants for which there generally are no ambient air quality standards. The Toxic Air Contaminant Identification and Control Act (AB 1807, Tanner, 1983) created California's first program to reduce exposures to air toxics by requiring CARB to adopt Air Toxics Control measures. Air Districts must either enforce these measures or adopt their own equally or more stringent measures. The Air Toxics "Hot Spots" Information and Assessment Act (AB 2588, Connelly,

1987) supplements the earlier program by requiring air toxics inventories for certain facilities, notification of people's exposure to significant health risks, and facility plans to reduce these risks. Under California's Air Toxics Program, the Office of Environmental Health Hazard Assessment (OEHHA) assesses the health effects of substances that may pose a risk of adverse health effects, and CARB assesses the potential for humans to be exposed to these substances. These effects are usually an increased risk for cancer, adverse birth outcomes, or respiratory effects. After review by the state Scientific Review Panel, CARB holds a public hearing on whether to formally list substances that may pose a significant risk to public health as a Toxic Air Contaminant. Chapter 9 of the draft 2016 AQMP describes the Air Toxics Control Plan for the SCAQMD.

Air toxics include many different types of chemicals, and the discussion here will not address all air toxics in a comprehensive manner. However, this section will discuss very briefly diesel particulate matter and volatile organic compounds (VOC's), because diesel particulate matter is the most significant contributor to cancer risk in the South Coast Air Basin, and because some VOC's are air toxics, and are part of the control measures proposed in the current Air Quality Management Plan.

Diesel Particulate Matter

The California Air Resources Board listed diesel particulate matter as a Toxic Air Contaminant in 1998, based on the determination that it was a human carcinogen (California Air Resources Board 2010b). The International Agency for Research on Cancer, an arm of the World Health Organization, classified diesel exhaust as probably carcinogenic to humans in 1989 (International Agency for Research on Cancer 1989). More recently, IARC convened an international panel of scientists to review the published literature since the initial classification regarding the carcinogenicity of diesel combustion emissions. The panel concluded that diesel exhaust is a substance that causes lung cancer in humans (International Agency for Research on Cancer 2012b).

OEHHA also establishes potency factors for air toxics that are carcinogenic. The potency factors can be used to estimate the additional cancer risk from ambient levels of toxics. This estimate represents the chance of contracting cancer in an individual over a lifetime exposure to a given level of an air toxic and is usually expressed in terms of additional cancer cases per million people exposed.

SCAQMD conducted studies on the ambient concentrations and estimated the potential health risks from air toxics (South Coast Air Quality Management District 2000; South Coast Air Quality Management District 2008; South Coast Air Quality Management District 2015). In the latest SCAQMD Multiple Air Toxics Exposure Study, MATES IV, a one-year monitoring program was undertaken at 10 sites throughout the SCAB over the time period July 2012 – June 2013 (South Coast Air Quality Management District 2015). Over 30 substances were measured, which included the toxics that contributed the most to health risks in the Basin. The results showed that the overall lifetime risk for excess cancer from a 70-year lifetime exposure to the levels of air toxics calculated from the regional model was 367 in a million. This reflects a greater than 50 percent reduction in exposures and risks compared to the MATES III Study that was conducted from 2004 -2006. The largest contributor to this risk was diesel particulate matter, accounting for 68 percent of the air toxics risk. The average measured levels were also compared to the non-cancer chronic Reference Exposure Levels (RELs), and found to be below the established RELs for the over 30 substances measured.

In 2015, OEHHA updated the calculation procedure to estimate cancer risks from air toxics exposures (Dodge et al. 2015). The revisions to the calculation methodology included accounting for higher risks attributable to early life exposures (up to age 16 years), updates to the population distribution of breathing rates by age, and a reduction in the time of household residence. In combination, these changes resulted in risk estimates in the MATES IV study to be about 2.5 times higher than the previous methodology employed in the MATES studies. The average lifetime risk for excess cancer cases is estimated to be 897 per million using the updated procedure (South Coast Air Quality Management District 2015). However, it is important to note that results from the MATES IV study still represent approximately a 50 percent reduction in air toxics levels and cancer risk compared to MATES III. In addition to the maps in the MATES IV final report (South Coast Air Quality Management District 2015), an interactive map of the MATES IV cancer risks from air toxics calculated using the 2015 OEHHA guidelines is available through this website: http://www.aqmd.gov/home/tools/public.

In 2009, the Advanced Collaborative Emissions Study (ACES) reported that newer diesel engine technologies are very effective in reducing the amount of emissions from diesel trucks, as required by recent regulations (Khalek et al. 2009). In a long-term exposure study published in 2015, rats breathing the lower emissions did not develop cancer, while the rats breathing the higher emissions from older diesel engines (in previous studies) did develop cancer (McDonald et al. 2015). However, the 2015 study did not evaluate whether the PM from the newer engines was any more or less toxic compared to the older engines on a gram per gram basis; the study was not designed to determine such differences. Therefore, without any additional data on the toxicity of PM from the newer diesel engines, the analysis done in the MATES IV study used the same risk factor for both, applied to the mass of PM. For example, whether a person is exposed to 10 ug/m^3 of particulate matter from a single old diesel engine or several new diesel engines, the cancer risk would be the same because it is calculated based on 10 ug/m^3 of exposure.

In the Particulate Matter section of this Appendix, the vast majority of the studies described evaluated the health effects of total PM2.5 exposures by mass, regardless of whether they were from newer diesel engines, older diesel engines, or other sources. While this new diesel technology is very effective in terms of reducing the amount of emissions from diesel trucks, what people are being exposed to is a total concentration of PM from many sources. Health studies generally use this total concentration to analyze whether or not there is an effect on the specific health outcomes evaluated. In addition, it is important to note that direct PM2.5 emissions from diesel engines represent a small portion of overall PM2.5 exposure. NO_x emissions from diesel engines that eventually lead to PM2.5 formation in the atmosphere, however, represent a larger component of PM2.5 exposure (South Coast Air Quality Management District 2013a; Harley 2014).

Volatile Organic Compounds

VOC's are a class of air pollutants that undergo photochemical reactions in the air to form ozone. It should be noted that there are no state or national ambient air quality standards for VOCs because they are not classified as criteria pollutants. VOCs are regulated, however, because limiting VOC emissions reduces the rate of photochemical reactions that contribute to the formation of ozone.

VOCs are also transformed into organic aerosols in the atmosphere, contributing to higher PM and lower visibility levels. In addition, VOC's that have toxic properties are also regulated as air toxics. Chapter 3 of the draft 2016 AQMP presents data on VOC sources and emissions in the South Coast Air Basin.

Some examples of VOC's that are known to cause health effects include benzene, toluene, ethylbenzene and xylenes (abbreviated BTEX), 1,3-butadiene, formaldehyde, and perchloroethylene. Several of these VOC's are carcinogenic. Based on the MATES IV analysis, benzene, 1,3-butadiene, and carbonyls (formaldehyde and acetaldehyde) together account for approximately 21 percent of the total cancer risk from air toxics in the SCAB. Not all carcinogenic VOC's are known to cause the same types of cancers, although several are associated with blood cancers. For example, the cancers most closely associated with long-term benzene exposure are leukemias. Formaldehyde is linked to nasopharyngeal cancer and leukemias, while 1,3-butadiene causes cancers in both the blood and lymphatic systems (International Agency for Research on Cancer 2012a).

Many VOC's can also cause non-cancer health effects. For these types of health outcomes, OEHHA has developed acute and chronic Reference Exposure Levels (RELs). RELs are concentrations in the air below which adverse health effects are not likely to occur. Acute RELs refer to short-term exposures, generally of one-hour duration. Chronic RELs refer to long-term exposures of several years. OEHHA has also established eight-hour RELs for several substances. The ratio of ambient concentration to the appropriate REL can be used to calculate a Hazard Index. A Hazard Index of less than one would not be expected to result in adverse effects (Dodge et al. 2015).

In the MATES IV assessment of chronic non-cancer health risks, the monitored air toxics levels were found to be below the chronic RELs. In other words, the general levels of air toxics in the SCAB are not expected to cause adverse non-cancer health effects. Importantly, the MATES IV monitoring network was designed to characterize the air toxics exposures in the basin overall. Given that ambient monitoring is necessarily conducted at a limited number of locations, and modeling is limited to a spatial resolution of 2km, there may be higher exposures not captured by the fixed-site monitoring. To address this limitation, particularly in some communities with environmental justice concerns, the MATES IV study also included local-scale studies in 3 communities very close to known industrial sources or large mobile source facilities, with a focus on ultrafine particles and diesel PM emissions. Details of these study results can be found in the MATES IV final report (South Coast Air Quality Management District 2015).

ODORS

Environmental odors are recognized as having the potential to cause health effects and/or quality of life impacts. The theory of "miasma" dates back to Hippocrates in ancient Greek times, and related bad odors to disease. The health effects of environmental odors can vary widely, and depend on the compound causing the odor, the level of the compound, as well as the sensitivity and physiological responses of the person detecting the odor.

Different levels of odor exposure can cause a range of responses and health effects, and the science of odor as a potential health issue was summarized previously by Schiffman and Williams (Schiffman et al. 2005b). There are two key nerves in the nasal cavity involved in odor effects: the olfactory nerve provides the sense of smell, while the trigeminal nerve provides the sense of irritation. At very low levels, an odor can be detected (i.e. odor threshold), and at slightly higher levels, an odor can be recognized and identified. At levels higher than detection or recognition levels, an odor can cause annoyance or intolerance, and at even higher levels, an odor can cause irritation or possible toxicity, if the odor is caused by a compound that is also an air toxic (Schiffman et al. 2005b).

Schiffman and Williams proposed three mechanisms of action for odor symptoms (Schiffman et al. 2005b). In the first mechanism, an odor substance can be at the level that can produce irritation, which triggers the trigeminal nerve. This mechanism is considered a toxic effect because symptoms appear when the chemical concentration is at or above the irritation level; here, the odor serves only as the marker of the toxic effect. In the second mechanism, the odor compound is below the irritation level but above odor detection thresholds, which can result in odor annoyance. This mechanism is relatively common among environmental odors, and has been studied in communities exposed to odors from landfills, hazardous waste sites or concentrated animal feeding operations (CAFO's) (Shusterman et al. 1991; Schiffman et al. 2005a; Heaney et al. 2011; Schinasi et al. 2011; Blanes-Vidal et al. 2012; Hooiveld et al. 2015). In this mechanism, the health effect is not a toxicological effect, and the dose does not necessarily correlate well with the effect in these instances. Genetic factors, previous exposure ("learning"), and beliefs about the safety of the odor may play important roles in these odors causing health symptoms (Shusterman 2001). The third proposed mechanism is when an odor substance is present along with a co-pollutant or endotoxin that is capable of producing health effects. In this mechanism, the effect is also a toxic effect, but the odor serves as a marker of the presence of a mixture that includes a toxic compound; if the co-pollutant were not present, no health effect would be expected in this scenario.

Individual characteristics can play important roles in altering an individual's response to an odor. Factors that can influence odor perception include age, genetics, gender, medical history (including mental health, neurological conditions, and other health conditions), health-related behaviors (tobacco, alcohol), and occupational and environmental factors (Greenberg et al. 2013; Wilson et al. 2014; Agency for Toxic Substances and Disease Registry 2016). Additionally, an individual's cognitive associations with the odor prior to an exposure can result in increased reporting of health-related symptoms after exposure (Shusterman et al. 1991; Shusterman 2001; Greenberg et al. 2013). Common symptoms associated with environmental odor exposures include headache, nasal congestion, eye, nose and throat irritation, hoarseness or sore throat, cough, chest tightness, shortness of breath, wheezing heart palpitations, nausea, drowsiness, and mental depression (Agency for Toxic Substances and Disease Registry 2016). If the concentrations of the odor compound are below irritation levels, then the symptoms are not expected to persist once the person is no longer exposed; however, being exposed to odor levels at or above irritation levels for longer periods of time may cause symptoms that persist after moving out of the exposure area (Agency for Toxic Substances and Disease Registry 2016).

CONCLUSIONS

A large body of scientific evidence shows that the adverse impacts of air pollution on human and animal health are clear. A considerable number of population-based and laboratory studies have established a link between air pollution and increased morbidity and, in some instances, premature mortality. Importantly, the health effects of air pollution extend beyond respiratory effects, and there is substantial evidence that air pollution (including particulate matter and ozone) exposures cause cardiovascular morbidity and mortality. Some air pollutants, such as diesel PM, lead, and several other air toxics, have been linked to increased cancer risk. Health studies have also identified populations who may be more susceptible to the adverse effects of air pollution, such as children, older adults, low SES communities, people with certain pre-existing health conditions, and people with certain genetic factors. Understanding the impacts of air pollution on these more susceptible populations can help inform policies that better protect public health, for example, in setting standards for criteria air pollutants, and in the development of methods to evaluate air toxics health risks. Continued research on the effects of specific PM constituents and ultrafine particles will be important in furthering the understanding of how these pollutants affect human health.

As the scientific methods for the study of air pollution health effects have progressed over the past decades, adverse effects have been shown to occur at lower levels of exposure. For some pollutants, no clear thresholds for effects have been demonstrated. The new findings have, in turn, led to the revision and lowering of National Ambient Air Quality Standards (NAAQS) which, in the judgment of the Administrator of the U.S. EPA, are necessary to protect public health. Chapter 8 of the draft 2016 AQMP provides an overview of the extensive, multi-year, public process involved in setting federal air quality standards. Assessments of the scientific evidence from health studies is an important part of the process, and has helped inform revisions to the federal air pollution standards. Figures I-15 and I-16 are meant to convey some of the historical context to recent revisions to the NAAQS for ozone and for particulate matter, with regard to key developments in the understanding of the health effects of these pollutants.

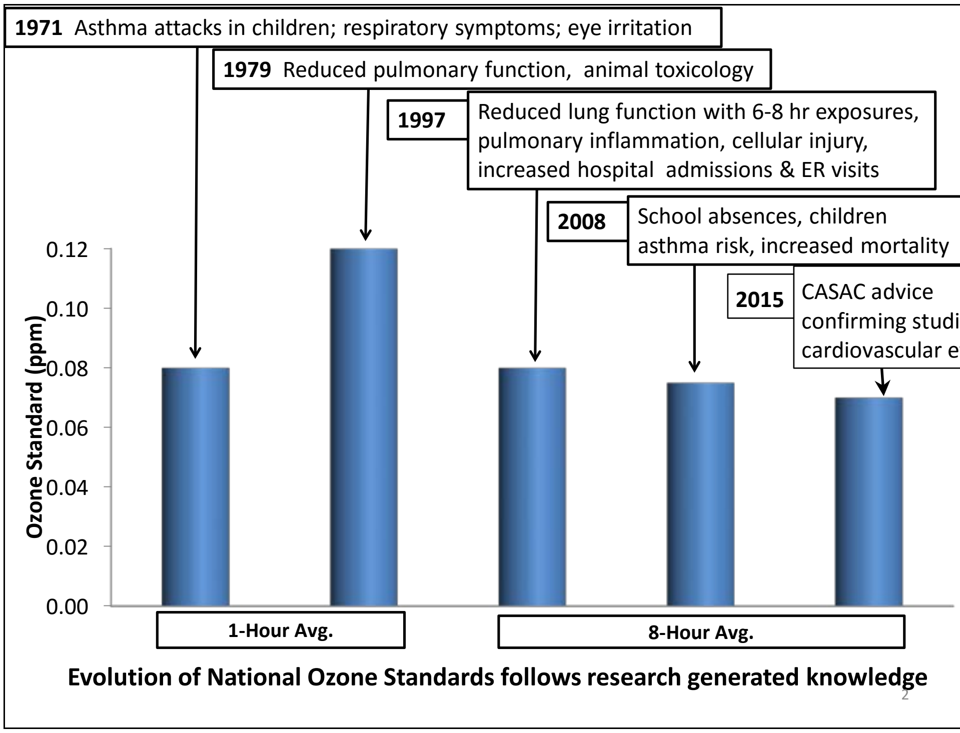


FIGURE I-15

Historical Context to Revisions of NAAQS for Ozone

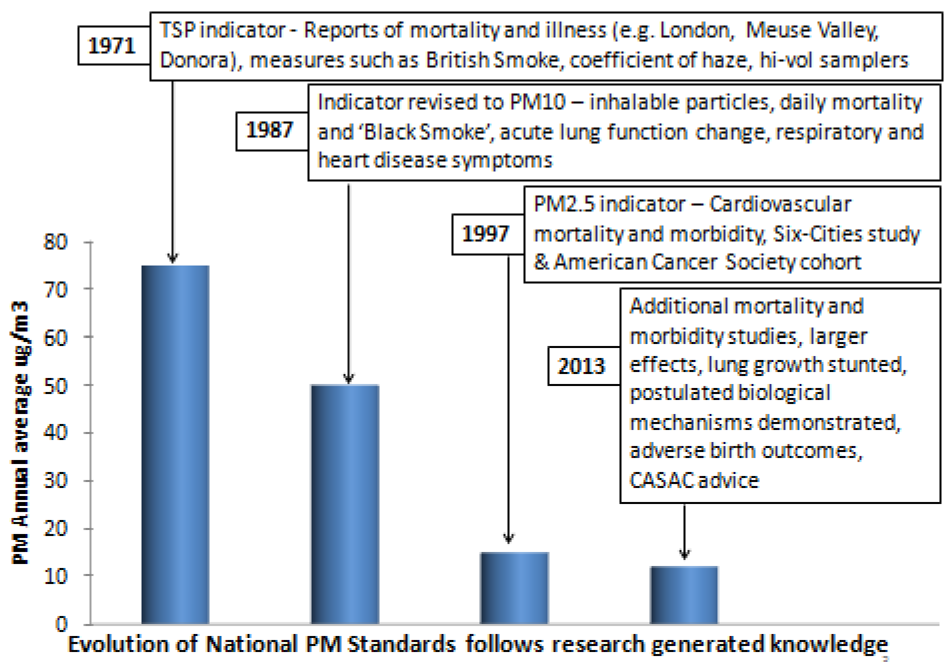


FIGURE I- 16

Historical Context to Revisions of NAAQS for PM

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ATTACHMENT 2

SCAQMD

SIERRA CLUB v. COUNTY OF FRESNO

AMICUS BRIEF

S219783

IN THE SUPREME COURT OF C ALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,

Plaintiffs and Appellants,

v.

COUNTY OF FRESNO,

Defendant and Respondent,

and,

FRIANT RANCH, L.P.,

Real Party in Interest and Respondent.

SUPREME COURT
FILED

APR 13 2015

Frank A. McGuire Clerk

Deputy

After a Published Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726
Honorable Rosendo A. Pena, Jr.

APPLICATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FOR LEAVE TO FILE BRIEF OF *AMICUS CURIAE* IN SUPPORT OF NEITHER PARTY AND *[PROPOSED]* BRIEF OF *AMICUS CURIAE*

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TO THE HONORABLE CHIEF JUSTICE AND JUSTICES OF THE SUPREME COURT:

APPLICATION FOR LEAVE TO FILE *AMICUS CURIAE* BRIEF

Pursuant to Rule 8.520(f) of the California Rules of Court, the South Coast Air Quality Management District (SCAQMD) respectfully requests leave to file the attached *amicus curiae* brief. Because SCAQMD's position differs from that of either party, we request leave to submit this amicus brief in support of neither party.

HOW THIS BRIEF WILL ASSIST THE COURT

SCAQMD's proposed amicus brief takes a position on two of the issues in this case. In both instances, its position differs from that of either party. The issues are:

1) Does the California Environmental Quality Act (CEQA) require an environmental impact report (EIR) to correlate a project's air pollution emissions with specific levels of health impacts?
2) What is the proper standard of review for determining whether an EIR provides sufficient information on the health impacts caused by a project's emission of air pollutants?

This brief will assist the Court by discussing the practical realities of correlating identified air quality impacts with specific health outcomes. In short, CEQA requires agencies to provide detailed information about a project's air quality impacts that is sufficient for the public and decisionmakers to adequately evaluate the project and meaningfully understand its impacts. However, the level of analysis is governed by a rule of reason; CEQA only requires agencies to conduct analysis if it is reasonably feasible to do so.

With regard to health-related air quality impacts, an analysis that correlates a project's air pollution emissions with specific levels of health impacts will be feasible in some cases but not others. Whether it is feasible depends on a variety of factors, including the nature of the project and the nature of the analysis under consideration. The feasibility of analysis may also change over time as air districts and others develop new tools for measuring projects' air quality related health impacts. Because SCAQMD has among the most sophisticated air quality modeling and health impact evaluation capability of any of the air districts in the State, it is uniquely situated to express an opinion on the extent to which the Court should hold that CEQA requires lead agencies to correlate air quality impacts with specific health outcomes.

SCAQMD can also offer a unique perspective on the question of the appropriate standard of review. SCAQMD submits that the proper standard of review for determining whether an EIR is sufficient as an informational document is more nuanced than argued by either party. In our view, this is a mixed question of fact and law. It includes determining whether additional analysis is feasible, which is primarily a factual question that should be reviewed under the substantial evidence standard. However, it also involves determining whether the omission of a particular analysis renders an EIR insufficient to serve CEQA's purpose as a meaningful, informational document. If a lead agency has not determined that a requested analysis is infeasible, it is the court's role to determine whether the EIR nevertheless meets CEQA's purposes, and courts should not defer to the lead agency's conclusions regarding the legal sufficiency of an EIR's analysis. The ultimate question of whether an EIR's analysis is "sufficient" to serve CEQA's informational purposes is predominately a question of law that courts should review de novo.

This brief will explain the rationale for these arguments and may assist the Court in reaching a conclusion that accords proper respect to a lead agency's factual conclusions while maintaining judicial authority over the ultimate question of what level of analysis CEQA requires.

STATEMENT OF INTEREST OF *AMICUS CURIAE*

The SCAQMD is the regional agency primarily responsible for air pollution control in the South Coast Air Basin, which consists of all of Orange County and the non-desert portions of the Los Angeles, Riverside, and San Bernardino Counties. (Health & Saf. Code § 40410; Cal. Code Regs., tit. 17, § 60104.) The SCAQMD participates in the CEQA process in several ways. Sometimes it acts as a lead agency that prepares CEQA documents for projects. Other times it acts as a responsible agency when it has permit authority over some part of a project that is undergoing CEQA review by a different lead agency. Finally, SCAQMD also acts as a commenting agency for CEQA documents that it receives because it is a public agency with jurisdiction by law over natural resources affected by the project.

In all of these capacities, SCAQMD will be affected by the decision in this case. SCAQMD sometimes submits comments requesting that a lead agency perform an additional type of air quality or health impacts analysis. On the other hand, SCAQMD sometimes determines that a particular type of health impact analysis is not feasible or would not produce reliable and informative results. Thus, SCAQMD will be affected by the Court's resolution of the extent to which CEQA requires EIRs to correlate emissions and health impacts, and its resolution of the proper standard of review.

CERTIFICATION REGARDING AUTHORSHIP AND FUNDING

No party or counsel in the pending case authored the proposed amicus curiae brief in whole or in part, or made any monetary contribution intended to fund the preparation or submission of the brief. No person or entity other than the proposed *Amicus Curiae* made any monetary contribution intended to fund the preparation or submission of the brief.

Respectfully submitted,

DATED: April 3, 2015

SOUTH COAST AIR QUALITY
MANAGEMENT DISTRICT
KURT R. WIESE, GENERAL COUNSEL
BARBARA BAIRD, CHIEF DEPUTY COUNSEL

By: Barbara Baird

Barbara Baird
Attorneys for [proposed] Amicus Curiae
SOUTH COAST AIR QUALITY
MANAGEMENT DISTICT

BRIEF OF AMICUS CURIAE

SUMMARY OF ARGUMENT

The South Coast Air Quality Management District (SCAQMD) submits that this Court should not try to establish a hard-and-fast rule concerning whether lead agencies are required to correlate emissions of air pollutants with specific health consequences in their environmental impact reports (EIR). The level of detail required in EIRs is governed by a few, core CEQA (California Environmental Quality Act) principles. As this Court has stated, "[a]n EIR must include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights Improvement Assn. v. Regents of the Univ of Cal.* (1988) 47 Cal.3d 376, 405 ["*Laurel Heights I*"]) Accordingly, "an agency must use its best efforts to find out and disclose all that it reasonably can." (*Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 428 (quoting CEQA Guidelines § 15144)[1].). However, "[a]nalysis of environmental effects need not be exhaustive, but will be judged in light of what is reasonably feasible." (*Association of Irritated Residents v. County of Madera* (2003) 107 Cal.App.4th 1383, 1390; CEQA Guidelines §§ 15151, 15204(a).)

With regard to analysis of air quality related health impacts, EIRs must generally quantify a project's pollutant emissions, but in some cases it is not feasible to correlate these emissions to specific, quantifiable health impacts (e.g., premature mortality; hospital admissions). In such cases, a general description of the adverse health impacts resulting from the pollutants at issue may be sufficient. In other cases, due to the magnitude

[1] The CEQA Guidelines are found at Cal. Code Regs., tit. 14 §§ 15000, *et seq*.

or nature of the pollution emissions, as well as the specificity of the project involved, it may be feasible to quantify health impacts. Or there may be a less exacting, but still meaningful analysis of health impacts that can feasibly be performed. In these instances, agencies should disclose those impacts.

SCAQMD also submits that whether or not an EIR complies with CEQA's informational mandates by providing sufficient, feasible analysis is a mixed question of fact and law. Pertinent here, the question of whether an EIR's discussion of health impacts from air pollution is sufficient to allow the public to understand and consider meaningfully the issues involves two inquiries: (1) Is it feasible to provide the information or analysis that a commenter is requesting or a petitioner is arguing should be required?; and (2) Even if it is feasible, is the agency relying on other policy or legal considerations to justify not preparing the requested analysis? The first question of whether an analysis is feasible is primarily a question of fact that should be judged by the substantial evidence standard. The second inquiry involves evaluating CEQA's information disclosure purposes against the asserted reasons to not perform the requested analysis. For example, an agency might believe that its EIR meets CEQA's informational disclosure standards even without a particular analysis, and therefore choose not to conduct that analysis. SCAQMD submits that this is more of a legal question, which should be reviewed de novo as a question of law.

ARGUMENT

I. RELEVANT FACTUAL AND LEGAL FRAMEWORK.

A. Air Quality Regulatory Background

The South Coast Air Quality Management District (SCAQMD) is one of the local and regional air pollution control districts and air quality management districts in California. The SCAQMD is the regional air pollution agency for the South Coast Air Basin, which consists of all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties. (Health & Saf. Code § 40410, 17 Cal. Code Reg. § 60104.) The SCAQMD also includes the Coachella Valley in Riverside County (Palm Springs area to the Salton Sea). (SCAQMD, *Final 2012 AQMP (Feb. 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "chapter 7" hyperlink; pp 7-1, 7-3 (last visited Apr. 1, 2015).) The SCAQMD's jurisdiction includes over 16 million residents and has the worst or nearly the worst air pollution levels in the country for ozone and fine particulate matter. (SCAQMD, *Final 2012 AQMP (Feb. 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "Executive Summary" hyperlink p. ES-1 (last visited Apr. 1, 2015).)

Under California law, the local and regional districts are primarily responsible for controlling air pollution from all sources except motor vehicles. (Health & Saf. Code § 40000.) The California Air Resources Board (CARB), part of the California Environmental Protection Agency, is primarily responsible for controlling pollution from motor vehicles. (*Id.*) The air districts must adopt rules to achieve and maintain the state and federal ambient air quality standards within their jurisdictions. (Health & Saf. Code § 40001.)

The federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (EPA) to identify pollutants that are widely distributed and pose a threat to human health, developing a so-called "criteria" document. (42 U.S.C. § 7408; CAA § 108.) These pollutants are frequently called "criteria pollutants." EPA must then establish "national ambient air quality standards" at levels "requisite to protect public health", allowing "an adequate margin of safety." (42 U.S.C. § 7409; CAA § 109.) EPA has set standards for six identified pollutants: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter (PM), and lead. (U.S. EPA, National Ambient Air Quality Standards (NAAQS), http://www.epa.gov/air/criteria.html (last updated Oct. 21, 2014).)[2]

Under the Clean Air Act, EPA sets emission standards for motor vehicles and "nonroad engines" (mobile farm and construction equipment, marine vessels, locomotives, aircraft, etc.). (42 U.S.C. §§ 7521, 7547; CAA §§ 202, 213.) California is the only state allowed to establish emission standards for motor vehicles and most nonroad sources; however, it may only do so with EPA's approval. (42 U.S.C. §§ 7543(b), 7543(e); CAA §§ 209(b), 209(c).) Sources such as manufacturing facilities, power plants and refineries that are not mobile are often referred to as "stationary sources." The Clean Air Act charges state and local agencies with the primary responsibility to attain the national ambient air quality standards. (42 U.S.C. § 7401(a)(3); CAA § 101(a)(3).) Each state must adopt and implement a plan including enforceable measures to achieve and maintain the national ambient air quality standards. (42 U.S.C. § 7410; CAA § 110.) The SCAQMD and CARB jointly prepare portion of the plan for the South Coast Air Basin and submit it for approval by EPA. (Health & Saf. Code §§ 40460, et seq.)

The Clean Air Act also requires state and local agencies to adopt a permit program requiring, among other things, that new or modified "major" stationary sources use technology to achieve the "lowest achievable emission rate," and to control minor stationary sources as

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[2] Particulate matter (PM) is further divided into two categories: fine particulate or $PM_{2.5}$ (particles with a diameter of less than or equal to 2.5 microns) and coarse particulate (PM_{10}) (particles with a diameter of 10 microns or less). (U.S. EPA, Particulate Matter (PM), http://www.epa.gov/airquality/particlepollution/ (last visited Apr. 1, 2015).)

needed to help attain the standards. (42 U.S.C. §§ 7502(c)(5), 7503(a)(2), 7410(a)(2)(C); CAA §§ 172(c)(5), 173(a)(2), 110(a)(2)(C).) The air districts implement these permit programs in California. (Health & Saf. Code §§ 42300, et seq.)

The Clean Air Act also sets out a regulatory structure for over 100 so-called "hazardous air pollutants" calling for EPA to establish "maximum achievable control technology" (MACT) for sources of these pollutants. (42 U.S.C. § 7412(d)(2); CAA § 112(d)(2).) California refers to these pollutants as "toxic air contaminants" (TACs) which are subject to two state-required programs. The first program requires "air toxics control measures" for specific categories of sources. (Health & Saf. Code § 39666.) The other program requires larger stationary sources and sources identified by air districts to prepare "health risk assessments" for impacts of toxic air contaminants. (Health & Saf. Code §§ 44320(b), 44322, 44360.) If the health risk exceeds levels identified by the district as "significant," the facility must implement a "risk reduction plan" to bring its risk levels below "significant" levels. Air districts may adopt additional more stringent requirements than those required by state law, including requirements for toxic air contaminants. (Health & Saf. Code § 41508; *Western Oil & Gas Assn. v. Monterey Bay Unified APCD* (1989) 49 Cal.3d 408, 414.) For example, SCAQMD has adopted a rule requiring new or modified sources to keep their risks below specified levels and use best available control technology (BACT) for toxics. (SCAQMD, *Rule 1401-New Source Review of Toxic Air Contaminants*, http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xiv; then follow "Rule 1401" hyperlink (last visited Apr. 1, 2015).)

B. The SCAQMD's Role Under CEQA

The California Environmental Quality Act (CEQA) requires public agencies to perform an environmental review and appropriate analysis for projects that they implement or approve. (Pub. Resources Code § 21080(a).) The agency with primary approval authority for a particular project is generally the "lead agency" that prepares the appropriate CEQA document. (CEQA Guidelines §§ 15050, 15051.) Other agencies having a subsequent approval authority over all or part of a project are called "responsible" agencies that must determine whether the CEQA document is adequate for their use. (CEQA Guidelines §§ 15096(c), 15381.) Lead agencies must also consult with and circulate their environmental impact reports to "trustee agencies" and agencies "with jurisdiction by law" including "authority over resources which may be affected by the project." (Pub. Resources Code §§ 21104(a), 21153; CEQA Guidelines §§ 15086(a)(3), 15073(c).) The SCAQMD has a role in all these aspects of CEQA.

Fulfilling its responsibilities to implement its air quality plan and adopt rules to attain the national ambient air quality standards, SCAQMD adopts a dozen or more rules each year to require pollution reductions from a wide variety of sources. The SCAQMD staff evaluates each rule for any adverse environmental impact and prepares the appropriate CEQA document. Although most rules reduce air emissions, they may have secondary environmental impacts such as use of water or energy or disposal of waste—e.g., spent catalyst from control equipment.[3]

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[3] The SCAQMD's CEQA program for its rules is a "Certified Regulatory Program" under which it prepares a "functionally equivalent" document in lieu of a negative declaration or EIR. (Pub. Resources Code § 21080.5, CEQA Guidelines § 15251(l).)

The SCAQMD also approves a large number of permits every year to construct new, modified, or replacement facilities that emit regulated air pollutants. The majority of these air pollutant sources have already been included in an earlier CEQA evaluation for a larger project, are currently being evaluated by a local government as lead agency, or qualify for an exemption. However, the SCAQMD sometimes acts as lead agency for major projects where the local government does not have a discretionary approval. In such cases, SCAQMD prepares and certifies a negative declaration or environmental impact report (EIR) as appropriate.[4] SCAQMD evaluates perhaps a dozen such permit projects under CEQA each year. SCAQMD is often also a "responsible agency" for many projects since it must issue a permit for part of the projects (e.g., a boiler used to provide heat in a commercial building). For permit projects evaluated by another lead agency under CEQA, SCAQMD has the right to determine that the CEQA document is inadequate for its purposes as a responsible agency, but it may not do so because its permit program already requires all permitted sources to use the best available air pollution control technology. (SCAQMD, *Rule 1303(a)(1) – Requirements*, http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xiii; then follow "Rule 1303" hyperlink (last visited Apr. 1, 2015).)

Finally, SCAQMD receives as many as 60 or more CEQA documents each month (around 500 per year) in its role as commenting agency or an agency with "jurisdiction by law" over air quality—a natural resource affected by the project. (Pub. Resources Code §§ 21104(a), 21153; CEQA Guidelines § 15366(a)(3).) The SCAQMD staff provides comments on as many as 25 or 30 such documents each month.

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[4] The SCAQMD's permit projects are not included in its Certified Regulatory Program, and are evaluated under the traditional local government CEQA analysis. (Pub. Resources Code §§ 21150-21154.)

(SCAQMD Governing Board Agenda, Apr. 3, 2015, Agenda Item 16, Attachment A, http://www.aqmd.gov/home/library/meeting-agendas-minutes/agenda?title=governing-board-meeting-agenda-april-3-2015; then follow "16. Lead Agency Projects and Environmental Documents Received by SCAQMD" hyperlink (last visited Apr. 1, 2015).) Of course, SCAQMD focuses its commenting efforts on the more significant projects.

Typically, SCAQMD comments on the adequacy of air quality analysis, appropriateness of assumptions and methodology, and completeness of the recommended air quality mitigation measures. Staff may comment on the need to prepare a health risk assessment detailing the projected cancer and noncancer risks from toxic air contaminants resulting from the project, particularly the impacts of diesel particulate matter, which CARB has identified as a toxic air contaminant based on its carcinogenic effects. (California Air Resources Board, Resolution 98-35, Aug. 27, 1998, http://www.arb.ca.gov/regact/diesltac/diesltac.htm; then follow Resolution 98-35 hyperlink (last visited Apr. 1, 2015).) Because SCAQMD already requires new or modified stationary sources of toxic air contaminants to use the best available control technology for toxics and to keep their risks below specified levels, (SCAQMD Rule 1401, supra, note 15), the greatest opportunity to further mitigate toxic impacts through the CEQA process is by reducing emissions—particularly diesel emissions—from vehicles.

II. THIS COURT SHOULD NOT SET A HARD-AND-FAST RULE CONCERNING THE EXTENT TO WHICH AN EIR MUST CORRELATE A PROJECT'S EMISSION OF POLLUTANTS WITH RESULTING HEALTH IMPACTS.

Numerous cases hold that courts do not review the correctness of an EIR's conclusions but rather its sufficiency as an informative document. (*Laurel Heights 1*, *supra*, 47 Cal.3d at p. 392; *Citizens of Goleta Valley v.*

Bd. of Supervisors (1990) 52 Cal.3d 553, 569; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1197.)

As stated by the Court of Appeal in this case, where an EIR has addressed a topic, but the petitioner claims that the information provided about that topic is insufficient, courts must "draw[] a line that divides *sufficient* discussions from those that are *insufficient*." (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271, 290.) The Court of Appeal readily admitted that "[t]he terms themselves – sufficient and insufficient – provide little, if any, guidance as to where the line should be drawn. They are simply labels applied once the court has completed its analysis." (*Id.*)

The CEQA Guidelines, however, provide guidance regarding what constitutes a sufficient discussion of impacts. Section 15151 states that "the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible." Case law reflects this: "Analysis of environmental effects need not be exhaustive, but will be judged in light of what was reasonably feasible." (*Association of Irritated Residents v. County of Madera, supra,* 107 Cal.App.4th at p. 1390; see also CEQA Guidelines § 15204(a).)

Applying this test, this Court cannot realistically establish a hard-and-fast rule that an analysis correlating air pollution impacts of a project to quantified resulting health impacts is always required, or indeed that it is never required. Simply put, in some cases such an analysis will be "feasible"; in some cases it will not.

For example, air pollution control districts often require a proposed new source of toxic air contaminants to prepare a "health risk assessment" before issuing a permit to construct. District rules often limit the allowable cancer risk the new source may cause to the "maximally exposed individual" (worker and residence exposures). (*See, e.g.*, SCAQMD Rule 1401(c)(8); 1401(d)(1), *supra* note 15.) In order to perform this analysis, it is necessary to have data regarding the sources and types of air toxic contaminants, location of emission points, velocity of emissions, the meteorology and topography of the area, and the location of receptors (worker and residence). (SCAQMD, *Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act (AB2588), pp. 11-16*; (last visited Apr. 1, 2015) http://www.aqmd.gov/home/library/documents-support-material; "Guidelines" hyperlink; AB2588; then follow AB2588 Risk Assessment Guidelines hyperlink.)

Thus, it is feasible to determine the health risk posed by a new gas station locating at an intersection in a mixed use area, where receptor locations are known. On the other hand, it may not be feasible to perform a health risk assessment for airborne toxics that will be emitted by a generic industrial building that was built on "speculation" (i.e., without knowing the future tenant(s)). Even where a health risk assessment can be prepared, however, the resulting maximum health risk value is only a calculation of risk—it does not necessarily mean anyone will contract cancer as a result of the project.

In order to find the "cancer burden" or expected additional cases of cancer resulting from the project, it is also necessary to know the numbers and location of individuals living within the "zone of impact" of the project: i.e., those living in areas where the projected cancer risk from the project exceeds one in a million. (SCAQMD, Health Risk Assessment Summary form, http://www.aqmd.gov/home/forms ; filter by "AB2588" category; then "Health Risk Assessment" hyperlink (last visited Apr. 1, 2015).) The affected population is divided into bands of those exposed to at least 1 in a million risk, those exposed to at least 10 in a million risk, etc. up to those exposed at the highest levels. (*Id.*) This data allows agencies to calculate an approximate number of additional cancer cases expected from the project. However, it is not possible to predict which particular individuals will be affected.

For the so-called criteria pollutants[5], such as ozone, it may be more difficult to quantify health impacts. Ozone is formed in the atmosphere from the chemical reaction of the nitrogen oxides (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. (U.S. EPA, Ground Level Ozone, http://www.epa.gov/airquality/ozonepollution/ (last updated Mar. 25, 2015).) It takes time and the influence of meteorological conditions for these reactions to occur, so ozone may be formed at a distance downwind from the sources. (U.S. EPA, *Guideline on Ozone Monitoring Site Selection* (Aug. 1998) EPA-454/R-98-002 § 5.1.2, http://www.epa.gov/ttnamti1/archive/cpreldoc.html (last visited Apr. 1, 2015).) NO_x and VOC are known as "precursors" of ozone.

Scientifically, health effects from ozone are correlated with increases in the ambient level of ozone in the air a person breathes. (U.S. EPA, *Health Effects of Ozone in the General Population,* Figure 9, http://www.epa.gov/apti/ozonehealth/population.html#levels (last visited Apr. 1, 2015).) However, it takes a large amount of additional precursor emissions to cause a modeled increase in ambient ozone levels over an entire region. For example, the SCAQMD's 2012 AQMP showed that reducing NO_x by 432 tons per day (157,680 tons/year) and reducing VOC by 187 tons per day (68,255 tons/year) would reduce ozone levels at the SCAQMD's monitor site with the highest levels by only 9 parts per billion. (South Coast Air Quality Management District, *Final 2012 AQMP (February 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "Appendix V: Modeling & Attainment Demonstrations" hyperlink,

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[5] See discussion of types of pollutants, supra, Part I.A.

pp. v-4-2, v-7-4, v-7-24.) SCAQMD staff does not currently know of a way to accurately quantify ozone-related health impacts caused by NO_x or VOC emissions from relatively small projects.

On the other hand, this type of analysis may be feasible for projects on a regional scale with very high emissions of NO_x and VOCs, where impacts are regional. For example, in 2011 the SCAQMD performed a health impact analysis in its CEQA document for proposed Rule 1315, which authorized various newly-permitted sources to use offsets from the districts "internal bank" of emission reductions. This CEQA analysis accounted for essentially *all* the increases in emissions due to new or modified sources in the District between 2010 and 2030.[6] The SCAQMD was able to correlate this very large emissions increase (e.g., 6,620 pounds per day NO_x (1,208 tons per year), 89,180 pounds per day VOC (16,275 tons per year)) to expected health outcomes from ozone and particulate matter (e.g., 20 premature deaths per year and 89,947 school absences in the year 2030 due to ozone).[7] (SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System* (see hyperlink in fn 6*)* at p. 4.1-35, Table 4.1-29.)

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[6] (SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, Attachment G, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System, Vol. 1, p.4.0-6,* http://www.aqmd.gov/home/library/meeting-agendas-minutes/agenda?title=governing-board-meeting-agenda-february-4-2011; the follow "26. Adopt Proposed Rule 1315 – Federal New Source Review Tracking System" (last visited April 1, 2015).)

[7] The SCAQMD was able to establish the location of future NO_x and VOC emissions by assuming that new projects would be built in the same locations and proportions as existing stationary sources. This CEQA document was upheld by the Los Angeles County Superior Court in *Natural Res. Def. Council v SCAQMD*, Los Angeles Superior Court No. BS110792).

However, a project emitting only 10 tons per year of NO_x or VOC is small enough that its regional impact on ambient ozone levels may not be detected in the regional air quality models that are currently used to determine ozone levels. Thus, in this case it would not be feasible to directly correlate project emissions of VOC or NO_x with specific health impacts from ozone. This is in part because ozone formation is not linearly related to emissions. Ozone impacts vary depending on the location of the emissions, the location of other precursor emissions, meteorology and seasonal impacts, and because ozone is formed some time later and downwind from the actual emission. (EPA Guideline on Ozone Monitoring Site Selection (Aug. 1998) EPA-454/R-98-002, § 5.1.2; https://www.epa.gov/ttnamti1/archive/cpreldoc.html; then search "Guideline on Ozone Monitoring Site Selection" click on pdf) (last viewed Apr. 1, 2015).)

SCAQMD has set its CEQA "significance" threshold for NO_x and VOC at 10 tons per year (expressed as 55 lb/day). (SCAQMD, *Air Quality Analysis Handbook*, http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook; then follow "SCAQMD Air Quality Significance Thresholds" hyperlink (last visited Apr. 1, 2015).) This is because the federal Clean Air Act defines a "major" stationary source for "extreme" ozone nonattainment areas such as SCAQMD as one emitting 10 tons/year. (42 U.S.C. §§ 7511a(e), 7511a(f); CAA §§ 182(e), 182(f).) Under the Clean Air Act, such sources are subject to enhanced control requirements (42 U.S.C. §§ 7502(c)(5), 7503; CAA §§ 172(c)(5), 173), so SCAQMD decided this was an appropriate threshold for making a CEQA "significance" finding and requiring feasible mitigation. Essentially, SCAQMD takes the position that a source that emits 10 tons/year of NO_x or VOC would contribute cumulatively to ozone formation. Therefore, lead agencies that use SCAQMD's thresholds of significance may determine that many projects have "significant" air quality impacts and must apply all feasible mitigation measures, yet will not be able to precisely correlate the project to quantifiable health impacts, unless the emissions are sufficiently high to use a regional modeling program.

In the case of particulate matter ($PM_{2.5}$)[8], another "criteria" pollutant, SCAQMD staff is aware of two possible methods of analysis. SCAQMD used regional modeling to predict expected health impacts from its proposed Rule 1315, as mentioned above. Also, the California Air Resources Board (CARB) has developed a methodology that can predict expected mortality (premature deaths) from large amounts of $PM_{2.5.}$ (California Air Resources Board, *Health Impacts Analysis: PM Premature Death Relationship*, http://www.arb.ca.gov/research/health/pm-mort/pm-mort_arch.htm (last reviewed Jan. 19, 2012).) SCAQMD used the CARB methodology to predict impacts from three very large power plants (e.g., 731-1837 lbs/day). (Final Environmental Assessment for Rule 1315, *supra*, pp 4.0-12, 4.1-13, 4.1-37 (e.g., 125 premature deaths in the entire SCAQMD in 2030), 4.1-39 (0.05 to 1.77 annual premature deaths from power plants.) Again, this project involved large amounts of additional $PM_{2.5}$ in the District, up to 2.82 tons/day (5,650 lbs/day of $PM_{2.5}$, or, or 1029 tons/year. (*Id.* at table 4.1-4, p. 4.1-10.)

However, the primary author of the CARB methodology has reported that this $PM_{2.5}$ health impact methodology is not suited for small projects and may yield unreliable results due to various uncertainties. [9] (SCAQMD, *Final Subsequent Mitigated Negative Declaration for: Warren*

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[8] SCAQMD has not attained the latest annual or 24-hour national ambient air quality standards for "$PM_{2.5}$" or particulate matter less than 2.5 microns in diameter.

[9] Among these uncertainties are the representativeness of the population used in the methodology, and the specific source of PM and the corresponding health impacts. (*Id.* at p. 2-24.)

E&P, Inc. WTU Central Facility, New Equipment Project (certified July 19, 2011), http://www.aqmd.gov/home/library/documents-support-material/lead-agency-permit-projects/permit-project-documents---year-2011; then follow "Final Subsequent Mitigated Negative Declaration for Warren E&P Inc. WTU Central Facility, New Equipment Project" hyperlink, pp. 2-22, 2-23 (last visited Apr. 1, 2015).) Therefore, when SCAQMD prepared a CEQA document for the expansion of an existing oil production facility, with very small $PM_{2.5}$ increases (3.8 lb/day) and a very small affected population, staff elected not to use the CARB methodology for using estimated $PM_{2.5}$ emissions to derive a projected premature mortality number and explained why it would be inappropriate to do so. (*Id.* at pp 2-22 to 2-24.) SCAQMD staff concluded that use of this methodology for such a small source could result in unreliable findings and would not provide meaningful information. (*Id.* at pp. 2-23, 2-25.) This CEQA document was not challenged in court.

In the above case, while it may have been technically possible to plug the data into the methodology, the results would not have been reliable or meaningful. SCAQMD believes that an agency should not be required to perform analyses that do not produce reliable or meaningful results. This Court has already held that an agency may decline to use even the "normal" "existing conditions" CEQA baseline where to do so would be misleading or without informational value. (*Neighbors for Smart Rail v. Exposition Metro Line* (2013) 57 Cal.4th 439, 448, 457.) The same should be true for a decision that a particular study or analysis would not provide reliable or meaningful results.[10]

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[10] Whether a particular study would result in "informational value" is a part of deciding whether it is "feasible." CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and

Therefore, it is not possible to set a hard-and-fast rule on whether a correlation of air quality impacts with specific quantifiable health impacts is required in all cases. Instead, the result turns on whether such an analysis is reasonably feasible in the particular case.[11] Moreover, what is reasonably feasible may change over time as scientists and regulatory agencies continually seek to improve their ability to predict health impacts. For example, CARB staff has been directed by its Governing Board to reassess and improve the methodology for estimating premature deaths. (California Air Resources Board, *Health Impacts Analysis: PM Mortality Relationship*, http://www.arb.ca.gov/research/health/pm-mort/pm-mort.htm (last reviewed Dec. 29, 2010).) This factor also counsels against setting any hard-and-fast rule in this case.

III. THE QUESTION OF WHETHER AN EIR CONTAINS SUFFICIENT ANALYSIS TO MEET CEQA'S REQUIREMENTS IS A MIXED QUESTION OF FACT AND LAW GOVERNED BY TWO DIFFERENT STANDARDS OF REVIEW.

A. Standard of Review for Feasibility Determination and Sufficiency as an Informative Document

A second issue in this case is whether courts should review an EIR's informational sufficiency under the "substantial evidence" test as argued by Friant Ranch or the "independent judgment" test as argued by Sierra Club.

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technological factors." (Pub. Resources Code § 21061.1.) A study cannot be "accomplished in a *successful* manner" if it produces unreliable or misleading results.

[11] In this case, the lead agency did not have an opportunity to determine whether the requested analysis was feasible because the comment was non-specific. Therefore, SCAQMD suggests that this Court, after resolving the legal issues in the case, direct the Court of Appeal to remand the case to the lead agency for a determination of whether the requested analysis is feasible. Because Fresno County, the lead agency, did not seek review in this Court, it seems likely that the County has concluded that at least some level of correlation of air pollution with health impacts is feasible.

As this Court has explained, "a reviewing court must adjust its scrutiny to the nature of the alleged defect, depending on whether the claim is predominantly one of improper procedure or a dispute over the facts." (*Vineyard Area Citizens v. City of Rancho Cordova, supra,* 40 Cal.4th at 435.) For questions regarding compliance with proper procedure or other legal questions, courts review an agency's action de novo under the "independent judgment" test. (*Id.*) On the other hand, courts review factual disputes only for substantial evidence, thereby "accord[ing] greater deference to the agency's substantive factual conclusions." (*Id.*)

Here, Friant Ranch and Sierra Club agree that the case involves the question of whether an EIR includes sufficient information regarding a project's impacts. However, they disagree on the proper standard of review for answering this question: Sierra Club contends that courts use the independent judgment standard to determine whether an EIR's analysis is sufficient to meet CEQA's informational purposes,[12] while Friant Ranch contends that the substantial evidence standard applies to this question.

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[12] Sierra Club acknowledges that courts use the substantial evidence standard when reviewing predicate factual issues, but argues that courts ultimately decide as a matter of law what CEQA requires. (Answering Brief, pp. 14, 23.)

SCAQMD submits that the issue is more nuanced than either party contends. We submit that, whether a CEQA document includes sufficient analysis to satisfy CEQA's informational mandates is a mixed question of fact and law,[13] containing two levels of inquiry that should be judged by different standards.[14]

The state CEQA Guidelines set forth standards for the adequacy of environmental analysis. Guidelines Section 15151 states:

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection, but for adequacy, completeness, and a good-faith effort at full disclosure.

In this case, the basic question is whether the underlying analysis of air quality impacts made the EIR "sufficient" as an informative document. However, whether the EIR's analysis was sufficient is judged in light of what was reasonably feasible. This represents a mixed question of fact and law that is governed by two different standards of review.

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[13] Friant Ranch actually states that the claim that an EIR lacks sufficient relevant information is, "most properly thought of as raising mixed questions of fact and law." (Opening Brief, p. 27.) However, the remainder of its argument claims that the court should apply the substantial evidence standard of review to all aspects of the issue.

[14] Mixed questions of fact and law issues may implicate predominantly factual subordinate questions that are reviewed under the substantial evidence test even though the ultimate question may be reviewed by the independent judgment test. *Crocker National Bank v. City and County of San Francisco* (1989) 49 Cal.3d 881, 888-889.

SCAQMD submits that an EIR's sufficiency as an informational document is ultimately a legal question that courts should determine using their independent judgment. This Court's language in *Laurel Heights I* supports this position. As this Court explained: "The court does not pass upon the correctness of the EIR's environmental conclusions, but only upon its *sufficiency as an informative document*." (*Laurel Heights I, supra*, 47 Cal.3d at 392-393) (emphasis added.) As described above, the Court in *Vineyard Area Citizens v. City of Rancho Cordova, supra,* 40 Cal.4th at 431, also used its independent judgment to determine what level of analysis CEQA requires for water supply impacts. The Court did not defer to the lead agency's opinion regarding the law's requirements; rather, it determined for itself what level of analysis was necessary to meet "[t]he law's informational demands." (*Id.* at p. 432.) Further, existing case law also holds that where an agency fails to comply with CEQA's information disclosure requirements, the agency has "failed to proceed in the manner required by law." (*Save Our Peninsula Comm. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 118.)

However, whether an EIR satisfies CEQA's requirements depends in part on whether it was reasonably feasible for an agency to conduct additional or more thorough analysis. EIRs must contain "a detailed statement" of a project's impacts (Pub. Res. Code § 21061), and an agency must "use its best efforts to find out and disclose all that it reasonably can." (CEQA Guidelines § 15144.) Nevertheless, "the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible." (CEQA Guidelines § 15151.)

SCAQMD submits that the question of whether additional analysis or a particular study suggested by a commenter is "feasible" is generally a question of fact. Courts have already held that whether a particular alternative is "feasible" is reviewed by the substantial evidence test.

(*Uphold Our Heritage v. Town of Woodside* (2007) 147 Cal.App.4th 587, 598-99; *Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866, 883.) Thus, if a lead agency determines that a particular study or analysis is infeasible, that decision should generally be judged by the substantial evidence standard. However, SCAQMD urges this Court to hold that lead agencies must explain the basis of any determination that a particular analysis is infeasible in the EIR itself. An EIR must discuss information, including issues related to the feasibility of particular analyses "in sufficient detail to enable meaningful participation and criticism by the public. '[W]hatever is required to be considered in an EIR must be in that formal report; what any official might have known from other writings or oral presentations cannot supply what is lacking in the report.'" (*Laurel Heights I*, *supra*, 47 Cal.3d at p. 405 (quoting *Santiago County Water District v. County of Orange* (1981) 118 Cal.App.3d 818, 831) (discussing analysis of alternatives).) The evidence on which the determination is based should also be summarized in the EIR itself, with appropriate citations to reference materials if necessary. Otherwise commenting agencies such as SCAQMD would be forced to guess where the lead agency's evidence might be located, thus thwarting effective public participation.

Moreover, if a lead agency determines that a particular study or analysis would not result in reliable or useful information and for that reason is not feasible, that determination should be judged by the substantial evidence test. (See *Neighbors for Smart Rail v. Exposition Metro Line Construction Authority*, *supra*, 57 Cal.4th 439, 448, 457:

whether "existing conditions" baseline would be misleading or uninformative judged by substantial evidence standard.[15])

If the lead agency's determination that a particular analysis or study is not feasible is supported by substantial evidence, then the agency has not violated CEQA's information disclosure provisions, since it would be infeasible to provide additional information. This Court's decisions provide precedent for such a result. For example, this Court determined that the issue of whether the EIR should have included a more detailed discussion of future herbicide use was resolved because substantial evidence supported the agency's finding that "the precise parameters of future herbicide use could not be predicted." *Ebbetts Pass Forest Watch v. California Dept. of Forestry & Fire Protection* (2008) 43 Cal.4th 936, 955.

Of course, SCAQMD expects that courts will continue to hold lead agencies to their obligations to consult with, and not to ignore or misrepresent, the views of sister agencies having special expertise in the area of air quality. (*Berkeley Keep Jets Over the Bay v. Board of Port Commissioners* (2007) 91 Cal.App.4th 1344, 1364 n.11.) In some cases, information provided by such expert agencies may establish that the purported evidence relied on by the lead agency is not in fact "substantial". (*Id.* at pp. 1369-1371.)

In sum, courts retain ultimate responsibility to determine what CEQA requires. However, the law does not require exhaustive analysis, but only what is reasonably feasible. Agencies deserve deference for their factual determinations regarding what type of analysis is reasonably feasible. On the other hand, if a commenter requests more information, and the lead agency declines to provide it but does *not* determine that the

[15] The substantial evidence standard recognizes that the courts "have neither the resources nor the scientific expertise" to weigh conflicting evidence on technical issues. (*Laurel Heights I, supra,* 47 Cal.3d 376, 393.)

requested study or analysis would be infeasible, misleading or uninformative, the question becomes whether the omission of that analysis renders the EIR inadequate to satisfy CEQA's informational purposes. (*Id.* at pp. 1370-71.) Again, this is predominantly a question of law and should be judged by the de novo or independent judgment standard of review. Of course, this Court has recognized that a "project opponent or reviewing court can always imagine some additional study or analysis that might provide helpful information. It is not for them to design the EIR. That further study...might be helpful does not make it necessary." (*Laurel Heights I, supra,* 47 Cal.3d 376, 415 – see also CEQA Guidelines § 15204(a) [CEQA "does not require a lead agency to conduct every test. . . recommended or demanded by commenters."].) Courts, then, must adjudicate whether an omission of particular information renders an EIR inadequate to serve CEQA's informational purposes.[16]

[16] We recognize that there is case law stating that the substantial evidence standard applies to "challenges to the scope of an EIR's analysis of a topic" as well as the methodology used and the accuracy of the data relied on in the document "because these types of challenges involve factual questions." (*Bakersfield Citizens for Local Control v. City of Bakersfield, supra,* 124 Cal.App.4^{th} 1184, 1198, and cases relied on therein.) However, we interpret this language to refer to situations where the question of the scope of the analysis really is factual—that is, where it involves whether further analysis is feasible, as discussed above. This interpretation is supported by the fact that the *Bakersfield* court expressly rejected an argument that a claimed "omission of information from the EIR should be treated as inquiries whether there is substantial evidence supporting the decision approving the project. " *Bakersfield, supra,* 124 Cal.App.4th at p. 1208. And the *Bakersfield* court ultimately decided that the lead agency must analyze the connection between the identified air pollution impacts and resulting health impacts, even though the EIR already included some discussion of air-pollution-related respiratory illnesses. *Bakersfield, supra,* 124 Cal.App.4th at p. 1220. Therefore, the court must not have interpreted this question as one of the "scope of the analysis" to be judged by the substantial evidence standard.

B. Friant Ranch's Rationale for Rejecting the Independent Judgment Standard of Review is Unsupported by Case Law.

In its brief, Friant Ranch makes a distinction between cases where a required CEQA topic is not discussed at all (to be reviewed by independent judgment as a failure to proceed in the manner required by law) and cases where a topic is discussed, but the commenter claims the information provided is insufficient (to be judged by the substantial evidence test). (Opening Brief, pp. 13-17.) The Court of Appeal recognized these two types of cases, but concluded that both raised questions of law. (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271, 290.) We believe the distinction drawn by Friant Ranch is unduly narrow, and inconsistent with cases which have concluded that CEQA documents are insufficient. In many instances, CEQA's requirements are stated broadly, and the courts must interpret the law to determine what level of analysis satisfies CEQA's mandate for providing meaningful information, even though the EIR discusses the issue to some extent.

For example, the CEQA Guidelines require discussion of the existing environmental baseline. In *County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 954-955, the lead agency had discussed the environmental baseline by describing historic month-end water levels in the affected lakes. However, the court held that this was not an adequate baseline discussion because it failed to discuss the timing and amounts of past actual water releases, to allow comparison with the proposed project. The court evidently applied the independent judgment test to its decision, even though the agency discussed the issue to some extent.

Likewise, in *Vineyard Area Citizens* (2007) 40 Cal.4th 412, this Court addressed the question of whether an EIR's analysis of water supply impacts complied with CEQA. The parties agreed that the EIR was required to analyze the effects of providing water to the development project, "and that in order to do so the EIR had, in some manner, to identify the planned sources of that water." (*Vineyard Area Citizens, supra,* at p. 428.) However, the parties disagreed as to the level of detail required for this analysis and "what level of uncertainty regarding the availability of water supplies can be tolerated in an EIR . . . ." (*Id.*) In other words, the EIR had analyzed water supply impacts for the project, but the petitioner claimed that the analysis was insufficient.

This Court noted that neither CEQA's statutory language or the CEQA Guidelines specifically addressed the question of how precisely an EIR must discuss water supply impacts. (*Id.*) However, it explained that CEQA "states that '[w]hile foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can.'" (*Id.*, [Guidelines § 15144].) The Court used this general principle, along with prior precedent, to elucidate four "principles for analytical adequacy" that are necessary in order to satisfy "CEQA's informational purposes." (*Vineyard Area Citizens, supra,* at p. 430.) The Court did not defer to the agency's determination that the EIR's analysis of water supply impacts was sufficient. Rather, this Court used its independent judgment to determine for itself the level of analysis required to satisfy CEQA's fundamental purposes. (*Vineyard Area Citizens, supra*, at p. 441: an EIR does not serve its purposes where it neglects to explain likely sources of water and "... leaves long term water supply considerations to later stages of the project.")

Similarly, the CEQA Guidelines require an analysis of noise impacts of the project. (Appendix G, "Environmental Checklist Form."[17]) In *Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1123, the court held that the lead agency's noise impact analysis was inadequate even though it had addressed the issue and concluded that the increase would not be noticeable. If the court had been using the substantial evidence standard, it likely would have upheld this discussion.

Therefore, we do not agree that the issue can be resolved on the basis suggested by Friant Ranch, which would apply the substantial evidence standard to *every* challenge to an analysis that addresses a required CEQA topic. This interpretation would subvert the courts' proper role in interpreting CEQA and determining what the law requires.

Nor do we agree that the Court of Appeal in this case violated CEQA's prohibition on courts interpreting its provisions "in a manner which imposes procedural or substantive requirements beyond those explicitly stated in this division or in the state guidelines." (Pub. Resources Code § 21083.1.) CEQA requires an EIR to describe *all* significant impacts of the project on the environment. (Pub. Resources Code § 21100(b)(2); *Vineyard Area Citizens, supra,* at p. 428.) Human beings are part of the environment, so CEQA requires EIRs to discuss a project's significant impacts on human health. However, except in certain particular circumstances,[18] neither the CEQA statute nor Guidelines specify the precise level of analysis that agencies must undertake to satisfy the law's requirements. (see, e.g., CEQA Guidelines § 15126.2(a) [EIRs must describe "health and safety problems caused by {a project's} physical changes"].) Accordingly, courts must interpret CEQA as a whole to

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[17] Association of Environmental Professionals, 2015 CEQA Statute and Guidelines (2015) p.287.

[18] E.g., Pub. Resources Code § 21151.8(C)(3)(B)(iii) (requiring specific type of health risk analysis for siting schools).

determine whether a particular EIR is sufficient as an informational document. A court determining whether an EIR's discussion of human health impacts is legally sufficient does not constitute imposing a new substantive requirement.[19] Under Friant Ranch's theory, the above-referenced cases holding a CEQA analysis inadequate would have violated the law. This is not a reasonable interpretation.

IV. COURTS MUST SCRUPULOUSLY ENFORCE THE REQUIREMENTS THAT LEAD AGENCIES CONSULT WITH AND OBTAIN COMMENTS FROM AIR DISTRICTS

Courts must "scrupulously enforce" CEQA's legislatively mandated requirements. (*Vineyard Area Citizens, supra*, 40 Cal.4th 412, 435.) Case law has firmly established that lead agencies must consult with the relevant air pollution control district before conducting an initial study, and must provide the districts with notice of the intention to adopt a negative declaration (or EIR). (*Schenck v. County of Sonoma* (2011) 198 Cal.App.4th 949, 958.) As *Schenck* held, neither publishing the notice nor providing it to the State Clearinghouse was a sufficient substitute for sending notice directly to the air district. (*Id.*) Rather, courts "must be satisfied that [administrative] agencies have fully complied with the procedural requirements of CEQA, since only in this way can the important public purposes of CEQA be protected from subversion." *Schenck,* 198 Cal.App.4th at p. 959 (citations omitted).[20]

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[19] We submit that Public Resources Code Section 21083.1 was intended to prevent courts from, for example, holding that an agency must analyze economic impacts of a project where there are no resulting environmental impacts (see CEQA Guidelines § 15131) , or imposing new procedural requirements, such as imposing additional public notice requirements not set forth in CEQA or the Guidelines.

[20] Lead agencies must consult air districts, as public agencies with jurisdiction by law over resources affected by the project, *before* releasing an EIR. (Pub. Resources Code §§ 21104(a); 21153.) Moreover, air

Lead agencies should be aware, therefore, that failure to properly seek and consider input from the relevant air district constitutes legal error which may jeopardize their project approvals. For example, the court in *Fall River Wild Trout Foundation v. County of Shasta,* (1999) 70 Cal.App.4th 482, 492 held that the failure to give notice to a trustee agency (Department of Fish and Game) was prejudicial error requiring reversal. The court explained that the lack of notice prevented the Department from providing any response to the CEQA document. (*Id.* at p. 492.) It therefore prevented relevant information from being presented to the lead agency, which was prejudicial error because it precluded informed decision-making. (*Id.*)[21]

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districts should be considered "state agencies" for purposes of the requirement to consult with "trustee agencies" as set forth in Public Resources Code § 20180.3(a). This Court has long ago held that the districts are not mere "local agencies" whose regulations are superseded by those of a state agency regarding matters of statewide concern, but rather have concurrent jurisdiction over such issues. (*Orange County Air Pollution Control District v. Public Util. Com.* (1971) 4 Cal.3d 945, 951, 954.) Since air pollution is a matter of statewide concern, *Id* at 952, air districts should be entitled to trustee agency status in order to ensure that this vital concern is adequately protected during the CEQA process.

[21] In *Schenck,* the court concluded that failure to give notice to the air district was not prejudicial, but this was partly because the trial court had already corrected the error before the case arrived at the Court of Appeal. The trial court issued a writ of mandate requiring the lead agency to give notice to the air district. The air district responded by concurring with the lead agency that air impacts were not significant. (*Schenck,* 198 Cal.App.4th 949, 960.) We disagree with the *Schenck* court that the failure to give notice to the air district would not have been prejudicial (even in the absence of the trial court writ) merely because the lead agency purported to follow the air district's published CEQA guidelines for significance. (*Id.*, 198 Cal.App.4th at p. 960.) In the first place, absent notice to the air district, it is uncertain whether the lead agency properly followed those guidelines. Moreover, it is not realistic to expect that an air district's published guidelines would necessarily fully address all possible air-quality related issues that can arise with a CEQA project, or that those

Similarly, lead agencies must obtain additional information requested by expert agencies, including those with jurisdiction by law, if that information is necessary to determine a project's impacts. (*Sierra Club v. State Bd. Of Forestry* (1994) 7 Cal.4th 1215, 1236-37.) Approving a project without obtaining that information constitutes a failure to proceed in the manner prescribed by CEQA. (*Id.* at p. 1236.)

Moreover, a lead agency can save significant time and money by consulting with the air district early in the process. For example, the lead agency can learn what the air district recommends as an appropriate analysis on the facts of its case, including what kinds of health impacts analysis may be available, and what models are appropriate for use. This saves the lead agency from the need to do its analysis all over again and possibly needing to recirculate the document after errors are corrected, if new significant impacts are identified. (CEQA Guidelines § 15088.5(a).) At the same time, the air district's expert input can help the lead agency properly determine whether another commenter's request for additional analysis or studies is reasonable or feasible. Finally, the air district can provide input on what mitigation measures would be feasible and effective.

Therefore, we suggest that this Court provide guidance to lead agencies reminding them of the importance of consulting with the relevant air districts regarding these issues. Otherwise, their feasibility decisions may be vulnerable to air district evidence that establishes that there is no substantial evidence to support the lead agency decision not to provide specific analysis. (*See Berkeley Keep Jets Over the Bay*, *supra*, 91 Cal.App.4th 1344, 1369-1371.)

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guidelines would necessarily be continually modified to reflect new developments. Therefore we believe that, had the trial court not already ordered the lead agency to obtain the air district's views, the failure to give notice would have been prejudicial, as in *Fall River, supra,* 70 Cal.App.4th 482, 492.

CONCLUSION

The SCAQMD respectfully requests this Court *not* to establish a hard-and-fast rule concerning whether CEQA requires a lead agency to correlate identified air quality impacts of a project with resulting health outcomes. Moreover, the question of whether an EIR is "sufficient as an informational document" is a mixed question of fact and law containing two levels of inquiry. Whether a particular proposed analysis is feasible is predominantly a question of fact to be judged by the substantial evidence standard of review. Where the requested analysis is feasible, but the lead agency relies on legal or policy reasons not to provide it, the question of whether the EIR is nevertheless sufficient as an informational document is predominantly a question of law to be judged by the independent judgment standard of review.

Respectfully submitted,

DATED: April 3, 2015

SOUTH COAST AIR QUALITY
MANAGEMENT DISTRICT
KURT R. WIESE, GENERAL COUNSEL
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CERTIFICATE OF WORD COUNT

Pursuant to Rule 8.520(c)(1) of the California Rules of Court, I hereby certify that this brief contains 8,476 words, including footnotes, but excluding the Application, Table of Contents, Table of Authorities, Certificate of Service, this Certificate of Word Count, and signature blocks. I have relied on the word count of the Microsoft Word Vista program used to prepare this Certificate.

DATED: April 3, 2015 Respectfully submitted,

Barbara Baird

Barbara Baird

PROOF OF SERVICE

I am employed in the County of Los Angeles, California. I am over the age of 18 years and not a party to the within action. My business address is 21865 Copley Drive, Diamond Bar, California 91765.

On April 3, 2015 I served true copies of the following document(s) described as **APPLICATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FOR LEAVE TO FILE BRIEF OF *AMICUS CURIAE* IN SUPPORT OF NEITHER PARTY AND *[PROPOSED]* BRIEF OF *AMICUS CURIAE*** by placing a true copy of the foregoing document(s) in a sealed envelope addressed as set forth on the attached service list as follows:

BY MAIL: I enclosed the document(s) in a sealed envelope or package addressed to the persons at the addresses listed in the Service List and placed the envelope for collection and mailing following our ordinary business practices. I am readily familiar with this District's practice for collection and processing of correspondence for mailing. Under that practice, the correspondence would be deposited with the United States Postal Service, with postage thereon fully prepaid at Diamond Bar, California, in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on April 3, 2015 at Diamond Bar, California.

Patricia Anderson

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ATTACHMENT 3

SJVAPCD

SIERRA CLUB v. COUNTY OF FRESNO

AMICUS BRIEF

CASE NO. S219783

IN THE SUPREME COURT OF CALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,
Plaintiffs and Appellants

v.

COUNTY OF FRESNO,
Defendant and Respondent

FRIANT RANCH, L.P.,
Real Party in Interest and Respondent

After a Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO AND REAL PARTY IN INTEREST AND RESPONDENT, FRIANT RANCH, L.P.

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APPLICATION

Pursuant to California Rules of Court 8.520(f)(1), proposed Amicus Curiae San Joaquin Valley Unified Air Pollution Control District hereby requests permission from the Chief Justice to file an amicus brief in support of Defendant and Respondent, County of Fresno, and Defendant and Real Parties in Interest Friant Ranch, L.P. Pursuant to Rule 8.520(f)(5) of the California Rules of Court, the proposed amicus curiae brief is combined with this Application. The brief addresses the following issue certified by this Court for review:

> Is an EIR adequate when it identifies the health impacts of air pollution and quantifies a project's expected emissions, or does CEQA further require the EIR to *correlate* a project's air quality emissions to specific health impacts?

As of the date of this filing, the deadline for the final reply brief on the merits was March 5, 2015. Accordingly, under Rule 8.520(f)(2), this application and brief are timely.

1. Background and Interest of San Joaquin Valley Unified Air Pollution Control District

The San Joaquin Valley Unified Air Pollution Control District ("Air District") regulates air quality in the eight counties comprising the San Joaquin Valley ("Central Valley"): Kern, Tulare, Madera, Fresno, Merced, San Joaquin, Stanislaus, and Kings, and is primarily responsible for attaining air quality standards within its jurisdiction. After billions of dollars of investment by Central Valley businesses, pioneering air quality regulations, and consistent efforts by residents, the Central Valley air basin has made historic improvements in air quality.

The Central Valley's geographical, topographical and meteorological features create exceptionally challenging air quality conditions. For example, it receives air pollution transported from the San Francisco Bay Area and northern Central Valley communities, and the southern portion of the Central Valley includes three mountain ranges (Sierra, Tehachapi, and Coastal) that, under some meteorological conditions, effectively trap air pollution. Central Valley air pollution is only a fraction of what the Bay Area and Los Angeles produce, but these natural conditions result in air quality conditions that are only marginally better than Los Angeles, even though about ten times more pollution is emitted in the Los Angeles region. Bay Area air quality is much better than the Central Valley's, even though the Bay Area produces about six times more pollution. The Central Valley also receives air pollution transported from the Bay Area and northern counties in the Central Valley, including Sacramento, and transboundary anthropogenic ozone from as far away as China.

Notwithstanding these challenges, the Central Valley has reduced emissions at the same or better rate than other areas in California and has achieved unparalleled milestones in protecting public health and the environment:

- In the last decade, the Central Valley became the first air basin classified by the federal government under the Clean Air Act as a "serious nonattainment" area to come into attainment of health-based National Ambient Air Quality Standard ("NAAQS") for coarse particulate matter (PM10), an achievement made even more notable given the Valley's extensive agricultural sector. Unhealthy levels of particulate matter can cause and exacerbate a range of chronic and acute illnesses.
- In 2013, the Central Valley became the first air basin in the country to improve from a federal designation of "extreme" nonattainment to

actually attain (and quality for an attainment designation) of the 1-hour ozone NAAQS; ozone creates "smog" and, like PM10, causes adverse health impacts.

- The Central Valley also is in full attainment of federal standards for lead, nitrogen dioxide, sulfur dioxide, and carbon monoxide.
- The Central Valley continues to make progress toward compliance with its last two attainment standards, with the number of exceedences for the 8-hour ozone NAAQS reduced by 74% (for the 1997 standard) and 38% (for the 2008 standard) since 1991, and for the small particulate matter (PM2.5) NAAQS reduced by 85% (for the 1997 standard) and 61% (for the 2006 standard).

Sustained improvement in Central Valley air quality requires a rigorous and comprehensive regulatory framework that includes prohibitions (e.g., on wood-burning fireplaces in new residences), mandates (e.g., requiring the installation of best available pollution reduction technologies on new and modified equipment and industrial operations), innovations (e.g., fees assessed against residential development to fund pollution reduction actions to "offset" vehicular emissions associated with new residences), incentive programs (e.g., funding replacements of older, more polluting heavy duty trucks and school buses)[1], ongoing planning for continued air quality improvements, and enforcement of Air District permits and regulations.

The Air District is also an expert air quality agency for the eight counties and cities in the San Joaquin Valley. In that capacity, the Air District has developed air quality emission guidelines for use by the Central

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[1] San Joaquin's incentive program has been so successful that through 2012, it has awarded over $ 432 million in incentive funds and has achieved 93,349 tons of lifetime emissions reductions. *See* SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, 2012 PM2.5 PLAN, 6-6 (2012) *available at* http://www.valleyair.org/Workshops/postings/2012/12-20-12PM25/FinalVersion/06%20Chapter%206%20Incentives.pdf.

Valley counties and cities that implement the California Environment Quality Act (CEQA).[2] In its guidance, the Air District has distinguished between toxic air contaminants and criteria air pollutants.[3] Recognizing this distinction, the Air District's CEQA Guidance has adopted distinct thresholds of significance for *criteria* pollutants (i.e., ozone, PM2.5 and their respective precursor pollutants) based upon scientific and factual data which demonstrates the level that can be accommodated on a cumulative basis in the San Joaquin Valley without affecting the attainment of the applicable NAAQS.[4] For *toxic air* pollutants, the District has adopted different thresholds of significance which scientific and factual data demonstrates has the potential to expose sensitive receptors (i.e., children, the elderly) to levels which may result in localized health impacts.[5]

The Air District's CEQA Guidance was followed by the County of Fresno in its environment review of the Friant Ranch project, for which the Air District also served as a commenting agency. The Court of Appeal's holding, however, requiring correlation between the project's criteria

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2 *See, e.g.*, SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, PLANNING DIVISION, GUIDE FOR ASSESSING AND MITIGATING AIR QUALITY IMPACTS (2015), *available at* http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf ("CEQA Guidance").

3 Toxic air contaminants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as birth defects. There are currently 189 toxic air contaminants regulated by the United States Environmental Protection Agency ("EPA") and the states pursuant to the Clean Air Act. 42 U.S.C. § 7412. Common TACs include benzene, perchloroethylene and asbestos. *Id.* at 7412(b).

In contrast, there are only six (6) criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. Although criteria air pollutants can also be harmful to human health, they are distinguishable from toxic air contaminants and are regulated separately. For instance, while criteria pollutants are regulated by numerous sections throughout Title I of the Clean Air Act, the regulation of toxic air contaminants occurs solely under section 112 of the Act. Compare 42 U.S.C. §§ 7407 – 7411 & 7501 – 7515 with 42 U.S.C. § 7411.

4 See, e.g., CEQA Guidance at http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf, pp. 64-66, 80.

5 See, e.g., CEQA Guidance at http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf, pp. 66, 99-101.

pollutants and local health impacts, departs from the Air District's Guidance and approved methodology for assessing criteria pollutants. A close reading of the administrative record that gave rise to this issue demonstrates that the Court's holding is based on a misunderstanding of the distinction between toxic air contaminants (for which a local health risk assessment is feasible and routinely performed) and criteria air pollutants (for which a local health risk assessment is not feasible and would result in speculative results).[6] The Air District has a direct interest in ensuring the lawfulness and consistent application of its CEQA Guidance, and will explain how the Court of Appeal departed from the Air District's long-standing CEQA Guidance in addressing criteria pollutants and toxic air contaminants in this amicus brief.

2. How the Proposed Amicus Curiae Brief Will Assist the Court

As counsel for the proposed amicus curiae, we have reviewed the briefs filed in this action. In addition to serving as a "commentary agency" for CEQA purposes over the Friant Ranch project, the Air District has a strong interest in assuring that CEQA is used for its intended purpose, and believes that this Court would benefit from additional briefing explaining the distinction between criteria pollutants and toxic air contaminants and the different methodologies employed by local air pollution control agencies such as the Air District to analyze these two categories of air pollutants under CEQA. The Air District will also explain how the Court of Appeal's opinion is based upon a fundamental misunderstanding of these two different approaches by requiring the County of Fresno to correlate the project's *criteria* pollution emissions with *local* health impacts. In doing

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[6] CEQA does not require speculation. *See, e.g., Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.*, 6 Cal. 4th 1112, 1137 (1993) (upholding EIR that failed to evaluate cumulative toxic air emission increases given absence of any acceptable means for doing so).

so, the Air District will provide helpful analysis to support its position that at least insofar as criteria pollutants are concerned, CEQA does not require an EIR to correlate a project's air quality emissions to specific health impacts, because such an analysis is not reasonably feasible.

Rule 8.520 Disclosure

Pursuant to Cal. R. 8.520(f)(4), neither the Plaintiffs nor the Defendant or Real Party In Interest or their respective counsel authored this brief in whole or in part. Neither the Plaintiffs nor the Defendant or Real Party in Interest or their respective counsel made any monetary contribution towards or in support of the preparation of this brief.

CONCLUSION

On behalf of the San Joaquin Valley Unified Air Pollution Control District, we respectfully request that this Court accept the filing of the attached brief.

Dated: April 2, 2015

Annette A. Ballatore-Williamson
District Counsel
Attorney for Proposed Amicus Curiae

SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL
DISTRICT

CASE NO. S219783

IN THE SUPREME COURT OF CALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,
Plaintiffs and Appellants

v.

COUNTY OF FRESNO,
Defendant and Respondent

FRIANT RANCH, L.P.,
Real Party in Interest and Respondent

After a Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726

AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO AND REAL PARTY IN INTEREST AND RESPONDENT, FRIANT RANCH, L.P.

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<u>**OTHER AUTHORITIES**</u>

I. INTRODUCTION.

The San Joaquin Valley Unified Air Pollution Control District ("Air District") respectfully submits that the Court of Appeal erred when it held that the air quality analysis contained in the Environmental Impact Report ("EIR") for the Friant Ranch development project was inadequate under the California Environmental Quality Act ("CEQA") because it did not include an analysis of the correlation between the project's criteria air pollutants and the potential adverse human health impacts. A close reading of the portion of the administrative record that gave rise to this issue demonstrates that the Court's holding is based on a misunderstanding of the distinction between toxic air contaminants and criteria air pollutants.

Toxic air contaminants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as birth defects. There are currently 189 toxic air contaminants (hereinafter referred to as "TACs") regulated by the United States Environmental Protection Agency ("EPA") and the states pursuant to the Clean Air Act. 42 U.S.C. § 7412. Common TACs include benzene, perchloroethylene and asbestos. *Id.* at 7412(b).

In contrast, there are only six (6) criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. Although criteria air pollutants can also be harmful to human health, they are distinguishable from TACs and are regulated separately. For instance, while criteria pollutants are regulated by numerous sections throughout Title I of the Clean Air Act, the regulation of TACs occurs solely under section 112 of the Act. *Compare* 42 U.S.C. §§ 7407 – 7411 & 7501 – 7515 *with* 42 U.S.C. § 7411.

The most relevant difference between criteria pollutants and TACs for purposes of this case is the manner in which human health impacts are accounted for. While it is common practice to analyze the correlation between an individual facility's TAC emissions and the expected localized human health impacts, such is not the case for criteria pollutants. Instead, the human health impacts associated with criteria air pollutants are analyzed and taken into consideration when EPA sets the national ambient air quality standard ("NAAQS") for each criteria pollutant. 42 U.S.C. § 7409(b)(1). The health impact of a particular criteria pollutant is analyzed on a regional and not a facility level based on how close the area is to complying with (attaining) the NAAQS. Accordingly, while the type of individual facility / health impact analysis that the Court of Appeal has required is a customary practice for TACs, it is not feasible to conduct a similar analysis for criteria air pollutants because currently available computer modeling tools are not equipped for this task.

It is clear from a reading of both the administrative record and the Court of Appeal's decision that the Court did not have the expertise to fully appreciate the difference between TACs and criteria air pollutants. As a result, the Court has ordered the County of Fresno to conduct an analysis that is not practicable and not likely yield valid information. The Air District respectfully requests that this portion of the Court of Appeal's decision be reversed.

II. THE COURT OF APPEAL ERRED IN FINDING THE FRIANT RANCH EIR INADEQUATE FOR FAILING TO ANALYZE THE SPECIFIC HUMAN HEALTH IMPACTS ASSOCIATED CRITERIA AIR POLLUTANTS.

Although the Air District does not take lightly the amount of air emissions at issue in this case, it submits that the Court of Appeal got it wrong when it required Fresno County to revise the Friant Ranch EIR to include an analysis correlating the criteria air pollutant emissions associated with the project with specific, localized health-impacts. The type of analysis the Court of Appeal has required will not yield reliable information because currently available modeling tools are not well suited for this task. Further, in reviewing this issue de novo, the Court of Appeal failed to appreciate that it lacked the scientific expertise to appreciate the significant differences between a health risk assessment commonly performed for toxic air contaminants and a similar type of analysis it felt should have been conducted for criteria air pollutants.

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A. Currently Available Modeling Tools are not Equipped to Provide a Meaningful Analysis of the Correlation between an Individual Development Project's Air Emissions and Specific Human Health Impacts.

In order to appreciate the problematic nature of the Court of Appeals' decision requiring a health risk type analysis for criteria air pollutants, it is important to understand how the relevant criteria pollutants (ozone and particulate matter) are formed, dispersed and regulated.

Ground level ozone (smog) is not directly emitted into the air, but is formed when precursor pollutants such as oxides of nitrogen (NOx) and volatile organic compounds (VOCs) are emitted into the atmosphere and undergo complex chemical reactions in the process of sunlight.[1] Once formed, ozone can be transported long distances by wind.[2] Because of the complexity of ozone formation, a specific tonnage amount of NOx or VOCs emitted in a particular area does not equate to a particular concentration of ozone in that area. In fact, even rural areas that have relatively low tonnages of emissions of NOx or VOCs can have high levels of ozone concentration simply due to wind transport.[3] Conversely, the San Francisco Bay Area has six times more NOx and VOC emissions per square mile than the San Joaquin Valley, but experiences lower

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[1] *See* United States Environmental Protection Agency, *Ground-level Ozone: Basic Information*, available at: http://www.epa.gov/airquality/ozonepollution/basic.html (visited March 10, 2015).
[2] *Id.*
[3] *Id.*

concentrations of ozone (and better air quality) simply because sea breezes disperse the emissions.[4]

Particulate matter ("PM") can be divided into two categories: directly emitted PM and secondary PM.[5] While directly emitted PM can have a localized impact, the tonnage emitted does not always equate to the local PM concentration because it can be transported long distances by wind.[6] Secondary PM, like ozone, is formed via complex chemical reactions in the atmosphere between precursor chemicals such as sulfur dioxides (SOx) and NOx.[7] Because of the complexity of secondary PM formation, the tonnage of PM-forming precursor emissions in an area does not necessarily result in an equivalent concentration of secondary PM in that area.

The disconnect between the *tonnage* of precursor pollutants (NOx, SOx and VOCs) and the *concentration* of ozone or PM formed is important because it is not necessarily the tonnage of precursor pollutants that causes human health effects, but the concentration of resulting ozone or PM. Indeed, the national ambient air quality standards ("NAAQS"), which are statutorily required to be set by the United States Environmental Protection

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[4] *San Joaquin Valley Air Pollution Control District 2007 Ozone Plan*, Executive Summary p. ES-6, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/03%20Executive%20Summary.pdf (visited March 10, 2015).
[5] United States Environmental Protection Agency, *Particulate Matter: Basic Information*, available at: http://www.epa.gov/airquality/particlepollution/basic.html (visited March 10, 2015).
[6] *Id.*
[7] *Id.*

Agency ("EPA") at levels that are "requisite to protect the public health," 42 U.S.C. § 7409(b)(1), are established as concentrations of ozone or particulate matter and not as tonnages of their precursor pollutants.[8]

Attainment of a particular NAAQS occurs when the concentration of the relevant pollutant remains below a set threshold on a consistent basis throughout a particular region. For example, the San Joaquin Valley attained the 1-hour ozone NAAQS when ozone concentrations remained at or below 0.124 parts per million Valley-wide on 3 or fewer days over a 3-year period.[9] Because the NAAQS are focused on achieving a particular concentration of pollution region-wide, the Air District's tools and plans for attaining the NAAQS are regional in nature.

For instance, the computer models used to simulate and predict an attainment date for the ozone or particulate matter NAAQS in the San Joaquin Valley are based on regional inputs, such as regional inventories of precursor pollutants (NOx, SOx and VOCs) and the atmospheric chemistry and meteorology of the Valley.[10] At a very basic level, the models simulate future ozone or PM levels based on predicted changes in precursor

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[8] See, e.g., United States Environmental Protection Agency, *Table of National Ambient Air Quality Standards*, available at: http://www.epa.gov/air/criteria.html#3 (visited March 10, 2015).
[9] *San Joaquin Valley Unified Air Pollution Control District 2013 Plan for the Revoked 1-Hour Ozone Standard*, Ch. 2 p. 2-16, available at: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/02Chapter2ScienceTrendsModeling.pdf (visited March 10, 2015).
[10] *Id.* at Ch. 2 p. 2-19 (visited March 12, 2015); *San Joaquin Valley Unified Air Pollution Control District 2008 PM2.5 Plan*, Appendix F, pp. F-2 – F-5, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Final_Adopted_PM2.5/20%20Appendix%20F.pdf
(visited March 19, 2015).

emissions Valley wide.[11] Because the NAAQS are set levels necessary to protect human health, the closer a region is to attaining a particular NAAQS, the lower the human health impact is from that pollutant.

The goal of these modeling exercises is not to determine whether the emissions generated by a particular factory or development project will affect the date that the Valley attains the NAAQS. Rather, the Air District's modeling and planning strategy is regional in nature and based on the extent to which *all* of the emission-generating sources in the Valley (current and future) must be controlled in order to reach attainment.[12]

Accordingly, the Air District has based its thresholds of significance for CEQA purposes on the levels that scientific and factual data demonstrate that the Valley can accommodate without affecting the attainment date for the NAAQS.[13] The Air District has tied its CEQA significance thresholds to the level at which stationary pollution sources permitted by the Air District must "offset" their emissions.[14] This "offset"

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[11] *Id.*

[12] Although the Air District does have a dispersion modeling tool used during its air permitting process that is used to predict whether a particular project's directly emitted PM will either cause an exceedance of the PM NAAQS or contribute to an existing exceedance, this model bases the prediction on a worst case scenario of emissions and meteorology and has no provision for predicting any associated human health impacts. Further, this analysis is only performed for stationary sources (factories, oil refineries, etc.) that are required to obtain a New Source Review permit from the Air District and not for development projects such as Friant Ranch over which the Air District has no preconstruction permitting authority. *See* San Joaquin Valley Unified Air Pollution Control District Rule 2201 §§ 2.0; 3.3.9; 4.14.1, available at: http://www.valleyair.org/rules/currntrules/Rule2201041l.pdf (visited March 19, 2015).

[13] *San Joaquin Valley Unified Air Pollution Control District Guide to Assessing and Mitigating Air Quality Impacts*, (March 19, 2015) p. 22, available at: http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan%202002%20Rev.pdf (visited March 30, 2015).

[14] *Id.* at pp. 22, 25.

level allows for growth while keeping the cumulative effects of all new sources at a level that will not impede attainment of the NAAQS.[15] In the Valley, these thresholds are 15 tons per year of PM, and 10 tons of NOx or VOC per year. *Sierra Club, supra*, 172 Cal.Rptr.3d at 303; AR 4554. Thus, the CEQA air quality analysis for criteria pollutants is not really a localized, project-level impact analysis but one of regional, "cumulative impacts."

Accordingly, the significance thresholds applied in the Friant Ranch EIR (15 tons per year of PM and 10 tons of NOx or VOCs) are not intended to be indicative of any localized human health impact that the project may have. While the health effects of air pollution are of primary concern to the Air District (indeed, the NAAQS are established to protect human health), the Air District is simply not equipped to analyze whether and to what extent the criteria pollutant emissions of an individual CEQA project directly impact human health in a particular area. This is true even for projects with relatively high levels of emissions of criteria pollutant precursor emissions.

For instance, according to the EIR, the Friant Ranch project is estimated to emit 109.52 tons per year of ROG (VOC), 102.19 tons per year of NOx, and 117.38 tons per year of PM. Although these levels well

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[15] [15] *San Joaquin Valley Unified Air Pollution Control District Environmental Review Guidelines* (Aug. 2000) p. 4-11, available at: http://www.valleyair.org/transportation/CEQA%20Rules/ERG%20Adopted%20_August%202000_.pdf (visited March 12, 2015).

exceed the Air District's CEQA significance thresholds, this does not mean that one can easily determine the concentration of ozone or PM that will be created at or near the Friant Ranch site on a particular day or month of the year, or what specific health impacts will occur. Meteorology, the presence of sunlight, and other complex chemical factors all combine to determine the ultimate concentration and location of ozone or PM. This is especially true for a project like Friant Ranch where most of the criteria pollutant emissions derive not from a single "point source," but from area wide sources (consumer products, paint, etc.) or mobile sources (cars and trucks) driving to, from and around the site.

In addition, it would be extremely difficult to model the impact on NAAQS attainment that the emissions from the Friant Ranch project may have. As discussed above, the currently available modeling tools are equipped to model the impact of *all* emission sources in the Valley on attainment. According to the most recent EPA-approved emission inventory, the NOx inventory for the Valley is for the year 2014 is 458.2 tons per day, or 167,243 tons per year and the VOC (or ROG) inventory is 361.7 tons per day, or 132,020.5 tons per year.[16] Running the photochemical grid model used for predicting ozone attainment with the

[16] *San Joaquin Valley Unified Air Pollution Control District 2007 Ozone Plan*, Appendix B pp. B-6, B-9,
available at:
http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/19%20Appendix%20B%20April%202007.pdf (visited March 12, 2015).

emissions solely from the Friant Ranch project (which equate to less than one-tenth of one percent of the total NOx and VOC in the Valley) is not likely to yield valid information given the relative scale involved.

Finally, even once a model is developed to accurately ascertain local increases in concentrations of photochemical pollutants like ozone and some particulates, it remains impossible, using today's models, to correlate that increase in concentration to a specific health impact. The reason is the same: such models are designed to determine regional, population-wide health impacts, and simply are not accurate when applied at the local level.

For these reasons, it is not the norm for CEQA practitioners, including the Air District, to conduct an analysis of the localized health impacts associated with a project's criteria air pollutant emissions as part of the EIR process. When the accepted scientific method precludes a certain type of analysis, "the court cannot impose a legal standard to the contrary." *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 717 n. 8. However, that is exactly what the Court of Appeal has done in this case. Its decision upends the way CEQA air quality analysis of criteria pollutants occurs and should be reversed.

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B. The Court of Appeal Improperly Extrapolated a Request for a Health Risk Assessment for Toxic Air Contaminants into a Requirement that the EIR contain an Analysis of Localized Health Impacts Associated with Criteria Air Pollutants.

The Court of Appeal's error in requiring the new health impact analysis for criteria air pollutants clearly stems from a misunderstanding of terms of art commonly used in the air pollution field. More specifically, the Court of Appeal (and Appellants Sierra Club et al.) appear to have confused the health risk analysis ("HRA") performed to determine the health impacts associated with a project's toxic air contaminants ("TACs"), with an analysis correlating a project's criteria air pollutants (ozone, PM and the like) with specific localized health impacts.

The first type of analysis, the HRA, is commonly performed during the Air District's stationary source permitting process for projects that emit TACs and is, thus, incorporated into the CEQA review process. An HRA is a comprehensive analysis to evaluate and predict the dispersion of TACs emitted by a project and the potential for exposure of human populations. It also assesses and quantifies both the individual and population-wide health risks associated with those levels of exposure. There is no similar analysis conducted for criteria air pollutants. Thus, the second type of analysis (required by the Court of Appeal), is not currently part of the Air District's process because, as outlined above, the health risks associated with exposure to criteria pollutants are evaluated on a regional level based on the region's attainment of the NAAQS.

The root of this confusion between the types of analyses conducted for TACs versus criteria air pollutants appears to stem from a comment that was presented to Fresno County by the City of Fresno during the administrative process.

In its comments on the draft EIR, the City of Fresno (the only party to raise this issue) stated:

> [t]he EIR must disclose the human health related effects of the Project's air pollution impacts. (CEQA Guidelines section 15126.2(a).) The EIR fails completely in this area. The EIR should be revised to disclose and determine the significance of TAC impacts, and of human health risks due to exposure to Project-related air emissions.

(AR 4602.)

In determining that the issue regarding the correlation between the Friant Ranch project's criteria air pollutants and adverse health impacts was adequately exhausted at the administrative level, the Court of Appeal improperly read the first two sentences of the City of Fresno's comment in isolation rather than in the context of the entire comment. *See Sierra Club v. County of Fresno* (2014) 172 Cal.Rptr.3d 271, 306. Although the comment first speaks generally in terms of "human health related effects" and "air pollution," it requests only that the EIR be revised to disclose "the significance of TACs" and the "human health risks due to exposure."

The language of this request in the third sentence of the comment is significant because, to an air pollution practitioner, the language would only have indicated only that a HRA for TACs was requested, and not a separate analysis of the health impacts associated with the project's criteria air pollutants. Fresno County clearly read the comment as a request to perform an HRA for TACs and limited its response accordingly. (AR 4602.)[17] The Air District submits that it would have read the City's comment in the same manner as the County because the City's use of the terms "human health risks" and "TACs" signal that an HRA for TACs is being requested. Indeed, the Air District was also concerned that an HRA be conducted, but understood that it was not possible to conduct such an analysis until the project entered the phase where detailed site specific information, such as the types of emission sources and the proximity of the sources to sensitive receptors became available. (AR 4553.)[18] The City of Fresno was apparently satisfied with the County's discussion of human health risks, as it did not raise the issue again when it commented on the final EIR. (AR 8944 – 8960.)

[17] Appellants do not challenge the manner in which the County addressed TACs in the EIR. (Appellants' Answer Brief p. 28 fn. 7.)

[18] Appellants rely on the testimony of Air District employee, Dan Barber, as support for their position that the County should have conducted an analysis correlating the project's criteria air pollutant emissions with localized health impacts. (Appellants Answer Brief pp. 10-11; 28.) However, Mr. Barber's testimony simply reinforces the Air District's concern that a risk assessment (HRA) be conducted once the actual details of the project become available. (AR 8863.) As to criteria air pollutants, Mr. Barber's comments are aimed at the Air District's concern about the amount of emissions and the fact that the emissions will make it "more difficult for Fresno County and the Valley to reach attainment which means that the health of Valley residents maybe [sic] adversely impacted." Mr. Barber says nothing about conducting a separate analysis of the localized health impacts the project's emissions may have.

The Court of Appeal's holding, which incorrectly extrapolates a request for an HRA for TACs into a new analysis of the localized health impacts of the project's criteria air pollutants, highlights two additional errors in the Court's decision.

First, the Court of Appeal's holding illustrates why the Court should have applied the deferential substantial evidence standard of review to the issue of whether the EIR's air quality analysis was sufficient. The regulation of air pollution is a technical and complex field and the Court of Appeal lacked the expertise to fully appreciate the difference between TACs and criteria air pollutants and tools available for analyzing each type of pollutant.

Second, it illustrates that the Court likely got it wrong when it held that the issue regarding the criteria pollutant / localized health impact analysis was properly exhausted during the administrative process. In order to preserve an issue for the court, '[t]he "exact issue" must have been presented to the administrative agency....' [Citation.] *Citizens for Responsible Equitable Environmental Development v. City of San Diego*, (2011) 196 Cal.App.4th 515, 527 129 Cal.Rptr.3d 512, 521; *Sierra Club v. City of Orange* (2008) 163 Cal.App.4th 523, 535, 78 Cal.Rptr.3d 1, 13. "'[T]he objections must be sufficiently specific so that the agency has the opportunity to evaluate and respond to them.' [Citation.]" *Sierra Club v. City of Orange*,163 Cal.App.4th at 536.[19]

As discussed above, the City's comment, while specific enough to request a commonly performed HRA for TACs, provided the County with no notice that it should perform a new type of analysis correlating criteria pollutant tonnages to specific human health effects. Although the parties have not directly addressed the issue of failure to exhaust administrative remedies in their briefs, the Air District submits that the Court should consider how it affects the issues briefed by the parties since "[e]xhaustion of administrative remedies is a jurisdictional prerequisite to maintenance of a CEQA action." *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1199, 22 Cal.Rptr.3d 203.

III. CONCLUSION

For all of the foregoing reasons, the Air District respectfully requests that the portion of the Court of Appeal's decision requiring an analysis correlating the localized human health impacts associated with an individual project's criteria air pollutant emissions be reversed.

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[19] *Sierra Club v. City of Orange*, is illustrative here. In that case, the plaintiffs challenged an EIR approved for a large planned community on the basis that the EIR improperly broke up the various environmental impacts by separate project components or "piecemealed" the analysis in violation of CEQA. In evaluating the defense that the plaintiffs had failed to adequately raise the issue at the administrative level, the Court held that comments such as *"the use of a single document for both a project-level and a program-level EIR [is] 'confusing',"* and *"[t]he lead agency should identify any potential adverse air quality impacts that could occur from all phases of the project and all air pollutant sources related to the project,"* were too vague to fairly raise the argument of piecemealing before the agency. *Sierra Club v. City of Orange*, 163 Cal.App.4th at 537.

correlating the localized human health impacts associated with an individual project's criteria air pollutant emissions be reversed.

Respectfully submitted,

Dated: April 2, 2015

Catherine T. Redmond
Attorney for Proposed Amicus Curiae

SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL DISTRICT

CERTIFICATE OF WORD COUNT

Pursuant to Rule 8.204 of the California Rules of Court, I hereby certify that this document, based on the Word County feature of the Microsoft Word software program used to compose and print this document, contains, exclusive of caption, tables, certificate of word count, signature block and certificate of service, 3806 words.

Dated: April 2, 2015

Annette A. Ballatore-Williamson
District Counsel (SBN 192176)

Sierra Club et al, v. County of Fresno, et al
Supreme Court of California Case No.: S219783
Fifth District Court of Appeal Case No.: F066798
Fresno County Superior Court Case No.: 11CECG00726

PROOF OF SERVICE

I am over the age of 18 years and not a p[arty to the above-captioned action; that my business address is San Joaquin Valley Unified Air Pollution Control District located at 1990 E. Gettysburg Avenue, Fresno, California 93726.

On April 2, 2015, I served the document described below:

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO

On all parties to this action at the following addresses and in the following manner:

PLEASE SEE ATTACHED SERVICE LIST

(XX) **(BY MAIL)** I caused a true copy of each document(s) to be laced in a sealed envelope with first-class postage affixed and placed the envelope for collection. Mail is collected daily at my office and placed in a United State Postal Service collection box for pick-up and delivery that same day.

( ) **(BY ELECTRONIC MAIL)** I caused a true and correct scanned image (.PDF file) copy to be transmitted via electronic mail transfer system in place at the San Joaquin Valley Unified Air Pollution Control District ("District"), originating from the undersigned at 1990 E. Gettysburg Avenue, Fresno, CA, to the address(es) indicated below.

( ) **(BY OVERNIGHT MAIL)** I caused a true and correct copy to be delivered via Federal Express to the following person(s) or their representative at the address(es) listed below.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that I executed this document on April 2, 2015, at Fresno, California.

Esthela Soto

SERVICE LIST

Sierra Club et al, v. County of Fresno, et al
Supreme Court of California Case No.: S219783
Fifth District Court of Appeal Case No.: F066798
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ATTACHMENT 4

SMAQMD

FRIANT RANCH

INTERIM RECOMMENDATION

Background

The California Supreme Court in the case of *Sierra Club v. County of Fresno* (2018) 6 Cal. 5th 502 regarding the proposed Friant Ranch project determined the air quality analysis in the environmental impact report (EIR) was inadequate because it did not make "a reasonable effort to substantively connect the project's air quality impacts to likely health consequences." The Court determined that "the EIR should be revised to relate the expected adverse air quality impacts to likely health consequences or explain in meaningful detail why it is not feasible at the time of drafting to provide such an analysis."

Need

Lead agencies and practitioners preparing documents to comply with the California Environmental Quality Act (CEQA) have requested guidance from the Sacramento Metropolitan Air Quality Management District (Sac Metro Air District) on implementing the Friant Ranch decision in the review and analysis of proposed projects in Sacramento County.

Interim Recommendation

The Sac Metro Air District does not currently have a methodology that would correlate the expected air quality emissions of projects to the likely health consequences of the increased emissions. The Sac Metro Air District is in the process of developing a methodology to assess these impacts, and anticipates releasing it in the fall of 2019. In the interim, agencies should follow the Friant Court's advice to explain in meaningful detail why this analysis is not yet feasible.

This explanation should describe the background underlying air regulations, the regional nature of the regulatory approach, and why the approach is not amenable to project level assessments. This should include a discussion of the public health impact analyses that form the basis for the state and federal health-based pollutant concentration standards, and the application of the standards to regions that were established based upon a commonality of factors impacting air quality. Air districts, in turn, have focused on reducing regional emissions from all sectors to meet the health-based concentration standards, thereby reducing the pollutant specific health impacts for the entire population. For example, the Sac Metro Air District prepared plans to attain and maintain the ozone and particulate matter ambient air quality standards. These attainment plans include emissions inventories, air monitoring data, control measures, modeling, future pollutant-level estimates, and general health information. Attainment planning models rely on regional inputs to determine ozone and particulate matter formation and concentrations in a regional context, not a project specific context. Because of the complexity of ozone formation, the pounds or tons of emissions from a proposed project in a specific geographical location does not equate to a specific concentration of ozone formation in a given area, because in addition to emission levels, ozone formation is affected by atmospheric chemistry, geography, and weather. Secondary formation of particulate matter is very similar to the complexity of ozone formation, and localized impacts of directly emitted particulate matter do not always equate to local particulate matter concentrations due to transport of emissions. The analysis should explain that because air district attainment plans and supporting air model tools are regional in nature, they do not allow for analysis of the health impacts of specific projects on any given geographic location. More information is included in the threshold justification documents developed by the Sac Metro Air District, and available at our website at www.airquality.org.

The analysis should also discuss the current models[i] used in CEQA in air quality analyses, which, in contrast to attainment models, are designed to calculate and disclose the mass emissions expected from the construction and operation of a proposed project (pounds/day and tons/year). The estimated emissions are then compared to significance thresholds, which are in turn keyed to reducing emissions to levels that will not interfere with the region's ability to attain the health-based standards. The Sac Metro Air District adopted operational emission thresholds for ozone precursors, nitrogen oxides (NOx) and reactive organic gasses (ROG), with the goal of obtaining 0.45 tons/year of NOx and 0.49 tons/year of ROG reductions from new development projects exceeding the thresholds by including emission reducing design features as mitigation.[ii] More recently, the Sac Metro Air District adopted particulate matter thresholds, PM10 and PM2.5, to align with the new source review permit offset levels, which are designed to prevent new emission sources from affecting attainment progress.[iii] Sac Metro Air District thresholds are set at 65 pounds/day NOx (11.8 tons/year), 65 pounds/day ROG (11.8 tons/year), 80 pounds/day PM10 (14.6 tons/year), and 82 pounds/day PM2.5 (15 tons/year).[iv] CEQA thresholds are a tool Sac Metro Air District uses to obtain emission reductions from development projects to support attainment of the Federal and State ambient air quality standards. This protects public health in the overall region, but there is currently no methodology to determine the impact of emissions on concentration levels in specific geographic areas.

The CEQA analysis should consider the degree to which various other tools, such as CalEEMod, EMFAC, OFFROAD, AERMOD, and HARP and CAMx, could assist in assessing specific health impacts of a project, and, where those tools would not be useful, explain why. For example, while CalEEMod may be useful in comparing emissions to significance thresholds, it is not able to assess transport of pollutants or the impacts of external factors (weather, terrain, etc.) on pollutant concentrations at particular locations.

In Sacramento, concentration modeling of ozone has not been an analytical tool used for project level emissions due to the complex nature of pollution concentration formation and numerous regional influences (multiple emission sources, meteorology, atmospheric chemistry and geography). Although some particulate matter concentration modeling has been conducted for project specific emissions for stationary source permitting purposes, concentration modeling has mainly been used to support ozone attainment demonstration.

Outside of these tools, neither the Sac Metro Air District nor any other air district currently have methodologies that would provide Lead Agencies and CEQA practitioners with a consistent, reliable, and meaningful analysis to correlate specific health impacts that may result from a proposed project’s mass emissions.

An expanded discussion of health impacts resulting from specific air pollutants may also be warranted for projects with emissions exceeding the Sac Metro Air District’s thresholds of significance. There is an array of information on health impacts related to exposure to ozone[v] and particulate matter[vi] emissions published by the US EPA and the California Air Resources Board. Health studies are used by these agencies to set the Federal and State ambient air quality standards. A more general discussion of health impacts related to air pollution is also available on www.sparetheair.com and in the Sac Metro Air District’s *Guide to Air Quality Assessment in Sacramento County.*[vii] None of the health-related information can be directly correlated to the pounds/day or tons/year of emissions estimated from a single, proposed project.

Developing Guidance

The interim recommendation is in place to assist lead agencies and practitioners with CEQA document preparation until Sac Metro Air District develops a methodology that provides a consistent, reliable and meaningful analysis to address the Court’s direction on correlating health impacts to a project’s emissions.

Sac Metro Air District staff have initiated discussions with the other air district’s in the Sacramento Federal Ozone Nonattainment area regarding developing guidance in response to Friant Ranch since we share air quality issues and use the same growth assumptions, mobile source emissions, and modeling efforts to support our ozone and particulate matter attainment plans.

One potentially useful tool in developing a methodology is the US EPA’s BenMap tool[viii]. According to US EPA’s website, BenMap is an “open-source computer program that calculates the number and economic value of air pollution-related deaths and illnesses. The software incorporates a database that includes many of the concentration-response relationships, population files, and health and economic data needed to quantify these impacts.” BenMap may be able to provide the detailed health information needed for the guidance under development.

Sac Metro Air District is working with its engineering and environmental technical support consultant, Ramboll USA Corporation, to develop a methodology that will provide a consistent, reliable, efficient, and meaningful analysis that correlates health impacts from proposed projects' emissions for the Sacramento region. The current strategy will analyze how various levels of emissions (the CEQA tonnage estimates) impact attainment pollutant concentration levels, and use BenMap to correlate increases in concentration levels to health impacts. Once a methodology is available, Sac Metro Air District staff will inform interested stakeholders and provide updated guidance in this document and in its *Guide to Air Quality Assessment in Sacramento County*.

Contact Information

Lead agencies and CEQA practitioners may contact Mr. Paul Philley, CEQA and Land Use Section Program Supervisor at 916-874-4882 or pphilley@airquality.org regarding Sac Metro Air District's recommendations.

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[i] CalEEMod, Road Construction Emissions Model, EMFAC, OFFROAD

[ii] Foundation for a Threshold, Justification for Air Quality Thresholds of Significance In the Sacramento Federal Nonattainment Area, August 15, 2001, Adopted March 28, 2002.

[iii] Proposed Particulate Matter CEQA Thresholds of Significance, March 19, 2015, Adopted May 28, 2015.

[iv] Sac Metro Air District, Guide to Air Quality Assessment in Sacramento County, December 2009 (latest update September 2018), Chapter 2, Thresholds of Significance table. http://www.airquality.org/LandUseTransportation/Documents/CH2ThresholdsTable5-2015.pdf

[v] https://www.epa.gov/ozone-pollution-and-your-patients-health/health-effects-ozone-general-population

[vi] https://www.arb.ca.gov/research/health/pm-mort/PMmortalityreportFINALR10-24-08.pdf

[vii] Sac Metro Air District, Guide to Air Quality Assessment in Sacramento County, December 2009 (latest update September 2018), Chapter 1. http://www.airquality.org/LandUseTransportation/Documents/Ch1IntroAq%20FINAL12-2016.pdf

[viii] https://www.epa.gov/benmap