PUBLIC PARTICIPATION AND CONSULTATION

COMMUNITY INPUT

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

2016 2040 RTPSCS

SUB APPENDIX PART 2B OF 5

Letters from Agencies/Organizations

C - Continued

ADOPTED | APRIL 2016

2016 2040 RTPSCS

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COMMUNITY INPUT | PUBLIC PARTICIPATION AND CONSULTATION

LETTERS FROM AGENCIES/ORGANIZATIONS C-Continued

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SUB APPENDIX PART 2B OF 5
Letters from Agencies/Organizations A–C

City Council
David A. Spence, Mayor
Jonathan C. Curtis, Mayor Pro Tem
Michael T. Davitt
Leonard Pieroni
Terry Walker

February 1, 2016

Ms. Courtney Aguirre and Ms. Lijun Sun
Southern California Association of Governments
818 W. 7th Street, 12th Floor
Los Angeles, CA 90017
Via Email: 2016PEIR@scag.ca.gov

Re: 2016 Draft Regional Transportation Plan/Sustainable Communities Strategy and Draft Program Environmental Impact Report

Dear Ms. Aguirre and Ms. Sun:

The City of La Cañada Flintridge is represented by the firm of Shute, Mihaly & Weinberger as a part of the 5-City Alliance (including the cities of Glendale, La Cañada Flintridge, Pasadena, Sierra Madre and South Pasadena) in the matter of the review of the 2016 Draft Regional Transportation Plan/Sustainable Communities Strategy and Draft Program Environmental Impact Report. Their letter, dated January 29, 2016, has been submitted to you separately. The City joins in, and incorporates herein by reference, those comments of the 5- City Alliance.

To serve as reinforcement of this letter, the City asserts its concurrence with the following points made within the letter:

I. The Proposed Freeway Tunnel Alternative Is Flawed and Unnecessary.
II. The Freeway Tunnel Alternative Would Not Implement the 2016 RTP/SCS's Goals.
III. There Are Viable Ways to Maximize the Productivity of the Region's Transportation System While Minimizing Environmental Harm.
IV. The RTP/SCS PEIR Violates CEQA.
   A. The PEIR's Justifications For Failing to Provide a More Detailed Analysis of the RTP/SCS's Environmental Impacts Are Unavailing.
   B. The PEIR's Description of the Project Violates CEQA.
   C. The PEIR's Analysis of and Mitigation for the Project's Air Quality Impacts Are Inadequate.
      1. The PEIR Fails to Adequately Evaluate the Plan's Potential to Violate Air Quality Standards and to Contribute Substantially to an Existing or Projected Violation.
      2. The PEIR Substantially Understates the Plan's Air Quality Impacts.
      3. The PEIR Fails to Analyze the Plan's Cumulative Air Quality Impacts.
      4. The PEIR Fails to Adequately Analyze or Mitigate the Plan's Construction-related Impacts.
      5. The PEIR Fails to Adequately Evaluate the Plan's Potential to Expose Sensitive Receptors to Substantial Pollutant Concentrations and Harm Public Health.

(a) The PEIR's Health Risk Assessment Relies on an Incorrect Baseline for Determining the Significance of the Plan's Health Risks.
(b) The PEIR Substantially Understates the Plan's Health Impacts Because It Studies Only a Fraction of the Plan's Highway Projects.
(c) The PEIR Does Not Analyze the Health Risk Near the SR- 710 North Project.
(d) The Health Risk Analysis Underestimates the Number of Potentially Affected People.
(e) The Health Risk Analysis Focuses Solely on Emissions from Trucks, Ignoring Hazardous Compounds Emitted from Cars.
(f) The PEIR Masks the Actual Health Effects of the Plan Because ItDoes Not Disclose Where the Impacts Would Occur.
(g) The PEIR's Mitigation Measures Are Vague, Optional, and Otherwise Unenforceable.

D. The PEIR Fails to Properly Analyze the Plan's Contribution to Climate Change.
   1. The PEIR Fails to Analyze the Plan's Inconsistency with State Climate Policy.
E. The PEIR Fails to Analyze the Plan's Inconsistency with State Climate Policy.
F. There Is No Evidence that the SR-710 North Project Was Included in the Greenhouse Gas Inventory for the Plan.

As can be seen by the points made by the 5-City Alliance, the City is gravely concerned with the project's impacts on air quality and health. The impacts of not addressing these air quality and health risk assessments adequately would result in very deleterious impacts on the residents of our City. In addition to incorporating the Shute, Mihaly & Weinberger letter that has been submitted regarding this matter, the City attaches its own comment letter dated August 4, 2015 and submitted to Caltrans in response to the SR-710 North Extension Project DEIR/S. This comment letter addresses primarily air quality, cancer and other health risks, in part, as follows:

I. Air Quality impacts have not been adequately disclosed and analyzed.
   In fact, the EPA comment letter dated August 27, 2015 which was submitted to Caltrans stated: *"refined analysis and disclosure to the public of impacts in anticipated hotspot locations, as well as the potential need for Freeway Tunnel Alternative design changes to eliminate identified impacts. For these reasons, and because the project area's existing air quality is so poor, we have rated the Freeway Tunnel Alternative as "3"-Inadequate Information..."*
   Additionally, the letter to Caltrans regarding the DEIR/S from the SCAQMD dated August 5, 2015 states: *"... <u>the Health Risk Assessment (HRA) for the project shows that the tunnel alternatives will present a significant health risk to local residents when compared to a No Build scenario</u>, however the Draft EIR/EIS concludes that this impact is less than significant, and no mitigation is required. Second, localized air quality impacts are not adequately analyzed, and decision-makers would not be able to use the EIR/EIS as written to determine if the project will adversely affect air quality in the local area. For example, there is no quantitative analysis of localized impacts for the freeway tunnel alternatives to determine if ambient air quality standards are exceeded for NO2 or CO. For these reasons, the analysis should be revised..."*

II. The DEIR/S Denigrates Its Own Analysis of Cancer Risks, Making the Document Self-Contradictory and Confusing, and Fatally Compromising its Function as a Full Disclosure Document.

III. The DEIR/S' Analysis of Conventional Air Pollutants is Inadequate.
IV. The DEIR/S Fails to Address California's Ambient Air Quality Standards.
V. The Analysis of Conformity With Federal Clean Air Act Requirements Does Not Excuse a Failure to Address the California Ambient Air Quality Standards.
VI. The DEIR/S' analysis of Construction Emissions is Inadequate.
VII. The DEIR/S Performs No Analysis of Secondary Particulate Matter Emissions.
VIII. The DEIR/S Fails to Calculate Total Local Expected Cancer Cases.
IX. The DEIR/S' Treatment of Greenhouse Gas (GHG) Emissions Due to the Project is Inadequate.
X. Traffic Impacts have not been adequately disclosed and analyzed.
   A. The DEIR/S's Traffic Analysis is Not Supported by Substantial Evidence and Fails Both to Provide Adequate Information and to Identify or Propose all Feasible Mitigation Measures for Adoption.
      1. The DEIR/S Uses a Transportation Model That Has Not Been Shown by Substantial Evidence to be Valid, Potentially Invalidating the Traffic Analysis, and the Air Quality Analysis.
XI. Seismic Impacts have not been adequately disclosed and analyzed.
XII. The Environmental Justice Analysis Fails to Address the Serious Health Issue of Disparate Impact of Exposure to Toxic Air contaminants.
XIII. Recirculation is required.

The City concurs with the conclusion of the Shute Mihaly letter, which states that **we respectfully request that SCAG eliminate the SR-710 North Project from the 2016 RTP/SCS**. First, the Freeway Tunnel Alternative is flawed and unnecessary, failing to provide a real solution to the region's transportation needs. Second, the Freeway Tunnel would be inconsistent with the RTP/SCS's goal that transportation projects be sustainable and environmentally protective. Third, there are viable alternatives to the Freeway Tunnel that improve mobility and expand transportation options while limiting dependence on personal vehicles. Finally, the PEIR's evaluation of environmental impacts from the RTP/SCS's transportation projects generally, and from the SR-710 North Project specifically, fails to comply with CEQA. Further, in the event that SCAG does not eliminate the SR-710 North Project from the RTP/SCS, it will need to prepare and recirculate a revised PEIR correcting the problems identified in the letter submitted by the 5-City Alliance in this matter.

On behalf of the City of La Cañada Flintridge, I submit this comment letter to the 2016 Draft Regional Transportation Plan/Sustainable Communities Strategy and Draft Program Environmental Impact Report.

Sincerely,

Mark R. Alexander
City Manager

c: City Council, City of La Cañada Flintridge

August 4, 2015

Mr. Garrett Damrath, Chief Environmental Planner
Division of Environmental Planning
Department of Transportation, District 7
100 S. Main Street, MS-16A
Los Angeles, CA 90012

Re: Comments by La Cañada Flintridge on the SR-710 North Extension Project DEIR/S

Dear Mr. Damrath:

I. INTRODUCTION.

The City of La Cañada Flintridge (City) submits the following comments on the Draft Environmental Impact Report/Statement for the extension of State Route 710 (DEIR/S) on its own behalf, and on behalf of the persons and families that live, work, and recreate in the City. The City also joins in, and incorporates herein by reference, the comments of the Five City Alliance, of which it is a part. The Alliance's comments are being filed separately.

The DEIR/S, while totaling approximately 26,000 pages (including appendices), nevertheless fails to fulfill the two basic duties imposed on government agencies by the California Environmental Quality Act (CEQA), Public Resources Code (PRC) §§ 21000, et seq., namely the duty to fully explore, analyze, and disclose all significant environmental effects of the proposed project (PRC § 21002.1), and to avoid or mitigate those significant effects, whether by choosing a less environmentally damaging alternative project or by identifying and recommending for adoption all feasible mitigation measures.

To begin with, the DEIR/S is confusing and cannot easily be navigated by a layperson with a realistic amount of time to devote to the task. (See CEQA Guidelines § 15140, which emphasizes that EIRs should be readily understandable by the lay public.) Although the main document refers to supporting documentation – for example, the Air Quality section of the DEIR/S relies on information in the separate Air Quality Assessment and Health Risk Assessment, each of which, in turn, has its own appendices in addition to the appendices to the main document – the main DEIR/S does not tell the reader where to find the supporting information in those additional documents, or in the appendices that themselves support those supporting documents. Similarly, the Geology/Soils/Seismic/Topography section of the DEIR/S relies on information in two additional supporting documents, but the reader is not told what portions of the main DEIR/S rely on information in the supporting documents, and where in those documents to find that information. This multi-tiered construct lacking explanatory sign posts to the reader not only promotes confusion, but actively frustrates meaningful public participation.

Further, the main document often is wholly conclusory in its discussion of the crucial topic of seismic safety related to alternatives that would be built and operate below ground directly over an active fault and two other potentially active faults, yet the reader cannot know without reading additional hundreds of pages of supporting documents where to find whatever evidence CalTrans/Metro has to support these conclusory statements. A non-expert – in other words, an ordinary member of the public – cannot know where in this overwhelming mass of data to find the information he or she seeks on a particular topic.

Compounding these problems, the segregation of information and analysis performed by CalTrans/Metro to attempt to satisfy the more stringent requirements of CEQA into a separate section of the DEIR/S means that a reader cannot read any section of the main document and trust that he or she has been told everything that the agencies know about a particular aspect of the project's environmental impacts without looking up that particular aspect in the separate CEQA section of the DEIR/S. The convoluted structure of the DEIR/S severely impairs its mandated function to be an informational document.

As will also be discussed below, the DEIR/S fails to correctly define the study area covered by the environmental analysis. The DEIR/S artificially circumscribes it by freeway routes rather than by the full reach of the proposed project's environmental effects. This results in a failure to identify all of the project's significant environmental effects.

The DEIR/S also fails to openly identify a preferred project, skewing the overall focus of the analysis and resulting in the illegal postponement of a crucial analysis until <u>after</u> the main public comment period, making it impossible for impacted parties to comment on the choice of alternative.

The document fails to set and disclose thresholds of significance for the effects it does identify, leading again to a failure to identify all significant effects or to identify them as significant. It minimizes the significance of the effects of toxic air pollutant emissions from the project and denigrates the very methods of analysis it employs to examine those effects.

CEQA's requirements are treated as an unwelcome burden, confined to a separate section of the DEIR/S that implies that the environmental effects examined under CEQA are of lesser significance, or less worthy of attention, than those analyzed under the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 et seq.

Finally, the document fails to identify and recommend for adoption all feasible mitigation measures. It focuses almost solely on mitigation for construction impacts, for which it proposes inadequate mitigation, and almost totally ignores mitigation for operational impacts.

As discussed below, the DEIR/S is so seriously flawed that it must be revised and recirculated.

II. THE SCOPE OF THE DEIR/S' "STUDY AREA" IS ILLEGALLY LIMITED.

CEQA requires an EIR to address "the area which will be affected by a proposed project. . . ." (CEQA Guidelines § 15125(c).) NEPA also requires that "the area to be affected or created" by the project being analyzed, and its alternatives, must be examined. (NEPA Guidelines, § 1502.15.) Neither set of Guidelines allows for the artificial limitation of the analysis area to existing freeway routes or a study area limited solely to that area that the agency wishes to study. Instead, the full reach of significant environmental effects must define the study area. (CEQA Guidelines § 15126.2(a); 6171919161716171818171817181718171817181718171817182020171817 (2004) 124 Cal.App.4th 1184, 1216.)

Notwithstanding the above, the DEIR/S uses an artificially truncated and inadequate geographic area of analysis, omitting areas where environmental impacts from the Project may or will be felt. The prime example of this is the limitation of the geographic area of analysis to the "Study Area" identified in the DEIR/S, which is artificially defined by freeways and state routes closest to the proposed Project. (See, e.g., Fig. ES-1.)

The DEIR/S limits the traffic analysis to a roughly rectangular area defined by several existing east-west and north-south freeways (see, e.g., Fig. ES-1.) It excludes analysis of freeways and intersections that its own data indicate would be affected by the Project, despite the fact that the DEIR/S states as two of its three main purposes to "[i]mprove efficiency of the existing *regional* freeway and transit network," and to "[m]inimize environmental impacts related to mobile sources." (p. 1-8, emphasis added.)

Among other things, the DEIR/S clearly shows that traffic impacts from the Project will extend beyond the boundaries of the Study Area, as for example, in up to 400 additional vehicles per hour at intersections on the I-210 westward of the Study Area. (pp. 3.5-48, 3.5-49, 3.5-53.) In many cases, the effects of the Project impact an intersection on the I-210 westbound that is already at Level of Service (LOS) F, the worst, most congested condition, and in some cases, the Project's effects push an intersection from LOS E to LOS F (e.g., for the Dual-Bore No Toll alternative, the I-210 eastbound between the Hubbard Street off-ramp and the on-ramp, the I-210 westbound between the Maclay Avenue off-ramp and the on-ramp, and the I-210 westbound between the Hubbard Street on-ramp and the Polk Street off-ramp [p. 3.5-51]; for the Dual-Bore No Toll and No Trucks alternative, the I-210 eastbound between the Hubbard Street off-ramp and the on-ramp [p. 3.5-53]).

Plainly, the Project will worsen traffic and cause many more vehicles to be on the I-210 eastbound, particularly in peak morning and evening commute hours. The Study Area should be expanded to include all areas where Project impacts will be experienced, and the DEIR/S should be revised to examine all Project impacts, including traffic congestion, air pollution, and noise impacts on these areas.

The Project will also add vehicles to the I-5 northbound, e.g., the I-5 northbound between the SR 2 southbound and northbound off- and on-ramps (pp. 3.5-51 [Dual-Bore No Tolls], 3.5-55 [Dual-Bore with Tolls]), a freeway that is already one of the most heavily congested in the region. Yet despite knowing that the Project will add vehicles on both the I-210 and the I-5, the DEIR/S does not analyze the impacts on the intersection of the I-210 and the I-5, a logical bottleneck that can also impact the I-5/I-14 junction. The DEIR/S cannot show that it "improve[s] the efficiency of the regional freeway . . . network" and "[minimize[s] environmental impacts related to mobile sources", two of the three purposes of the Project, without expanding the Study Area to include these intersections and examining the Project's impacts on them.[1]

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1 See the discussion of artificial limitation of the study area in the Willdan Report, filed with these comments.

In addition, the DEIR/S has artificially limited the geographic scope of impacts from mobile source air pollutant emissions, and in particular, emission of mobile source air toxics (MSATS) such as diesel particulate (DPM) emissions, that will result from the proposed Project. Diesel particulate emissions have been found by the California Air Resources Board to be a Toxic Air Contaminant because of its serious effects on human health. (Cal. Code of Regs., tit. 17, § 93000.) It has also been declared by the State's qualified scientific experts to be a substance known to the State of California to cause cancer (Cal. Code of Regs, tit. 27, § 27001) pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986, commonly referred to as Proposition 65, Cal. Health and Safety Code §§ 25249.6, et seq.[2]

Because of their potential to seriously harm human health, it is crucial to predict and disclose increases in emissions of MSATs, especially diesel particulates. Here, the public cannot be sure that the full reach of the increases in MSAT emissions, and resultant cancer risks, have been predicted and disclosed, because of the limits placed by the DEIR/S on the Study Area.

In the Health Risk Assessment, maps are presented that purport to show the increase in cancer risk, over a no-build scenario, as a result of the Project's different alternatives. (Health Risk Assessment, Figures 11-19.) These maps show increased cancer risks by highlighting various geographic areas within the Study Area in different colors, each corresponding to a range of increased cancer risk. However, the colored areas bleed over the Study Area boundaries in ways that do not make clear whether the full extent of each cancer risk zone has been documented and displayed. In the clearest example, Figures 11, 12, 14, 15, and 18 all show the darker green area of cancer risk increases of between one and ten cancer cases per million people exposed at that level of carcinogen emissions in the area in and around La Cañada Flintridge. The color overlays all end in a straight line, and seem to be cut off (at least in part) by the top of the image's frame (roughly corresponding to the border of the Study Area), rather than by the end of the risk zone's boundaries.

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2 While governmental entities are not subject to Proposition 65 (Health and Safety Code § 25249.11(b)), and are not compelled to provide the exposure warning that a private business might have to provide, the listing of diesel particulate matter as a known carcinogen is relevant to analyzing the impacts on the human environment of a project that will increase the amount and distribution of its emission.

Similarly, the cancer risk shaded area at the northern edge of Figures 12, 14, 15, 17, and 18 all appear to cut off sharply at a line that roughly corresponds to Sierra Madre Boulevard. The Figures' appearance strongly suggests that modeling of cancer risks was cut off at this point by design, rather than by the actual modeling outputs as to the relevant risk levels.

Finally, the cancer risk shaded areas around the I-605 in Figures 11, 12, 16, 17, 18, and 19 is shown ending in a series of stair-stepped angles, again suggested that the full extent of the risk area was not shown, but, rather, that modeling was cut off to correspond with the boundaries of the Study Area, rather than with the cancer risk levels.

Overall, the Figures suggest that the air quality modeling for MSATs was designed to address only the risks in the pre-determined Study Area, not the full impacts of the Project on MSAT cancer risk in the region. This violates both NEPA and CEQA.

III. AIR QUALITY IMPACTS HAVE NOT BEEN ADEQUATELY DISCLOSED AND ANALYZED.

1. Failure to Identify a Preferred Project Slants the DEIR/S' Analysis.

The DEIR/S does not identify a preferred project. The Executive Summary states that the preferred alternative – the actual Project – will not be selected until after the DEIR/S is circulated and all comments from agencies and the public have been considered; in other words, not until after general public review is over. (pp. ES-15, 3.13-2.) Such a procedure makes the DEIR/S less focused and less likely to stimulate public discussion and comments. Here, it is also inconsistent with the DEIR/S's reliance on the adoption into regional transportation funding plans of a tunnel project to justify a finding of Conformity with federal Clean Air Act requirements. CalTrans/Metro cannot legitimately rely on the Southern California Association of Governments (SGAG) Regional Transportation Plan's (RTP) inclusion of a tunnel alternative to satisfy the Clean Air Act's requirements, and at the same time also claim that a tunnel alternative has not actually been chosen as the preferred project.

The failure to openly select a preferred project seriously compromises the informational function of the document, including because the Air Quality section states that no localized analysis of particulate matter emissions for federal Clean Air Act purposes will be conducted until and unless one of the Tunnel alternatives is chosen as the preferred project. This procedure, which improperly allows deferred study and deferred mitigation, results in an environmental document that does not put front and center an analysis of one of the most serious health threats that a new transportation facility may pose: increased localized exposure of the public to fine particulate matter, especially to diesel particulate matter emissions. The omission of the analysis of particulate matter emissions and their extremely serious health effects robs the decision makers and the public of information on health risks that should be critical to the decision as to whether to build the Project, or whether to choose an alternative to a tunnel alternative. Figures 11 through 19, buried at the back of the Health Risk Assessment, show increased cancer risks to substantial areas in several different parts of the Study Area due to exposure to diesel particulate emissions. That analysis should have been placed in the body of the DEIR/S and in the context of an acknowledged choice of a preferred project.

2. The DEIR/S Denigrates Its Own Analysis of Cancer Risks, Making the Document Self-Contradictory and Confusing, and Fatally Compromising its Function as a Full Disclosure Document.

Probably because CalTrans/Metro understand that CEQA requires an analysis of such a significant potential impact of the Project as increased exposure to carcinogenic vehicle emissions, the DEIR/S does an analysis, but does it in a way that minimizes its accessibility to the general public and openly denigrates its value. The analysis appears in a separate, 100+ page, technical Health Risk Assessment, and is summarized in a bare, five-page section of the main body of the DEIR/S that is identified as an evaluation done solely for CEQA purposes. (CEQA Evaluation of air quality impacts at pp. 4-5 through 4-9.)

In yet another document, the Air Quality Assessment contradicts the entire premise of the Health Risk Assessment and the CEQA analysis of increased exposure to carcinogenic vehicle emissions (primarily diesel particulate emissions) by forcefully arguing for FHWA's position that such an analysis is "not . . . useful to decision-makers", in part because the FHWA believes that there is no "national consensus on an acceptable level of risk", and that there are not generally accepted methodologies for performing an analysis of risks to health from exposure to toxic air pollutants. (Air Quality Assessment Report at 5-26.)

CalTrans/Metro have given the public two documents that appear mutually contradictory. The Air Quality Assessment states that there are no accepted methods for calculating the risks to human health posed by exposure to toxic air pollutants (Id.), while the Health Risk Analysis uses the methods that California has adopted for performing such analyses, and concludes that the Project will cause increased cancer risks to significant numbers of residents near the different Project alternatives. How is the public to evaluate a document that performs an essential analysis, but at the same time states that the analysis is meaningless? The internal inconsistency of the DEIR/S, and its failure to make clear and to take seriously the full extent of the health risk from the SR-710 extension, as discussed below, make it flawed and inadequate as an informational document under both NEPA and CEQA.

3. The DEIR/S' Analysis of Conventional Air Pollutants is Inadequate.[3]

One of the most serious failings of the DEIR/S is its conspicuous failure to present adequately the extreme nature of the existing air pollution problem in this region. The document persistently downplays, buries or ignores altogether the severe existing health threat from air pollution in this area, and the degree to which various Project alternatives will make that health threat worse.[4]

The Project is proposed for an area that the American Lung Association, in its State of the Air 2014 report, ranked as the worst in the U.S. as to the total number of people whose health is at risk from ozone pollution, the fourth most-polluted area in the U.S. for short-term particulate pollution, and the third most-polluted in the U.S. for year-round particulate pollution.[5] The DEIR/S concedes that the region fails to meet the health-based National Ambient Air Quality Standards (NAAQS) for ozone (DEIR/S p. 3.13-7), and that it is designated as an "extreme" nonattainment area, one of only two

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3 La Canada Flintridge notes that underestimation of traffic counts and impacts by CalTrans/Metro, discussed further on in this letter, may have fatally compromised the air quality analysis. See Traffic Impacts discussion, below, and the Willdan Report filed with these comments.

4 The discussion of PM2.5 in this section addresses only PM2.5 insofar as it is a criteria pollutant, and not as a Mobile Source Air Toxic (MSAT).

5 All American Lung Association rankings found at www.stateoftheair.org/2015/city-rankings/most-polluted-cities.html. All documents incorporated by reference and/or provided via embedded links herein are requested to be part of the administrative record for this matter. In addition, excerpts from State of the Air are attached hereto as Exhibit 1.

areas in the nation designated "extreme" ozone polluted areas by the U.S. EPA[6]. The region also fails to meet the NAAQS for fine particulate matter that measures less than 2.5 microns in diameter, and is therefore referred to as "PM2.5". (DEIR/S at pp. 3.13-7, 3.13-7.) The DEIR/S also admits that the region fails to meet the more stringent California Ambient Air Quality Standards (CAAQS) for ozone, fine particulate matter, and larger breathable particulate matter (less than 10 microns in diameter, and therefore referred to as "PM10"). (DEIR/S at 3.13-7.)

The main body of the DEIR/S presents only one page with very small print that gives a short description of the adverse health effects of these pollutants (DEIR/S at 3.13-7), and the Air Quality Assessment Report displays a three-page table with only short summaries of health effects of the various pollutants (DEIR/S at 2-6-8). This lack of full information about the severity of the area's air pollution problem is a critical and inexcusable failure to provide the full environmental disclosure that NEPA and CEQA require. Exposure to ozone at levels present in the greater Los Angeles area have been shown to interfere with the lung development in children, leading to significant lung damage as they reach adulthood.[7] Children exercising during high-ozone days have been found to be at risk of developing asthma. The DEIR/S presents data from air pollution monitors in Pasadena and downtown Los Angeles that make it appear that ozone is no longer a serious problem (p. 3.13-5-6), but the California Air Resources Board reports that Los Angeles County exceeded the health-based state standard for ozone on 66 days in 2014, 59 days in 2013, and 79 days in 2012, showing that air pollution is still a critical public health problem. (http://www.arb.ca.gov/adam/topfour/topfour2.php.) Since ozone is a regional pollutant, emissions from the Project will contribute to that problem.

Particulate matter pollution is also a serious threat to health. The DEIR/S admits that exposure to fine particulate matter, PM2.5, can cause cancer, and presents maps showing areas where various alternative Projects are projected to cause various rates of increased cancers.[8] (Health Risk Assessment, Figures 11-19.) However, the DEIR/S does not discuss, outside of the brief paragraph-long descriptions cited above, the non-

6 California's San Joaquin Valley is the other "extreme" ozone area.

7 Gauderman, et al., "The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age," New England Journal of Medicine, vol. 351, no. 11, pp. 1057-1067 (Sept. 2004), attached hereto as Exhibit 2.

8 Discussed further, infra.

cancer health damage caused by exposure to particulate matter in the air. For example, the American Heart Association, in a 2010 Scientific Statement, presented its expert conclusion that exposure to PM2.5 for even a few days to weeks can trigger both fatal and non-fatal heart attacks; exposure for longer periods can shorten life expectancy in the exposed population.[9][10] The Health Risk Assessment calculates the levels of "non-cancer chronic and acute risks" from exposure to Project-caused MSAT emissions (see, e.g., HRA at p. 3-5), but it never spells out for the public the full nature of these risks, and certainly does not make clear that cardiovascular disease and heart attacks are among them.

CEQA requires that an agency "find out and disclose all it reasonably can" about the environmental consequences of a project. (CEQA Guidelines § 15144; see also, Santiago County Water Dist. v. County of Orange (1981) 118 Cal.App.3d 818, 829 (decision to approve or disapprove an a project "is a nullity if based upon an EIR that does not provide the decision makers, and the public, with the information about the project that is required by CEQA"); NEPA Guidelines at § 1502.16(a), (b), and (d); Kern v. U.S. Bureau of Land Management (2002) 284 F.3d 1062, 1072.)

CEQA and NEPA both require the disclosure and consideration of relevant public health information and of a project's effects on human health. (CEQA Guidelines § 15126.2(a); Bakersfield Citizens for Local Control v. City of Bakersfield (2004) 124 Cal.App.4th 1184, 1219; Metropolitan Edison Company v. People Against Nuclear Energy, et al. (1983) 460 U.S. 766, 771 ("NEPA requires agencies to consider effects on health"; City of Las Vegas, Nev. v. F.A.A. (9th Cir. 2009) 570 F.3d 1109, 1115 ("Although NEPA is primarily concerned about the environment, the regulations state that, in determining whether a federal action would 'significantly' affect the environment, the agency should consider '[t]he degree to which the proposed action affects public health and safety' [citing the NEPA Guidelines at 40 C.F.R. § 1508.27])."

The DEIR/S fails in this duty as to the non-cancer risks from exposure to

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9 Brook, et al., "Particulate Matter Air Pollution and Cardiovascular Disease – An Update to the Scientific Statement from the American Heart Association" (2010), attached hereto as Exhibit 3, and available at http://circ.ahajournals.org.

10 See also, "What is a safe distance to live or work near high auto emission roads?" San Diego UrbDeZine, May 18, 2015, attached hereto as Exhibit 4, and available at http://sandiego.urbdezine.com.

particulate matter pollution. The Health Risk Assessment does present calculations of the "non-cancer chronic and acute risks" (HRA at p. 2-1), but does not define these risks beyond the facts that they are non-cancer, and are either chronic or acute.[11] The decision makers and the public cannot know whether the numbers in the Health Risk Assessment do or do not include asthma, decreased lung function, heart disease, heart attacks, or other known health effects of the various components of automobile and truck emission other than carcinogens. The DEIR/S and its various appendices grossly fail to provide adequate information as to the human health impacts of the Project.

The document also fails to perform a carbon monoxide "hot spot" analysis for the La Cañada Flintridge areas where traffic and congestion will both increase, thereby also increasing the emissions of carbon monoxide and the chances that a hot spot will occur. La Cañada Flintridge requests such an analysis.

4. The DEIR/S Fails to Address California's Ambient Air Quality Standards.

Another grave failure of the DEIR/S to provide full environmental disclosure is its failure to address the California Ambient Air Quality Standards (CAAQS), even though they are as fully legally applicable to the Study Area and the region as the National Ambient Air Quality Standards (NAAQS)[12] (DEIR/S, p. 3.13-1; Air Quality Assessment, p. 3-1.) Not only are the CAAQS more stringent than the NAAQS, but some address different lengths of time over which pollutants are averaged (e.g., the year-long average standard for PM10) than the NAAQS, and different, perhaps more stringent, control measures may be required in order to meet them. Nor does the federal Clean Air Act Conformity analysis, discussed below, demonstrate compliance with the CAAQS, or show the effect of the Project on meeting the CAAQS.

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11 The HRA is confined to the risks posed by MSATs, but diesel particulate emissions are included in the definition of MSATs. (DEIR/S at p. 3.13-31.) As discussed above, cardiovascular risks posed by exposure to diesel particulates have been demonstrated. Therefore, at least the cardiovascular risks posed by the diesel particulate component of the MSAT total could and should have been calculated, given their severity (including possible death). If a quantitative analysis is not feasible, the DEIR/S should have demonstrated that infeasibility and made whatever qualitative analysis is feasible.

12 The federal Clean Air Act ("CAA"), found at 42 U.S.C §§ 7400, et seq., explicitly permits states to adopt and enforce their own air quality standards, so long as those standards are more stringent than their federal counterparts. 42 U.S.C. § 7616. No federal preemption applies.

The CAAQS are found at California Code of Regulations, title 17, § 70200, Table of Standards. They are adopted by the California Air Resources Board under authority granted by the California Health and Safety Code, § 39601, are generally more stringent than the NAAQS, and cover more pollutants than the NAAQS. The DEIR/S admits that the region fails to meet the CAAQS for ozone, PM10, PM2.5, and nitrogen oxides (DEIR/S at p. 3.13-7), but does not present any analysis of the Project's impact from failing to meet the CAAQS, despite the provision in the CEQA Checklist that requires an examination of and answer to the question:

III. Air Quality. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determination. Would the project:

> (c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal *or state* ambient air quality standard (Including releasing emissions which exceed quantitative thresholds for ozone precursors)?

(CEQA Guidelines Appendix G, Environmental Checklist, Evaluation of Environmental Impacts, Section III(c), found at DEIR/S vol. II, p. 3, emphasis added.)

The DEIR/S does not appear to have any evaluation of impacts of the Project on attainment of the CAAQS at all, despite the fact that the basin is in non-attainment of the CAAQS for ozone (both one-hour concentrations and eight-hour concentrations), for PM10, for PM2.5, and for nitrogen dioxide. (DEIR/S, Table 3.13.3, p. 3.13-7). The DEIR/S simply ignores Project impacts on the CAAQS for ozone, nitrogen dioxide, and for both PM10 and PM2.5 (insofar as PM10 and PM2.5 are criteria, i.e., conventional, pollutants covered by ambient air quality standards), performing no analysis of the impacts of Project-caused emissions on those CAAQS.

The DEIR/S does not offer any evidence that the CAAQS will be met by the opening year of any Project alternative. If they are not met, then added pollutant emissions from the Project may interfere with meeting them. If they are met, then added pollutant emissions from the Project might push the region back into nonattainment. Either way, analysis of added emissions from the Project should be given to the public and the decision makers. For example, opening year nitrogen oxide emissions from all Dual-Bore alternatives exceed the emissions from the No-Build alternative, and emissions of PM10 and PM2.5 from all Single-Bore and Dual-Bore alternatives exceed these emissions from the No-Build alternative. (Air Quality Assessment at p. 5-21.)

These emissions may affect either meeting or maintaining the CAAQS for nitrogen dioxide, ozone[13], and particulate matter.

The DEIR/S' failure to analyze and disclose the impacts of the Project on the CAAQS is a per se violation of CEQA, and the document must be revised and recirculated to provide the decisionmakers and the public with this analysis.

5. The Analysis of Conformity With Federal Clean Air Act Requirements Does Not Excuse a Failure to Address the California Ambient Air Quality Standards.

The DEIR/S and its appendices only examine the consistency of the Project with federal Clean Air Act requirements, namely a so-called "conformity" analysis. (See, e.g., DEIR/S at pp. 3.13-1-2, 3.13-14-31.) This conformity analysis addresses only the conventional pollutants (also called "criteria" pollutants), meaning pollutants for which definite, numerical, federal standards have been set by the U.S. EPA. (DEIR/S, p. 3.13-1.) Each state must have a State Implementation Plan (SIP) by which it will attain the National Ambient Air Quality Standards (NAAQS). (42 U.S.C. § 7410.) The conformity process was put into the Clean Air Act to prevent federal agencies from "engag[ing] in, support[ing] in any way or provid[ing] financial assistance for, licens[ing] or permit[ting], or approv[ing], any activity which does not conform to [a state] implementation plan." (42 U.S.C. § 7506(c)(1).) In other words, Conformity is intended to prevent the federal government from carrying out, funding, or approving actions that add pollutants to a state's air while the state is carrying out a federally mandated plan to reduce those pollutants. The Clean Air Act does this by requiring that federal actions make findings that their actions "conform" to the provisions of the SIP. "These safeguards prevent the Federal Government from interfering with the States' abilities to comply with the C[lean] A[ir] A[ct's] requirements." Department of Transp. v. Public Citizen (2004) 541 U.S. 752, 758.

Conformity is a tool used by the federal government to ensure that it is not investing taxpayer dollars in projects that worsen air quality, and to ensure that the air quality impacts of federally funded projects are being planned for by the states and localities that receive the funding. By its nature, it addresses only the NAAQS, not the California standards. At page 5-7, the Air Quality Assessment states that the Conformity analysis covers only the federal PM10 and PM2.5 standards, leaving the CAAQS

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13 Nitrogen oxides are precursor emissions that combine with reactive organic gas (ROG) emissions in sunlight to form ozone. (Air Quality Assessment at p. 4-1.)

unaddressed. Nor does the Clean Air Act's Conformity section (42 U.S.C. § 7506) preempt the CAAQS. Nor could they, since, as noted above, the Clean Air Act does not preempt the setting and enforcement of state air quality standards (42 U.S.C. § 7416), but explicitly allows states to set and enforce separate, more stringent standards, as the CAAQS are.

Beyond being irrelevant to the Project's impact on the CAAQS, the Conformity determination discussed in the DEIR/S also fails to be the accessible, clear discussion of air quality that NEPA and CEQA require. (CEQA Guidelines § 15140, requiring CEQA documents to "be written in plain language"; NEPA Guidelines § 1502.8, requiring environmental impact statements to "be written in plain language.") The DEIR/S' discussion of how certain computerized modeling of air quality and pollutant concentrations was done cannot possibly be described as plain language – it is, instead, often pure "geek speak", and prevents the public from understanding and evaluating the quality of the background work that purports to support the Conformity analysis. (See DEIR/S at 3.13, p. 20-21.) This is a failure to perform the DEIR/S' central function as an informational tool.

Finally, because it fails to analyze the impacts on the CAAQS of the Project, the DEIR/S does not propose adoption of mitigation for those impacts. The only mitigation measures proposed relate to construction, not operation, and, as discussed below, even those are woefully inadequate.

6. The DEIR/S' analysis of Construction Emissions is Inadequate.

The DEIR/S is careful to point out that construction emissions, because they would not last longer than five years at any one general location, are exempt from a federal conformity analysis for compliance with plans to meet the NAAQS. (DEIR/S, p. 3.13-10.) This, however, does exempt them from either NEPA or CEQA analysis, or an analysis of their impacts on meeting the CAAQS. A full analysis of construction emissions must be done under those statutes.

The DEIR/S does provide information on the maximum pollutant emissions *per day* from construction of the various alternatives (DEIR/S, p. 3.13-11), but this should be only the start of the analysis. Construction of the Project may extend for up to five years (DEIR/S, p. 3.13-10); the estimated per year and total construction emissions of all criteria and MSAT pollutants should be calculated and presented. The current table, listing only per-day emissions, minimizes the amount of aerial pollution that will be dumped into the Study Area air over the construction of the Project.

Nor is the significance of the emissions made clear. While the DEIR/S does not adopt significance criteria for construction emissions, the South Coast Air Quality Management District (SCAQMD) has adopted such thresholds for use in evaluating projects under CEQA within the SCAQMD's jurisdiction, as this Project is.[14] The DEIR/S could and should have presented and applied these thresholds, which are applicable in the Study Area. Below, we have created a table comparing the data in the DEIR/S' Table 3.13-4, Maximum Construction Emissions by Alternative (lbs. /day), found at page 3.13-11, with the SCAQMD thresholds. All numbers refer to pounds per day of pollutant emissions.

Comparison of Project Construction Emissions with SCAQMD Significance Thresholds (lbs./day)

Alternative	**Reactive Organic gases (ozone precursor)**[15]	**Carbon Monoxide**	**Nitrogen Oxides (ozone precursor)**	**PM10**	**PM2.5**
TSM/TDM	49	548	935	513	130
Bus Rapid Transit	12	123	206	327	74
Light Rail Transit	119	1,335	2,242	720	207
Freeway Tunnel Single-Bore	214	2,167	4,337	1,116	330
Freeway Tunnel Dual-Bore	237	2,284	4,926	1,460	411
SCAQMD Significance Thresholds (lbs./day)	**75**	**550**	**100**	**150**	**55**

14 Found at www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn+2, and attached hereto as Exhibit 5.

15 Ozone is not directly emitted, but forms in the air when reactive organic gases (ROG), also sometimes referred to as volatile organic compounds (VOC), mix with nitrogen oxides in the air in the presence of sunlight. (DEIR/S, Table 3.13-3, found at p. 3.13-7, in the box describing "Typical Source" for ozone.)

As the table above shows, the pollutant emissions projected for construction of the Project exceed SCAQMD significance thresholds for every Build alternative, in some case by forty times or more (e.g., nitrogen oxide emissions for the tunnel alternatives). Only the TSM/TDM alternative fails to exceed the thresholds, and then only for reactive organic gases and carbon monoxide. Construction of any alternative, and especially the tunnel alternatives, will have significant effects on air quality in the areas in which construction will occur.

Impacts of such high significance demand correspondingly serious mitigation, especially since this Project will be built in a heavily populated urban area. The DEIR/S does not provide it. Only five mitigation measures to mitigate all of the criteria pollutant, MSAT pollutant, and GHG pollutant emissions of all construction are set out in the DEIR/S. (DEIRS/S at p. 3.13-40-42.) Of those avoidance, minimization, and/or mitigation measures, several measures simply require compliance with applicable laws and regulations (e.g., AQ-1 requires dust control by compliance with SCAQMD's Rule 403, and AQ-3 requires the construction contractor to use the diesel fuel required by U.S. EPA), some are the most basic common sense (e.g., AQ-3 requires that construction equipment be located away from sensitive receptors and away from buildings' fresh air intakes), and others contain loopholes (e.g., AQ-2 requires the use of cleaner [U.S. EPA Tier 2] diesel engines only if "available, which term is not defined), AQ-3 says to use alternative fuels like natural gas and electric power "where appropriate", which term is also not defined). Strangely, Metro's Green Construction Policy is only applied to the TSM/TDM, Bus Rapid Transit, and Light Rail Transit alternatives, and CalTrans' Standard Specifications for Construction are only applied to the tunnel alternatives. No reason is given for this segregation of mitigation by alternative. Given the gravity of the potential health impacts, the more stringent of these regulatory regimes should be applied to all aspects of Project construction.

At the very least, use of the non-diesel construction equipment, or the cleanest diesel equipment now manufactured, and, where the cleanest diesels are not available, mandatory installation of California Air Resources Board certified particulate traps as retrofits on dirtier equipment, should be adopted. Metro's Green Construction Policy should be applied across the board, and, climate-change mitigation such as cool roofs and pavements should be considered for all construction, as should GHG emissions offsets.[16]

The DEIR/S concludes that these few and inadequate mitigation measures "would

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16 GHG emissions will linger in the atmosphere, sometimes for decades, making offsets an effective mitigation.

reduce construction-related air quality impacts and fugitive dust emissions and construction equipment emissions of the Build Alternatives to less than significant levels." (DEIR/S, p. 4-7.) The document offers no substantial evidence, indeed, no evidence at all, to substantiate this claim. There are no calculations presented in the body of the document that show construction emission levels being reduced below the SCAQMD thresholds of significance, and if they appear in Appendix A to the Air Quality Assessment Report, these technical details are not summarized in that document, as required by CEQA Guidelines § 15147. Substantial evidence is not identified that supports the claim of mitigation of construction emissions to levels of insignificance.

The construction emissions analysis in the DEIR/S is deficient, and should be redone and recirculated, both as to analysis and disclosure of impacts and as to mitigation.

7. The DEIR/S Performs No Analysis of Secondary Particulate Matter Emissions.

All particulates are not directly emitted from stationary sources or from vehicles. As the DEIR/S explains, there are both directly and indirectly emitted particulates. Directly emitted particulates include particulates emitted directly from vehicle tailpipes, particulates emitted as vehicle brakes wear down, particulates emitted as vehicle tires wear down, and road dust that is swept into the air by vehicles traveling over the roads. (DEIR/S at p. 3.13-19.) The DEIR/S explicitly states that it analyzes only these types of directly emitted particulates. (Id.) However, some particulates form in the air through the interaction of chemicals and other materials over time. (Id.) The DEIR/S explicitly states that it does not analyze the environmental or health effects of secondary particulates, that this analysis is subsumed into the determination as to whether the Project is in conformity with the region wide SIP. (Id.)

Yet the only discussion of conformity of the Project with the NAAQS for particulate matter states that "[s]econdary emissions of PM2.5 and PM10 are considered part of the regional emissions analysis prepared for the conforming [Regional Transportation Plan] and [Federal Transportation Improvements Plan]. (DEIR/S at 3.13-20.) *No* analysis of the impacts of the Project on the CAAQS for these pollutants is done in this document, nor are citations provided to any such analysis of conformity with the NAAQS for the Regional Transportation Plan or the Federal Transportation Improvements Plan, to allow a reader to determine the adequacy of those analyses. No analysis of the health effects of such particulates is performed, and no mitigation is identified or proposed for adoption. This is a clear violation of both NEPA and CEQA.

8. The DEIR/S Fails to Calculate Total Local Expected Cancer Cases.

As discussed above, both NEPA and CEQA require that the impacts of a project on human health must be analyzed and disclosed. The DEIR/S and its appendices profoundly fail to adequately identify and disclose the human health effects of the Project, in that they fail to perform a calculation of the total number of cancer cases that can be expected to result from the Project. The DEIR/S affirmatively states:

> "Because the no build and build alternatives of the project would have net health benefits in the region, evaluation of the population cancer burden is not necessary."

CalTrans/Metro do not define "the region." Is it limited to the Study Area? Does it include all of Los Angeles County, or the entire South Coast Air Basin? The reader does not know. The reader does know from the Health Risk Assessment (HRA) that certain portions of the Study Area will be subjected to increased risk of cancer from the Project; maps are provided that show the areas and the level of increased risk. (HRA at Figures 11-19.)[17] It would be reasonable and practical to overlay these maps on standard census tract maps to estimate the total number of persons within each exposure area.[18]

Applying the risk factor given in the Health Risk Assessment (e.g., ten cancer cases per million persons exposed in a given area) to the population total for a given area would yield the estimated total number of expected cancer cases in that area, sometimes called a "population cancer burden." These projected cancer cases could be summed, and the totals presented and compared with the DEIR/S' claims of net "regional" benefits.

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17 The Health Risk Assessment also contains maps showing the cancer risk for various areas *as compared with conditions in 2012* (HRA at Figures 1-10), apparently asserting that the overall decrease in the cancer risk from vehicle emissions that will be brought about by U.S. EPA, California Air Resources Board, and South Coast Air Quality Management District regulations and enforcement actions are somehow part of the SR-710 North Extension project. While local cancer risks in some areas would be reduced over current conditions by the shift in vehicle traffic that the Project would cause, the overwhelming bulk of the reductions are not due to the Project, but to the regulatory agencies' actions over many years. It is misleading for the Project to appear to take credit for them.

18 CalTrans/Metro clearly has access to such maps, since they are used in the Environmental Justice section of the DEIR/S (e.g., at 3.3-57-58), and in Appendix L.

Such analyses have been done for Proposition 65 environmental exposures, and should have been done in the Health Risk Assessment for the areas in Figures 11 through 19 that show increased cancer risk due to various Project alternatives. (See "Technical Support Document for Exposure Assessment and Stochastic Analysis, FINAL," August, 2012, Tier 4 Analysis, available at the Office of Environmental Health Hazard Assessment website at www.oehha.ca.gov/air/hot_spots/pdf/2012tsd/TSDportfolio2012.pdf.)

The decision makers and the public would benefit from estimated numbers of persons in specific areas who are expected to develop cancer as a result of the various Project alternatives, although CalTrans/Metro should perform both a local and a regional cancer burden analysis. Such information, as the California Supreme Court stated in Laurel Heights Improvement Committee v. Regents of the University of California (1988) 47 Cal.3d 376, 392, would enable the public to "know the basis on which its responsible officials either approve or reject environmentally significant action, and the public, being duly informed, can respond accordingly to action with which it disagrees." Portions of La Cañada Flintridge lie within a zone of increased cancer risk for several alternatives, including the TSM/TDM alternative (HRA, Figure 11), the BRT alternative (HRA, Figure 12), the LRT alternative (HRA, Figure 13), and all tunnel alternatives that do not ban trucks (HRA, Figures 14, 15, 17 and 18).

As far as can be discerned from the small maps in the Health Risk Assessment, some of these risk zones appear to encompass multiple sites where children will be present, including multiple schools and at least one day care center. A color map showing the location of schools in La Cañada Flintridge, and showing their proximity to the I-210, is attached to this letter as Exhibit 7. All of these zones include some residential areas. La Cañada Flintridge wants to know, and is entitled to know, how many of its residents – particularly its children – would be exposed to what level of cancer risks as a result of the Project. This is part of CalTrans/Metro's duty under NEPA Guidelines § 1502.15 to describe the environment of the area to be affected by the proposed project, and CEQA Guidelines § 15125 (same). We believe that every city within the increased cancer risk zones wants, and is entitled to, the same knowledge. In addition, the decision makers should be able to evaluate this information, and balance it against the information as to the number of persons who will be able to make two and one-half minute shorter trips – a main Project benefit cited in the DEIR/S – if the Project is carried out. (DEIR/S, p. 3.5-37.)

Since the maps in the Health Risk Assessment clearly show that Project construction will redistribute the existing cancer risk around the Study Area and beyond, depending on which Project alternative is chosen (HRA, Figures 11-19), the calculation should be made for all areas that would be exposed to increased cancer risks from the Project. The same calculation should be performed for non-cancer risks, including risk of heart disease and heart attacks. This information would allow the decision makers and the public to know the full health consequences of choosing one alternative over another, including the consequences of choosing a Build over the No-Build alternative.

In addition, the DEIR/S shows that it is possible to identify the location of sensitive receptors, using the same system of identification used for the Atmospheric Modeling system (AERMOD) analysis for the tunnel alternatives (HRA, p. 2-13). The sensitive receptors in each area of increased exposure to particulate pollution from the Project's various alternatives should be plotted and provided to the decision makers and the public.

This analysis would also allow the identification of potential mitigation measures for the increased exposure to MSATs, something that is barely discussed in the DEIR/S, and generally only in the context of Project construction, not operation. If sensitive receptors are identified in areas of increased exposure, such measures as retrofitting schools and day care centers with HEPA filters on air conditioners to filter out particulates, at least while children are indoors, could be carried out. It is CalTrans/Metro's affirmative duty under CEQA to identify and adopt all feasible mitigation, including for Project operation. (Pub. Res. Code §§ 21002, 21081(a).)

We note also that emissions of diesel particulates may be underestimated by the DEIR/S. The filters through which vehicle emissions in the tunnels would pass are assumed to have an efficiency of between 80% and 99+% removal of particulates, with the 80% figure used to be conservative. (HRA, p. 2-7.) However, details about the filters are extremely sketchy, and do not, without more, appear to constitute substantial evidence for these removal numbers. The Health Risk Assessment rightly states that control efficiency of the filters depends on the distribution of particle size (id.); presumably, the smaller the particles, the less the filter efficiency. However, there is evidence that ultrafine particulates as small as 0.1 micron in diameter, capable of being deeply inhaled, can have health effects as serious as those of PM2.5, including exacerbating or even causing heart and respiratory diseases.[19]

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19 See, e.g., Ostro, et al., "Associations of Mortality with Long-Term Exposures to Fine and Ultrafine Particles, Species and Sources: Results from the California Teachers Study Cohort," Environmental Health Perspectives, vol. 123, no. 6, pp. 549-556 (June 2015), attached hereto as Exhibit 6.

The DEIR/S provides no data on the particle size proven to be controlled by the filters, or the filters' continued efficiency (or deterioration) over time. Although a citation (presumably, to a vendor) is given, no description of the contents of the referenced work is provided. Without backup data, the decision makers and the public cannot know whether ultrafine particles will be controlled and at what efficiency, or the overall durability and reliability of the filters and filtration system as to all sizes of particles, and over what time frame.

This is too important an impact to be taken solely on trust. If the particulate emissions from the tunnels are understated, then the health risks may be significantly greater than the DEIR/S estimates. CalTrans/Metro must provide more than a single citation, without more, in order to claim that substantial evidence supports the DEIR/S' conclusions as to particulate emissions from the tunnel alternatives.

9. The DEIR/S' Treatment of Greenhouse Gas (GHG) Emissions Due to the Project is Inadequate.

The DEIR/S' treatment of climate change and greenhouse gas (GHG) emissions begins with a disclaimer that "it is too speculative to make a significance determination regarding the project's direct and indirect impact with respect to climate change." (DEIR/S, p. 4-60.) The "analysis" that follows appears colored by this position. Although CalTrans acknowledges the existence of Executive Orders EO-3-05 and EO-01-07, which mandate reductions in California's GHG emissions on general timetables (Id.), the analysis never compares the GHG emissions from the Project to the requirements of either Executive Order. Such a comparison should have been made, since 40% of California's GHG emissions come from the transportation sector, and the requirements of EO-3-05 and EO-01-07cannot be met without significant reductions in transportation-caused GHG emissions.

CalTrans is a state agency, and is bound by the terms of these Executive Orders. At least a comparison of Project emissions with the mandated emissions reductions of the Executive Orders should be provided. The document shows that both total vehicle miles traveled (VMT) (Air Quality Assessment, p. 5-29) and per capita VMT rise in the Study Area by the horizon year of 2035, contradicting the goals of the Executive Orders, AB 32, and SB 375 (the Sustainable Communities and Climate Protection Act of 2008, Health and Safety Code §§ 65080, et seq.).

The DEIR/S claims that the GHG emissions from Project operations would be slightly lower than the No-Build, as shown in Tables 4.9-4.11 (p. 4-100). These Tables present the per-day GHG emissions, rather than the standard convention of per-year totals, presumably to make the Project's GHG emissions appear as small as possible. The DEIR/S also separately reports the GHG emissions from Project construction from the operational emissions (Table 4-12, p. 4-101), despite the fact that both sets of GHG emissions are attributable to the same Project, again making the totals appear smaller. Adding in the daily emissions due to electricity needed to power the Light Rail alternative and the ventilation, lighting, etc., needed to operate the tunnels would reduce even the modest GHG emissions reductions shown in the DEIR/S. Even without this addition, the GHG emissions from the LRT and BRT alternatives exceed the No-Build alternative's emissions in 2035. Because the DEIR/S cuts off analysis at 2035, the public cannot know whether the GHG emissions of the Project's other alternatives would continue to rise as well, reducing or eliminating the supposed GHG benefits of the Project.

Finally, mitigation measures for GHG emissions are almost completely limited to construction emissions, except for using LED lighting in the tunnel alternatives. No real operational mitigation is proposed, despite the fact that the Tables show a slowing in the difference between Project per-day GHG emissions and No-Build per-day GHG emissions between 2025 and 2035, and total Project area vehicle miles traveled (VMT) are projected to increase by 11.3% (Air Quality Assessment, p. 5-29), implying that GHG emissions will also rise. Yet no mitigation beyond LED lighting is discussed or adopted. Offsetting of Project GHG emissions (e.g., by buying and crushing old, inefficient vehicles, which would also reduce conventional and MSAT pollutant emissions in the area)[20] is not even discussed. In violation of CEQA, the DEIR/S fails to identify and recommend for adoption all feasible mitigation.

IV. TRAFFIC IMPACTS HAVE NOT BEEN ADEQUATELY DISCLOSED AND ANALYZED.

1. The DEIR/S's Traffic Analysis is Not Supported by Substantial Evidence and Fails Both to Provide Adequate Information and to Identify or Propose all Feasible Mitigation Measures for Adoption.

La Cañada Flintridge has had an analysis of the traffic impacts of the SR-710 extension project performed by a well-respected transportation engineering firm; its report is attached as Exhibit 8 to these comments. The report shows that the DEIR/S'

20 Should a toll alternative be chosen, use of toll revenue might be considered for this purpose, as part of the environmental mitigation for Project impacts.

traffic analysis fails to comply with CEQA both as an environmental full disclosure document, and as a substantive document of mitigation and environmental protection. In addition, these failures also corrupt the basis of the air quality analysis, likely leading to an underestimation of the amount of new criteria and toxic pollutants the Project will cause to be dumped into the air La Cañada Flintridge residents must breathe.

2. The DEIR/S Uses a Transportation Model That Has Not Been Shown by Substantial Evidence to be Valid, Potentially Invalidating the Traffic Analysis, and the Air Quality Analysis.

The importance of the transportation modeling in the DEIR/S cannot be overstated. One of the main objectives of the Project is to "[i]mprove efficiency of the existing regional freeway and transit network." (p. 1-8.) Reliable predictions as to whether, and how well, the various Project alternatives can or cannot meet this objective depend on accurate and adequate transportation modeling. In addition, the air quality analysis and noise analysis both depend heavily on the volumes of traffic expected, for example, to use the Project's Freeway Tunnel alternatives. Without accurate predictions of traffic volume, timing, and location, air pollutant emissions levels cannot be accurately modeled. Projections of traffic volumes form the basis for the air quality analysis, as, for example, in the use of traffic counts for various intersections and freeway segments in the Air Quality Assessment (see, e.g., pp. 5-9), and modeled average daily traffic data that were used as input to air quality models in order to project the expected pollutant emissions and concentration along various surface streets and freeway segments. (See, e.g., Air Quality Assessment Report at 5-14 to 5-15.)

The traffic volumes projected by CalTrans/Metro's traffic models also form the basis for the calculation of expected MSAT emissions and the inputs to the toxics concentration modeling whose results are reported in the Health Risk Assessment. (E.g., at 2-1 to 2-2, 2-5 to 2-6.) In addition, modeling results form the basis for the federal Clean Air Act Conformity determination, crucial to Project funding. (DEIR/S at 3.13-16-17, and 3.13-21-22.) If the model used by CalTrans/Metro is not valid, if it does not predict future traffic volumes at specified locations and time periods (such as AM and PM commute times) with acceptable accuracy, then not only the DEIR/S' conclusions as to Project's traffic impacts, but its conclusions as to air quality impacts, lack substantial supporting evidence. In that case, the DEIR/S is inadequate under both NEPA and CEQA as an informational document. (Inland Empire Public Lands Council v. U.S. Forest Service (9th Cir. 1996) 88 F.3d 754, 758; Save Our Peninsula Committee v. Monterey County Bd. of Supervisors (2001) 87 Cal.App.4th 99, 128.)

That is exactly what the traffic report done for La Cañada Flintridge by the Willdan Group (hereafter "Willdan Report") shows. Evaluating the modeling results on several crucial points, the Willdan Report shows that the SR-710 North travel model used by CalTrans/Metro does not appear to be valid, and likely underestimates the traffic volumes predicted in the DEIR/S. If a traffic model is valid, its predictions should match reality within a reasonable range, and not predict unacceptably high or low results. The DEIR/S itself in its Transportation Technical Report, Table 3-2, compares the volumes of traffic predicted by its model with actual volumes ("counts") in the real world, calculating the percentage by which the model outputs either exceed (a positive number) or are less than (a negative number) actual traffic volume counts. These percentage variances between the modeled traffic volumes and actual counted traffic volumes are compared with the range of model-to-count variations that CalTrans' guidelines and Federal Highway Administration guidelines specify as acceptable. (Table 3-2, reproduced at page 3 of Willdan Report.) This comparison shows whether the percentage variations from real counts for the DEIR/S' model are within an acceptable range, or whether the model's predictions vary from reality too much for it be used and relied on as an acceptable, validated model.

Table 3-2 shows that, as compared with CalTrans' and FHWA's own guidelines, the model's predictions fall outside a range considered acceptable for a valid model as to more than half of the predictions being evaluated. (See Willdan Report at p. 2.) The DEIR/S claims that its model is well validated, but does not explain why a model that fails to conform to CalTrans' own guidelines (and FHWA's) for model validation to this degree can be considered valid. Without a well-supported explanation of why the model is valid, despite its significant deviance from the requirements of CalTrans' and FHWA's guidelines, the DEIR/S lacks substantial evidence supporting the traffic analysis, the air quality analysis, and probably the noise analysis.

Similarly, Figure 6-5, in Appendix A to the DEIR/S' Transportation Technical Report, called the Model Validation Report, compares the modeled volume of traffic for various kinds of streets, for on- and off-ramps, and for freeways, with actual counts for these streets, ramps, and freeways. The straight lines going from the lower left corner to the upper right corner of the graph show what complete agreement between the model's predictions and actual counts for PM volumes would look like, while the data points show where the model's predictions varied from the count. The Willdan Report concludes that the preponderance of points below the model-to-count agreement line shows that the model predicts PM traffic volumes that "could be very low compared to what they should be. The resulting analysis would indicate much better LOS [i.e., less congestion] than there actually would be." (Willdan Report at p. 3, emphasis in original.)

The DEIR/S currently lacks substantial evidence supporting the accuracy and acceptability of its transportation model. Lacking traffic projects produced by a valid transportation model, the air quality analysis, including the Conformity analysis, are also not supported by substantial evidence. The DEIR/S fails as an environmental full disclosure document under both NEPA and CEQA. (NEPA Guidelines § 1502.16; CEQA Guidelines § 15003(c).)

3. The Thresholds of Significance in the Traffic Analysis Impermissibly Minimize the SR-710 Extension Project's Impacts on Signalized Intersections.

A lead agency has some discretion to set significance levels under CEQA for the evaluation of project impacts. (Guidelines § 15064.7.) However, once agencies have set such thresholds, the public has the right to expect that the agency will apply the applicable thresholds consistently. Here, LA Metro, in its Congestion Management Plan (CMP), and the Los Angeles City's Department of Transportation (LADOT) have adopted significance thresholds that inform the decision makers and the public when a project's effects on traffic become significant. Such a finding of significant impact, of course, triggers a CEQA duty to impose all feasible mitigation for such significant impacts. (PRC §§ 21002, 21081(a); Guidelines § 15126.4(a).)

Here, CalTrans/Metro has ignored thresholds of significance established by LA Metro for intersections governed by the CMP, and have adopted significance thresholds for the Project that are more lenient (require a higher impact to be considered significant) than the CMP thresholds, and more lenient than Los Angeles County's Department of Public Works and LA DOT's thresholds. (See Table "Comparison of Significant Impact Thresholds" in Willdan Report at p. 6.)

In some cases, the specially set thresholds of significance for the Project are over twice as lenient as other agencies' thresholds, and may deem over a hundred signalized intersections as not significantly affected, when they would be deemed significantly affected under the CMP or LA DOT standards. (See id.) By creating these looser thresholds of significance, CalTrans/Metro may have violated one of the most central principles of CEQA, namely that all feasible mitigation must be adopted for significant impacts from a project. (City of Marina v. Bd. of Trustees of the California State University (2006) 39 Cal.4th 341, 350.) CalTrans/Metro must provide an adequate justification for the thresholds it uses, in order to have an EIR/S that complies with CEQA.

4. The Thresholds of Significance in the Traffic Analysis Impermissibly Minimize the SR-710 Extension Project's Impacts on Freeway Segments.

The Willdan Report also compares the benchmarks used in the DEIR/S to identify freeway segments that would be significantly affected by the Project to CalTrans' own criteria. (See Willdan Report at pp.7-8.) It concludes that CalTrans/Metro has ignored CalTrans' own Measures of Effectiveness (MOE), in which the target MOE for freeway segments is between Level of Service (LOS) C and LOS D, and mitigation must be applied if the MOE is exceeded. Here, by contrast, CalTrans/Metro appears to have abandoned this MOE, and will classify a freeway as significantly affected by the Project only if it is expected to operate at LOS F under a Build Alternative, and if traffic demand increases by 2 percent or more. In other words, only outright gridlock is unacceptable and requires mitigation; anything less than gridlock apparently will not be mitigated.

Without more justification, use of benchmarks that are such a departure from CalTrans' normal benchmarks of significant impacts would require a far greater showing of justification than the DEIR/S currently supplies in order for the DEIR/S to provide substantial evidence supporting the DEIR/S's conclusions about lack of significant impacts and lack of need for mitigation as to freeways. This is especially true for a Project, one of whose chief purposes is to improve freeway system efficiency and, presumably, decrease congestion. Willdan has identified multiple freeway segments and ramps on I-210 that would require mitigation under CalTrans' normal MOE standards, and each one should be analyzed and examined for significant impacts and need for mitigation. (Id. at p. 7.)

5. The DEIR/S Does Not Comply with CEQA's Mandate That All Significant Impacts Be Mitigated or That Mitigation be Shown to be Infeasible.

The Legislature was clear in passing CEQA that "the long-term protection of the environment, consistent with the provision of a decent home and suitable living environment, for every Californian, shall be the guiding criterion in public decisions." (PRC §21001, subd. (d).) CEQA mandates that "[e]ach public agency shall mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so." (PRC § 21002.1(b).) If it is infeasible to mitigate any significant environmental impact from a project, the public agency must make findings that mitigation is infeasible for specified reasons, or that the mitigation is the responsibility of another agency. (PRC § 21081(a).) The DEIR/S fails this mandate as to traffic impacts.

As the Willdan Report sets out in detail (see pp. 8-9), CalTrans/Metro identify multiple intersections and freeway segments that would suffer significant impacts from various Project alternatives in Tables 3.5.12 and Table 3.5.13 in the DEIR/S. Some "potential improvement" is listed for each such impact, presumably as potential mitigation. Most of the "potential improvements" are not recommended for adoption. However, instead of making a showing of infeasibility, the DEIR/S gives what might be called a shorthand reason, such as that the "potential improvement" would cost too much, or would require acquisition of additional land. While some, or all, of these reasons may be true, the DEIR/S does not make the actual showing of infeasibility, supported by substantial evidence, that CEQA requires. Further, as Willdan points out (p. 8 of Report), the DEIR/S does not even demonstrate that each "potential improvement" would, if applied, actually mitigate the significant impact. This portion of the DEIR/S is patently inadequate under both NEPA and CEQA. This lack of mitigation will impact La Cañada Flintridge seriously, causing greater congestion, slower traffic, and probably increased air pollutant emissions. (See Willdan Report at p. 9.)

In sum, the DEIR/S profoundly fails to comply with NEPA and CEQA as to traffic impacts. The document must be rewritten to comply with these statutes, and recirculated, so that the public can be adequately informed as to the impacts of the Project on traffic and the roads and freeways.

V. SEISMIC IMPACTS HAVE NOT BEEN ADEQUATELY DISCLOSED AND ANALYZED.

The Geology/Soils/Seismic/Topography section does a good job of describing the existing environment and enumerating the hazards posed by the known and presumed active faults, but is extremely vague as to the likelihood of any of the hazards occurring. It is almost silent as to what types and degrees of damage to the human environment could occur if any of the hazards it identifies should actually occur. Finally, it is terse and conclusory as to methods by which the dangers would be prevented, and silent as to how any damage would or could be remedied.

The DEIR discloses that all Project alternatives would cross the Raymond Fault, an active fault with the capability to produce a 6.7 magnitude earthquake, and two potentially active faults, the Eagle Rock and the San Rafael. (DEIR/S, p. 3.10-4.) It also discloses that the Light Rail Transit and the tunnel alternatives, which involve excavation and tunnel construction below ground surface (Light Rail tunnel crown about 60 feet below ground surface, and Freeway tunnels about 120-250 feet below ground surface) would cross the Raymond and San Rafael faults at tunnel level. The Freeway tunnels would also cross the potentially active Eagle Rock fault. (Geologic Hazard Evaluation to Support Environmental Studies Document SR 710 North Study, Los Angeles, hereafter "Geologic Hazard Evaluation", at p. ES-1, ES-5.)

Building such structures directly across active faulting zones poses substantial dangers. The DEIR/S lists such dangers, but gives grossly inadequate information as to the environmental effects that could occur, or the mitigation measures that CalTrans/Metro would use to avoid or minimize the dangers. In most cases, the answer is a combination of stating that CalTrans/Metro would follow existing regulations and design standards, and stating that mitigation would be based on geologic studies that would be done only after public review is completed and the EIR/S is certified.

The air quality consequences of CalTrans/Metro's decision not to select a preferred Project alternative were discussed above. That decision has also crippled the DEIR/S' ability to provide the relevant information to the public about the seismic dangers the Project poses, and the viability of proposed mitigation measures for those dangers. For example, the determination of the actual ground motion that the Project might be subjected to from possible earthquakes will not be determined until a "decision is made on the final Alternative for development." (Preliminary Earthquake Acceleration Response Spectra, SR 710 North Study, Los Angeles County, California (hereafter, "Spectra Study", p. 2, found in the Geologic Hazard Evaluation.) Additional field studies "to provide more specific geotechnical information" will also wait until a specific Project alternative is chosen. CalTrans/Metro's decision not to identify a preferred Project has deprived the public of timely information about the degree of threat from possible earthquakes.

Nor is that the only information missing from the DEIR/S. Despite the DEIR/S' repeated assertions that it will use existing design standards and specifications in designing and building the alternatives that require tunnels, the Geologic Hazard Evaluation states that "[n]o Caltrans seismic design criteria for tunnels are currently available . . . . Project site-specific seismic criteria will be developed in future design phases and used for final design of the Freeway Tunnel." Here, the split between CalTrans' and Metro's jurisdiction becomes apparent. Metro has seismic design criteria, having built subway tunnels, but apparently these criteria would not be applied to the Freeway tunnels, which would be controlled by the seismic criteria CalTrans has yet to develop, and that CalTrans seemingly would develop only after CEQA review is completed. (Spectra Study, p. 8.) In addition, field studies to verify the ground motion that can be expected from the faults crossed by the tunnels would not be performed, or the numbers calculated, until after the final alternative Project is chosen, which appears to be after the public comment period on the DEIR/S is over. (Spectra Study, p. 2.) This has the process exactly backwards.

Although lacking crucial data and relevant design criteria, CalTrans/Metro confidently assert in the body of the DEIR/S that they can solve all seismic problems, because such problems have been solved in the past for other projects. For example, problems of groundwater intrusion during construction of the tunnels, which may affect the Light Rail and Freeway tunnel alternatives, can be prevented because "linings can be designed to limit the groundwater inflows." (DEIR/S, p. 3.10-19; the entire discussion for the Freeway tunnels is only three sentences long, the Light Rail discussion only one sentence.) No description, depiction, or examples of such linings is given. Similarly, pockets of oil and gas may be struck while tunneling, and may be classified by Cal-OSHA as areas of "Gassy or Potentially Gassy Operation," presumably a potential hazard to workers.

The DEIR/S dismisses this problem in a single sentence, saying that such naturally occurring oil and gas is "not unusual" in the region, "and tunnels have been excavated through these conditions previously." (DEIR/S at 3.10-13.) This is the entire discussion of this potential hazard for the Light Rail alternative, and this single sentence is echoed without elaboration in the discussion of the Freeway tunnel alternatives. (DEIR/S at 3.10-19.) Such cursory and conclusory statements cannot constitute substantial evidence that all impacts have been analyzed and disclosed, or that all feasible mitigation has been adopted. (Citizens To Preserve the Ojai v. County of Ventura (1985) 176 Cal.App.3d 421, 428, ["[a] conclusory statement unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind not only fails to crystallize the issues but affords no basis for a comparison of the problems involved with the proposed project and the difficulties involved in the alternatives"].) (Citations and internal quotation marks omitted.)

The DEIR/S acknowledges that "moderate to severe seismic shaking" (i.e., earthquakes) may occur within the life of the Project, and that such shaking "is a common hazard for every project in Southern California, and the hazard cannot be avoided." (DEIR/S, p. 3.10-17.) However, rather than present, for example, a table or figure that would explain the severity of shaking that could be expected from the active and potentially active faults that the Project would cross, the DEIR/S states that "[b]ored tunnels generally perform well during earthquake ground shaking," because they are "embedded in the ground [and] move with the ground. . . ." Examples of tunnels that have fared well during earthquakes, including the Metro's Segment 1 Red Line in the 1989 Northridge quake, and the Bay Area Rapid Transit's tunnels in the 1994 Loma Prieto quake are given. (DEIR/S, p. 3.10-17.) However, no information is given to support the comparison, such as the location of these tunnels relative to the faults that ruptured in those quakes, or a comparison between their design and the design criteria that would be used here (at least, the design criteria that are now known).

The entire seismic section is filled with such conclusory statements and assurances that CalTrans/Metro would find out everything they need to know to make the tunnels survive seismic hazards, and that they would do all those things, just as other projects have done in the past. They would do all these things based on data they would gather, and criteria they would design, after the actual Project is selected, and presumably after the CEQA/NEPA public process is over.

With all due respect to CalTrans and Metro and their engineering expertise, this line of argument could be used to dispense with CEQA/NEPA review in many if not most cases, regardless of the seismic hazards presented. It is the job of an EIR/S to "demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its actions." (Laurel Heights Improvement Assn. v. Regents of the University of California (1989) 47 Cal.3d 376,392, quoting No Oil, Inc., v. City of Los Angeles (1974) 13 Cal.3d 68, 86.) Here, the DEIR/S essentially asks the public to take its seismic assurances on faith, not presenting so much as an illustration of the linings that CalTrans/Metro believes would keep out groundwater and oil/gas intrusions, or the boring machine face that it believes would prevent soil collapse during boring.

The Geologic section of the DEIR/S simply and utterly fails as an informative document.

VI. THE ENVIRONMENTAL JUSTICE ANALYSIS FAILS TO ADDRESS THE SERIOUS HEALTH ISSUE OF DISPARATE IMPACT OF EXPOSURE TO TOXIC AIR CONTAMINANTS.

1. Federal Law and CalTrans' Internal Agency Directives Require an Adequate Analysis of Disproportionate Impacts of the Project on Environmental Justice Populations.

The DEIR/S correctly recognizes that "[a]ll projects involving a federal action (funding, permit, or land) must comply with Executive Order (EO) 12898, Federal

Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. . . ." (DEIR/S, 3.3-57.) In addition, the CEQA Guidelines require an EIR to analyze and disclose any "health and safety problems caused by the physical change" that the proposed project will cause. (Guidelines, § 15126.2, subd. (a); Bakersfield Citizens for Local Control v. City of Bakersfield (2004) 124 Cal.App.4th 1184, 1219.) The Guidelines also provide that the lead agency for a project "must use its best efforts to find out and disclose all that it reasonably can." (Guidelines § 15144, emphasis added; Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova (2007) 40 Cal.4th 412, 428.) This should include identifying and disclosing the health risks of exposure to toxic air contaminants that are expected to result from Project operation, as well as construction. (See Berkeley Keep Jets Over the Bay Com. v. Board of Port Comrs. (2001) 91 Cal.App.4th 1344, 1367-1371.)

NEPA also requires analysis and disclosure of potential human health effects of projects, where such health effects are directly tied to changes in the physical environment, as they would be here. (Metropolitan Edison Company v. People Against Nuclear Energy, et al. (1983) 103 S.Ct. 1556, 1560.) In addition, the CalTrans Director's Policy, number 21, dated November 5, 2001, and the Deputy Directive, number DD-63, dated November 5, 2011, also obligate CalTrans "to ensure there are no disproportionate adverse impacts, particularly on minority and low-income populations." (Director's Policy No. 21, p. 1.) The current, 11-page, Environmental Justice section of the DEIR/S patently fails to carry out CalTrans/Metro's obligations under federal law, and CalTrans' obligations under its own internal directives.

2. Possibility of Disproportionate Impacts of Toxic Air Contaminants on Environmental Justice Populations from the Project.

The Project has the potential for disproportionate health impacts on environmental justice populations resulting from exposure to traffic-related air pollutants, including MSATs, from the Project. Examination of the health effects of such exposure is especially important given that "nearly one-half of the census tracts in the study area contain one or more environmental justice populations." (DEIR/S, at 3.3-62.)

As set out above, the CEQA Guidelines require an EIR to analyze and disclose any "health and safety problems caused by the physical change" that the proposed project will cause. (Guidelines, § 15126.2, subd. (a).) The Guidelines also provide that the lead agency for a project "must use its best efforts to find out and disclose all that it reasonably can." (Guidelines § 15144, emphasis added.) This should include identifying and disclosing the health risks of exposure to toxic air contaminants that are expected to result from Project operation, as well as construction.

NEPA also requires analysis and disclosure of potential human health effects of projects, where such health effects are directly tied to changes in the physical environment, as they would be here.
The DEIR/S currently contains a Health Risk Assessment for the Project, but it does not contain a specific analysis of the potential for disproportionate health risks to environmental justice populations.

A generic assessment of health risk, without making a special examination of the risk to environmental justice populations, may miss significant impacts. Environmental justice populations may have multiple risk factors that may make them more sensitive to the adverse health impacts of exposure to air pollutants, including vehicle emissions, than the general population. "[A] number of studies have reported increased sensitivity to pollution, for communities with low income levels, low education levels, and other biological and social factors. This combination of multiple pollutants and increased sensitivity in these communities can result in a higher cumulative pollution impact." (California Office of Environmental Health Hazard Assessment, Cumulative Impacts: Building a Scientific Foundation (Dec. 2010), Exec. Summary at p. ix.) However, the DEIR/S includes no analysis of this potential for disproportionate impacts.

Such an analysis is feasible, and should be performed. CalTrans/Metro have data showing the location of census tracts with environmental justice populations within the Study Area, and also have modeling data showing the probable cancer risks due to MSAT emissions attributable to the Project throughout the Study Area. The DEIR/S should also use the census tract data they already possess, including the census tract data identifying environmental justice populations, to determine the differences in cancer and acute health risks that would be created by each Project alternative to the various environmental justice census tracts and the non-environmental justice census tracts. Such an analysis would allow CalTrans/Metro to determine and disclose to the public whether each Project alternative would impose a disproportionate cancer or acute health risk burden on environmental justice populations.

The DEIR/S claims that "because the long-term adverse effects of the Freeway Tunnel Alternative on all populations including environmental justice populations, can be substantially reduced, the operation of the Freeway Tunnel Alternative would not result in adverse impacts that are appreciably more severe or greater in magnitude on environmental justice populations than the adverse effects experienced by non-environmental justice populations." (DEIR/S, at 3.3-66.)

Until the analysis described above, or a similar one, is performed, the DEIR/S lacks substantial evidence to support this sweeping statement, at least as to health effects. The DEIR/S shows increased cancer risks resulting from vehicle emissions attributable to the Project, and has presented no actual analysis showing that the few and scanty mitigation or avoidance measures proposed by the DEIR/S will "substantially reduce[]" those cancer risks. It has made no attempt to demonstrate that there are no cancer risks, or other acute air pollution-related health impacts, that are not proportionately greater for affected environmental justice populations. This is a failure of analysis and full disclosure under both NEPA and CEQA, and of mitigation under CEQA. The DEIR/S should be revised to include the analysis described here, or an equivalent analysis, and recirculated.

3. Disproportionate Impacts on EJ Populations Related to Travel.

The DEIR/S states that selection of a tolled Freeway Tunnel alternative will not disproportionately affect environmental justice populations, because: 1) they, like other populations, will "still have travel options for reaching their destinations"; 2) surface streets, one of the other "travel options", should have "reduced traffic" if a Freeway Tunnel is built; and 3) TDM and TSM measures, which will be part of any Build alternative, will benefit all Study Area populations. (DEIR/S, at 3.3-66.) Accepting these statements as factually correct for the sake of argument, the conclusion that selection of a tolled Freeway Tunnel alternative will not disproportionately affect environmental justice populations still does not follow. On the contrary, CalTrans/Metro do not seem to understand the concept of a disproportionate effect in this context.

The Director's Policy cited above states that CalTrans "strives for equity and balance in transportation investments, economic prosperity, and environmental protection." (Policy, p. 1.) However, selection of a tolled Freeway Tunnel alternative would not be equitable to the environmental justice communities that would be disrupted by its construction and operation. We will discuss the financial inequity first.
The Project as set out in the DEIR/S Project would be funded at least in part through funds derived from Measure R, described in the DEIR/S as "a half-cent sales tax dedicated to transportation projects in Los Angeles County." (DEIR/S at 1-1.) A sales tax is, by definition, a regressive tax, because it takes a higher percentage of low incomes than of higher incomes. (dictionary.com, found at www.dictionary.reference.com/browse/regressive+taxs+t._)

A sales tax is also applied across the board on taxable items, meaning that all populations must pay it in order to buy necessities such as clothing, some foods, and the cars needed to travel on a Freeway Tunnel alternative. Thus, environmental justice populations will pay towards the Project through the half-cent sales tax imposed by Measure R, whether they use the Project or not. If, in addition, a toll is imposed for use of a Freeway Tunnel alternative, it is more likely that low-income environmental justice populations will be unable to afford that toll than that non-environmental justice populations will be unable to afford it. The environmental justice populations will then be forced to contribute towards the cost of a Project whose construction will disrupt their communities, but that they cannot afford to use. The DEIR/S does not show that such an impact on environmental justice populations would not be disproportionate, and there is every reason to conclude it would be.

Environmental justice populations that could not afford to use a tolled Freeway Alternative would also lose the benefit of reduced travel time that is one of the primary benefits of the Project cited in the DEIR/S. (DEIR/S, p. 3.5-37.) In addition, while low-income environmental justice populations would still be able to use the other "travel options" referred to by the DEIR/S, they would do so not by choice, but by economic necessity. Such a deprivation of choice is in itself an impact that would fall disproportionately on low-income environmental justice populations.

CalTrans/Metro states that use of alternative alignments might result in even greater disproportionate impacts on environmental justice communities. Since the choice of funding for the Project appears fixed – and is inherently more likely to disproportionately impact environmental justice communities – La Cañada Flintridge respectfully suggests that CalTrans/Metro mitigate that impact by choosing a non-Freeway Tunnel alternative. The Bus Rapid Transit or Light Rail Transit alternatives would provide more travel options for all communities, thereby "providing transportation services in an equitable manner to all segments of society," as directed by the CalTrans Director's Policy cited above, without a disproportionate impact on environmental justice populations.

Both the analysis of health impacts and risks, and of financial impacts, in the DEIR/S fail to analyze the potential for disparate impacts on environmental justice populations, and , thereby, also fail to adopt all feasible mitigation measures for such impacts. The DEIR/S should be revised and recirculated.

VII. RECIRCULATION IS REQUIRED.

The flaws in the DEIR/S, both as a document of information and one of avoidance or mitigation of environmental damage, are so serious that the entire document must be rewritten and recirculated. As Save Our Peninsula Comm. v. Monterey Bd. of Supervisors (2001) 87 Cal.App.4th 99, 131, holds, recirculation gives the public and the decision makers a chance to review new data and the validity of the conclusions of the EIR. CEQA Guidelines § 15088.5 provides in pertinent part that recirculation is needed where a draft EIR "was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded." Such is the case here, including but not limited to air quality and seismic impacts.

The DEIR/S must be rewritten and recirculated so that the public can evaluate the new information and comment on it. Merely providing the information in the Final EIR/S is not sufficient, given the number of issues and the amount of additional information that is required to make the DEIR/S adequate under CEQA and NEPA.

VIII. CONCLUSION.

The DEIR/S fails both to adequately inform the decision makers and the public about the environmental consequences of this Project, and to identify and propose for adoption all feasible mitigation measures for the Project's environmental and public health harms. It buries vital air pollution and health information in unreadable appendices, omits critical seismic information altogether, ignores the duty of all California state agencies to aggressively reduce greenhouse gas emissions, fails properly to analyze traffic impacts, and gives only lip service to environmental justice. CalTrans and Metro need to go back to the drawing board to craft and recirculate a thoroughly revised DEIR/S that complies with both NEPA and CEQA, and that shows respect for the communities in which the ill-justified Project is proposed.

Sincerely,

David A. Spence

David A. Spence

Mayor

EXHIBIT 1

STATE OF THE AIR 2014

AMERICAN LUNG ASSOCIATION®

People at Risk from Short-term Particle Pollution (24-Hour $PM_{2.5}$)

	Chronic Diseases						Age Groups			
In Counties where the Grades were:	Adult Asthma	Pediatric Asthma	COPD	CV Disease	Diabetes	Poverty	Under 18	65 and Over	Total Population	Number of Counties
Grade A (0.0)	4,209,381	1,346,270	3,146,095	4,179,137	4,939,239	9,987,659	15,101,759	8,540,433	63,768,955	266
Grade B (0.3-0.9)	4,014,172	1,212,570	2,852,365	3,676,126	4,337,074	8,710,105	13,334,445	7,522,293	58,330,127	163
Grade C (1.0-2.0)	2,183,338	621,887	1,507,301	1,969,260	2,320,052	4,663,638	7,040,265	4,231,961	31,006,014	76
Grade D (2.1-3.2)	1,160,599	356,702	708,415	941,907	1,178,708	2,896,834	3,911,548	1,981,934	16,109,693	28
Grade F (3.3+)	2,949,649	953,276	1,732,531	2,384,411	3,162,804	7,522,859	10,915,968	5,379,279	44,156,781	50
National Population in Counties with $PM_{2.5}$ Monitors	15,087,442	4,660,351	10,364,331	13,708,883	16,591,727	34,821,643	52,254,491	28,879,287	221,647,091	647

People at Risk from Year-Round Particle Pollution (Annual $PM_{2.5}$)

	Chronic Diseases						Age Groups			
In Counties where the Grades were:	Adult Asthma	Pediatric Asthma	COPD	CV Disease	Diabetes	Poverty	Under 18	65 and Over	Total Population	Number of Counties
Pass	10,720,495	3,236,432	7,466,837	9,901,686	11,811,595	23,704,202	36,463,837	20,802,308	156,807,359	464
Fail	3,096,331	1,025,583	2,006,862	2,655,175	3,427,301	8,475,349	11,351,156	5,596,944	46,284,891	54
National Population in Counties with $PM_{2.5}$ Monitors	15,087,442	4,660,351	10,364,331	13,708,883	16,591,727	34,821,643	52,254,491	28,879,287	221,647,091	647

People at Risk from Ozone

	Chronic Diseases					Age Groups			
In Counties where the Grades were:	Adult Asthma	Pediatric Asthma	COPD	CV Disease	Poverty	Under 18	65 and Over	Total Population	Number of Counties
Grade A (0.0)	1,320,459	371,193	905,816	1,245,680	3,119,192	4,431,907	2,881,567	19,497,130	127
Grade B (0.3-0.9)	1,535,373	435,400	1,229,737	1,650,630	3,417,687	4,988,560	3,567,140	22,732,980	105
Grade C (1.0-2.0)	1,639,228	486,376	1,127,194	1,475,895	3,146,416	5,488,645	3,144,579	23,403,658	115
Grade D (2.1-3.2)	1,527,358	467,602	1,055,385	1,372,093	3,402,065	5,251,797	2,831,073	22,484,036	90
Grade F (3.3+)	9,513,298	3,049,904	6,461,645	8,529,355	21,820,804	33,827,364	17,655,027	140,576,080	296
National Population in Counties with Ozone Monitors	15,791,350	4,884,041	10,974,663	14,534,975	35,430,736	54,812,409	30,654,002	232,400,175	809

Note: *The State of the Air 2014* covers the period 2010-2012. The Appendix provides a full discussion of the methodology.

People at Risk In 25 U.S. Cities Most Polluted by Short-term Particle Pollution (24-hour $PM_{2.5}$)

2014 Rank[1]	Metropolitan Statistical Areas	Total Population[2]	Under 18[3]	65 and Over[3]	Pediatric Asthma[4,6]	Adult Asthma[5,6]	COPD[7]	CV Disease[8]	Diabetes[9]	Poverty[10]
1	Fresno-Madera, CA	1,100,113	321,057	118,768	28,163	68,342	35,124	49,661	73,409	296,919
2	Visalia-Porterville-Hanford, CA	603,341	187,060	57,426	16,409	36,397	18,204	25,234	37,915	161,299
3	Bakersfield, CA	856,158	255,815	80,525	22,440	52,552	26,262	36,291	54,932	195,433
4	Los Angeles-Long Beach, CA	18,238,998	4,510,957	2,112,146	395,699	1,207,447	626,541	889,485	1,317,256	3,180,714
5	Modesto-Merced, CA	784,031	226,011	85,097	19,826	49,029	25,321	35,859	53,125	165,981
6	Pittsburgh-New Castle-Weirton, PA-OH-WV	2,661,369	522,226	472,879	53,760	214,860	149,397	207,620	229,649	327,390
7	Fairbanks, AK	100,272	24,757	7,165	2,177	6,771	3,554	4,060	4,739	8,847
8	Salt Lake City-Provo-Orem, UT	2,350,274	735,347	204,516	52,201	143,124	61,102	87,864	113,663	287,433
9	El Paso-Las Cruces, TX-NM	1,045,180	299,658	115,604	23,081	54,409	39,900	54,711	76,037	251,188
10	San Jose-San Francisco-Oakland, CA	8,370,967	1,870,295	1,071,176	164,061	574,247	305,542	440,420	646,630	1,018,010
11	Logan, UT-ID	128,306	40,072	11,141	2,919	7,736	3,286	4,635	5,919	19,089
12	Missoula, MT	110,977	21,388	13,807	1,637	8,559	4,833	6,353	5,511	16,277
13	Davenport-Moline, IA-IL	474,226	111,869	74,476	8,163	29,901	22,955	31,878	36,165	59,914
14	Chicago-Naperville, IL-IN-WI	9,899,902	2,416,660	1,205,623	224,825	637,270	446,747	576,699	691,916	1,422,025
15	Phoenix-Mesa-Scottsdale, AZ	4,329,534	1,110,210	573,413	94,629	278,199	187,356	266,697	335,194	739,213
16	Indianapolis-Carmel-Muncie, IN	2,310,360	580,360	284,320	54,927	156,574	129,262	161,629	183,582	339,595
16	New York-Newark, NY-NJ-CT-PA	23,362,099	5,226,786	3,220,554	488,177	1,662,512	1,068,245	1,392,908	1,710,199	3,232,239
18	Harrisburg-York-Lebanon, PA	1,228,559	272,205	191,293	28,289	96,565	63,765	87,181	98,027	134,306
18	Lancaster, PA	526,823	128,066	82,655	13,309	40,265	26,506	36,476	40,662	59,731
20	San Diego-Carlsbad, CA	3,177,063	726,268	380,276	63,708	215,294	111,464	158,275	233,550	465,651
21	Seattle-Tacoma, WA	4,399,332	977,724	546,985	65,294	331,831	190,214	237,015	293,198	515,767
21	Yakima, WA	246,977	74,562	29,906	4,979	16,695	9,646	12,181	14,799	55,498
23	Green Bay-Shawano, WI	357,045	85,395	49,693	6,544	23,279	13,981	21,166	22,498	40,952
23	South Bend-Elkhart-Mishawaka, IN-MI	721,296	180,494	105,222	17,084	51,094	41,574	54,437	59,597	117,073
25	Sacramento-Roseville, CA	2,462,722	595,104	325,693	52,202	165,261	89,297	130,118	189,132	408,101

Notes:

1. Cities are ranked using the highest weighted average for any county within that Combined or Metropolitan Statistical Area.
2. **Total Population** represents the at-risk populations for all counties within the respective Combined or Metropolitan Statistical Area.
3. Those **under 18** and **65 and over** are vulnerable to $PM_{2.5}$ and are, therefore, included. They should not be used as population denominators for disease estimates.
4. Pediatric asthma estimates are for those under 18 years of age and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
5. **Adult asthma** estimates are for those 18 years and older and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
6. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma.
7. **COPD** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
8. **CV disease** is cardiovascular disease and estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
9. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
10. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

People at Risk In 25 U.S. Cities Most Polluted by Year-Round Particle Pollution (Annual $PM_{2.5}$)

2014 Rank[1]	Metropolitan Statistical Areas	Total Population[2]	Under 18[3]	65 and Over[3]	Pediatric Asthma[4,6]	Adult Asthma[5,6]	COPD[7]	CV Disease[8]	Diabetes[9]	Poverty[10]
1	Fresno-Madera, CA	1,100,113	321,057	118,768	28,163	68,342	35,124	49,661	73,409	296,919
2	Visalia-Porterville-Hanford, CA	603,341	187,060	57,426	16,409	36,397	18,204	25,234	37,915	161,299
3	Bakersfield, CA	856,158	255,815	80,525	22,440	52,552	26,262	36,291	54,932	195,433
3	Los Angeles-Long Beach, CA	18,238,998	4,510,957	2,112,146	395,699	1,207,447	626,541	889,485	1,317,256	3,180,714
5	Modesto-Merced, CA	784,031	226,011	85,097	19,826	49,029	25,321	35,859	53,125	165,981
6	Pittsburgh-New Castle-Weirton, PA-OH-WV	2,661,369	522,226	472,879	53,760	214,860	149,397	207,620	229,649	327,390
7	El Centro, CA	176,948	50,686	19,527	4,446	11,084	5,722	8,115	11,970	38,189
8	El Paso-Las Cruces, TX-NM	1,045,180	299,658	115,604	23,081	54,409	39,900	54,711	76,037	251,188
8	Phoenix-Mesa-Scottsdale, AZ	4,329,534	1,110,210	573,413	94,629	278,199	187,356	266,697	335,194	739,213
8	St. Louis-St. Charles-Farmington, MO-IL	2,900,605	673,074	409,326	66,572	221,038	169,514	205,856	232,181	404,224
11	Cincinnati-Wilmington-Maysville, OH-KY-IN	2,188,001	534,579	282,828	47,895	175,182	147,881	163,816	183,926	321,436
11	Philadelphia-Reading-Camden, PA-NJ-DE-MD	7,129,428	1,625,860	1,005,294	159,508	536,473	343,689	463,539	529,938	938,401
13	Louisville/Jefferson County-Elizabethtown-Madison, KY-IN	1,478,637	349,246	198,854	35,110	120,277	118,408	129,934	121,032	229,972
13	New York-Newark, NY-NJ-CT-PA	23,362,099	5,226,786	3,220,554	488,177	1,662,512	1,068,245	1,392,908	1,710,199	3,232,239
15	Macon-Warner Robins, GA	418,201	103,738	53,345	11,225	25,844	23,080	29,124	32,613	86,424
16	Birmingham-Hoover-Talladega, AL	1,309,818	308,441	183,656	34,704	85,987	98,561	117,729	122,364	221,999
16	Cleveland-Akron-Canton, OH	3,497,711	779,681	555,966	66,994	283,053	237,500	278,890	327,060	531,631
18	Atlanta-Athens-Clarke County-Sandy Springs, GA	6,092,295	1,564,174	617,176	169,253	371,132	315,121	377,489	430,790	1,017,357
19	Wheeling, WV-OH	146,420	28,482	27,019	2,327	12,122	11,661	15,527	15,329	22,988
20	Chicago-Naperville, IL-IN-WI	9,899,902	2,416,660	1,205,623	224,825	637,270	446,747	576,699	691,916	1,422,025
20	Indianapolis-Carmel-Muncie, IN	2,310,360	580,360	284,320	54,927	156,574	129,262	161,629	183,582	339,595
22	Columbus-Auburn-Opelika, GA-AL	491,852	117,334	56,877	12,930	31,310	29,973	35,489	38,431	96,604
23	Dayton-Springfield-Sidney, OH	1,079,417	246,098	170,912	21,146	86,918	72,107	84,546	98,998	172,857
23	Johnstown-Somerset, PA	218,541	41,597	42,384	4,323	17,635	12,448	17,661	19,496	28,490
23	San Diego-Carlsbad, CA	3,177,063	726,268	380,276	63,708	215,294	111,464	158,275	233,550	465,651

Notes:

1. Cities are ranked using the highest weighted average for any county within that Combined or Metropolitan Statistical Area.
2. **Total Population** represents the at-risk populations for all counties within the respective Combined or Metropolitan Statistical Area.
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5. **Adult asthma** estimates are for those 18 years and older and represent the **estimated** number of people who had asthma in 2012 based on state rates (BRFSS) applied to population estimates (U.S. Census).
6. Adding across rows does not produce valid estimates, e.g., summing pediatric and adult asthma.
7. **COPD** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
8. **CV** disease is cardiovascular disease and estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
9. **Diabetes** estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
10. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

People at Risk In 25 Most Ozone-Polluted Cities

2014 Rank[1]	Metropolitan Statistical Areas	Total Population[2]	Under 18[3]	65 and Over[3]	Pediatric Asthma[4,6]	Adult Asthma[5,6]	COPD[7]	CV Disease[8]	Poverty[9]
1	Los Angeles-Long Beach, CA	18,238,998	4,510,957	2,112,146	395,699	1,207,447	626,541	889,485	3,180,714
2	Visalia-Porterville-Hanford, CA	603,341	187,060	57,426	16,409	36,397	18,204	25,234	161,299
3	Bakersfield, CA	856,158	255,815	80,525	22,440	52,552	26,262	36,291	195,433
4	Fresno-Madera, CA	1,100,113	321,057	118,768	28,163	68,342	35,124	49,661	296,919
5	Sacramento-Roseville, CA	2,462,722	595,104	325,693	52,202	165,261	89,297	130,118	408,101
6	Houston-The Woodlands, TX	6,371,677	1,733,980	597,789	135,031	316,186	232,392	328,577	1,034,302
7	Modesto-Merced, CA	784,031	226,011	85,097	19,826	49,029	25,321	35,859	165,981
8	Dallas-Fort Worth, TX-OK	7,095,411	1,921,982	707,161	149,749	354,389	263,975	375,698	1,052,441
8	Washington-Baltimore-Arlington, DC-MD-VA-WV-PA	9,331,587	2,158,553	1,100,311	213,935	651,339	400,803	550,553	884,620
10	Las Vegas-Henderson, NV-AZ	2,247,056	538,993	307,611	35,543	127,438	124,833	150,272	373,333
11	Phoenix-Mesa-Scottsdale, AZ	4,329,534	1,110,210	573,413	94,629	278,199	187,356	266,697	739,213
12	New York-Newark, NY-NJ-CT-PA	23,362,099	5,226,786	3,220,554	488,177	1,662,512	1,068,245	1,392,908	3,232,239
13	St. Louis-St. Charles-Farmington, MO-IL	2,900,605	673,074	409,326	66,572	221,038	169,514	205,856	404,224
14	Tulsa-Muskogee-Bartlesville, OK	1,122,259	280,163	156,101	23,961	85,591	63,219	86,051	174,911
15	Cincinnati-Wilmington-Maysville, OH-KY-IN	2,188,001	534,579	282,828	47,895	175,182	147,881	163,816	321,436
16	Philadelphia-Reading-Camden, PA-NJ-DE-MD	7,129,428	1,625,860	1,005,294	159,508	536,473	343,689	463,539	938,401
17	El Centro, CA	176,948	50,686	19,527	4,446	11,084	5,722	8,115	38,189
18	Louisville/Jefferson County-Elizabethtown-Madison, KY-IN	1,478,637	349,246	198,854	35,110	120,277	118,408	129,934	229,972
19	Oklahoma City-Shawnee, OK	1,367,325	339,847	168,717	29,065	104,454	73,644	97,967	215,506
20	Chicago-Naperville, IL-IN-WI	9,899,902	2,416,660	1,205,623	224,825	637,270	446,747	576,699	1,422,025
21	Pittsburgh-New Castle-Weirton, PA-OH-WV	2,661,369	522,226	472,879	53,760	214,860	149,397	207,620	327,390
22	Fort Collins, CO	310,487	64,060	40,112	5,632	22,009	11,857	14,516	41,513
23	Birmingham-Hoover-Talladega, AL	1,309,818	308,441	183,656	34,704	85,987	98,561	117,729	221,999
24	Cleveland-Akron-Canton, OH	3,497,711	779,681	555,966	66,994	283,053	237,500	278,890	531,631
24	Sheboygan, WI	115,009	26,716	17,789	2,047	7,547	4,734	7,286	12,043

Notes:

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8. **CV disease** is cardiovascular disease and estimates are for adults 18 and over who have been diagnosed within their lifetime, based on state rates (BRFSS) applied to population estimates (U.S. Census).
9. **Poverty** estimates come from the U.S. Census Bureau and are for all ages.

EXHIBIT 2

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The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age

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ABSTRACT

BACKGROUND

Whether exposure to air pollution adversely affects the growth of lung function during the period of rapid lung development that occurs between the ages of 10 and 18 years is unknown.

METHODS

In this prospective study, we recruited 1759 children (average age, 10 years) from schools in 12 southern California communities and measured lung function annually for eight years. The rate of attrition was approximately 10 percent per year. The communities represented a wide range of ambient exposures to ozone, acid vapor, nitrogen dioxide, and particulate matter. Linear regression was used to examine the relationship of air pollution to the forced expiratory volume in one second (FEV_1) and other spirometric measures.

RESULTS

Over the eight-year period, deficits in the growth of FEV_1 were associated with exposure to nitrogen dioxide (P=0.005), acid vapor (P=0.004), particulate matter with an aerodynamic diameter of less than 2.5 μm ($PM_{2.5}$) (P=0.04), and elemental carbon (P=0.007), even after adjustment for several potential confounders and effect modifiers. Associations were also observed for other spirometric measures. Exposure to pollutants was associated with clinically and statistically significant deficits in the FEV_1 attained at the age of 18 years. For example, the estimated proportion of 18-year-old subjects with a low FEV_1 (defined as a ratio of observed to expected FEV_1 of less than 80 percent) was 4.9 times as great at the highest level of exposure to $PM_{2.5}$ as at the lowest level of exposure (7.9 percent vs. 1.6 percent, P=0.002).

CONCLUSIONS

The results of this study indicate that current levels of air pollution have chronic, adverse effects on lung development in children from the age of 10 to 18 years, leading to clinically significant deficits in attained FEV_1 as children reach adulthood.

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THERE IS MOUNTING EVIDENCE THAT air pollution has chronic, adverse effects on pulmonary development in children. Longitudinal studies conducted in Europe[1-3] and the United States[4-6] have demonstrated that exposure to air pollution is associated with reductions in the growth of lung function, strengthening earlier evidence[7-12] based on cross-sectional data. However, previous longitudinal studies have followed young children for relatively short periods (two to four years), leaving unresolved the question of whether the effects of air pollution persist from adolescence into adulthood. The Children's Health Study[13] enrolled children from 12 southern California communities representing a wide range of exposures to ambient air pollution. We documented the children's respiratory growth from the ages of 10 to 18 years. Over this eight-year period, children have substantial increases in lung function. By the age of 18 years, girls' lungs have nearly matured, and the growth in lung function in boys has slowed considerably, as compared with the rate in earlier adolescence.[14] We analyzed the association between long-term exposure to ambient air pollution and the growth in lung function over the eight-year period from the ages of 10 to 18 years. We also examined whether any observed effect of air pollution on this eight-year growth period results in clinically significant deficits in attained lung function at the age of 18 years.

METHODS

STUDY SUBJECTS

In 1993, the Children's Health Study recruited 1759 fourth-grade children (average age, 10 years) from elementary schools in 12 southern California communities as part of an investigation of the long-term effects of air pollution on children's respiratory health.[6,12,13] Data on pulmonary function were obtained by trained field technicians, who traveled to study schools annually from the spring of 1993 through the spring of 2001 to perform maximal-effort spirometric testing of the children. Details of the testing protocol have been published previously.[12] We analyzed three measures of pulmonary function: forced vital capacity (FVC), forced expiratory volume in the first second (FEV_1), and maximal midexpiratory flow rate (MMEF). Pulmonary-function tests were not performed on any child who was absent from school on the day of testing, but such a child was still eligible for testing in subsequent years. Children who moved away from their recruitment community were classified as lost to follow-up and were not tested further. From the initial sample of the 1759 children in 1993, the number of children available for follow-up was 1414 in 1995, 1252 in 1997, 1031 in 1999, and 747 in 2001, reflecting the attrition of approximately 10 percent of subjects per year.

A baseline questionnaire, completed at study entry by each child's parents or legal guardian, was used to obtain information on the children's characteristics, including race, presence or absence of Hispanic ethnic background, level of parental education, presence or absence of a history of asthma diagnosed by a doctor, exposure to maternal smoking in utero, and household exposure to gas stoves, pets, and environmental tobacco smoke. Questions administered at the time of annual pulmonary-function testing were used to update information on asthma status, personal smoking status, and exposure to environmental tobacco smoke. The distribution of baseline characteristics of all study subjects and of two subgroups defined according to the length of follow-up (all eight years or less than eight years) is shown in the Supplementary Appendix (available with the full text of this article at www.nejm.org). The length of follow-up was significantly associated with factors related to the mobility of the population, including race, presence or absence of Hispanic ethnic background, presence or absence of exposure to environmental tobacco smoke, and parents' level of education. However, the length of follow-up was not significantly associated with baseline lung function or the level of exposure to air pollution, suggesting that the loss to follow-up did not differ with respect to the primary variables of interest.

The study protocol was approved by the institutional review board for human studies at the University of Southern California, and written informed consent was provided by a parent or legal guardian for all study subjects. We did not obtain assent from minor children, since this was not standard practice when the study was initiated.

AIR-POLLUTION DATA

Air-pollution–monitoring stations were established in each of the 12 study communities and provided continuous data, beginning in 1994. Each station measured average hourly levels of ozone, nitrogen dioxide, and particulate matter with an aerodynamic diameter of less than 10 μm (PM_{10}). Stations also collected two-week integrated-filter samples for measuring acid vapor and the mass and chemical makeup of particulate matter with an aerodynamic diameter of less than 2.5 μm ($PM_{2.5}$). Acid vapor included both inorganic acids (nitric and hydrochloric) and organic acids (formic and acetic). For statistical analysis, we used total acid, computed as the sum of nitric, formic, and acetic acid levels. Hydrochloric acid was excluded from this sum, since levels were very low and close to the limit of detection. In addition to measuring $PM_{2.5}$, we determined the levels of elemental carbon and organic carbon, using method 5040 of the National Institute for Occupational Safety and Health.[15] We computed annual averages on the basis of average levels in a 24-hour period in the case of PM_{10} and nitrogen dioxide, and a two-week period in the case of $PM_{2.5}$, elemental carbon, organic carbon, and acid vapor. For ozone, we computed the annual average of the levels obtained from 10 a.m. to 6 p.m. (the eight-hour daytime average) and of the one-hour maximal levels. We also calculated long-term mean pollutant levels (from 1994 through 2000) for use in the statistical analysis of the lung-function outcomes.

STATISTICAL ANALYSIS

The outcome data consisted of the results of 5454 pulmonary-function tests of 876 girls and 5300 tests of 883 boys over the eight-year period. We adopted a two-stage regression approach to relate the longitudinal pulmonary-function data for each child to the average air-pollution levels in each study community.

The first-stage model was a regression of each pulmonary-function measure (values were log-transformed) on age to obtain separate, community-specific average growth curves for girls and boys. To account for the growth pattern during this period, we used a linear spline model[14] that consisted of four straight lines over the age intervals of younger than 12 years, 12 to 14 years, 14 to 16 years, and older than 16 years, constrained to be connected at the three "knot" points. The model included adjustments for log values for height; body-mass index (the weight in kilograms divided by the square of the height in meters); the square of the body-mass index; race; the presence or absence of Hispanic ethnic background, doctor-diagnosed asthma, any tobacco smoking by the child in the preceding year, exposure to environmental tobacco smoke, and exercise or respiratory tract illness on the day of the test; and indicator variables for the field technician and the spirometer. In addition to these covariates, random effects were included to account for the multiple measurements contributed by each subject. An analysis of residual values confirmed that the assumptions of the model had been satisfied. The first-stage model was used to estimate the mean and variance of the growth in lung function over the eight-year period in each of the 12 communities, separately for girls and boys.

The second-stage model was a linear regression of the 24 sex- and community-specific estimates of the growth in lung function over the eight-year period on the corresponding average levels of each air pollutant in each community. Inverses of the first-stage variances were incorporated as weights, and a community-specific random effect was included to account for residual variation between communities. A sex-by-pollutant interaction was included in the model to evaluate whether there was a difference in the effect of a given pollutant between the sexes, and when this value was nonsignificant, the model was refitted to estimate the sex-averaged effect of the pollutant. Pollutant effects are reported as the difference in the growth in lung function over the eight-year period from the least to the most polluted community, with negative differences indicative of growth deficits with increasing exposure. We also considered two-pollutant models obtained by simultaneously regressing the growth in lung function over the eight-year period on pairs of pollutants.

In addition to examining the growth in lung function over the eight-year period, we analyzed the FEV_1 measurements obtained in 746 subjects during the last year of follow-up (average age, 17.9 years) to determine whether exposure to air pollution was associated with clinically significant deficits in attained FEV_1. We defined a low FEV_1 as an attained FEV_1 below 80 percent of the predicted value, a criterion commonly used in clinical settings to identify persons who are at increased risk for adverse respiratory conditions. To determine the predicted FEV_1, we first fitted a regression model for observed FEV_1 (using log-transformed values) with the following predictors: log-transformed height, body-mass index, the square of the body-mass index, sex, race or ethnic group, asthma status, field technician, and interactions between sex and log-transformed height, sex and asthma, and sex and race or ethnic group. This model explained 71 percent of the variance in the attained FEV_1 level. For each subject, we then computed the predicted FEV_1 from the model and considered subjects to have a low FEV_1 if the ratio of observed to predicted FEV_1 was less than 80 percent. Linear regression was then used to examine the correlation between the community-specific proportion of subjects with a low FEV_1 and the average level of each pollutant from 1994 through 2000. This model included a community-specific random effect to account for residual variation. Regression procedures in SAS software[16] were used to fit all models. Associations denoted as statistically significant were those that yielded a P value of less than 0.05, assuming a two-sided alternative hypothesis.

RESULTS

From 1994 through 2000, there was substantial variation in the average levels of study pollutants across the 12 communities, with relatively little year-to-year variation in the annual levels within each community (Fig. 1). From 1994 through 2000, the

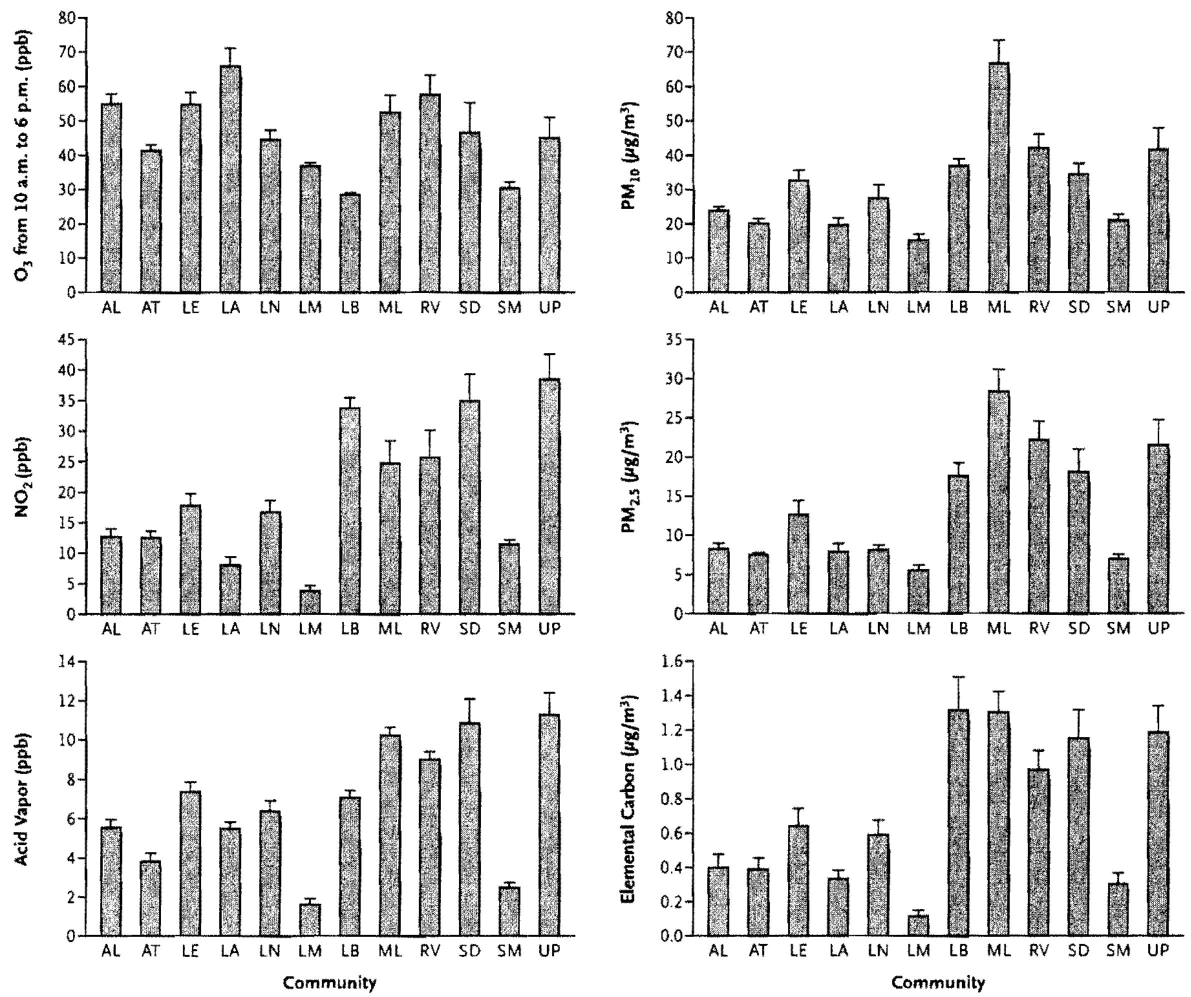

Figure 1. **Mean (+SD) Annual Average Levels of Pollutants from 1994 through 2000 in the 12 Study Communities in Southern California.**
AL denotes Alpine, AT Atascadero, LE Lake Elsinore, LA Lake Arrowhead, LN Lancaster, LM Lompoc, LB Long Beach, ML Mira Loma, RV Riverside, SD San Dimas, SM Santa Maria, and UP Upland. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.

average levels of ozone were not significantly correlated across communities with any other study pollutant (Table 1). However, correlations between other pairs of pollutants were all significant, ranging from an R of 0.64 ($P<0.05$) for nitrogen dioxide and organic carbon, to an R of 0.97 ($P<0.001$) for PM_{10} and organic carbon. Thus, nitrogen dioxide, acid vapor, and the particulate-matter pollutants can be regarded as a correlated "package" of pollutants with a similar pattern relative to each other across the 12 communities.

Among the girls, the average FEV_1 increased from 1988 ml at the age of 10 years to 3332 ml at the age of 18 years, yielding an average growth in FEV_1 of 1344 ml over the eight-year period (Table 2). The corresponding averages in boys were 2082 ml and 4464 ml, yielding an average growth in FEV_1 of 2382 ml over the eight-year period. Similar patterns of growth over the eight-year period were observed for FVC and MMEF (Table 2).

Although the average growth in FEV_1 was larger in boys than in girls, the correlations of growth with air pollution did not differ significantly between the sexes, as shown for nitrogen dioxide in Figure 2. The sex-averaged analysis, depicted by the regression line in Figure 2, demonstrated a significant negative correlation between the growth in FEV_1 over the eight-year period and the average nitrogen dioxide level ($P=0.005$). The estimated difference in the average growth in FEV_1 over the eight-year period from the community with the lowest nitrogen dioxide level to the community with the highest nitrogen dioxide level, represented by the slope of the plotted regression line in Figure 2, was −101.4 ml.

Estimated differences in the growth of FEV_1, FVC, and MMEF during the eight-year period with respect to all pollutants are summarized in Table 3. Deficits in the growth of FEV_1 and FVC were observed for all pollutants, and deficits in the growth of MMEF were observed for all but ozone, with several combinations of outcome variables and pollutants attaining statistical significance. Specifically, for FEV_1 we observed significant negative correlations between the growth in this variable over the eight-year period and exposure to acid vapor ($P=0.004$), $PM_{2.5}$ ($P=0.04$), and elemental carbon ($P=0.007$), in addition to the above-mentioned correlation with nitrogen dioxide. As with FEV_1, the effects of the various pollutants on FVC and MMEF did not differ significantly between boys and girls. Significant deficits in FVC were associated with exposure to nitrogen dioxide ($P=0.05$) and acid vapor ($P=0.03$), whereas deficits in MMEF were associated with exposure to nitrogen dioxide ($P=0.02$) and elemental carbon ($P=0.04$). There was no significant evidence that ozone, either the average value obtained from 10 a.m. to 6 p.m. or the one-hour maximal level, was associated with any measure of lung function. In two-pollutant models for any of the measures of pulmonary function, adjustment for ozone did not substantially alter the effect estimates or significance levels of any other pollutant (data not shown). In general, two-pollutant models for any pair of pollutants did not provide a significantly better fit to the data than the corre-

Table 1. **Correlation of Mean Air-Pollution Levels from 1994 through 2000 across the 12 Study Communities.***

Pollutant	O_3 (10 a.m.–6 p.m.)	NO_2	Acid Vapor†	PM_{10}	$PM_{2.5}$	Elemental Carbon	Organic Carbon
			R value				
O_3							
1-Hour maximal level	0.98	0.10	0.53	0.31	0.33	0.17	0.25
10 a.m.–6 p.m.		−0.11	0.35	0.18	0.18	−0.03	0.13
NO_2			0.87	0.67	0.79	0.94	0.64
Acid vapor†				0.79	0.87	0.88	0.76
PM_{10}					0.95	0.85	0.97
$PM_{2.5}$						0.91	0.91
Elemental carbon							0.82

* Unless otherwise noted, values are the 24-hour average pollution levels. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.
† Acid vapor is the sum of nitric, formic, and acetic acid levels.

Table 2. **Mean Levels of Growth in Pulmonary Function during the Eight-Year Study Period, from 1993 to 2001.***

Pulmonary-Function Measure	Girls			Boys		
	Age of 10 yr	Age of 18 yr	Average 8-yr growth	Age of 10 yr	Age of 18 yr	Average 8-yr growth
FVC (ml)	2262	3790	1528	2427	5202	2775
FEV_1 (ml)	1988	3332	1344	2082	4464	2382
MMEF (ml/sec)	2311	3739	1428	2287	4709	2422

* Levels at the ages of 10 and 18 years are derived from the growth model described in the Methods section. FVC denotes forced vital capacity, FEV_1 forced expiratory volume in one second, and MMEF maximal midexpiratory flow rate.

sponding single-pollutant models; this was not surprising, given the strong correlation between most pollutants.

The association between pollution and the growth in FEV_1 over the eight-year period remained significant in a variety of sensitivity analyses (Table 4). For example, estimates of the effect of acid vapor and elemental carbon (model 1 in Table 4) changed little with adjustment for in-utero exposure to maternal smoking (model 2), presence in the home of a gas stove (model 3) or pets (model 4), or parental level of education (model 5). To account for possible confounding by short-term effects of air pollution, we fitted a model that adjusted for the average ozone, nitrogen dioxide, and PM_{10} levels on the three days before each child's pulmonary-function test. This adjustment also had little effect on the estimates of the long-term effects of air pollution (model 6). Table 4 also shows that the effects of pollutants remained large and significant in the subgroups of children with no history of asthma (model 7) and those with no history of smoking (model 8). The effects of pollutants were not significant among the 457 children who had a history of asthma or among the 483 children who had ever smoked (data not shown), although the sample sizes in these subgroups were small. Model 9 demonstrates that the extremes in pollutant levels did not drive the observed associations; in other words, we found similar effect estimates after eliminating the two communities with the highest and lowest levels of each pollutant. Finally, model 10 shows the effects of pollutants in the subgroup of subjects who underwent pulmonary-function testing in both 1993 and 2001 (i.e., subjects who participated in both the first and last year of the study). The magnitudes of effects in this subgroup were similar to those in the entire sample (model 1), suggesting that observed effects of pollutants in the entire sample cannot be attributed to biased losses to follow-up across communities. These sensitivity analyses were also applied to the other pollutants and to FVC and MMEF, with similar results.

Pollution-related deficits in the average growth in lung function over the eight-year period resulted in clinically important deficits in attained lung function at the age of 18 years (Fig. 3). Across the 12 communities, a clinically low FEV_1 was positively correlated with the level of exposure to nitrogen dioxide (P=0.005), acid vapor (P=0.01), PM_{10} (P=0.02), $PM_{2.5}$ (P=0.002), and elemental carbon (P=0.006). For example, the estimated proportion of children with a low FEV_1 (represented by the regression line in Fig. 3) was 1.6 percent at the lowest level of exposure to $PM_{2.5}$ and was 4.9 times as great (7.9 percent) at the highest level of exposure to $PM_{2.5}$

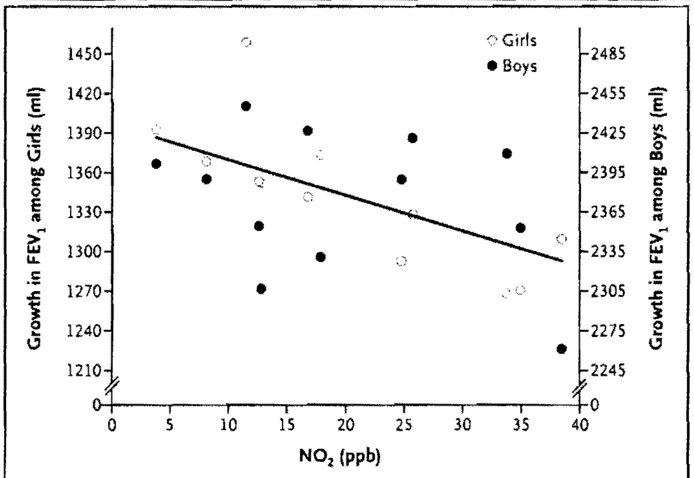

Figure 2. **Community-Specific Average Growth in FEV_1 among Girls and Boys During the Eight-Year Period from 1993 to 2001 Plotted against Average Nitrogen Dioxide (NO_2) Levels from 1994 through 2000.**

Table 3. **Difference in Average Growth in Lung Function over the Eight-Year Study Period from the Least to the Most Polluted Community.***

Pollutant	FVC		FEV_1		MMEF	
	Difference (95% CI)	P Value	Difference (95% CI)	P Value	Difference (95% CI)	P Value
	ml		*ml*		*ml/sec*	
O_3						
10 a.m.–6 p.m.	−50.6 (−171.0 to 69.7)	0.37	−22.8 (−122.3 to 76.6)	0.62	85.6 (−130.0 to 301.1)	0.40
1-Hour maximal level	−70.3 (−183.3 to 42.6)	0.20	−44.5 (−138.9 to 50.0)	0.32	45.7 (−172.3 to 263.6)	0.65
NO_2	−95.0 (−189.4 to −0.6)	0.05	−101.4 (−164.5 to −38.4)	0.005	−211.0 (−377.6 to −44.4)	0.02
Acid vapor	−105.2 (−194.5 to −15.9)	0.03	−105.8 (−168.8 to −42.7)	0.004	−165.0 (−344.8 to 14.7)	0.07
PM_{10}	−60.2 (−190.6 to 70.3)	0.33	−82.1 (−176.9 to 12.8)	0.08	−154.2 (−378.3 to 69.8)	0.16
$PM_{2.5}$	−60.1 (−166.1 to 45.9)	0.24	−79.7 (−153.0 to −6.4)	0.04	−168.9 (−345.5 to 7.8)	0.06
Elemental carbon	−77.7 (−166.7 to 11.3)	0.08	−87.9 (−146.4 to −29.4)	0.007	−165.5 (−323.4 to −7.6)	0.04
Organic carbon	−58.6 (−196.1 to 78.8)	0.37	−86.2 (−185.6 to 13.3)	0.08	−151.2 (−389.4 to 87.1)	0.19

* Values are the differences in the estimated rate of eight-year growth at the lowest and highest observed levels of the indicated pollutant. Differences are scaled to the range across the 12 study communities in the average level of each pollutant from 1994 through 2000 as follows: 37.5 ppb of O_3 (measured from 10 a.m. to 6 p.m.), 46.0 ppb of O_3 (the one-hour maximal level), 34.6 ppb of NO_2, 9.6 ppb of acid vapor, 51.4 μg of PM_{10} per cubic meter, 22.8 μg of $PM_{2.5}$ per cubic meter, 1.2 μg of elemental carbon per cubic meter, and 10.5 μg of organic carbon per cubic meter. CI denotes confidence interval.

(P=0.002). Similar associations between these pollutants and a low FEV_1 were observed in the subgroup of children with no history of asthma and the subgroup with no history of smoking (data not shown). A low FEV_1 was not significantly correlated with exposure to ozone in any group.

DISCUSSION

The results of this study provide robust evidence that lung development, as measured by the growth in FVC, FEV_1, and MMEF from the ages of 10 to 18 years, is reduced in children exposed to higher levels of ambient air pollution. The strongest associations were observed between FEV_1 and a correlated set of pollutants, specifically nitrogen dioxide, acid vapor, and elemental carbon. The effects of these pollutants on FEV_1 were similar in boys and girls and remained significant among children with no history of asthma and among those with no history of smoking, suggesting that most children are susceptible to the chronic respiratory effects of breathing polluted air. The magnitude of the observed effects of air pollution on the growth in lung function during this age interval was similar to those that have been reported for exposure to maternal smoking[17,18] and smaller than those reported for the effects of personal smoking.[17,19]

Cumulative deficits in the growth in lung function during the eight-year study period resulted in a strong association between exposure to air pollution and a clinically low FEV_1 at the age of 18 years. In general, lung development is essentially complete in girls by the age of 18 years, whereas in boys it continues into their early 20s, but at a much reduced rate. It is therefore unlikely that clinically significant deficits in lung function at the age of 18 years will be reversed in either girls or boys as they complete the transition into adulthood. Deficits in lung function during young adulthood may increase the risk of respiratory conditions — for example, episodic wheezing that occurs during a viral infection.[20] However, the greatest effect of pollution-related deficits may occur later in life, since reduced lung function is a strong risk factor for complications and death during adulthood.[21-27]

Deficits in lung function were associated with a correlated set of pollutants that included nitrogen dioxide, acid vapor, fine-particulate matter ($PM_{2.5}$), and elemental carbon. In southern California, the primary source of these pollutants is motor vehicles, either through direct tailpipe emissions or downwind physical and photochemical reactions of vehicular emissions. Both gasoline- and diesel-powered engines contribute to the tons of pollutants exhausted into southern California's air every day, with diesel vehicles responsible for disproportionate amounts of nitrogen dioxide, $PM_{2.5}$, and ele-

Table 4. **Sensitivity Analysis of the Effects of Acid Vapor and Elemental Carbon on Growth in FEV_1 over the Eight-Year Study Period.***

Model	Acid Vapor	Elemental Carbon
	Difference (95% Confidence Interval)	
Main model (model 1)†	−105.8 (−168.8 to −42.7)	−87.9 (−146.4 to −29.4)
Additional covariates‡		
Main model + in-utero exposure to maternal smoking (model 2)	−108.8 (−173.3 to −44.2)	−85.8 (−147.4 to −24.1)
Main model + exposure to gas stove (model 3)	−106.0 (−181.5 to −30.6)	−84.8 (−154.7 to −14.9)
Main model + pets in home (model 4)	−108.4 (−171.6 to −45.2)	−89.8 (−149.1 to −30.6)
Main model + parental level of education (model 5)	−100.7 (−167.2 to −34.2)	−80.9 (−142.7 to −19.0)
Main model + short-term effects of pollution (model 6)§	−112.4 (−201.4 to −23.3)	−103.2 (−181.8 to −24.5)
Subgroup effects		
No history of asthma (model 7)¶	−98.1 (−166.4 to −29.8)	−88.9 (−149.2 to −28.6)
No history of smoking (model 8)‖	−115.6 (−233.7 to 2.5)	−113.3 (−214.9 to −11.6)
After exclusion of communities with lowest and highest levels of pollution (model 9)**	−106.7 (−192.3 to −21.2)	−94.7 (−173.7 to −15.7)
Complete follow-up (model 10)††	−132.4 (−226.2 to −38.7)	−97.4 (−195.6 to 0.9)

* Values are the differences in the estimated rate of eight-year growth at the lowest and highest observed levels of the indicated pollutant. Differences are scaled to the range across the 12 study communities in the average level of each pollutant from 1994 through 2000 as follows: 9.6 ppb of acid vapor and 1.2 μg of elemental carbon per cubic meter.

† Model 1 is equivalent to effect estimates for FEV_1 in Table 3 and is based on data on 1759 children.

‡ The main model was adjusted for each of the covariates listed.

§ Values were adjusted for the average levels of O_3, NO_2, and PM_{10} on the three days before each child's pulmonary-function test.

¶ The analysis includes data on 1302 children with no history of doctor-diagnosed asthma.

‖ The analysis includes data on 1276 children with no history of active tobacco smoking at any time during follow-up.

** The analysis excludes children from the two communities with the lowest and highest levels of each pollutant. This leaves 1507 children (excluding those from Lompoc and Upland) in the analysis of acid vapor and 1484 children (excluding those from Lompoc and Long Beach) in the analysis of elemental carbon.

†† The analysis includes 713 children who underwent pulmonary-function testing in both 1993 and 2001 (i.e., those observed throughout the study).

mental carbon. In the current study, however, we could not discern the independent effects of pollutants because they came from common sources and there was a high degree of intercorrelation among them; similar difficulties have also been encountered in other studies of lung function and air-pollutant mixtures.[1,2,9,28-30] Since ozone is also formed during photochemical reactions involving fuel-combustion products, one might expect ozone to be correlated with the other study pollutants and therefore to show similar associations with lung function. However, the Children's Health Study was specifically designed to minimize the correlation of ozone with other pollutants across the 12 study communities. Thus, although ozone has been convincingly linked to acute health effects in many other studies,[11] our results provide little evidence that ambient ozone at current levels is associated with chronic deficits in the growth of lung function in children. Only a few other studies have addressed the long-term effects of ozone on lung development in children, and results have been inconsistent.[31] Although we found little evidence of an effect of ozone, this result needs to be interpreted with caution given the potential for substantial misclassification of exposure to ozone.[32,33]

The mechanism whereby exposure to pollutants could lead to reduced lung development is unknown, but there are many possibilities. Our observation of associations between air pollution and all three measures of lung function — FVC, FEV_1, and MMEF — suggests that more than one process is involved. FVC is largely a function of the number and size of alveoli, with differences in volume pri-

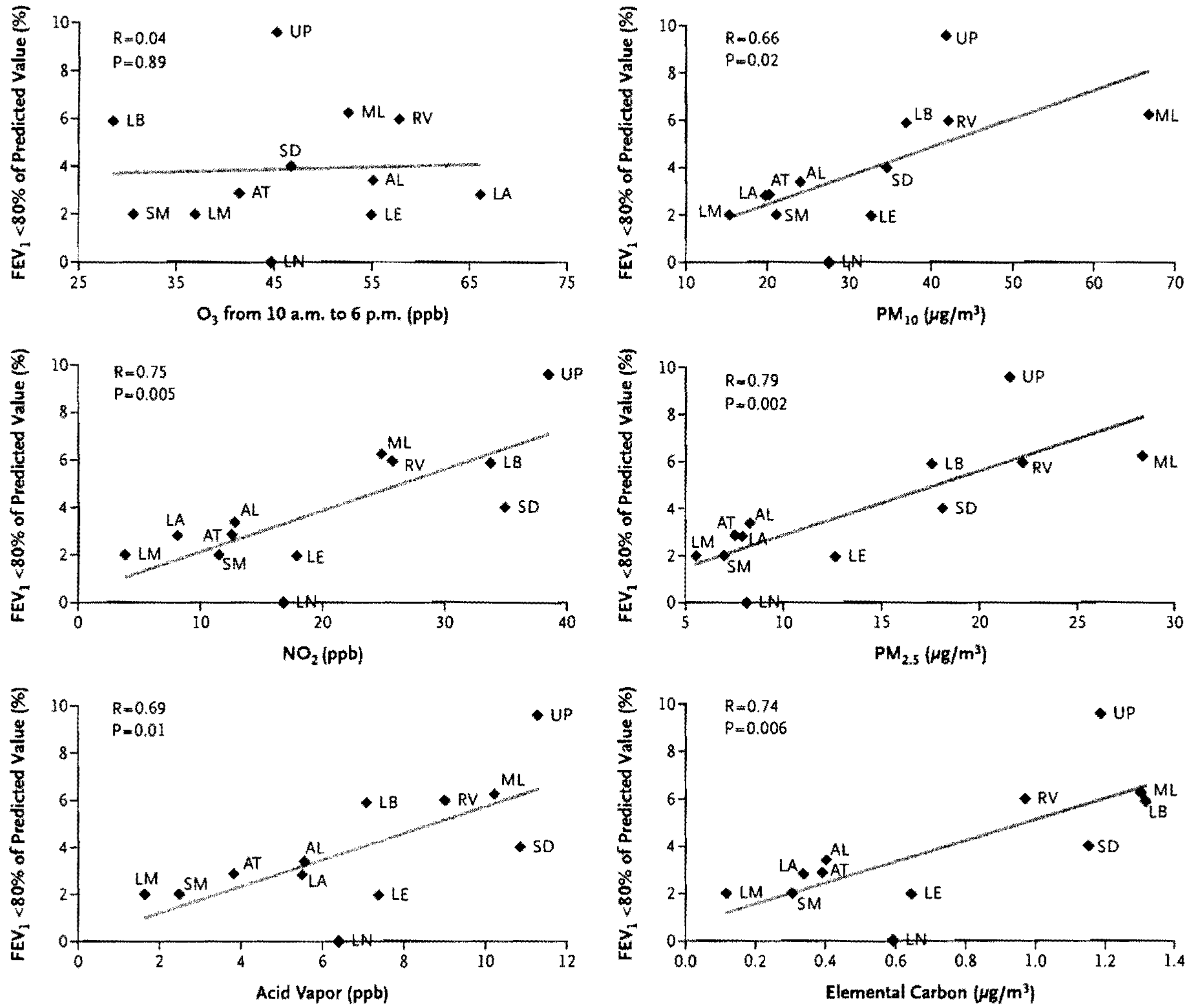

Figure 3. **Community-Specific Proportion of 18-Year-Olds with a FEV_1 below 80 Percent of the Predicted Value Plotted against the Average Levels of Pollutants from 1994 through 2000.**

The correlation coefficient (R) and P value are shown for each comparison. AL denotes Alpine, AT Atascadero, LE Lake Elsinore, LA Lake Arrowhead, LN Lancaster, LM Lompoc, LB Long Beach, ML Mira Loma, RV Riverside, SD San Dimas, SM Santa Maria, and UP Upland. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.

marily attributable to differences in the number of alveoli, since their size is relatively constant.[34] However, since the postnatal increase in the number of alveoli is complete by the age of 10 years, pollution-related deficits in the growth of FVC and FEV_1 during adolescence may, in part, reflect a reduction in the growth of alveoli. Another plausible mechanism of the effect of air pollution on lung development is airway inflammation, such as occurs in bronchiolitis; such changes have been observed in the airways of smokers and of subjects who lived in polluted environments.[35,36]

A strength of our study was the long-term, prospective follow-up of a large cohort, with exposure and outcome data collected in a consistent manner throughout the study period. As in any epidemiologic study, however, the observed effects could be biased by underlying associations of the exposure and outcome to some confounding variables. We adjusted for known potential confounders, including personal characteristics and other sources of exposure to pollutants, but the possibility of confounding by other factors still exists. Over the eight-year follow-up period, approximately 10 percent of study subjects were lost to follow-up each year. Attrition is a potential source of bias in a cohort study if loss to follow-up is related to both exposure and outcome. However, we did not see evidence that the loss of subjects was related to either baseline lung function or exposure to air pollution. In addition, we observed significant associations between air pollution and lung growth in the subgroup of children who were followed for the full eight years of the study, with effects that were similar in magnitude to those in the group as a whole, thus making loss of subjects an unlikely source of bias.

We have shown that exposure to ambient air pollution is correlated with significant deficits in respiratory growth over an eight-year period, leading to clinically important deficits in lung function at the age of 18 years. The specific pollutants that were associated with these deficits included nitrogen dioxide, acid vapor, $PM_{2.5}$, and elemental carbon. These pollutants are products of primary fuel combustion, and since they are present at similar levels in many other areas,[37,38] we believe that our results can be generalized to children living outside southern California. Given the magnitude of the observed effects and the importance of lung function as a determinant of morbidity and mortality during adulthood, continued emphasis on the identification of strategies for reducing levels of urban air pollutants is warranted.

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REFERENCES

1. Frischer T, Studnicka M, Gartner C, et al. Lung function growth and ambient ozone: a three-year population study in school children. Am J Respir Crit Care Med 1999;160:390-6.
2. Jedrychowski W, Flak E, Mroz E. The adverse effect of low levels of ambient air pollutants on lung function growth in preadolescent children. Environ Health Perspect 1999;107:669-74.
3. Horak F Jr, Studnicka M, Gartner C, et al. Particulate matter and lung function growth in children: a 3-yr follow-up study in Austrian schoolchildren. Eur Respir J 2002; 19:838-45.
4. Gauderman WJ, McConnell R, Gilliland F, et al. Association between air pollution and lung function growth in southern California children. Am J Respir Crit Care Med 2000;162:1383-90.
5. Avol EL, Gauderman WJ, Tan SM, London SJ, Peters JM. Respiratory effects of relocating to areas of differing air pollution levels. Am J Respir Crit Care Med 2001; 164:2067-72.
6. Gauderman WJ, Gilliland GF, Vora H, et al. Association between air pollution and lung function growth in southern California children: results from a second cohort. Am J Respir Crit Care Med 2002;166:76-84.
7. Ware JH, Ferris BG Jr, Dockery DW, Spengler JD, Stram DO, Speizer FE. Effects of ambient sulfur oxides and suspended particles on respiratory health of preadolescent children. Am Rev Respir Dis 1986;133: 834-42.
8. Dockery DW, Speizer FE, Stram DO, Ware JH, Spengler JD, Ferris BG Jr. Effects of inhalable particles on respiratory health of children. Am Rev Respir Dis 1989;139: 587-94.
9. Schwartz J. Lung function and chronic exposure to air pollution: a cross-sectional analysis of NHANES II. Environ Res 1989; 50:309-21.
10. Raizenne M, Neas LM, Damokosh AI, et al. Health effects of acid aerosols on North American children: pulmonary function. Environ Health Perspect 1996;104:506-14.
11. Committee of the Environmental and Occupational Health Assembly of the American Thoracic Society. Health effects of outdoor air pollution. Am J Respir Crit Care Med 1996;153:3-50, 477-98.
12. Peters JM, Avol E, Gauderman WJ, et al. A study of twelve Southern California communities with differing levels and types of air pollution. II. Effects on pulmonary function. Am J Respir Crit Care Med 1999;159:768-75.
13. Peters JM, Avol E, Navidi W, et al. A study of twelve Southern California communities with differing levels and types of air pollution. I. Prevalence of respiratory morbidity. Am J Respir Crit Care Med 1999; 159:760-7.
14. Wang X, Dockery DW, Wypij D, et al. Pulmonary function growth velocity in children 6 to 18 years of age. Am Rev Respir Dis 1993;148:1502-8.
15. Elemental carbon (diesel exhaust). In: NIOSH manual of analytical methods. No. 5040. Issue 3 (interim report). Cincinnati: National Institute for Occupational Safety and Health, 1999.
16. SAS/STAT user's guide, version 9. Cary, N.C.: SAS Institute, 2002.
17. Tager IB, Weiss ST, Munoz A, Rosner B, Speizer FE. Longitudinal study of the effects of maternal smoking on pulmonary function in children. N Engl J Med 1983;309: 699-703.
18. Wang X, Wypij D, Gold DR, et al. A longitudinal study of the effects of parental smoking on pulmonary function in children 6-18 years. Am J Respir Crit Care Med 1994; 149:1420-5.
19. Tager I, Munoz A, Rosner B, Weiss ST, Carey V, Speizer FE. Effect of cigarette smoking on the pulmonary function of children and adolescents. Am Rev Respir Dis 1985;131:752-9.
20. Mckean M, Leech M, Lambert PC, Hewitt C, Myint S, Silverman M. A model of viral wheeze in nonasthmatic adults: symptoms and physiology. Eur Respir J 2001;18: 23-32.
21. Schroeder EB, Welch VL, Couper D, et al. Lung function and incident coronary heart disease: the Atherosclerosis Risk in Communities Study. Am J Epidemiol 2003; 158:1171-81.
22. Schunemann HJ, Dorn J, Grant BJ, Winkelstein W Jr, Trevisan M. Pulmonary function is a long-term predictor of mortality in the general population: 29-year follow-up of the Buffalo Health Study. Chest 2000; 118:656-64.
23. Knuiman MW, James AL, Davitini ML, Ryan G, Bartholomew HC, Musk AW. Lung function, respiratory symptoms, and mortality: results from the Busselton Health Study. Ann Epidemiol 1999;9:297-306.
24. Hole DJ, Watt GC, Davey Smith G, Hart CL, Gillis CR, Hawthorne VM. Impaired

lung function and mortality risk in men and women: findings from the Renfrow and Paisley prospective population study. BMJ 1996;313:711-5.

25. Kannell WB, Hubert H, Lew EA. Vital capacity as a predictor of cardiovascular disease: the Framingham Study. Am Heart J 1983;105:311-5.

26. Friedman GD, Klatsky AL, Siegelaub AB. Lung function and risk of myocardial infarction and sudden cardiac death. N Engl J Med 1976;294:1071-5.

27. Ashley F, Kannell WB, Sorlie PD, Masson R. Pulmonary function: relation to aging, cigarette habit, and mortality. Ann Intern Med 1975;82:739-45.

28. Detels R, Tashkin DP, Sayre JW, et al. The UCLA population studies of chronic obstructive respiratory disease. 9. Lung function changes associated with chronic exposure to photochemical oxidants: a cohort study among never-smokers. Chest 1987; 92:594-603.

29. Detels R, Tashkin DP, Sayre JW, et al. The UCLA population studies of CORD. X. A cohort study of changes in respiratory function associated with chronic exposure to SOx, NOx, and hydrocarbons. Am J Public Health 1991;81:350-9.

30. Tashkin DP, Detels R, Simmons M, et al. The UCLA population studies of chronic obstructive respiratory disease. XI. Impact of air pollution and smoking on annual change in forced expiratory volume in one second. Am J Respir Crit Care Med 1994;149:1209-17.

31. Tager IB. Air pollution and lung function growth: is it ozone? Am J Respir Crit Care Med 1999;160:387-9.

32. Avol EL, Navidi WC, Rappaport EB, Peters JM. Acute effects of ambient ozone on asthmatic, wheezy, and healthy children. Res Rep Health Eff Inst 1998;82:1-30.

33. Sarnat JA, Schwartz J, Catalano PJ, Suh HH. Gaseous pollutants in particulate matter epidemiology: confounders or surrogates? Environ Health Perspect 2001;109:1053-61.

34. Ochs M, Nyengaard JR, Jung A, et al. The number of alveoli in the human lung. Am J Respir Crit Care Med 2004;169:120-4.

35. Churg A, Brauer M, del Carmen Avila-Casado M, Fortoul TI, Wright JL. Chronic exposure to high levels of particulate air pollution and small airway remodeling. Environ Health Perspect 2003;111:714-8.

36. Sherwin RP, Richters V, Kraft P, Richters A. Centriacinar region inflammatory disease in young individuals: a comparative study of Miami and Los Angeles residents. Virchows Arch 2000;437:422-8.

37. Tolocka M, Solomon P, Mitchell W, Norris G, Gemmill D, Wiener R. East vs. West in the US: chemical characteristics of PM2.5 during the winter of 1999. Aerosol Sci Technol 2001;34:88-96.

38. Latest findings on national air quality: 2002 status and trends. Research Triangle Park, N.C.: Environmental Protection Agency, 2003. (Report no. 454/K-03-001.)

EXHIBIT 3

AHA Scientific Statement

Particulate Matter Air Pollution and Cardiovascular Disease

An Update to the Scientific Statement From the American Heart Association

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Abstract**—**In 2004, the first American Heart Association scientific statement on "Air Pollution and Cardiovascular Disease" concluded that exposure to particulate matter (PM) air pollution contributes to cardiovascular morbidity and mortality. In the interim, numerous studies have expanded our understanding of this association and further elucidated the physiological and molecular mechanisms involved. The main objective of this updated American Heart Association scientific statement is to provide a comprehensive review of the new evidence linking PM exposure with cardiovascular disease, with a specific focus on highlighting the clinical implications for researchers and healthcare providers. The writing group also sought to provide expert consensus opinions on many aspects of the current state of science and updated suggestions for areas of future research. On the basis of the findings of this review, several new conclusions were reached, including the following: Exposure to PM <2.5 μm in diameter ($PM_{2.5}$) over a few hours to weeks can trigger cardiovascular disease–related mortality and nonfatal events; longer-term exposure (eg, a few years) increases the risk for cardiovascular mortality to an even greater extent than exposures over a few days and reduces life expectancy within more highly exposed segments of the population by several months to a few years; reductions in PM levels are associated with decreases in cardiovascular mortality within a time frame as short as a few years; and many credible pathological mechanisms have been elucidated that lend biological plausibility to these findings. It is the opinion of the writing group that the overall evidence is consistent with a causal relationship between $PM_{2.5}$ exposure and cardiovascular morbidity and mortality. This body of evidence has grown and been strengthened substantially since the first American Heart Association scientific statement was published. Finally, $PM_{2.5}$ exposure is deemed a modifiable factor that contributes to cardiovascular morbidity and mortality. **(*Circulation.* 2010;121:2331-2378.)**

Key Words: AHA Scientific Statements ■ atherosclerosis ■ epidemiology ■ prevention ■ air pollution ■ public policy

In 2004, the American Heart Association (AHA) published its first scientific statement regarding air pollution and cardiovascular disease (CVD).[1] The rationale was to provide researchers, healthcare providers, and regulatory agencies with a comprehensive review of the evidence linking air pollution exposure with cardiovascular morbidity and mor-

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

This statement was approved by the American Heart Association Science Advisory and Coordinating Committee on February 22, 2010. A copy of the statement is available at http://www.americanheart.org/presenter.jhtml?identifier=3003999 by selecting either the "topic list" link or the "chronological list" link (No. KB-0038). To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.

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Expert peer review of AHA Scientific Statements is conducted at the AHA National Center. For more on AHA statements and guidelines development, visit http://www.americanheart.org/presenter.jhtml?identifier=3023366.

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tality. There was also an explicit aim to educate clinicians about the importance of this issue, because the cardiovascular health consequences of air pollution generally equal or exceed those due to pulmonary diseases.[1–4] Finally, a list of key remaining scientific questions and strategic avenues for investigation were provided to help foster and guide future research.

The first AHA writing group concluded that short-term exposure to particulate matter (PM) air pollution contributes to acute cardiovascular morbidity and mortality[1] and that exposure to elevated PM levels over the long term can reduce life expectancy by a few years. Although some mechanistic details remained incompletely described, the existing science was deemed adequate to substantiate several plausible biological pathways whereby PM could instigate acute cardiovascular events and promote chronic disease.

There is mounting evidence from a rapid growth of published data since the previous statement related to the harmful cardiovascular effects of air pollution.[3,4] Most, but not all, epidemiological studies corroborate the elevated risk for cardiovascular events associated with exposure to fine PM <2.5 μm in aerodynamic diameter ($PM_{2.5}$). $PM_{2.5}$ generally has been associated with increased risks of myocardial infarction (MI), stroke, arrhythmia, and heart failure exacerbation within hours to days of exposure in susceptible individuals. Several new studies have also demonstrated that residing in locations with higher long-term average PM levels elevates the risk for cardiovascular morbidity and mortality. Some recent evidence also implicates other size fractions, such as ultrafine particles (UFPs) <0.1 μm, gaseous copollutants (eg, ozone and nitrogen oxides [NO_x]), and specific sources of pollution (eg, traffic). In addition, there have been many insights into the mechanisms whereby PM could prove capable of promoting CVDs.[2–4] Air pollutants have been linked with endothelial dysfunction and vasoconstriction, increased blood pressure (BP), prothrombotic and coagulant changes, systemic inflammatory and oxidative stress responses, autonomic imbalance and arrhythmias, and the progression of atherosclerosis. In the interim, the US Environmental Protection Agency (EPA) completed its updated "Air Quality Criteria for Particulate Matter"[5] and afterward strengthened the National Ambient Air Quality Standards (NAAQS) for daily $PM_{2.5}$ levels starting in 2006 (down from 65 to 35 $\mu g/m^3$).[6] The most recent scientific review coordinated by the EPA, the final report of the Integrated Science Assessment for Particulate Matter (http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546), has also been made available publicly. These numerous changes and advances provide the rationale for the present updated AHA scientific statement on PM air pollution and CVD. This updated statement is similar in scope, content, and overall structure to the first document; however, it provides many additional conclusions and recommendations that can now be made because of the expanded number and quality of studies.

Objectives and Methods

The primary objective of this scientific statement is to provide a comprehensive updated evaluation of the evidence linking PM exposure with CVDs. The focus of this review is explicitly on PM because the majority of air pollution studies have centered on its cardiovascular effects, and the strength of the evidence makes it possible to provide consensus opinions and recommendations. Except for in a few circumstances, such as when copollutants have been shown to (or not to) modify the responses to PM exposure or to have independent cardiovascular effects in epidemiological studies of major importance, a detailed discussion of other air pollutants (eg, ozone and NO_2) is beyond the scope of this document. Additional objectives are to provide expert consensus opinions on aspects related to the current state of science, to specifically highlight the health and clinical implications of the reviewed findings, and to provide prudent and practical recommendations for measures to reduce PM exposure that might thereby lower the associated cardiovascular risk. This updated scientific statement is structured to first provide a clinical perspective on the cardiovascular risks posed by PM exposure and then briefly review the components of air pollution. The following sections highlight the major findings from epidemiological studies, including mortality, morbidity, and surrogate outcome results. Next, the animal and human mechanistic studies are reviewed, and an overall framework whereby PM exposure could cause CVDs is outlined. Finally, updated consensus opinions and conclusions are provided, followed by suggestions for areas of future research and policy considerations.

Members of the current writing group were selected from across a broad range of disciplines, including cardiovascular and environmental epidemiology and statistics, atmospheric sciences, cardiovascular and pulmonary medicine, basic science research, and public policy. The writing group identified studies published in the English language between January 1, 2004, and March 31, 2009, by a World Wide Web–based literature search using Medline, PubMed, and Google search engines. Key terms included *air pollution* or *particulate matter* plus any of the following: *cardiovascular, myocardial, heart, cardiac, stroke, heart failure, arrhythmia, heart rate variability, autonomic, sympathetic, atherosclerosis, vascular, blood pressure, hypertension, diabetes, metabolic, thrombosis,* and *coagulation.* Additional studies were identified within the references of these publications and by the personal knowledge of the writing group members. A few studies published after March 31, 2009, were added during the review process. All of the identified epidemiological studies that provided mortality data or hard cardiovascular outcomes (eg, MIs) and controlled human exposure protocols were included. In a few circumstances, studies before 2004 were included briefly in the discussion or tables when it was believed that they provided contextual background and/or relevant findings from earlier analyses of ongoing studies (eg, Harvard Six Cities and American Cancer Society [ACS] cohorts) from which new results after 2004 have been published. It is a limitation of the present review that it was not possible to cite all surrogate outcome human studies because of the enormous number of publications. Some were not included, without intentional bias with regard to results, when multiple referenced studies demonstrated similar findings. In such a situation (eg, heart rate variability [HRV]), this limitation was noted within the specific section. A main theme of the present statement is to provide clinical context and recommendations for healthcare providers, and thus, it was beyond the scope and not the intent of this document to include all animal, ex vivo, or toxicological studies. A number of these publications were also not included, without intentional bias with regard to results. The writing group included publications that were believed to have relevant implications for human cardiovascular health, those that formed the foundation of the mechanistic hypotheses, and studies that were deemed of major importance. Finally, the "evidence summary" statements and all points in the conclusions and recommendations represent consensus expert opinions agreed on by all members of the writing group during formal discussions. It is explicitly stated when no such agreement was reached. These statements and the points within Tables 6 and 7 do not represent the result of applying the standard AHA criteria (ie, level and class) to the sum findings of the present review, because those do not apply, but rather the qualitative consensus opinions agreed on by the writing group. The purpose is to provide expert opinions on the comparative relative ranking and the strength of the overall evidence regarding different areas within this field of science.

Perspective on the Air Pollution–Cardiovascular Risk Association

Traditional cardiovascular risk factors account for the major portion of the risk for ischemic cardiac events within a population.[7] Individuals with optimal levels of all risk factors have been shown to have a low lifetime cardiovascular event rate.[8] Thus, control of the traditional risk factors is recognized to be of paramount importance to prevent CVDs. In this context, there has been some debate about the overall clinical relevance and utility of adding novel risk factors to risk-prediction models to incrementally improve their overall predictive value, even when assessed by multiple methodologies.[9] On the other hand, the ability to predict future events by existing models remains imperfect. In addition to several mathematical and statistical explanations for this shortcoming,[10,11] it is important to recognize that the development of vascular or atherosclerotic disease (the factor predicted by most statistical models) is usually a necessary but insufficient cause of future ischemic events in and of itself. Cardiovascular events must also be triggered by an additional factor at some unknowable future time, and therefore, they transpire as a stochastic process within a population.[12] This is one of several reasons why PM air pollution is a uniquely important public health issue among the list of novel risk factors; PM inhalation is an established trigger of cardiovascular events that occur within hours to days after exposure.[12] Because of the ubiquitous and involuntary nature of PM exposure, it may continuously enhance acute cardiovascular risk among millions of susceptible people worldwide in an often inconspicuous manner. Moreover, beyond serving as a simple trigger, PM elicits numerous adverse biological responses (eg, systemic inflammation) that, in premise, may further augment future cardiovascular risk over the long term after months to years of exposure.

Effects of Short-Term Exposure

Time-series studies estimate that a 10-$\mu g/m^3$ increase in mean 24-hour $PM_{2.5}$ concentration increases the relative risk (RR) for daily cardiovascular mortality by approximately 0.4% to 1.0%.[3] Despite theoretical statistical risks ascribed to all individuals, this elevated risk from exposure is not equally distributed within a population. At present-day levels, $PM_{2.5}$ likely poses an acute threat principally to susceptible people, even if seemingly healthy, such as the elderly and those with (unrecognized) existing coronary artery or structural heart disease.[13] Therefore, the absolute risk rather than the RR of exposure may more effectively convey the tangible health burden within a population. A 10-$\mu g/m^3$ increase during the preceding day contributes on average to the premature death of approximately 1 susceptible person per day in a region of 5 million people (based on annual US death rates in 2005).[3,14] Although the dangers to 1 individual at any single time point may be small, the public health burden derived from this ubiquitous risk is enormous. Short-term increases in $PM_{2.5}$ levels lead to the early mortality of tens of thousands of individuals per year in the United States alone.[1,3,5]

Effects of Long-Term Exposure

Cohort studies estimate that the RR associated with living in areas with higher PM levels over the long term is of greater magnitude than that observed from short-term exposure increases (RR between 1.06 and 1.76 per 10 $\mu g/m^3$ $PM_{2.5}$).[3] In this context, the World Health Organization estimated that $PM_{2.5}$ contributes to approximately 800 000 premature deaths per year, ranking it as the 13th leading cause of worldwide mortality.[15] Hence, PM air pollution appears to be an important modifiable factor that affects the public health on a global scale.

Air Pollution

The first AHA statement on air pollution reviewed the size fractions, sources, and chemical constituents of PM and the main gaseous air pollutants: Nitrogen oxides (NO_x; ie, $NO+NO_2$), carbon monoxide (CO), sulfur dioxide (SO_2), and ozone (O_3).[1] Therefore, this section within the updated statement focuses on several other contemporary aspects of air pollution characterization and exposure assessment, particularly in relation to their potential influences on cardiovascular health. In brief, PM is broadly categorized by aerodynamic diameter: All particles <10 μm (thoracic particles [PM_{10}]), all particles <2.5 μm (fine particles [$PM_{2.5}$]), all particles <0.1 μm (UFP), and particles between 2.5 and 10 μm (coarse particles [$PM_{10-2.5}$]). Hence, PM_{10} contains within it the coarse and $PM_{2.5}$ fractions, and $PM_{2.5}$ includes UFP particles. The concentrations of PM_{10} and $PM_{2.5}$ are typically measured in their mass per volume of air ($\mu g/m^3$), whereas UFPs are often measured by their number per cubic centimeter (Table 1). The major source of $PM_{2.5}$ throughout

Table 1. Ambient Air Pollutants

Pollutant	US Average Range	US Typical Peak*	Most Recent NAAQS for Criteria Pollutants (Averaging Time)
O_3†	0–125 ppb	200 ppb	75 ppb (8 h)‡
NO_2†	0.5–50 ppb	200 ppb	100 ppb (1 h)§ 53 ppb (Annual mean)
NO†	0–100 ppb	200 ppb	
SO_2†	0.1–50 ppb	150 ppb	140 ppb (24 h)‖ 30 ppb (Annual mean)
CO†	0.1–5 ppm	20 ppm	35 ppm (1 h)‖ 9 ppm (8 h)‖
PM_{10}¶	10–100 $\mu g/m^3$	300 $\mu g/m^3$	150 $\mu g/m^3$ (24 h)#
$PM_{2.5}$¶	5–50 $\mu g/m^3$ (Mean=13.4±5.6)	100 $\mu g/m^3$	15 $\mu g/m^3$ (Annual mean) 35 $\mu g/m^3$ (24 h)**
$PM_{2.5}$ lead¶	0.5–5 ng/m^3	150 ng/m^3	0.15 $\mu g/m^3$ (Rolling 3-month average)††
NH_3†	0.1–20 ppb	100 ppb	
HNO_3†	0–5 ppb	10 ppb	
Methane†	1–2 ppm	5 ppm	
Formaldehyde†	0.1–10 ppb	40 ppb	
Acetaldehyde†	0.1–5 ppb	20 ppb	
NMHC (VOC)¶	20–100 $\mu g/m^3$	250 $\mu g/m^3$	
Propane¶	2–20 $\mu g/m^3$	500 $\mu g/m^3$	
Benzene¶	0.5–10 $\mu g/m^3$	100 $\mu g/m^3$	
1,3-Butadiene¶	0.1–2 $\mu g/m^3$	10 $\mu g/m^3$	
Total suspended particles¶	20–300 $\mu g/m^3$	1000 $\mu g/m^3$	
$PM_{10-2.5}$¶	5–50 $\mu g/m^3$	200 $\mu g/m^3$	
Sulfate¶	0.5–10 $\mu g/m^3$	30 $\mu g/m^3$	
Nitrate¶	0.1–5 $\mu g/m^3$	20 $\mu g/m^3$	
Organic carbon¶	1–20 $\mu g/m^3$	30 $\mu g/m^3$	
Elemental carbon¶	0.1–3 $\mu g/m^3$	10 $\mu g/m^3$	
PAH¶	2–50 ng/m^3	200 ng/m^3	
UFP†	1000–20 000/cm^3	100 000/cm^3	

ppb indicates parts per billion; ppm, parts per million; and PAH, polycyclic aromatic hydrocarbon.

*Generally not in concentrated plumes or locations of direct source emission impact.

†Typical hourly average concentrations reached in US cities.

‡The 8-hour standard is met when the 3-year average of the 4th highest daily maximum 8-hour average is less than or equal to the indicated number. In January 2010, the EPA proposed a more stringent 8-hour standard within the range of 60 to 70 ppb (http://www.epa.gov/air/ozonepollution/actions.html).

§To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed this value.

‖The level is not to be exceeded more than once per year.

¶Typical 24-hour average concentrations.

#The level is not to be exceeded more than once per year on average over 3 years.

**The daily standard is met when the 3-year average of the 98th percentile of 24-hour PM level is less than or equal to the indicated number.

††Although the typical concentrations shown in the table are for $PM_{2.5}$, the lead standard continues to be based on measurements in total suspended particulate.

the world today is the human combustion of fossil fuels from a variety of activities (eg, industry, traffic, and power generation). Biomass burning, heating, cooking, indoor activities, and nonhuman sources (eg, fires) may also be relevant sources, particularly in certain regions.

Common air pollutants and those designated as EPA criteria pollutants (ie, specifically targeted in regulations through limits on emissions or government standards such as the NAAQS) are listed in Table 1. The World Health Organization also provides ambient guidelines (http://www.euro.who.int/Document/E90038.pdf). As a result, many pollutant concentrations are tracked in the United States by nationwide monitoring networks, with up to approximately 1200 sites for O_3 and $PM_{2.5}$. Data are archived by the EPA and are available to the public (http://www.epa.gov/ttn/airs/airsaqs/). O_3 levels exceed the national standard in many areas, and thus, daily information is provided to assist the public in reducing their exposure. A lower standard for ozone concentrations was proposed recently, which will lead to more frequent occurrences of outdoor exposures deemed to be excessive (Table 1). The reporting of $PM_{2.5}$ is also becoming common because of its impact on public health and frequent violations of standards. Current and forecast air quality indices and information on both $PM_{2.5}$ and ozone are available (http://airnow.gov/). At the end of 2008, 211 US counties (or portions of counties) were in nonattainment of the 2006 daily $PM_{2.5}$ NAAQS (http://www.epa.gov/pmdesignations/2006standards/state.htm). On a positive note, the various regulations that have been established have led to substantial reductions in PM and other pollutant levels over the past 40 years in the United States and contributed toward similar improvements in other countries. However, reducing the levels of some pollutants, such as O_3, remains a challenge because of the complex chemical processes that lead to their formation in the atmosphere.[16] The population of many developing nations (China, India, Middle Eastern countries) continues to be exposed to high levels, particularly of PM, which can routinely exceed 100 $\mu g/m^3$ for prolonged periods (http://siteresources.worldbank.org/DATASTATISTICS/Resources/table 3_13.pdf).

Air Pollution Mixtures, Chemistry, and Sources

Detailed information regarding PM sizes, composition, chemistry, sources, and atmospheric interactions is beyond the scope of this document but can be found in the 2004 US EPA Air Quality Criteria for Particulate Matter final report (http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87903). The source for much of the information provided in this brief summary is this document, unless otherwise specifically referenced. The typical range of ambient concentrations for several air pollutants in the United States, including the latest US NAAQS for the criteria pollutants, is given in Table 1. Classification of air quality according to 1 single pollutant and by size or mass provides an incomplete picture, because ambient air pollution is a complex mixture of gases, particles, and liquids that are continually changing and interacting with each other and natural atmospheric gases. Although $PM_{2.5}$ mass has rightfully attracted considerable attention as a target for regulation and epidemiological study, more than 98% of the air pollutant mass in the mixture we breathe in urban settings is from gases or vapor-phase compounds such as CO, nonmethane hydrocarbons or volatile organic carbons (VOCs), NO_2, NO, O_3, and SO_2. Each of these can have independent and potentially synergistic or antagonistic effects with each other and with PM; however, at present, the cardiovascular health impact of exposure to combinations of air pollutants is not well understood.

Most of the studies linking CVDs with PM exposures have focused on particle mass; thus, this association is evaluated and reported in the majority of epidemiological and toxicological studies reviewed. Although PM is regulated by mass concentration, the aspect of PM most harmful to cardiovascular health may not be best quantified by mass measurement alone. The sum effect of many features related to chemical composition and size/morphology (eg, oxidative stress potential, solubility, charge, surface area, particle count, lung deposition, and stability within the atmosphere and biological tissues) is important to consider. With regard to specific "toxic" compounds within PM, several lines of existing evidence support the idea that transition metals, organic compounds, semiquinones, and endotoxin are likely relevant in relation to promoting CVDs. In addition, certain characteristics of UFPs (eg, high surface area, particle number, metal and organic carbon content) suggest that they may pose a particularly high cardiovascular risk after short-term exposure.[17] Both the additional characterization of "criteria" pollutants and the measurement of several other pollutants (discussed below) are important to inform air quality management practices that involve air quality modeling, as well as epidemiological studies and risk assessment, which ultimately aim to improve risk-reduction strategies.

In addition to their mass concentration, pollutants can be characterized on the basis of their origin or chemical and physical properties. In terms of origin, nitrogen oxides ($NO+NO_2$), CO, SO_2, and $PM_{2.5}$, as well as carbon dioxide (CO_2), are mainly associated with combustion of fuel or other high-temperature industrial processes. Combustion PM is composed of many chemical compounds, including organic carbon species, elemental or black carbon, and trace metals (eg, lead and arsenic). They range in size from molecular clusters a few nanometers in diameter to light-scattering particles that peak on a mass contribution basis in the diameter range of 200 to 1000 nm (0.2 to 1 μm). UFP numbers are also strongly linked to fresh combustion and traffic-related pollution. Ammonia, methane, pesticides (persistent organic pollutants), reduced sulfur compounds, resuspended dust, and natural coarse particles ($PM_{10-2.5}$) are associated with noncombustion surface or fugitive releases that arise from a variety of human (eg, agriculture) and natural (eg, erosion) activities. Agricultural emissions and releases from a range of industrial processes and waste management are also important sources. Road and windblown dust from agricultural practices and from certain industrial facilities (eg, mineral industry) also contribute to these particles, which are typically in the coarse ($PM_{10-2.5}$) or even larger ($>PM_{10}$) range.

In addition to pollutants formed directly by combustion, many others are produced primarily through chemical reactions in the atmosphere among directly emitted pollutants. These are known as secondary pollutants. Sunlight, water vapor, and clouds are often involved in this atmospheric chemistry, which leads to greater oxidation of the pollutants. Examples include PM-associated sulfate, nitrate, and ammonium and many of the organic compounds within $PM_{2.5}$. Besides O_3, which is the most prevalent secondary gaseous oxidant, a number of inorganic and organic acids and VOCs form in the atmosphere. Examples are the hydroxyl radical, peroxyacetyl nitrate, nitric acid, formic and acetic acid, formaldehyde, and acrolein.

VOCs and semivolatile organic compounds (SVOCs), the latter of which are found in both the gas and particle phase, are an additional large class of pollutants. They are associated with both combustion and fugitive emissions, as well as with secondary formation. Key examples are benzene, toluene, xylene, 1,3-butadiene, and polycyclic aromatic hydrocarbons. VOCs are among the 188 hazardous air pollutants listed by the EPA, and their main emission sources have been identified and are regulated (http://www.epa.gov/ttn/atw/mactfnlalph.html). VOCs can undergo reactions that convert toxic substances to less toxic products or vice versa. Many VOCs contribute to the formation of O_3 and are oxidized in the atmosphere, becoming SVOCs, and subsequently partition within particles and contribute to the composition of $PM_{2.5}$, as well as to its mass. A great deal of research has focused on $PM_{2.5}$ in the past decade, which has led to advances in measurement technologies[18] and greater understanding of its chemistry and atmospheric behavior.[19] Nonetheless, understanding is incomplete, particularly with regard to formation of the secondary organic fraction, the relative role of anthropogenic and biogenic emissions to organics, surface chemistry, oxidative potential,[20] and gas-to-particle partitioning.

An alternative to attempting to identify one by one which pollutant(s) or chemical compounds are most harmful is to focus on identifying the sources, which typically emit mixtures of pollutants, of greatest concern. It may be the mixture of pollutants (along with the source from which it is derived, which determines its characteristics) that is most pertinent to human health outcomes. Such information may actually be more relevant for aiding the development of effective air quality policies. One important example reviewed in the epidemiology section is that the evidence continues to grow regarding the harmful cardiovascular effects of traffic-related pollution. Traffic is ubiquitous in modern society, with a sizeable proportion of the population, particularly persons disadvantaged by low socioeconomic status, living close enough (within 500 m) to a major road or a freeway to be chronically exposed to elevated concentrations. Additionally, daily behavior brings most people close to this source, with the average US citizen over 15 years of age spending 55 minutes each day traveling in motor vehicles.[21] However, despite the consistent epidemiological findings, these studies have yet to elucidate which of the many pollutants or other associated risks (ie, noise) produced by traffic are responsible for the increase in risk for CVD. Until the most harmful agents are identified, the only practical manner to potentially reduce health consequences would be to reduce overall traffic and related emissions and to configure cities and lifestyles such that there is greater separation between the people and the source, so that we could spend less time in traffic (a major source of personal exposures in our society). There are also a myriad of other important pollutant sources of known toxic pollutants that have been implicated in health-effect studies (eg, power generation, industrial sources, steel mills, and wood smoke). A better understanding of the factors that influence population exposure to these sources, of how their emissions and mixtures of different sources affect health, and about the factors that make individuals more susceptible will aid in the development of more effective environmental health policies.

Determinants of Air Pollution Exposure

Many aspects of air pollution play a role in the characteristics of population- and individual-level exposures. Pollutants vary on multiple time scales, with emission rates, weather patterns, and diurnal/seasonal cycles in solar radiation and temperature having the greatest impact on concentrations. The temporal behavior of a pollutant is also governed by its formation rate and the length of time it remains in the atmosphere. As such, the concentrations of many air pollutants tend to co-vary. For example, NO_x and CO are emitted during combustion, as are some particle constituents (eg, elemental carbon) and VOCs, and thus, their concentrations peak during rush hour. On the other hand, O_3 and other photochemical oxidants, including secondary $PM_{2.5}$ and secondary VOCs, peak in the afternoon, particularly given certain meteorologic conditions (eg, more sunshine). Among the common air pollutants, O_3 and $PM_{2.5}$ have the longest atmospheric lifetime and thus can build up over multiple days and spread, by the prevailing winds, over large geographic regions. This can lead to similarities in their temporal and spatial patterns over broad regions and to greater numbers of people being exposed to similar levels, thus lessening interindividual variability in exposure.

Periods of suppressed horizontal and vertical mixing in the lower atmosphere lead to the buildup of multiple pollutants. These situations are most common under slow-moving or stationary high-pressure systems, which bring light winds, a stable atmosphere, and more sunshine. The frequency and seasonality of these meteorologic conditions and how they affect concentrations vary geographically, which leads to differences in the characteristics of pollution episodes from the western to the eastern United States, as well as within these regions.

The commonality of meteorology and emission sources leads to covariation in pollutant concentrations on multiple temporal and spatial scales, which makes it more challenging for epidemiological studies to identify the health effects of individual pollutants and the effects of copollutants or mixtures. Studies that depend on daily counts of mortality or morbidity events have difficulties separating the effects of the different pollutants in the urban mix. Even prospective panel studies measuring specific end points on a subdaily time scale are hindered by pollutant covariation. Some of these challenges could potentially be addressed by undertaking studies covering multiple geographic locations with differences in the structure of pollutant covariation due to different meteorology and source mixes. Indeed, this has been done, at least in part, by several existing multicity studies. Consistency in the findings in individual studies conducted in different cities also helps isolate the pollutants that may be more responsible for the health effects. The consistent positive findings with certain pollutants (eg, PM mass concentration) have helped strengthen the evidence regarding PM_{10} and $PM_{2.5}$ effects, but regardless of location, there remains the strong underlying commonality of fossil fuel combustion for many pollutants.

A final issue to consider is the cardiovascular health effects of exposures that occur at the personal level because of the different microenvironments or activities an individual experiences (eg, time in traffic, indoor sources, secondhand tobacco smoke, occupational exposure, and degree of indoor penetration of ambient PM into homes) versus the effects of exposures from less variable urban- to regional-scale ambient concentrations (ie, background pollution that most individuals encounter more uniformly). Personal monitoring demonstrates substantial variations among individual pollution exposures or characteristics among those living within the same metropolitan area and even the same neighborhood.[22,23] However, the differing additive, synergistic, and/or confounding effects on cardiovascular health of these 2 contrasting components of a person's overall exposure have not been well described. For the most part, the magnitude of the findings reported by the major epidemiological studies (see next section) are indicative of the effects of the urban- to regional-scale ambient concentrations. Actual exposures to all pollutants also vary at the personal level. The cardiovascular health importance of these individual-level variations (above and beyond the effect of urban/regional levels) remains largely unknown, in part because it has been difficult to quantify. The degree to which measurement of personal exposures or more precise exposure assessment (eg, use of geographic information systems, land-use regression models, spatial-temporal models, and adjustments for indoor penetration) can reduce the effects of exposure misclassification in epidemiological studies also remains to be fully elucidated.[24–26]

Epidemiological Studies of Air Pollution

Epidemiological studies of air pollution have examined the health effects of exposures observed in real-world settings at ambient levels. Associations between relevant health end points and measures of air pollution are evaluated while attempting to control for effects of other pertinent factors (eg, patient and environmental characteristics). Despite substantial study and statistical improvements and the relative consistency of results, some potential for residual confounding of variables and publication bias[27] of positive studies are limitations to acknowledge. Probably the most relevant, well-defined, and extensively studied health end points include mortality (all-cause and cause-specific), hospitalizations, and clinical cardiovascular events. This section reviews the results of the epidemiological research with a focus on new studies since the first AHA statement was published,[1] as well as on the cardiovascular health implications. In sum, numerous studies of varied design have been published in the interim that significantly add to the overall weight of evi-

Table 2. Comparison of Pooled Estimated of Percent Increase (and 95% CI or Posterior Interval or *t* Value) in RR of Mortality Estimated Across Meta-Analyses and Multicity Studies of Daily Changes in Exposure

			Percent Increases in Mortality (95% CI)		
	Primary Source	Exposure Increment	All-Cause	Cardiovascular	Respiratory
Meta-estimate with and without adjustment for publication bias	Anderson et al[27] 2005	20 $\mu g/m^3$ PM_{10}	1.0 (0.8–1.2) 1.2 (1.0–1.4)	...	...
Meta-estimates from COMEAP report to the UK Department of Health on CVD and air pollution	COMEAP[31] 2006	20 $\mu g/m^3$ PM_{10} 10 $\mu g/m^3$ $PM_{2.5}$	... ...	1.8 (1.4–2.4) 1.4 (0.7–2.2)	... ...
NMMAPS, 20 to 100 US cities	Dominici et al[34] 2003	20 $\mu g/m^3$ PM_{10}	0.4 (0.2–0.8)	0.6 (0.3–1.0)*	...
APHEA-2, 15 to 29 European cities	Katsouyanni et al[35] 2003 Analitis et al[36] 2006	20 $\mu g/m^3$ PM_{10}	1.2 (0.8–1.4)	1.5 (0.9–2.1)	1.2 (0.4–1.9)
US, 6 cities	Klemm and Mason[37] 2003	10 $\mu g/m^3$ $PM_{2.5}$	1.2 (0.8–1.6)	1.3 (0.3–2.4)†	0.6 (−2.9, 4.2)‡
US, 27 cities, case-crossover	Franklin et al[38] 2007	10 $\mu g/m^3$ $PM_{2.5}$	1.2 (0.3–2.1)	0.9 (−.1, 2.0)	1.8 (0.2, 3.4)
California, 9 cities	Ostro et al[39] 2006	10 $\mu g/m^3$ $PM_{2.5}$	0.6 (0.2–1.0)	0.6 (0.0, 1.1)	2.2 (0.6, 3.9)
France, 9 cities	Le Tertre et al[40] 2002	20 $\mu g/m^3$ BS	1.2 (0.5–1.8)§	1.2 (0.2–2.2)§	1.1 (−1.4, 3.2)§
Japan, 13 cities, age >65 y	Omori et al[41] 2003	20 $\mu g/m^3$ SPM	1.0 (0.8–1.3)	1.1 (0.7–1.5)	1.4 (0.9–2.1)
Asia, 4 cities	Wong et al[42] 2008	10 $\mu g/m^3$ PM_{10}	0.55 (0.26–0.85)	0.59 (0.22–0.93)	0.62 (0.16–1.04)
US, 112 cities	Zanobetti et al[43] 2009	10 $\mu g/m^3$ $PM_{2.5}$	0.98 (0.75–1.22)	0.85 (0.46–1.24)	1.68 (1.04–2.33)
		10 $\mu g/m^3$ $PM_{10-2.5}$‖	0.46 (0.21–0.71)	0.32 (0.00–0.64)	1.16 (0.43–1.89)
		10 $\mu g/m^3$ $PM_{2.5}$¶	0.77 (0.43–1.12)	0.61 (0.05–1.17)	1.63 (0.69–2.59)
		10 $\mu g/m^3$ $PM_{10-2.5}$¶	0.47 (0.21–0.73)	0.29 (−0.04, 0.61)	1.14 (0.043–1.85)

CI indicates confidence interval or posterior interval.
*Cardiovascular and respiratory deaths combined.
†Ischemic heart disease deaths.
‡Chronic obstructive pulmonary disease deaths.
§Includes general additive model–based analyses with potentially inadequate convergence.
‖Results for $PM_{10-2.5}$ are from 47 cities.
¶Results of 2 pollutant models controlling for alternate PM size in 47 cities.

dence that exposure to air pollutants at present-day levels contributes to cardiovascular morbidity and mortality.

Mortality and Air Pollution

Time-Series and Related Studies

Time-series and case-crossover studies explore associations between short-term changes in air pollution and daily changes in death counts. The sum of current evidence supports the findings of an earlier review[28] that demonstrated that short-term elevations in daily PM levels lead to a greater absolute risk for CVD-related mortality than for all other causes. Even if similar acute RR elevations ($\approx$1.01) are estimated between cardiovascular and pulmonary mortality, CVDs account for 69% of the increase in absolute mortality rates compared with 28% for pulmonary diseases attributable to short-term PM exposure. Recently, more rigorous modeling techniques have been used in attempts to better estimate pollution-mortality associations while controlling for other time-dependent confounding covariables.[29,30] There have been well over 100 published daily time-series studies reporting small but statistically significant PM-mortality associations that have been the subject of quantitative reviews or meta-analyses.[3,27,31–33] Table 2 summarizes recent multicity analyses and studies published since 2004.

To address concerns about city selection bias, publication bias, and influences of copollutants, several large, multicity, daily time-series studies have been conducted worldwide. One of the largest was the National Morbidity, Mortality, and Air Pollution Study (NMMAPS). Published reports from this study included as few as 20 US cities,[44,45] as many as 100 cities,[46,47] and more recently, data for hundreds of counties (Table 2).[48] The observed relationship between PM exposure and excess mortality remained independent of several gaseous copollutants (NO_2, CO, or SO_2). Recent analyses suggest that O_3 may also independently contribute to cardiopulmonary mortality risk[49,50]; however, coexposures to secondary particle pollutants may be responsible in part for this latter association.[51]

Several studies have also been conducted outside the United States, including the Air Pollution and Health: A European Approach (APHEA and APHEA-2) projects, which examined daily PM-related mortality effects in multiple cities.[36,52] PM air pollution was significantly associated with daily mortality counts for all-cause, cardiovascular, and respiratory mortality (Table 2). Further analyses of the European data suggest that CVD deaths are also associated with exposure to NO_2[53] and CO.[54] A few new time-series studies have also confirmed similar increases in cardiovascular mortality related to short-term PM exposure in China[55–57] and Bangkok, Thailand.[42] Additional multicity studies have been conducted worldwide with analyses of CVD deaths (Table 2).[38–42,58–60] Finally, in a recent analysis that included several Asian cities, SO_2, NO_2, O_3, and PM_{10} were all associated with excess cardiovascular mortality.[42]

In an attempt to evaluate the coherence of multicity studies across continents, the Air Pollution and Health: A Combined European and North American Approach (APHENA) study analyzed data from the APHEA, NMMAPS, and Canadian studies.[61] The combined effect on all-cause mortality ranged from 0.2% to 0.6% for a 10-$\mu g/m^3$ elevation in daily ambient PM_{10}, with the largest effects observed in Canada. Among individuals older than 75 years, the effects were greater for cardiovascular mortality than for overall and pulmonary mortality (0.47% to 1.30%). Older age (>75 years) and higher rates of unemployment were related to greater PM mortality risks in both continents. Higher NO_2 levels were associated with larger PM_{10} effects on mortality, particularly in Europe. Finally, there appeared to be no lower-limit threshold below which PM_{10} was not associated with excess mortality across all regions.

Evidence Summary

The overall evidence from time-series analyses conducted worldwide since publication of the first AHA statement[1] confirms the existence of a small, yet consistent association between increased mortality and short-term elevations in PM_{10} and $PM_{2.5}$ approximately equal to a 0.4% to 1.0% increase in daily mortality (and cardiovascular death specifically) due to a 10-$\mu g/m^3$ elevation in $PM_{2.5}$ during the preceding 1 to 5 days (Table 2).

Cohort and Related Studies

Although short-term changes in PM concentrations have deleterious health effects, longer-term exposures may have a more pertinent clinical health effect on cardiovascular morbidity and mortality given that individuals are typically exposed to higher air pollution levels over extended periods of time. An additional source of exposure variability that has been exploited in epidemiological studies is spatial variability, which includes differences in average ambient concentrations over extended periods of time across metropolitan areas or across smaller communities within local areas. Recent emphasis has been on prospective cohort studies that control for individual differences in multiple confounding variables and cardiovascular risk factors. A summary of these studies is presented in Table 3 and Figure 1. These cohort studies generally demonstrate larger overall mortality effects than the results of time-series analyses.

Harvard Six Cities and ACS Studies

Two landmark cohort-based mortality studies, the Harvard Six Cities[62] and the ACS studies,[66] were reported in the mid 1990s and were discussed previously.[1] In both, $PM_{2.5}$ and sulfate particulate pollution were associated with increases in all-cause and cardiopulmonary disease (Table 3). In addition, intensive independent reanalyses[63] corroborated the original findings of both studies and resulted in innovative methodological contributions that demonstrated the robustness of the results to alternative modeling approaches. In both the Harvard Six Cities[62,64] and the ACS[67] studies, PM air pollution–related mortality was substantially higher for cardiovascular- than for pulmonary-related causes.

Since 2004, there have been further analyses of both studies. Laden et al[64] extended the mortality follow-up of the Harvard Six Cities cohort for an additional 8 years. $PM_{2.5}$ associations, similar to those found in the original analysis, were observed for all-cause and CVD mortality (Table 3). Furthermore, reductions in $PM_{2.5}$ concentrations for the extended follow-up period were associated with reduced mortality risk. Further analysis suggested that the health effects of changes in exposure were seen primarily within 2 years.[84] In addition to confirming the earlier mortality relationship, the recent observations suggest that the adverse health effects mediated by longer-term PM air pollution exposure can be estimated reasonably accurately by the previous few years of particle levels.

Extended analyses of the ACS cohort that emphasize efforts to control for the effects of other covariates and risk factors have corroborated the previously reported mortality associations with particulate and sulfur oxide pollution.[68] Elevated mortality risks were most strongly associated with $PM_{2.5}$. Coarse particles ($PM_{10-2.5}$) and gaseous pollutants, except for SO_2, were generally not significantly related to mortality. In another extended analysis,[67] the death certificate classifications of underlying causes of death due to $PM_{2.5}$ exposures were observed to be principally ischemic heart disease, arrhythmias, heart failure, and cardiac arrest. Finally, recent additional analyses attempted to control for the fact that variations in exposure to air pollution across cities or within cities may correlate with socioeconomic or demographic gradients that influence health and susceptibility to environmental exposures.[85,86] When controlled for individual risk factor data, the mortality associations for intrametropolitan $PM_{2.5}$ concentration differences within the Los Angeles, Calif, area were generally larger than those observed in the full cohort across metropolitan areas.[69] However, the results were somewhat sensitive to the inclusion of zip code–level ecological variables, which suggests potential contextual neighborhood confounding. Krewski et al[70] subsequently observed that full adjustments for multiple ecological covariates did not reduce the estimated $PM_{2.5}$-related mortality effect. The association for ischemic heart disease mortality in particular was highly robust across various study areas and modeling strategies and after controlling for both individual and ecological covariates.

An additional recent analysis of the ACS cohort evaluated the health effects of ozone compared with $PM_{2.5}$.[87] The findings reconfirmed the independent cardiovascular mortality increase related to fine-particle exposure. However, after adjustment for $PM_{2.5}$, ozone was associated solely with an elevated risk of death due to respiratory causes; there was no independent risk of ozone exposure on CVD-related mortality. This suggests that the positive findings reported in NMMAPS[50] regarding cardiopulmonary mortality and short-term ozone exposure could be explained at least in part by the enhanced risk of mortality due to lung disease categories.

Table 3. Summary of Cohort Study Results

Study	Size of Cohort (000s)	Follow-Up Period	Covariates Controlled for	Percent Increases in Mortality (95% CI) Associated With 10 $\mu g/m^3$ $PM_{2.5}$ (or Other When Indicated)			
				All-Cause	Cardiopulmonary	Cardiovascular	Ischemic Heart Disease
Harvard Six Cities, original (Dockery et al[62] 1993)	≈8	1974–1991	Individual (smoking+others)	13 (4.2–23)	18 (6.0–32)	…	…
Harvard Six-Cities, HEI reanalysis, Krewski et al[63] 2004	≈8	1974–1991	Individual (smoking+others)	14 (5.4–23)	19 (6.5–33)	…	…
Harvard Six-Cities, extended, Laden et al[64] 2006	≈8	1974–1998	Individual (smoking+others)	16 (7–26)	…	28 (13–44)	…
Six-Cities Medicare cohort, Eftim et al[65] 2008	≈340	2000–2002	Individual (age, sex)	21 (15–27)	…	…	…
ACS, Original, Pope et al[66] 1995	≈500	1982–1989	Individual (smoking+others)	6.6 (3.5–9.8)	12 (6.7–17)	…	…
ACS, HEI reanalysis, Krewski et al[63] 2004	≈500	1982–1989	Individual (smoking+others) +ecological	7.0 (3.9 10)	12 (7.4–17)	13 (8.1–18)	…
ACS, extended I, Pope et al[67,68] 2002, 2004	≈500	1982–1998	Individual (smoking+others)	6.2 (1.6–11)	9.3 (3.3–16)	12 (8–15)	18 (14–23)
ACS, intrametro Los Angeles, Jerrett et al[69] 2005	≈23	1982–2000	Individual (smoking+others) +ecological	17 (5–30)	12 (−3–30)	…	39 (12–73)
ACS, extended II, Krewski et al[70] 2009	≈500	1982–2000	Individual (smoking+others) +ecological	5.6 (3.5–7.8)	13 (9.5–16)	…	24 (20–29)
ACS, Medicare cohort, Eftim et al[65] 2008	7333	2000–2002	Individual (age, sex)+ecological +COPD	11 (9–13)	…	…	…
US Medicare cohort, east/central/west, Zeger et al[71] 2008	13 200	2000–2005	Individual (age, sex)+ecological +COPD	6.8 (4.9–8.7),* 13 (9.5–17) −1.1 (−3 to 0.8)	…	…	…
Women's Health Initiative, Miller et al[72] 2007	≈66	1994–2002	Individual (smoking+others)	…	…	76 (25–147), 24 (9–41)†	…
Nurses' Health Study, Puett et al[73] 2008	≈66	1992–2002	Individual (smoking+others) ecological	7.0 (−3.0 to 18)‡	…	30 (0–71)‡	…
AHSMOG, males only, McDonnell et al[74] 2000	≈4	1977–1992	Individual (smoking+others)	8.5 (−2.3 to 21)	23 (−3 to 55)	…	…
AHSMOG, females only, Chen et al[75] 2005	≈4	1977–2000	Individual (smoking+others)	…	…	42 (6–90)	…
VA hypertensive male I study, Lipfert et al[76] 2006	≈42	1989–1996	Individual (smoking+others) +ecological	15 (5–26)§	…	…	…
VA hypertensive male II study, Lipfert et al[77] 2006	≈30	1997–2001	Individual (smoking+others) +ecological	6 (−6 to 22)	…	…	…
11 CA county, elderly, Enstrom[78] 2005	≈36	1973–2002	Individual (smoking+others) +ecological	4 (1–7)‖, 1 (−0.6 to 2.6)	…	…	…
French PAARC, Filleul et al[79] 2005	≈14	1974–2000	Individual (smoking+others)	7 (3–10)‡	5 (−2 to 12)‡	…	…
German women, Gehring et al[80] 2006	≈5	1980s, 1990s–2003	Individual smoking and socioeconomic status	12 (−8 to 38)	52 (9–115)	…	…

(Continued)

Table 3. Continued

Study	Size of Cohort (000s)	Follow-Up Period	Covariates Controlled for	Percent Increases in Mortality (95% CI) Associated With 10 $\mu g/m^3$ $PM_{2.5}$ (or Other When Indicated)			
				All-Cause	Cardiopulmonary	Cardiovascular	Ischemic Heart Disease
Oslo, Norway, intrametro, Naess et al[81] 2007	≈144	1992–1998	Individual age, occupational class, education	...	...	10 (5–16),¶ 14 (6–21), 5 (1–8), 3 (0–5)	...
Dutch cohort, Beelen et al[82] 2008	≈121	1987–1996	Individual (smoking+others) +ecological	6 (−3 to 16)	...	4 (−10 to 21)	...
Great Britain, Elliott et al[83] 2007	≈660	1966–1998	Socioeconomic status	1.3 (1.0–1.6)‡#	1.7 (1.3–2.2)‡#	1.2 (0.7–1.7)‡#	

HEI indicates Health Effects Institute; VA, Veterans Affairs; COPD, chronic obstructive pulmonary disease; and CA, California.

*Three estimates are for the East, Central, and West regions of the United States, respectively.

†Any cardiovascular event.

‡Associated with 10 $\mu g/m^3$ British Smoke (BS) or PM_{10}.

§Estimates from the single-pollutant model. Effect estimates were smaller and statistically insignificant in analyses restricted to counties with nitrogen dioxide data. County-level traffic density was a strong predictor of survival, and stronger than $PM_{2.5}$ when included with $PM_{2.5}$ in joint regressions.

||Two estimates are for the follow-up period 1973–1982 and the follow-up period 1983–2002, respectively.

¶Four estimates are for men 51–70 y old, women 51–70 y old, men 71–90 y old, and women 71–90 y old, respectively.

#Using last 0- to 4-year exposure window.

Additional Cohort Studies

Several additional cohort studies have been published in the past few years (Table 3). Eftim and colleagues[65] studied 2 very large "cohorts" of US Medicare participants who lived in locations included in the Harvard Six Cities and ACS studies. Effects of $PM_{2.5}$ exposure on mortality for the period 2000 to 2002 were estimated after controlling for multiple factors, although not at the individual patient level. For all-cause mortality, the $PM_{2.5}$-mortality associations were larger than those observed in the Harvard Six Cities or ACS cohorts. In an additional analysis of 13.2 million US Medicare participants for the time period 2000 to 2005,[71] $PM_{2.5}$-mortality associations were shown to be similar to those observed in the Harvard Six Cities and ACS studies in the East and Central regions of the United States (and when the data were pooled for the entire United States). However, $PM_{2.5}$ was not associated with mortality in the Western United States or for the oldest age group (>85 years old). These findings generally corroborate the earlier cohort studies and add evidence that aspects of exposure (PM sources or composition) and patient susceptibility might play important roles in determining the health risks.

In a cohort of postmenopausal women without prior CVD from the Women's Health Initiative Observational Study,[72] an association between longer-term $PM_{2.5}$ exposure (median follow-up of 6 years) and cardiovascular events (primary end point) was observed. After adjustment for age and other risk factors, an incremental difference of 10 $\mu g/m^3$ $PM_{2.5}$ was associated with a 24% (95% confidence interval [CI]9% to 41%) increase in all first cardiovascular events (fatal and nonfatal, with a total of 1816 cases). Notably, an incremental difference of 10 $\mu g/m^3$ $PM_{2.5}$ was also associated with a large 76% (95% CI 25% to 147%) increase in fatal cardiovascular events, based on 261 deaths. The risks for both coronary heart disease and strokes were found to be similarly elevated. Interestingly, within-city $PM_{2.5}$ gradients appeared to have larger cardiovascular effects than those between cities, although this difference was not statistically significant. Finally, overweight women (body mass index >24.8 kg/m^2) were at relatively greater cardiovascular risk due to particulate air pollution than leaner women. Noteworthy aspects of this study were improved assessment of the end points by medical record review (rather than by death certificate) and long-term particle exposure estimation. The control for individual-level confounding variables was also superior to that of previous cohort studies.

In another cohort of women, a subset of the Nurses' Health Study from the northeastern United States,[73] an increase of 10 $\mu g/m^3$ modeled estimates of PM_{10} exposures was associated with an approximately 7% to 16% increased risk of all-cause mortality and a 30% to 40% increase in fatal coronary heart disease, depending on the level of adjustment for covariates. This study found that the strongest health risks for all-cause and cardiovascular mortality were seen in association with the average PM_{10} exposure during the previous 24 months before death. Similar to the findings of the Women's Health Initiative, the cardiovascular mortality risk estimates were larger than those of previous cohort studies. In addition, obese women (body mass index >30 kg/m^2) were at greater relative risk, and the increases in mortality (all-cause and cardiovascular) were larger than the effects on nonfatal events. The results were also in accordance with the latest Harvard Six Cities analyses[64] that show that exposure over the most recent preceding 1 to 2 years can accurately estimate the majority of the health risks due to longer-term PM air pollution exposures.

The pollution-mortality association has also been assessed in several other cohort studies in the United States and Europe (Table 3).[76–83] In a recent analysis of the Adventist Health Study of Smog (AHSMOG) cohort with a much

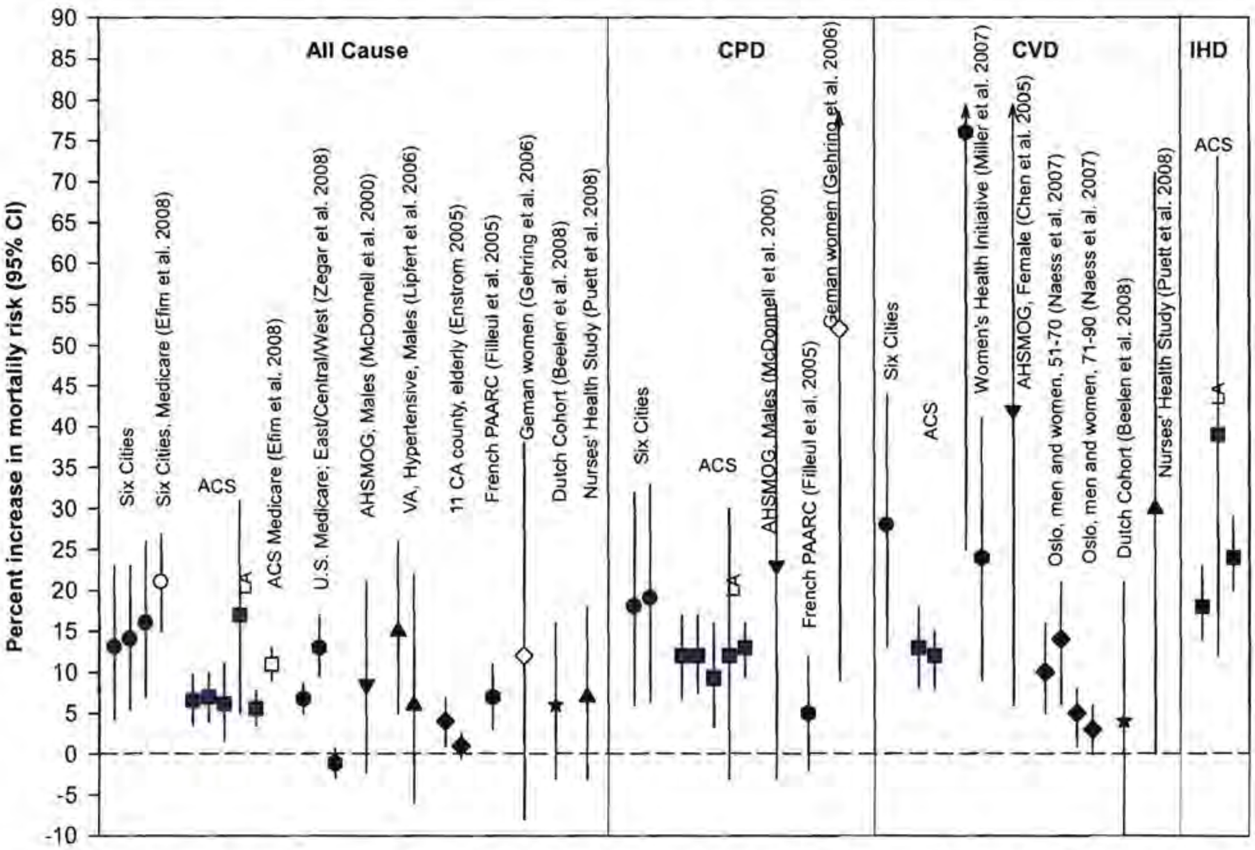

Figure 1. Risk estimates provided by several cohort studies per increment of 10 $\mu g/m^3$ in $PM_{2.5}$ or PM_{10}. CPD indicates cardiopulmonary disease; IHD, ischemic heart disease.

longer follow-up than the original studies,[74,88] fatal coronary heart disease was significantly associated with $PM_{2.5}$ among females but not males.[75] These observations along with the remarkably robust health effects in the Women's Health Initiative Observational Study and Nurses' Health Study suggest that women may be at special risk from PM exposure. The overall cohort study evidence demonstrates that a 10-$\mu g/m^3$ increase in $PM_{2.5}$ exposure is in general positively associated with excess mortality, largely driven by increases in cardiopulmonary or cardiovascular deaths (Figure 1). Independent results from the Women's Health Initiative Study,[72] the US Medicare cohorts,[71] the German women cohort,[80] and the intracity Oslo (Norway) study[81] contribute substantially to this evidence. Although the Dutch cohort,[82] AHSMOG,[74,75] French PAARC (Pollution Atmosphérique et Affections Respiratoires Chroniques [air pollution and chronic respiratory diseases]),[79] Veterans Affairs hypertensive male study,[77] and 11 CA county[78] studies observed increased mortality risks associated with higher $PM_{2.5}$ exposure that were statistically significant in some analyses, the observed health risks were less robust. A finding that is somewhat consistent across the Veterans Affairs hypertensive male study,[77] 11 CA county,[78] Oslo,[81] and US Medicare cohorts[71] is that the $PM_{2.5}$-mortality effect estimates tend to decline with longer periods of follow up or in a substantially older cohort. These studies also often observed elevated mortality risks according to alternative indicators of air pollution exposure, especially metrics of traffic-related exposure.

Evidence Summary

The overall evidence from the cohort studies demonstrates on average an approximate 10% increase in all-cause mortality per 10-$\mu g/m^3$ elevation in long-term average $PM_{2.5}$ exposure. The mortality risk specifically related to CVD appears to be elevated to a similar (or perhaps even greater) extent, ranging from 3% to 76% (Table 3). This broader estimated range in risk compared with the short-term effects observed in time series is due to several recent cohort studies[72,73] that demonstrated larger cardiovascular mortality risks (eg, >30%) than in earlier cohort observations. This may reflect superior aspects of these studies that allowed for a better characterization of the cardiovascular risk of long-term exposure, the fact that these cohorts consisted of only women, or other unclear reasons. Compared with cardiovascular mortality, there is less existing evidence to support an increase in the risk for nonfatal cardiovascular events related to $PM_{2.5}$ exposure among the existing cohort studies, because many of them did not specifically investigate nonfatal outcomes, and several of the more recent studies reported nonsignificant relationships.[72,73]

Natural Experiment and Intervention Studies

Several studies have shown improvements in health outcomes in association with exposures using well-defined natural experiments or interventions, such as abrupt reductions in air pollution[89–91] or changes over a longer period of time.[64,92]

Table 4. Comparison of Pooled Estimated of Percent Increase in Risk of Hospital Admission for CVD Estimated Across Meta-Analyses and Multicity Studies of Daily Changes in Exposure

	Primary Source	Exposure Increment	% Increase (95% CI)
Cardiac admissions, meta-analysis of 51 estimates	COMEAP[31] 2006	20 $\mu g/m^3$ PM_{10}	1.8 (1.4–1.2)
Cardiac admissions, 8 US cities	Schwartz[96] 1999	20 $\mu g/m^3$ PM_{10}	2.0 (1.5–2.5)
Cardiac admissions, 10 US cities	Zanobetti et al[97] 2000	20 $\mu g/m^3$ PM_{10}	2.6 (2.0–3.0)
Cardiac admissions, 14 US cities	Samet et al[98] 2000	20 $\mu g/m^3$ PM_{10}	2.0 (1.5–2.5)
	Schwartz et al[99] 2003		
Cardiac admissions, 8 European cities	Le Tertre et al[40] 2002	20 $\mu g/m^3$ PM_{10}	1.4 (0.8–2.0)
Cardiovascular admissions, 14 Spanish cities	Ballester et al[100] 2006	20 $\mu g/m^3$ PM_{10}	1.8 (7–3.0)
Cardiovascular admission, 8 French cities	Larrieu et al[101] 2007	20 $\mu g/m^3$ PM_{10}	1.6 (0.4–3.0)
Cardiovascular admissions, 202 US counties	Bell et al[102] 2008	20 $\mu g/m^3$ PM_{10}	0.8 (0.6–1.0)
Medicare national claims history files	Dominici et al[103] 2006	10 $\mu g/m^3$ $PM_{2.5}$	
Ischemic heart disease,			0.44 (0.02–0.86)
Cerebrovascular disease			0.81 (0.30–1.32)
Heart failure			1.28 (0.78–1.78)
Heart rhythm			0.57 (−0.01 to 1.15)

Small but statistically significant drops in mortality were associated with an 8½-month copper smelter strike that resulted in sharp reductions in sulfate PM and related air pollutants across 4 Southwest states, even after controlling for other factors.[93] Data from US Medicare enrollment files were used to estimate the association between changes in monthly mortality rates for US counties and average $PM_{2.5}$ concentrations for the previous 12 months.[94] $PM_{2.5}$-mortality associations were observed at the national scale but not the local scale, which raises concerns about possible statistical confounding due to unmeasured individual and ecological variables as a cause for any positive findings in this study. However, a recent large study found that reductions in PM air pollution exposure on a local scale (across US counties) over a 2-decade period (1980s and 1990s) were associated with increased life expectancy even after controlling for changes in socioeconomic, demographic, and proxy smoking variables.[95] Indeed, a decrease of 10 $\mu g/m^3$ in the long-term $PM_{2.5}$ concentration was related to an increase in mean life expectancy of 0.61±0.20 years.

Hospitalization Rates

There are many daily time-series or case-crossover studies that have evaluated associations between cardiovascular hospitalizations and short-term changes in air pollution. Because of the great number of publications, all studies (particularly those focusing on nonparticulate air pollutants) cannot be discussed individually. Nevertheless, Table 4 presents a comparison of pooled estimates of percent increase in RR of hospital admission for general cardiac conditions across a previous meta-analysis of 51 published estimates (COMEAP [Committee on the Medical Effects of Air Pollutants]) and results from many selected multicity studies published after 2004. Several studies before 2004 are included in Table 4 only to demonstrate the consistency of effect.

Because of its comparatively large size and importance, the results of a recent analysis of Medicare files in 204 US urban counties with 11.5 million individuals older than 65 years merit discussion. Daily changes in $PM_{2.5}$ levels were associated with a variety of cardiovascular hospital admission subtypes.[103] A 10-$\mu g/m^3$ increase in $PM_{2.5}$ exposure was related to increases in hospitalizations for cerebrovascular disease by 0.81% (95% CI 0.3% to 1.32%), peripheral vascular disease by 0.86% (95% CI −0.06% to 1.79%), ischemic heart disease by 0.44% (95% CI 0.02% to 0.86%), arrhythmias by 0.57% (95% CI −0.01% to 1.15%), and heart failure by 1.28 (95% CI 0.78% to 1.78%). The most rapid effects, which occurred largely on the same day of $PM_{2.5}$ elevation, were seen for cerebrovascular, arrhythmia, and heart failure admissions. Ischemic heart disease events tended to increase to a greater extent 2 days after exposures. A consistent finding was that the cardiovascular effects of pollution were much stronger in the Northeast than in other regions. In fact, there were few significant associations in Western US regions. It was speculated that these differences reflected variations in particle composition (eg, greater sulfate in the East and nitrate components in the West) and pollution sources (eg, power generation in the East and transportation sources in the West). In a follow-up analysis by Peng et al,[104] $PM_{10-2.5}$ levels were not statistically associated with cardiovascular hospitalizations after adjustment for $PM_{2.5}$. This suggests that the smaller particles (ie, $PM_{2.5}$) are principally responsible for the cardiovascular hospitalizations attributed in prior studies to the combination of both fine and coarse particles (ie, PM_{10}). Given the differences between the size fractions, the results imply that particles and their components derived from combustion sources (ie, $PM_{2.5}$) are more harmful to the cardiovascular system than larger coarse particles. Finally, there is some evidence that gaseous pollutants may also instigate hospitalizations. Hospital admissions for cardiovascular causes, particularly ischemic heart disease, were found to rise in relation to the previous-day and same-day level of SO_2, even after adjustment for PM_{10} levels.[105]

Table 5. Comparisons of Estimated Percent Increase in Risk of Ischemic Heart Disease Events due to Concurrent or Recent Daily PM Exposure

Event/Study Area	Primary Source	Exposure Increment	% Increase (95% CI)
MI events–Boston, Mass	Peters et al[110] 2001	10 $\mu g/m^3$ $PM_{2.5}$	20 (5.4–37)
MI, 1st hospitalization–Rome, Italy	D'Ippoliti et al[112] 2003	30 $\mu g/m^3$ TSP	7.1 (1.2–13.1)
MI, emergency hospitalizations–21 US cities	Zanobetti and Schwartz[113] 2005	20 $\mu g/m^3$ PM_{10}	1.3 (0.2–2.4)
Hospital readmissions for MI, angina, dysrhythmia, or heart failure of MI survivors–5 European cities	Von Klot et al[114] 2005	20 $\mu g/m^3$ PM_{10}	4.2 (0.8–8.0)
MI events–Seattle, Wash	Sullivan et al[115] 2005	10 $\mu g/m^3$ $PM_{2.5}$	4.0 (−4.0–14.5)
MI and unstable angina events–Wasatch Front, Utah	Pope et al[13] 2006	10 $\mu g/m^3$ $PM_{2.5}$	4.8 (1.0–6.6)
Tokyo metropolitan area	Murakami et al[109] 2006	TSP >300 $\mu g/m^3$ for 1 h vs reference periods <99 $\mu g/m^3$	40 (0–97)*
Nonfatal MI, Augsburg, Germany	Peters et al[111] 2004	Exposure to traffic 1 h before MI (note: not PM but self-reported traffic exposure)	292 (222–383)
Nonfatal MI, Augsburg, Germany	Peters et al[116] 2005	Ambient UFP, $PM_{2.5}$, and PM_{10} levels	No association with UFP or $PM_{2.5}$ on same day. Positive associations with $PM_{2.5}$ levels on 2 days prior

TSP indicates total suspended particulate matter.
*Adjusted rate ratio for MI deaths.

Evidence Summary

Excess cardiovascular mortality and increased rates of hospitalizations are similarly associated with day-to-day changes in PM air pollution (Tables 2 and 4). However, significant differences between geographic regions in the risk relationships have been observed, and more investigation is required to explain this heterogeneity.

Specific Cardiovascular Events/Conditions

Ischemic Heart Disease

Among the cohort studies that provided relevant results, the ACS study found a relationship between increased risk for ischemic heart disease death and long-term exposure to elevated $PM_{2.5}$ levels (Table 3).[67,69,106] Indeed, ischemic cardiac events accounted for the largest relative (RR 1.18, 95% CI 1.14 to 1.23) and absolute risk for mortality per 10-$\mu g/m^3$ elevation in $PM_{2.5}$.[67] A survival analysis of US Medicare data for 196 000 survivors of acute MI in 21 cities showed the risk of an adverse post-MI outcome (death, subsequent MI, or first admission for congestive heart failure) was increased with higher exposure to PM_{10}.[107] Data from the Worcester Heart Attack study also found that long-term exposure to traffic-related air pollution was associated with significantly increased risk of acute MI.[108] However, in the Women's Health Initiative[72] and the Nurses' Health Study,[73] only disease categories that included fatal coronary events, but not nonfatal MI alone, were statistically elevated in relation to $PM_{2.5}$. The effect size for cardiovascular mortality was much larger and much more statistically robust than for nonfatal events such as MI in both studies.

Various time-series and case-crossover studies have also reported increased ischemic heart disease hospital admissions associated with short-term elevated concentrations of inhalable and/or fine PM air pollution.[31,40,103] In the US Medicare study, a reduction of $PM_{2.5}$ by 10 $\mu g/m^3$ was estimated to reduce ischemic heart disease admissions in 204 counties by 1523 (95% posterior interval 69 to 2976) cases per year.[103] Several studies have also found positive associations between elevated PM or traffic exposures over a period as brief as a few hours[109–111] or a few days and an elevated risk for MI (Table 5).[13,110,112–115] In general, acute increases in risk for ischemic heart disease events have been observed consistently, even as rapidly as 1 to 2 hours after exposure to elevated PM, in case-crossover analyses.[109–111] Other studies have reported an increased risk for MI shortly after exposure to traffic. Peters et al[111] reported in 691 subjects in Augsburg, Germany, a strong association (odds ratio 2.92, 95% CI 2.22 to 3.83) between onset of MI and traffic exposure within the past hour, although whether this was a result of the air pollution or a combination of other factors (eg, noise and stress) is not certain. Additional analyses did not report an association between recent UFP exposures and MI onset; however, the levels of $PM_{2.5}$ and several gaseous pollutants 2 days earlier were related to MI risk.[116] The lack of relationship between MI and UFPs may be due to the fact that the levels were measured regionally and remote from the localized source and may therefore reflect exposure misclassification. Finally, in the only study in which participating subjects had coronary angiograms performed previously, ischemic cardiac events were found to occur in relation to PM air pollution exposure solely among individuals with obstructive coronary atherosclerosis in at least 1 vessel.[13] This finding suggests the importance of patient susceptibility (eg, the presence of preexisting coronary artery disease) for PM to trigger an acute ischemic event within hours to days after exposure.

Heart Failure

In the ACS cohort study, it appeared that deaths due to arrhythmias, heart failure, and cardiac arrest (RR 1.13, 95% CI 1.05 to 1.21 per 10 $\mu g/m^3$) were also associated with prolonged exposure to $PM_{2.5}$, although not as strongly as ischemic heart disease mortality,[67] although potential mortality misclassification on death certificates makes the actual cause of death not entirely certain in all circumstances. Heart failure rates or mortality associations were not reported in the other cohort studies.

Daily hospitalizations for heart failure have also been associated with short-term changes in PM exposure.[31] Heart failure associations with PM were observed in a large daily time-series analysis of $PM_{2.5}$ and cardiovascular and respiratory hospitalizations by use of a national database constructed from US Medicare files.[103] A 10-$\mu g/m^3$ increase in concurrent-day $PM_{2.5}$ was associated with a 1.28% (95% CI 0.78% to 1.78%) increase in heart failure admissions, the single largest cause for hospitalization in this cohort. A reduction of $PM_{2.5}$ by 10 $\mu g/m^3$ was estimated to reduce heart failure admissions in 204 counties by 3156 (95% posterior interval 1923 to 4389) cases per year.[103] Another analysis in Medicare recipients in 7 US cities found a 10-$\mu g/m^3$ increase in concurrent-day PM_{10} was associated with a 0.72% (95% CI 0.35% to 1.10%) increase in heart failure admissions.[117] Traffic-related air pollution has also been shown to be significantly associated with increased mortality risk after acute heart failure.[118] Finally, a study from Utah's Wasatch Front area explored longer lagged-exposure periods and found that a 14-day lagged cumulative moving average of 10 $\mu g/m^3$ $PM_{2.5}$ was associated with a 13.1% (95% CI 1.3% to 26.2%) increase in heart failure admissions.[119]

Cerebrovascular Disease

Among the cohort studies that provided pertinent results, the Women's Health Initiative reported significant increases in both nonfatal stroke (hazard ratio 1.28, 95% CI 1.02 to 1.61) and fatal cerebrovascular disease (hazard ratio 1.83, 95% CI 1.11 to 3.00) per 10-$\mu g/m^3$ elevation in prolonged exposure to $PM_{2.5}$.[72] However, no significant association between stroke mortality and PM air pollution was found in the ACS study.[67]

Several studies have also reported small but statistically significant associations between short-term PM exposure and cerebrovascular disease. Daily time-series studies of stroke mortality in Seoul, Korea,[120,121] observed that elevated air pollution (including measures of PM, NO_2, CO, and O_3) was associated with increases in stroke mortality. When analyzed separately by stroke type,[121] the pollution association was associated with ischemic but not hemorrhagic stroke. Risk of stroke mortality was also associated with daily increases in PM_{10} and NO_2 in Shanghai, China.[56] A daily time-series study in Helsinki, Finland,[122] found that $PM_{2.5}$ and CO were associated with stroke mortality in the warm but not the cold seasons. Several studies have also observed increased stroke or cerebrovascular hospital admissions associated with increased exposure to PM or related pollutants.[31,38,40,46,123–125] For example, a study of hospital admissions for Medicare recipients in 9 US cities[125] found that several measures of air pollution (PM_{10}, CO, NO_2, and SO_2) 0 to 2 days before admission were associated with ischemic but not hemorrhagic stroke. Studies of ischemic stroke and transient ischemic attacks based on population-based surveillance have also been conducted in Dijon, France,[126] where O_3 exposure (but not PM_{10}) was associated with ischemic stroke, and in Corpus Christi, Tex,[127] where both $PM_{2.5}$ and O_3 were associated with ischemic strokes and transient ischemic attacks.

Peripheral Arterial and Venous Diseases

There have been only a few studies that have explored a relationship between air pollution and peripheral vascular diseases. Studies using Medicare data for 204 US counties observed nearly statistically significant positive associations between daily changes in measures of PM pollution and hospitalizations for peripheral vascular diseases.[103,104] The ACS cohort found no association between other atherosclerotic and aortic aneurysm deaths and long-term $PM_{2.5}$ exposure.[67]

Recently, a case-control study from the Lombardy region of Italy found a 70% increase in risk of deep vein thrombosis per 10-$\mu g/m^3$ elevation in long-term PM_{10} level.[128] This is the first observation that particulate air pollution can enhance coagulation and thrombosis risk in a manner that adversely affects the venous circulation in addition to the arterial cardiovascular system.

Cardiac Arrhythmias and Arrest

Several studies have observed associations between fine PM and related pollutants and cardiac arrhythmias, often based on data from implanted cardioverter-defibrillators.[129–136] However, no clear pollution-related associations were observed in studies from a relatively clean metropolitan area, Vancouver, British Columbia, Canada,[137,138] or from a relatively large study in Atlanta, Ga.[139] Similarly, pollution-related associations have been observed with cardiac arrest in Rome, Italy,[140] and Indianapolis, Ind,[141] but not in Seattle, Wash.[142,143] The mixed results may reflect different PM compositions due to different sources or variations among the methods used.

Evidence Summary

On the basis of the available epidemiological studies that have reported the associations between PM exposures with specific subsets of cardiovascular outcomes (morbidity, mortality, or hospitalizations), the existing level of overall evidence is strong for an effect of PM on ischemic heart disease, moderate (yet growing) for heart failure and ischemic stroke, and modest or mixed for peripheral vascular and cardiac arrhythmia/arrest (Table 6).

Ambient Air Pollution and Subclinical Pathophysiological Responses in Human Populations

It is likely that many subclinical physiological changes occur in individuals in response to $PM_{2.5}$ exposures that do not become overtly manifest as a cardiovascular event (eg, death or MI). The illustration of these more subtle responses bolsters the plausibility of the observable outcome associations and provides insight into the pathways whereby air

Table 6. Overall Summary of Epidemiological Evidence of the Cardiovascular Effects of $PM_{2.5}$, Traffic-Related, or Combustion-Related Air Pollution Exposure at Ambient Levels

Health Outcomes	Short-Term Exposure (Days)	Longer-Term Exposure (Months to Years)
Clinical cardiovascular end points from epidemiological studies at ambient pollution concentrations		
Cardiovascular mortality	↑ ↑ ↑	↑ ↑ ↑
Cardiovascular hospitalizations	↑ ↑ ↑	↑
Ischemic heart disease*	↑ ↑ ↑	↑ ↑ ↑
Heart failure*	↑ ↑	↑
Ischemic stroke*	↑ ↑	↑
Vascular diseases	↑	↑†
Cardiac arrhythmia/cardiac arrest	↑	↑
Subclinical cardiovascular end points and/or surrogate measures in human studies		
Surrogate markers of atherosclerosis	N/A	↑
Systemic inflammation	↑ ↑	↑
Systemic oxidative stress	↑	
Endothelial cell activation/ blood coagulation	↑ ↑	↑
Vascular/endothelial dysfunction	↑ ↑	
BP	↑ ↑	
Altered HRV	↑ ↑ ↑	↑
Cardiac ischemia	↑	
Arrhythmias	↑	

The arrows are not indicators of the relative size of the association but represent a qualitative assessment based on the consensus of the writing group of the strength of the epidemiological evidence based on the number and/or quality, as well as the consistency, of the relevant epidemiological studies.

↑ ↑ ↑ Indicates strong overall epidemiological evidence.

↑ ↑ Indicates moderate overall epidemiological evidence.

↑ Indicates some but limited or weak available epidemiological evidence.

Blank indicates lack of evidence.

N/A indicates not applicable.

*Categories include fatal and nonfatal events.

†Deep venous thrombosis only.

pollutants mediate CVDs. The "Biological Mechanisms" section discusses the hypothesized global pathways and reviews the studies related to the fundamental cellular/ molecular mechanisms elucidated by controlled human and animal exposures and toxicological/basic science experiments. The following section reviews the recent evidence that ambient exposure to air pollution can mediate potentially harmful subclinical cardiovascular effects. In general, many positive associations are found (Table 6). Numerous complex interactions between variations in the characteristics, sources, and chemistry of the particles, coupled with diversity in time frames, mixtures of exposures, and degrees of individual susceptibility, likely explain some of the disparity among findings.

Systemic Inflammation

There is evidence that under some circumstances, exposure to ambient PM can be associated with elevated circulating proinflammatory biomarkers that are indicative of a systemic response after PM air pollution inhalation that is not limited to the confines of the lung. Early reports found associations with day-to-day variation in acute-phase proteins, such as C-reactive protein (CRP), fibrinogen, or white blood cell counts,[144–147] as reviewed previously.[1] Limited evidence on the association between cumulative PM exposures and fibrinogen levels and counts of platelets and white blood cells was also available.[148]

A number of more recent studies have reported positive associations with short-term ambient PM exposure and day-to-day elevations in inflammatory markers. These include increases in CRP in an elderly population[149] and individuals with coronary atherosclerosis[150]; CRP and fibrinogen in young adults[151] and elderly overweight individuals[152]; and CRP, tumor necrosis factor-α (TNF-α), and interleukin (IL)-1β in children.[153] Recent evidence has also been found for an upregulation of circulating soluble adhesion molecules (eg, intercellular adhesion molecule-1) in 92 Boston, Mass–area individuals with diabetes[154] and 57 male subjects with coronary artery disease in Germany.[150] In a larger analysis of 1003 MI survivors, also in Germany, CRP was not related to PM exposure; however, ambient particle number concentration and PM_{10} were associated with increased IL-6 and fibrinogen, respectively.[155] Short-term levels of in-vehicle $PM_{2.5}$ have also been linked to increases in CRP among healthy highway patrol troopers.[156] In a follow-up analysis, elevations in certain particulate components of traffic pollution (eg, chromium) were associated with increased white blood cell counts and increased IL-6 levels.[157] Short-term changes in ambient PM levels have also been linked to acute (1 to 3 days later) alterations in biomarkers of inflammation, oxidative stress, and platelet activation among elderly adults with coronary artery disease living in retirement communities in Los Angeles, Calif.[158,159] Pollutants associated with primary combustion (eg, elemental and black carbon, primary organic carbon) and UFPs rather than $PM_{2.5}$ appeared to be strongly associated with adverse responses in this population.

Regarding more long-term exposures,[160] a positive association between white blood cell count and estimated long-term 1-year exposure to PM_{10} was reported in the Third National Health and Nutrition Examination Survey. Among 4814 adults in Germany, small increases in annual mean $PM_{2.5}$ (3.9 $\mu g/m^3$) were associated with increases in high-sensitivity CRP by 23.9% and in fibrinogen by 3.9% among men only. Estimated long-term traffic exposure was not related to inflammatory changes in either sex.[161]

Several studies, including some with improved exposure assessment,[162] some that included analyses of large population cohorts,[163,164] and a recent evaluation of long-term annual PM_{10} levels in England,[165] have not found a relationship between particulate exposure and inflammation. It is conceivable that differences in the magnitude or character of the inflammatory response will occur because of variations in the particulate chemistry and duration/intensity of exposures. Certain individuals may also be more susceptible. The evidence suggests that subjects with underlying cardiovascular risk factors and the metabolic syndrome may exhibit stronger associations.[152,160,166] Conversely, antiinflammatory medications such as statins may mitigate the actions of ambient particles.[152,155] All together, there is some evidence for a positive association between recent and long-term PM exposure and a systemic proinflammatory response; nevertheless, there is variation in the strength and consistency of changes among the variety of biomarkers and patient populations evaluated (Table 6).

Systemic Oxidative Stress

A state of oxidative stress refers to a condition in which levels of free radicals or reactive oxygen/nitrogen species (eg, O_2^-, H_2O_2, $ONOO^-$) are higher than normal (eg, healthy individuals in whom they are countered by homeostatic processes such as antioxidants) and thus are capable of exerting many adverse biological effects (eg, lipid/protein/deoxyribonucleic acid [DNA] oxidation, initiation of proinflammatory cascades). Although many biomarkers of differing systemic responses are available (eg, lipid or protein oxidation products), oxidative stress may occur at the local cellular/tissue level and not be directly observable by circulating markers. In addition, oxidative stress is often induced by and elicits inflammatory processes. The 2 processes are biologically linked. Therefore, human studies investigating the effect of PM on oxidative stress per se are difficult to perform. Only a few studies have directly investigated the occurrence of systemic oxidative stress in humans in relation to ambient PM exposure. Three studies of young adults conducted in Denmark demonstrated elevations in biomarkers of protein, lipid, or DNA oxidation in relation to PM exposure from traffic sources.[167–169] In a study of 76 young adults from Taipei, Taiwan,[151] the investigators found evidence of increased levels of 8-hydroxy-2′-deoxyguanosine adducts in DNA in relation to short-term elevations in ambient PM. Two studies have also demonstrated increases in plasma homocysteine, evidence that exposure to ambient PM can elevate this circulating mediator of oxidative stress.[170,171] Finally, Romieu et al[172] found that dietary supplementation with omega-3 polyunsaturated fatty acids might be capable of altering the systemic oxidative stress response (reduction in copper/zinc superoxide dismutase and glutathione) induced by air pollutants among residents living in a nursing home in Mexico City, Mexico. Because of the relatively small number of studies, more investigation is required to make firm conclusions and to understand the nature of the systemic oxidative stress response potentially induced by ambient PM (Table 6).

Thrombosis and Coagulation

Early reports indicated that increased plasma viscosity[144] and elevated concentrations of fibrinogen[146] are associated with short-term changes in ambient PM concentrations. More recent evidence was found for an upregulation of circulating von Willebrand factor in 57 male subjects with coronary artery disease in Germany[150] and 92 Boston-area individuals with diabetes.[154] Riediker[157] found that components of in-vehicle $PM_{2.5}$ were also related to increased von Willebrand factor and decreased protein C among highway patrol troopers. In the Atherosclerosis Risk in Communities study, a 12.8-μg/m^3 elevation in ambient PM_{10} was associated with a 3.9% higher von Willebrand factor level,[173] but only among those with diabetes. There was no linkage between PM_{10} exposure and fibrinogen or white blood cell levels.

Alterations in other markers that indicate changes in thrombosis, fibrinolysis, and global coagulation have also been reported. An immediate elevation in soluble CD40-ligand concentration, possibly reflecting platelet activation, recently was found to be related to ambient UFP and accumulation-mode particle ($PM_{0.1-1.0}$) levels in patients with coronary artery disease.[155] Ambient PM_{10} levels have also been associated with augmented platelet aggregation 24 to 96 hours after exposure among healthy adults.[174] In this study, there were no concomitant observable changes in thrombin generation, CRP, or fibrinogen induced by PM_{10}. Increases in plasminogen activator inhibitor-1 and fibrinogen levels have been noted in healthy subjects,[151] as well as elevated plasminogen activator inhibitor-1 in patients with coronary artery disease only,[175] in association with ambient PM levels in Taipei. Chronic indoor pollution exposure to biomass cooking in rural India has also been associated with elevated circulating markers of platelet activation.[176] Recently, Baccarelli et al[128,177] demonstrated in healthy subjects and among individuals with deep venous thrombosis living in the Lombardy region of Italy that prothrombin time was shortened in relation to recent and long-term ambient PM_{10} concentrations. Nevertheless, some studies found no effects of ambient pollution,[178] nor have significant changes been reported among all the biomarkers or subgroups of individuals investigated.[150,154,170,173] Similar to the study on systemic inflammation, the results related to thrombosis/coagulation are quite variable given the differences in study designs, patients, biomarkers evaluated, and pollutants; however, these adverse effects appear somewhat more consistent among higher-risk individuals (Table 6).

Systemic and Pulmonary Arterial BP

Several studies have reported that higher daily PM levels are related to acute increases in systemic arterial BP (approximately a 1- to 4-mm Hg increase per 10-μg/m^3 elevation in PM).[179–184] In a small study of patients with severe heart failure,[185] pulmonary artery and right ventricular diastolic BP were found to increase slightly in relation to same-day levels of PM. Chronic exposure to elevated $PM_{2.5}$ was associated with increased levels of circulating endothelin (ET)-1 and elevated mean pulmonary arterial pressure in children living in Mexico City.[186] These results may explain in part the risk for heart failure exacerbations due to PM exposure; however, not all studies of systemic arterial BP have been positive.[187–189]

Recently, Dvonch et al[190] demonstrated significant associations between increases in systolic BP and daily elevations in $PM_{2.5}$ across 347 adults living in 3 distinct communities within metropolitan Detroit, Mich. Much larger effects were observed 2 to 5 days after higher $PM_{2.5}$ levels within a specific urban location of southwest Detroit (8.6 mm Hg systolic BP increase per 10-$\mu g/m^3$ $PM_{2.5}$) than throughout the entire region or cohort (3.2 mm Hg). This suggests that specific air pollution sources and components contribute significantly to the potential for PM exposure to raise BP. Interestingly, it was recently reported in a crossover study of 15 healthy individuals that systolic BP was significantly lower (114 versus 121 mm Hg) during a 2-hour walk in Beijing, China, while the subjects were wearing a high-efficiency particulate-filter facemask than when they were not protected.[191] Wearing the facemask was also associated with increased HRV, which suggests that the rapid BP-raising effects of particle inhalation may be mediated through the autonomic nervous system (ANS). In a similar fashion,[192] reducing exposure to particulate pollution from cooking stoves was shown to be associated with lower systolic (3.7 mm Hg, 95% CI −8.1 to 0.6 mm Hg) and diastolic (3.0 mm Hg, 95% CI −5.7 to −0.4 mm Hg) BP among Guatemalan women than among control subjects after an average of 293 days. These findings demonstrate that indoor sources of PM (eg, cooking, biomass) may have important cardiovascular health consequences and that reductions in particulate exposure are capable of lowering BP, and they suggest that chronic exposure to PM air pollution may alter long-term basal BP levels. Even given the rapid variability of BP on a short-term basis and the numerous factors involved in determining individual responses (eg, patient susceptibility, PM composition, and time frames of exposure), overall, it appears that ambient PM can adversely affect systemic hemodynamics, at least under certain circumstances (Table 6).

Vascular Function

In the first ambient PM study related to changes in vascular function, O'Neill et al[193] reported that both endothelium-dependent and -independent vasodilation were blunted in relation to air pollution levels in Boston. The largest changes occurred in association with sulfate and black carbon, suggestive of coal-burning and traffic sources, respectively. Significant adverse responses were observed within 1 day yet were still present and slightly more robust up to 6 days after exposure. Moreover, the adverse responses occurred solely among diabetic individuals and not in patients at risk for diabetes mellitus. Two other studies[184,194] also demonstrated impaired vascular function due to short-term changes in ambient PM among diabetic patients. In the study by Schneider et al,[194] endothelium-dependent vasodilation was blunted during the first day, whereas small-artery compliance was impaired 1 to 3 days after elevated ambient PM levels. Interestingly, higher concentrations of blood myeloperoxidase were related to a greater degree of endothelial dysfunction, which suggests that white blood cell sources of reactive oxygen species (ROS) may be involved.

In healthy adults, very short-term exposure to elevated levels of ambient PM from traffic sources while exercising for 30 minutes near roadways[195] and when resting by bus stops for 2 hours[196] has been related to impaired endothelium-dependent vasodilation. Daily changes in ambient gaseous pollutants (SO_2 and NO_x) in Paris, France, have also been associated with impaired endothelium-dependent vasodilation among nonsmoking men.[197] Finally, indoor particulate air pollution may also be harmful to vascular function. Bräuner and colleagues[198] recently reported that reductions in 48-hour $PM_{2.5}$ levels due to filtering of air in subjects' homes resulted in improved microvascular vascular function among elderly subjects. Nevertheless, changes in short-term ambient PM levels have not been linked with impaired conduit[197] or microvascular[178] endothelial function in all studies. Even when the few negative studies are considered, the overall evidence supports the concept that ambient PM is capable of impairing vascular function, particularly among higher-risk individuals (eg, those with diabetes) and after traffic-related exposure (Table 6).

Atherosclerosis

A few cross-sectional studies have reported an association between measures of atherosclerosis in humans and long-term exposures to ambient air pollution levels. The first study to demonstrate this relationship was an analysis of data from 798 participants in 2 clinical trials conducted in the Los Angeles area. A cross-sectional contrast in exposure of 10 $\mu g/m^3$ $PM_{2.5}$ was associated with an adjusted nonsignificant 4.2% (95% CI −0.2% to 8.9%) increase in common carotid intima-media thickness[199]; however, in certain subgroups of patients, such as women, the effect was much larger (13.8%, 95% CI 4.0% to 24.5%). In a population-based sample of 4494 subjects from Germany,[200] it was found that residential proximity to major roadways was associated with increased coronary artery calcification. A reduction in distance from a major road by half was associated with a 7% (95% CI 0.1% to 14.4%) higher coronary artery calcium score. Proximity to traffic was also related to an increased risk for peripheral artery disease in women but not men.[201] In an analysis of 3 measures of subclinical disease (carotid intima-media thickness, coronary calcium, and ankle-brachial index) among 5172 adults from the Multi-Ethnic Study of Atherosclerosis, only common carotid intima-media thickness was modestly (yet significantly) associated with 20-year exposure to $PM_{2.5}$.[202] In a related study from the same cohort, abdominal aortic calcium was associated with long-term $PM_{2.5}$ exposure, especially for residentially stable participants who resided near a $PM_{2.5}$ monitor.[203] Although it appears that long-term exposure to higher levels of ambient PM might accelerate the progression of atherosclerosis, more investigations are needed (Table 6).

Heart Rate Variability

Numerous studies have continued to explore associations between daily changes in PM air pollution exposure and alterations (typically reductions) in HRV metrics, putative markers of cardiac autonomic balance.[129,149,156,204–242] Recent observations in the Normative Aging Study cohort have shown strong effect modification of the PM-HRV relationship by obesity and genes that modulate endogenous oxidative stress or xenobiotic metabolism, such as glutathione S-transferase M1, methylenetetrahydrofolate reductase, and the hemochromatosis gene.[207,243,244] Additional findings suggest protective effects of statins, dietary antioxidants, and B vitamins, as well as omega-3 polyunsaturated fatty acids.[205,207,215,243,244] These results suggest that pathways that reduce endogenous oxidative stress have a protective effect that mitigates reductions in HRV due to ambient PM exposure.

However, the overall results are not entirely consistent. Some studies have reported increases in HRV mediated by PM, specifically among younger healthy people and patients with chronic obstructive lung disease.[156,208,216] Nevertheless, the general pattern suggests that PM exposure is associated with increased heart rate and reductions in most indices of HRV among older or susceptible individuals, such as those with obesity and the metabolic syndrome. Typically, time-domain measures (eg, standard deviation of normal RR intervals) and total power are reduced within hours after exposure. Most, but not all, pertinent studies have also found that the largest reduction in power is within the high-frequency domain. In sum, these observations provide some evidence that ambient PM air pollution exposure rapidly reduces HRV, a surrogate marker for a worse cardiovascular prognosis (Table 6). Although studies corroborating changes in autonomic activity by other methods (eg, microneurography or norepinephrine kinetics) have not been performed, the HRV findings are perhaps reflective of the instigation of a generalized cardiovascular autonomic imbalance due to relatively greater parasympathetic than sympathetic nervous system withdrawal.

Cardiac Ischemia and Repolarization Abnormalities

There has been limited direct evidence for the actual induction of cardiac ischemia or repolarization abnormalities in the electrocardiogram (ECG) by exposure to ambient levels of PM.[223,245] Recent follow-up analyses from the initial ULTRA study (Exposure and Risk Assessment for Fine and Ultrafine Particles in Ambient Air)[245] suggested that traffic-related combustion pollutants were most strongly related to the promotion of ST-segment depression among elderly nonsmokers during exercise stress testing.[246] Moreover, even very acute $PM_{2.5}$ exposure within the past 1 or 4 hours has been associated with cardiac ischemia during exercise.[247] New findings support these associations in elderly subjects[248] and in patients with coronary artery disease in Boston.[249] In the latter study, traffic-related PM was most strongly related to the incidence of ST-segment depression during 24-hour Holter monitoring, and the risk for ischemia was greatest within the first month after a cardiac event among patients with diabetes. Overall, there is a modest level of evidence that PM exposure can promote cardiac ischemia in susceptible individuals (Table 6).

Epigenetic Changes

There have been relatively few studies examining gene–air pollution exposure interactions, and most have done so while investigating a small number of loci for genetic polymorphisms. Although some studies have suggested greater air pollution susceptibility with one or another genomic polymorphism,[207,243,244] few have evaluated the potential for epigenetic changes after exposures. Reduced levels of DNA methylation have been linked to aging, oxidative stress, and CVD. Recently, Baccarelli et al[250] have shown among 718 elderly participants in the Normative Aging Study that short-term exposures (over 1 to 7 days) to $PM_{2.5}$ and black carbon are associated with decreased "global" DNA methylation in long interspersed nucleotide elements. It was posited that oxidative stress from air pollution exposure could have interfered with the capacity for methyltransferases to interact with DNA or altered the expression of genes involved in the methylation process. This observed effect of pollution exposure was analogous to changes seen with 3.4 years of aging in the cohort. Additional findings among workers in a furnace steel plant support these observations.[251] Nevertheless, the mechanisms involved and the cardiovascular implications of these preliminary, although provocative, epigenetic changes require more investigation.

Traditional Cardiovascular Risk Factors

In addition to the fact that individuals with traditional risk factors are likely to be at higher risk for cardiovascular events due to PM exposure, air pollutants may also promote the development of these risk factors over a prolonged period of time. Few published studies have investigated this possibility. A report from the Multi-Ethnic Study of Atherosclerosis has demonstrated that residential proximity to major roadways was associated with a higher left ventricular mass index as measured by cardiac magnetic resonance imaging.[252] The degree of increase was analogous to a 5.6-mm Hg increase in systolic BP among the study participants. This suggests that traffic-related exposures may have increased left ventricular mass by chronically elevating systemic arterial BP, a common cause of left ventricular hypertrophy. However, other mechanisms cannot be excluded, such as systemic inflammation and oxidative stress, which could potentially activate neurohormonal pathways (eg, ANS imbalance, renin-angiotensin system) that could directly mediate such a finding. In addition, a recent study of adults older than 30 years of age (n=132 224) participating in the National Health Interview Survey reported a significant association between self-reported hypertension and estimated annual $PM_{2.5}$ exposure using US EPA monitoring data.[253] A 10-$\mu g/m^3$ elevation in $PM_{2.5}$ was associated with an adjusted odds ratio of 1.05 (CI 1.00 to 1.10) for the presence of hypertension. The increase in risk was found only among non-Hispanic whites. These studies provide some initial evidence that longer-term PM exposures may augment the risk for developing chronically elevated BP levels or even overt hypertension.

Brook et al[254] have also demonstrated a novel relationship between a metric of long-term traffic exposure (NO_2 level by residence) and the odds of having the diagnosis of diabetes mellitus among patients in 2 respiratory clinics in Ontario, Canada. In women only, the odds ratio of diabetes was 1.04 (95% CI 1.00 to 1.08) for each increase of 1 parts per billion (ppb) of NO_2. Across the interquartile range (4 ppb NO_2), exposures were associated with nearly a 17% increase in odds for diabetes mellitus. The first biological support for this finding comes from a study in Iran that demonstrated that the previous 7-day-long exposure to PM_{10} was independently associated with worse metabolic insulin sensitivity among 374 children 10 to 18 years of age.[255] These findings suggest that the systemic proinflammatory and oxidative responses due to long-term PM air pollution exposure could potentially increase the risk for developing clinically important aspects of the metabolic syndrome, such as hypertension and diabetes mellitus. Further studies in this regard are warranted.

Evidence Summary

Table 6 provides a consensus qualitative synopsis based on the expert opinions of the writing group members of the overall level of existing support, linking each surrogate or intermediate cardiovascular outcome with exposures to PM at ambient concentrations, based solely on the database of observational studies.

Additional Epidemiological Findings and Areas of Continued Research

Responsible Sources and Pollution Constituents

Although PM concentration (mass per cubic meter) has been associated with cardiovascular events in numerous studies, the specific particulate constituents and the sources responsible remain less clear. Despite the fact that it is a difficult undertaking, several epidemiological studies have attempted to identify the culprit components within the PM mixtures. With regard to PM-associated inorganic ions (nitrate and sulfate), it has been suggested that the overall toxicological data do not clearly implicate these compounds as responsible for mediating the cardiovascular health effects of $PM_{2.5}$.[256] Nevertheless, sulfate particles have been associated with cardiopulmonary mortality in the ACS and Harvard Six Cities studies.[62,68] A recent time-series analysis among 25 US cities found that cardiovascular risk was increased when PM mass contained a higher proportion of sulfate, as well as some metals (aluminum, arsenic, silicon, and nickel).[257] It is possible that these positive findings represent sulfate serving as a marker for an effect mediated by a toxic PM mixture derived from commonly associated sources (eg, coal combustion). Nevertheless, a direct role for particle sulfate in causing cardiovascular events cannot be excluded entirely.[256]

In California, short-term exposures to several different PM constituents that likely reflect combustion-derived particulates, including organic and elemental carbon and nitrates, were most strongly associated with higher cardiovascular mortality.[258] Certain metals (zinc, titanium, potassium, and iron) and sulfate levels in the winter months were also positively related. Similarly, ambient levels of organic and elemental carbon have been most strongly linked among PM constituents with hospitalizations for CVDs in multipollutant models in a study among 119 US cities.[259] Finally, $PM_{2.5}$ composed of higher levels of elemental carbon, along with the metals nickel and vanadium,[48] has also been linked with greater risks for cardiovascular hospitalizations.[260] These results support that the chemistry or composition of the $PM_{2.5}$ (eg, organic/elemental carbon and certain metals) along with the responsible source from which these mixtures are derived (eg, fresh combustion, traffic) may play important roles in determining the risk for cardiovascular events. However, the extent to which these constituents mediate specific responses, alone or together, and their importance beyond the concentration of $PM_{2.5}$ mass alone represent an area of active research that requires more investigation to reach firm conclusions.

Many experiments have demonstrated the especially toxic properties and strong oxidizing potential of the smallest particle sizes (eg, UFP) and of the specific chemical species typically rich within this size fraction (eg, transition metals, organic compounds, and semiquinones).[261] Although some epidemiological evidence suggests that exposure to ultrafine compounds[17] may be associated with higher cardiovascular risk (eg, an elevation of UFP count by 9748/cm^3 has been associated with an increase in cardiovascular mortality of approximately 3% within 4 days in Erfurt, Germany[262]) and adverse responses,[158,159] there have been few such studies because they are challenging to conduct, for numerous reasons. Moreover, there are few UFP monitors, and the levels measured at regional sites may not accurately reflect an individual person's exposure because of marked spatial heterogeneity, because the concentrations are dominated by local point sources of fresh combustion (eg, roadways). This could help explain some of the previously negative study findings.[116]

Similarly, coarse particulates between 0.25 and 1.0 μm in diameter may affect the cardiovascular system,[221,264,265] and although the available data related to hard events and cardiovascular mortality have suggested a relationship,[265,266] recent findings have been less consistent.[104] In the most recent time-series analysis of 112 US cities, coarse PM was independently associated with elevated all-cause, stroke, and pulmonary, but not cardiovascular, mortality after controlling for $PM_{2.5}$.[43] Coarse PM was also not associated with either fatal or nonfatal cardiovascular events after controlling for $PM_{2.5}$ levels in the Nurses' Health Study[267] or the Women's Health Initiative cohort analyses.[72] Additional research is required to establish whether there are independent health effects of the other particulate size fractions beyond those posed by fine particles. On the other hand, $PM_{2.5}$ mass concentration is the metric most consistently associated with cardiovascular morbidity and mortality. It remains to be determined whether this reflects limitations of available data, the long-lived and regionally homogenous atmospheric nature of $PM_{2.5}$, that few studies have investigated the independent effects of the other sizes, difficulties in performing epidemiology studies with adequate UFP exposure estimates, or that specific constituents within the fine PM fraction (or another unidentified agent correlated with that fraction) are actually responsible for causing cardiovascular events. Although particles <0.1 μm (ie, UFPs) do make up a small fraction of $PM_{2.5}$ mass, the correlation between UFP particle number and total $PM_{2.5}$ mass concentration is often weak. Because of their minute size, UFPs make up only a small portion of the total $PM_{2.5}$ mass, even though they represent the largest actual number of particles within fine PM. They also have the highest surface area and a differing surface chemistry. Therefore, changes in the underlying UFP concentration do not likely account for or explain the linkages between $PM_{2.5}$ mass concentration and cardiovascular events observed in large multicity studies. The overall epidemiological evidence thus indicates that fine PM poses an independent cardiovascular risk and that any putative effects of these other size fractions cannot fully explain the observed $PM_{2.5}$–cardiovascular morbidity/mortality relationship.

On the other hand, there is mounting evidence for a distinctive role played by motor vehicle traffic–related exposures in elevating cardiovascular risk.[108,111,268,269] Lipfert et al[76,77] interpreted the results of their analysis of the Veterans Affairs hypertensive male cohort as suggesting that traffic density was a more "significant and robust predictor of survival in this cohort" than $PM_{2.5}$. Analyses of the Oslo,[81] Dutch,[82] AHSMOG,[74,75,88] French PAARC,[79] and German women cohorts[80] and related studies from areas in the United Kingdom,[270] Canada,[271] Norway,[272] and Rome[273] found that measures that often indicate traffic-related exposure (NO_2, NO_x, traffic density, and living near major roads) were also associated with increased mortality. Long-term 5-year average traffic-generated air pollution exposure has been associated with an increased risk of fatal MI (odds ratio 1.23, 95% CI 1.15 to 1.32 per 31-$\mu g/m^3$ increase in NO_2) but not nonfatal MI in Stockholm County, Sweden.[274] The results mirror the results of several cohort studies[72,73] that found that air pollution exposures appeared to be more strongly linked with cardiovascular mortality than nonfatal events. Recently, an analysis from a cohort in the Netherlands demonstrated that several metrics of traffic-related air pollution exposure remained significantly associated with increased risk for cardiovascular events even after adjustment for higher levels of traffic noise.[275]

The effect of long-term traffic-related exposure on incidence of fatal and nonfatal coronary heart disease was recently assessed after adjustment for background air pollutants and cardiovascular risk factors in 13 309 adults in the Atherosclerosis Risk in Communities study.[276] Interestingly, background chronic ambient $PM_{2.5}$ concentrations were not related to the interpolated traffic exposure levels or to heart disease outcomes, which supports the highly localized nature of traffic sources of exposure. After 13 years of follow-up in 4 US communities, individuals residing within the highest quartile of traffic density had a relative risk of 1.32 (95% CI 1.06 to 1.65) for fatal and nonfatal heart disease events. Despite multiple statistical adjustments, the investigators also acknowledged the possibility for residual confounding as a potential source of bias. The specific traffic-related pollution components, such as UFP or gaseous-phase chemicals (eg, SVOCs), that are responsible for the positive findings among these studies remain unknown. The close proximity to roadways within these epidemiological studies (eg, 400 m) required to observe an association with elevated cardiovascular risk, however, matches the atmospheric fate of these shorter-lived pollutants. The findings may thus suggest the existence of cardiovascular health effects mediated by specific air pollutants rather than $PM_{2.5}$ per se. There is room for improvement in assessment of traffic exposures in epidemiological research, and better approaches are now being incorporated into research projects, such as accounting for associated factors (eg, noise or spatial autocorrelation with socioeconomic status).[275,277]

Geographic differences in cardiovascular risk due to PM have also been observed across US regions, with more consistent or stronger effects observed in Eastern versus Western states.[71,103,257] Differences between North American and European cities have also been reported.[61] PM exposures are typically, but not always,[258] associated with larger effects during warmer months (spring through fall) than in the winter.[45,103,257] Variations in pollution characteristics (eg, sulfate), time spent outdoors, air conditioning usage and particle penetration indoors, ambient temperature and meteorology, and mobile (eg, diesel) or stationary (eg, coal combustion) sources of exposure may help explain these differences. Finally, variations in the cardiovascular risk posed by PM may also occur because of heterogeneity in the metric of exposure, such as personal versus background regional,[25] indoor versus outdoor sources, and differences in intracity versus intercity gradients.[69] A better understanding of the responsible constituents and sources is important and could potentially lead to more targeted and effective regulations. On the other hand, finding continued evidence that the adverse cardiovascular health effects cannot be linked conclusively to a particular or specific chemical species or source of pollution but rather that they occur in response to a variety of exposure types or mixtures would support the present-day policy of reducing exposure to overall fine particulate mass to achieve public health benefits.

Time Course and Concentration-Response Relationships

Many studies have demonstrated that PM air pollution exposure does not simply advance the mortality by a few days of critically ill individuals who would have otherwise died (eg, mortality displacement or "harvesting").[278,279] There also appears to be a monotonic (eg, linear or log-linear) concentration-response relationship between $PM_{2.5}$ and mor-

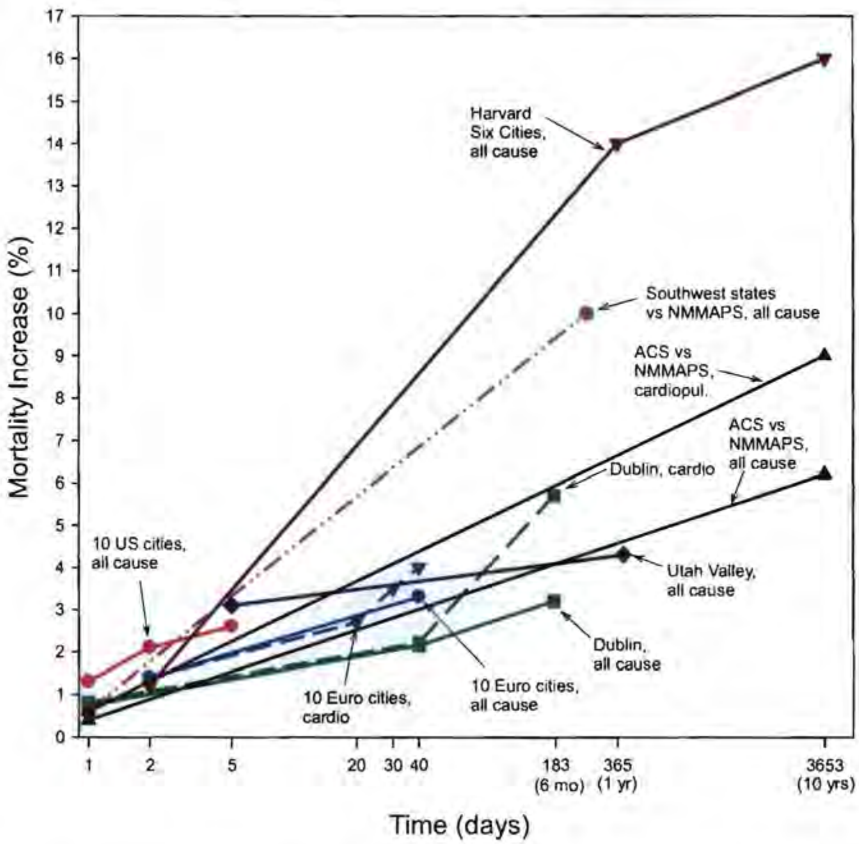

Figure 2. Comparison of estimates of percent change in mortality risk associated with an increment of 10 $\mu g/m^3$ in $PM_{2.5}$ or 20 $\mu g/m^3$ of PM_{10} or British Smoke (BS) for different time scales of exposure (log scale of approximate number of days, updated and adapted from Pope[281a]). Euro indicates European; cardio, cardiovascular disease; and cardiopul, cardiopulmonary.

tality risk observed in cohort studies that extends below present-day regulations of 15 $\mu g/m^3$ for mean annual levels, without a discernable "safe" threshold.[67,70,84] Cardiovascular risk due to particle exposure was also shown to extend below 15 $\mu g/m^3$ in the recent analysis of the Women's Health Initiative Observational Study.[72] This monotonic association supports the idea that any reduction in particulate pollution will translate into health benefits within a population of people, each with their own individual level of susceptibility. It also suggests that a larger decrease in $PM_{2.5}$ exposures will produce a greater reduction in mortality. Finally, a recent analysis of the literature provided important new insights into the nature of the PM exposure-response relationship.[280] The risk for cardiovascular mortality was shown to increase in a linear fashion across a logarithmically increasing dosage of inhaled fine-particle levels that ranged from ambient PM air pollution ($\approx$0.2 mg/d), through secondhand smoke ($\approx$1 mg/d), to active smoking (200 mg/d). This means that the exposure response is extremely steep at very low PM levels (ie, ambient air pollution) and flattens out at higher concentrations (ie, active smoking). This may help explain the seemingly incongruent and comparatively very high degree of cardiovascular risk posed by the much lower levels of PM exposure from ambient pollution and secondhand smoke versus the much higher doses due to active smoking. Thus, the cardiovascular system may be extremely sensitive to very low levels of PM inhalation as encountered with ambient pollution.

At present, the underlying nature and full scope of the temporal-risk relationship posed by longer-term PM exposures remain uncertain.[2,281] The writing group members did concur that the available epidemiological studies demonstrate larger cardiovascular risks posed by more prolonged exposures to higher PM levels than observed over only a few days (Figure 2). Cohort studies using Cox regression survival analyses (over months to years) are capable of evaluating a more complete portion of the temporal-risk relationship than time-series analyses over only a few days that use Poisson regression. However, given the lack of complete information, no conclusions could be drawn on the full magnitude of the augmented risk posed by chronic exposures, the time window (a few months versus decades) required to exhibit this enhanced risk, the underlying biological causes, the extent to which statistical differences between study types explain the variations in risk, and whether clinically relevant chronic CVDs are precipitated by chronic exposures. Some writing group members believe it is important to differentiate as 2 distinct issues the potentially greater effect of long-term exposures on increasing the risk for acute events (eg, cardiovascular mortality) compared with the putative effect on initiating or accelerating the development of chronic CVD processes per se (eg, coronary atherosclerosis). As such, it is possible that the greater risks observed in cohort studies could be capturing the fact that repetitive exposures over months or years augment the risk for sudden cardiovascular events in susceptible people, without actually worsening an underlying "chronic" disease process.

On the one hand, the available studies demonstrate that the majority of the larger risk-effect sizes posed by longer-term versus short-term exposures appear to be manifested within only 1 to 2 years of follow-up. Extending the duration of follow-up increases cardiovascular risk, but to a progressively smaller degree over time (Figure 2). The discrepancy in the effect sizes among study types (eg, cohort versus time-series studies) could also reflect differences in statistical methodologies or population susceptibilities.[282–284] Recent attempts to investigate this matter[64,84] suggest that the risk for acute events associated with chronic exposures may be reasonably well estimated by only the most proximal 1 to 2 years of PM levels. The most recent time frames of exposure also explain a substantial portion of the excess cardiovascular risk observed in several cohort studies.[70,72,73,83] These findings bolster the argument that relatively rapid and pliable (and potentially reversible) biological responses, such as the instigation of plaque instability or the enhanced thrombotic potential caused by PM-mediated inflammation or endothelial dysfunction (which can occur and abate over only a few weeks to months), could explain the biology responsible for this greater relative risk.

On the other hand, cogent alternative arguments can be made to explain the differences in relative risk between the cohort and time-series studies. The likely high correlation of a recent year's exposure levels with exposures over many years, as well as the uniform rank ordering of exposure severity over time among cities, can explain why only a short period of PM exposure assessment is required to understand the risk of longer-term exposures. In addition, no studies have evaluated the potential risks of exposure over decades or a lifetime. PM augments the ability of traditional risk factors to accelerate the development of atherosclerosis in experimental settings. As such, it is also plausible that long-term exposures may enhance cardiovascular risk to an even greater extent by increasing an individual's susceptibility for future cardiovascular events or acute exposures. In addition, the full extent of this possibility may not be illustrated by the limited follow-up period (4 to 5 years) of the majority of cohort studies. The writing group thus agreed that this important issue requires more investigation.

It is also possible that these 2 explanations are not mutually exclusive. Furthermore, it cannot be concluded from available information that a long period of time is required for reductions in PM levels to translate into a decrease in cardiovascular risk. On the contrary, reductions in secondhand smoke[285] and PM air pollution levels[64,84,90,95] appear to produce fairly rapid decreases in cardiovascular event rates, within a few months to years.[284] At present, the available data do not allow for firm conclusions regarding the underlying biology and the full extent of the potentially nonuniform PM exposure–to–cardiovascular risk temporal relationship.

Susceptibility to Air Pollution Exposure

Susceptibility refers to a heightened risk for a particular cardiovascular end point or event to occur compared with the general population at the same concentration of PM exposure. Typically, this is indicative of an underlying medical condition (eg, diabetes) or personal characteristic (eg, old age) that causes this enhanced risk. This is in contrast to the term "vulnerability," which refers to a population of individuals at greater risk for more frequent or high levels of exposures.

Earlier studies reviewed in the first AHA scientific statement[1] suggested that susceptible populations include the elderly; individuals with diabetes; patients with preexisting coronary heart disease, chronic lung disease, or heart failure; and individuals with low education or socioeconomic status. In the ACS study, current and previous smokers appeared to be at the same or greater degree of risk.[67] Among more recent studies, the Women's Health Initiative also reported positive findings among active smokers and an elevated risk for cardiovascular mortality induced by $PM_{2.5}$.[72] Conversely, current smokers were found to be at no increased risk for cardiovascular mortality in response to $PM_{2.5}$ exposure in the Nurses' Health Study.[73] Thus, the effect modification of smoking status requires more investigation. The APHENA study of European and North American cities recently confirmed that elderly and unemployed individuals are at higher risk of short-term PM exposure.[61] In a multicity time-series study in Asia, women, the elderly, and individuals with lower education and socioeconomic status were also shown to be at elevated risk.[286] A few additional studies have reported some evidence of susceptibility to short-term PM exposures among older individuals, people with diabetes, and those with a lower level of education.[287–289] Finally, a recent study illustrated that present-day levels of $PM_{2.5}$ likely increase the risk for a cardiac event within a few days of exposure principally (or even solely) among individuals with preexisting significant coronary artery disease, even if they are seemingly healthy (eg, without anginal symptoms). Patients without obstructive lesions on heart catheterization were not at any risk for $PM_{2.5}$-induced myocardial events over the short term.[13] This is not surprising, because most acute cardiovascular events occur among individuals with underlying vulnerable substrate (eg, unstable plaques) and not in individuals with normal coronary arteries.

Obesity has been newly recognized as a possible susceptibility factor. Two cohort studies have shown that a greater body mass index enhances the susceptibility for PM-induced cardiovascular mortality, at least among women.[72,73] Although individuals with diabetes showed a trend toward greater risk in the Women's Health Initiative,[72] hypertension, high cholesterol, smoking, elderly age, education, and income did not alter the risk association. Overall, there appears to be little effect modification by race, hypercholesterolemia, or BP among the studies. Finally, sex may also be a risk-effect modifier. The particularly robust risk estimates of the 2 cohort studies that included only women,[72,73] the fact that PM increased cardiovascular risk in female but not male participants of the AHSMOG study,[75] and the multicity time-series findings in Asia[286] suggest that women may be at greater risk for cardiovascular mortality related to PM. Further studies are needed to clarify whether obese individuals and women are indeed susceptible populations.

Biological Mechanisms

There has been substantial improvement in our understanding of the biological mechanisms involved in PM-mediated

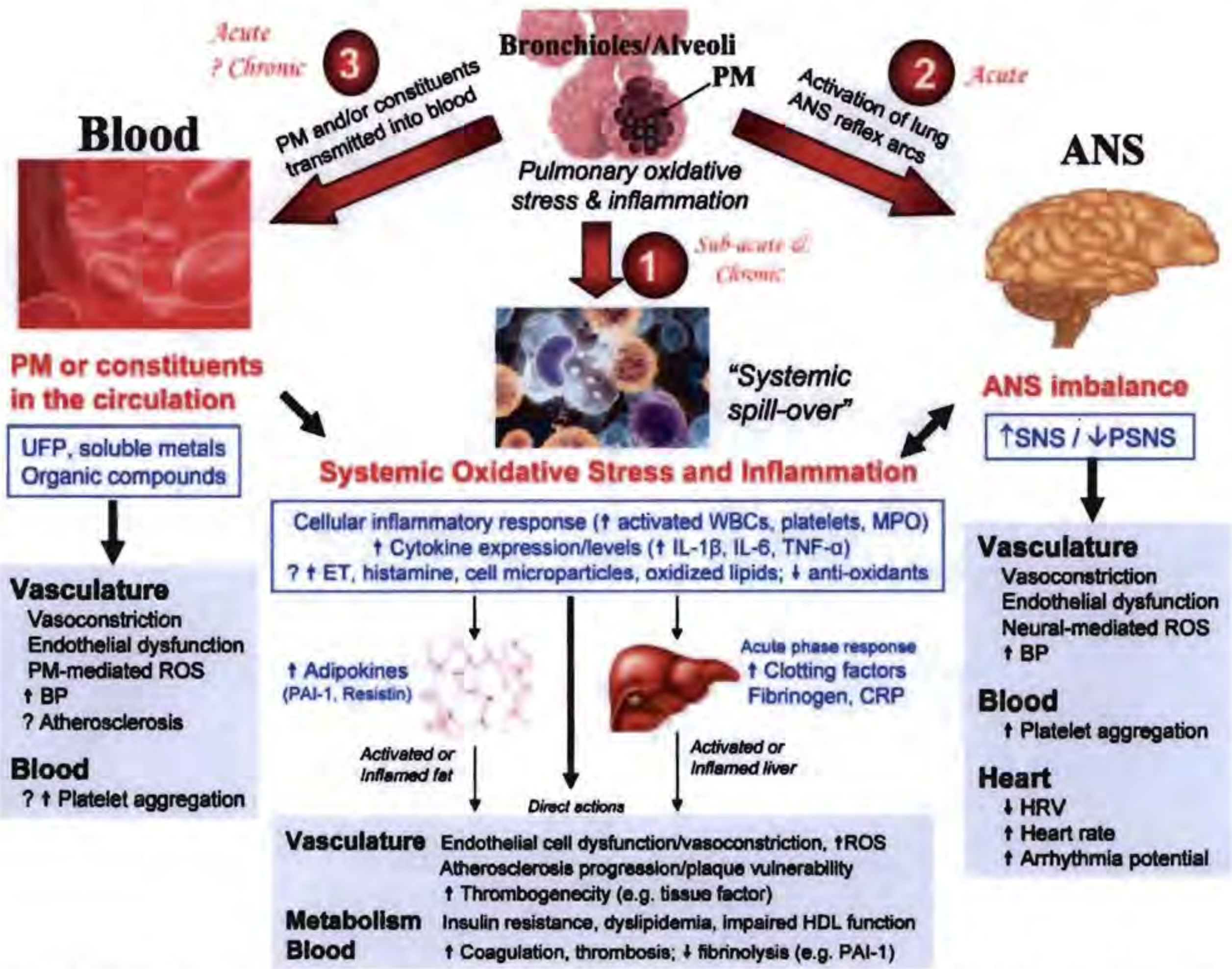

Figure 3. Biological pathways linking PM exposure with CVDs. The 3 generalized intermediary pathways and the subsequent specific biological responses that could be capable of instigating cardiovascular events are shown. MPO indicates myeloperoxidase; PAI, plasminogen activator inhibitor; PSNS, parasympathetic nervous system; SNS, sympathetic nervous system; and WBCs, white blood cells. A question mark (?) indicates a pathway/mechanism with weak or mixed evidence or a mechanism of likely yet primarily theoretical existence based on the literature.

cardiovascular effects. Studies before 2004 were reviewed previously,[1] and only some are again discussed here for contextual background. A number of new experiments have demonstrated very rapid effects of air pollution, such as vascular dysfunction, which argues for the existence of pathways that convey signals systemically within hours of PM inhalation. On the other hand, there is also support for chronic biological effects, such as the promotion of atherosclerosis. At the molecular level, persuasive evidence supports an integral role for ROS-dependent pathways at multiple stages, such as in the instigation of pulmonary oxidative stress, systemic proinflammatory responses, vascular dysfunction, and atherosclerosis. In sum, new studies continue to support the idea that inhalation of PM can instigate extrapulmonary effects on the cardiovascular system by 3 general "intermediary" pathways. These include pathway 1, the release of proinflammatory mediators (eg, cytokines, activated immune cells, or platelets) or vasculoactive molecules (eg, ET, possibly histamine, or microparticles) from lung-based cells; pathway 2, perturbation of systemic ANS balance or heart rhythm by particle interactions with lung receptors or nerves; and pathway 3, potentially the translocation of PM (ie, UFPs) or particle constituents (organic compounds, metals) into the systemic circulation (Figure 3).

Exposure Considerations

Animal and human exposure studies are discussed separately and apart from the effect of ambient PM because their methodologies and clinical relevancies vary widely. Controlled exposure studies involve exposing a subject to various size fractions of PM within a chamber connected to ambient air (concentrated or nonconcentrated) or a source of aerosolized particles. Virtual impactor systems that deliver concentrated ambient particles (CAPs) from "real-world" ambient air are a commonly used approach for mimicking exposures to higher levels of ambient particles without requiring invasive methods or the generation of artificial particles.[3] Both a strength and limitation, however, is that CAPs can vary considerably from day to day in composition. Additionally, only certain particle size ranges are typically concentrated (eg, PM from 0.1 to 2.5 μm in the fine-CAP system), whereas ambient air contains a mixture of particle sizes, volatile organics, and gases that are not concentrated (and can be lowered). Potential interactions between PM and gaseous copollutants on health end points are therefore excluded, unless the latter are reintroduced in an artificial fashion. Other methods of controlled-inhalation exposures include diesel engine exhaust (diluted and aged mixtures of high numbers of fresh combustion UFPs with vapor-phase components), roadside aerosols, and wood-burning sources. Regarding animal exposures, intratracheal instillation methods may sometimes be required because of the limited availability of inhalation exposure systems. Unfortunately, particle size and surface characteristics—mostly retained in inhalation systems with fresh sources of pollution and which may be important in influencing biological effects—are likely significantly altered in instillation systems or by methods that use previously collected particulate. However, the use of carefully modeled exposures (eg, deposition calculation) and the recognition that areas of "hot spots" containing markedly higher PM levels within the lung may occur even during normal inhalation make the results of these experiments potentially relevant.[2] Further detailed discussions of exposure considerations are reviewed elsewhere.[290]

The protocol details vary considerably among the studies. Many aspects of exposure, including the duration, concentration, PM size ranges and composition, and gaseous copollutants, are important to consider. A wide variety of outcomes may be anticipated depending on the biological pathways evoked by differing exposures. Moreover, there are multiple determinants of the subsequent physiological responses, including the time frames of investigation, preexisting susceptibility, animal models, and the details of the outcomes investigated. All of these factors may explain some of the heterogeneity in the reported study results and must be taken into consideration when interpreting the findings.

Animal Exposure and Toxicological Studies

Studies that investigate the effects of exposure on susceptible animals (eg, those with preexisting cardiovascular or metabolic abnormalities) may be preferable in many circumstances because of the increasing recognition that the pathways underlying the biological effects of PM overlap (ie, modify and/or enhance) those of conventional cardiovascular risk factors. Such factors (eg, hypertension or atherosclerosis) may also be necessary or at least responsible for the evocation of a more readily observable or robust response. For example, in the context of systemic oxidative stress or inflammation, the cellular machinery for the generation of excess ROS and proinflammatory responses (eg, adhesion molecule and cytokine expression) is already primed or operational in susceptible animals.

Pulmonary Oxidative Stress and Inflammation

The molecular events responsible for triggering pulmonary oxidative stress and inflammation, along with the interactions between lung and immune cells, the inhaled PM, and the protective secretions (eg, surfactant, proteins, and antioxidants), are highly complex,[4–6] as reviewed in detail elsewhere.[290a,290b,414] In brief, size, charge, solubility, aggregation, ROS-producing potential, and chemistry play roles in determining the responses. These include the particle fate (eg, lung clearance versus retention rates), the nature of the PM-cell interactions (eg, immune versus lung cell uptake, host cell responses, and intracellular sequestration/location), and the dose (likely typically a small percentage of inhaled PM) and pathways of potential systemic transmission of PM or its constituents, such as in the circulation [free, intracellular within circulating cells, (lipo)protein-bound] or via lymphatic spread.[4,5,290a,290b] Because of their nano-scale size, UFPs may directly enter multiple lung cell types via nonphagocytic pathways and adversely affect organelles, such as mitochondria.[6,290a,290b] Larger unopsonized fine particles are more typically taken up by phagocytes through interactions with innate immunity receptors such as MARCO (macrophage receptor with collagenous structure) or other scavenger receptors.[5,290a,290b] This may in fact be a protective mechanism that sometimes prevents harmful lung inflammation. Certain particle compounds may directly generate ROS in vivo because of their surface chemistry (eg, metals, organic compounds, and semiquinones) or after bioactivation by cytochrome P450 systems (eg, polycyclic aromatic hydrocarbon conversion to quinones).[6,290a,290b] A particle surface or anions present on otherwise more inert particles may disrupt iron homeostasis in the lung and thereby also generate ROS via Fenton reactions.[291] Other PM constituents may do so indirectly by the upregulation of endogenous cellular sources (eg, nicotinamide adenine dinucleotide phosphate [NADPH]) oxidase)[292,293] or by perturbing organelle function (eg, mitochondria) by taken-up PM components.[261] Particle stimulation of irritant and afferent ANS fibers may also play a role in local and systemic oxidative stress formation.[294] Given the rich antioxidant defenses in the lung fluid, secondarily generated oxidization products of endogenous molecules (eg, oxidized phospholipids, proteins) or a reduction in endogenous antioxidants per se may be responsible at least in part for the state of oxidative stress in the lungs (along with instigating the subsequent cellular responses) rather than ROS derived directly from PM and its constituents.

Subsequent to oxidative stress, antioxidant and phase II defenses may be activated (eg, inducible nitric oxide synthase, glutathione) via transcription factor Nrf2-dependent pathways.[261] When inadequate, pathological oxidative stress can initiate a variety of pulmonary inflammatory responses. For example, ROS in the lungs has been shown to augment the signal transduction of membrane ligand (eg, epidermal growth factor by disrupting phosphatases) or pattern-recognition receptors (eg, toll-like receptors [TLR])[295–299] and/or stimulate intracellular pathways (eg, mitogen-activated protein kinases) that lead to the activation of proinflammatory transcription factors (eg, nuclear factor-$\kappa\beta$) that upregulate expression of a variety of cytokines and chemokines.[261] Alteration in lung cell redox status may itself stimulate nuclear factor-$\kappa\beta$. Biological components within coarse PM could also directly trigger inflammation (eg, nuclear factor-$\kappa\beta$ pathways) by binding to TLR2 or TLR4 receptors or other innate immune pattern-recognition receptors.[297] It is also possible that other components of metal-rich

PM could instigate inflammatory pathways via TLR activation directly or via the oxidation of endogenous biological compounds that then serve as TLR ligands.[300] Finally, there is some evidence that PM can activate inflammatory mitogen-activated protein kinase signaling by angiotensin II receptor–dependent pathways.[295] These inflammatory responses can also exacerbate the initial oxidative stress [eg, via upregulation of cellular NAD(P)H oxidase] and thus initiate a positive-feedback cycle.

Available studies support important contributions to pulmonary inflammation from innate immune cells such as neutrophils and macrophages (TNF-α, IL-6), as well as from the adaptive immune system, such as T cells (IL-1, IL-4, IL-6, and IL-10). Although the dominant source of cytokines likely represents the alveolar macrophages and lung epithelial cells, the role of other innate and adaptive immune cells cannot be ruled out.[299,301,302] Recently, myeloperoxidase activity was shown to increase after PM exposure in the same time course of appearance of cellular inflammation (primarily neutrophils) in the lung.[303] Gaseous components such as ozone may also amplify the toxicity of PM.[304]

Systemic Inflammation

In the context of examining the cardiovascular effects of air pollution, it is important to consider the inflammatory mediators that are released from lung cells after contact with PM, because some could conceivably spill over to the general circulation or increase liver production of acute-phase proteins (eg, CRP, fibrinogen). An increase in circulating proinflammatory mediators (eg, activated immune cells, cytokines) could thus serve as a pathway to instigate adverse effects on the heart and vasculature. Numerous experiments have demonstrated increased cellular and inflammatory cytokine content, such as IL-6, IL-1β, TNF-α, interferon-γ, and IL-8, of bronchial fluid and sometimes in circulating blood after acute exposure to a variety of pollutants.[292,305–311]

Critical roles for the elevations in systemic and pulmonary levels of IL-6 and TNF-α have been observed after PM exposure, typically coincident with pulmonary inflammation.[292,302,306,309,311–314] There is at least some evidence that the degree of pulmonary inflammation and systemic inflammation (IL-6) correlates with the elevation of systemic cytokines and systemic vascular dysfunction.[314] In a 4-week inhalation exposure to freshly generated diesel exhaust, IL-6 knockout mice did not demonstrate increased cellular inflammation or TNF-α in bronchial fluid, which implies a role for IL-6.[315] Consistent with these findings, acute intratracheal exposure to PM_{10} resulted in an increase in IL-6, TNF-α, and interferon-γ in the bronchial fluid.[316] However, in this study, IL-6$^{-/-}$ mice showed roughly the same levels of TNF-α in bronchial fluid as wild-type mice, although interferon-γ was decreased to control values.[316] The results also suggested that lung macrophages play an important role, because depletion of these cells abolished the increases in some of the cytokines and systemic cardiovascular responses. Although our understanding of the source of IL-6 and TNF-α and their involvement in the systemic inflammatory response after PM exposure remains incomplete, these and other experiments appear to suggest that at least with PM_{10} particles, alveolar macrophages play a dominant role.[309,314,316]

Among remaining uncertainties, the upstream signaling pathway responsible for the recognition of PM components that in turn produce the systemic inflammation has not been fully elucidated[317]; however, there is some evidence with other particulates and experimental models of lung injury that ROS generated by NADPH oxidase or pattern-recognition receptors may modulate some of these responses.[292,299,318] NADPH-oxidase knockout mice demonstrated significantly lower IL-6 and macrophage inflammatory protein-2 responses to collected PM than wild-type mice.[292] Extrapulmonary sources may also be involved in promulgating the systemic inflammation. $PM_{2.5}$ exposure in a model of diet-induced obesity in C57Bl/6 mice for a duration of 24 weeks resulted in elevations in TNF-α and IL-6. In addition, there were increases in circulating adipokines, such as resistin and plasminogen activator inhibitor-1.[319] The elevation in cytokines, thought to be derived from adipose sources, in addition to findings of adipose inflammation in that study, raises the possibility of additional systemic nonpulmonary sources of such cytokines.

Systemic Oxidative Stress

Numerous in vitro studies have demonstrated activation of ROS-generating pathways by PM incubation, such as NADPH oxidases, mitochondrial sources, cytochrome P450 enzymes, and endothelial nitric oxide synthase in cultured cells or in pulmonary and vascular tissue.[293,311,320–329] Similar to inflammation, the oxidative stress after PM inhalation may not always stay confined within the lungs.[330] The sources of excess ROS within cardiovascular tissue may include circulating immune cells or cytokines, depletion of defense mechanisms (eg, impaired high-density lipoprotein function), oxidation of lipoproteins or other plasma constituents,[331] activation of ANS pathways,[294] or circulating PM constituents (eg, soluble metals, organic compounds) reaching the vasculature.[261] Activation of ROS-dependent pathways modulates diverse responses with far-reaching consequences, including vascular inflammation/activation, atherosclerosis, impaired basal vasomotor balance, enhanced coagulation/thrombosis, and platelet activation.[290b]

Recent experiments have indeed confirmed the existence of footprints or markers of oxidative stress within the cardiovascular system in the in vivo context. Acute-exposure studies[332] have shown a relationship between the vascular dysfunction in spinotrapezius microvessels and the release of myeloperoxidase from leukocytes into the vasculature within only hours after the pulmonary instillation of PM.[332] Interestingly, an insoluble particle (TiO_2) induced very similar effects. More long-term studies[333] have demonstrated that 10 weeks of exposure to $PM_{2.5}$ increased superoxide production in response to angiotensin II and resulted in upregulation of NAD(P)H oxidase subunits and depletion of tetrahydrobiopterin in the vasculature. These effects had functional consequences in terms of increases in systemic vascular resistance and BP. In another investigation that involved apolipoprotein E–deficient (ApoE$^{-/-}$) fed a high-fat diet, chronic exposure to $PM_{2.5}$ exacerbated vascular oxidant stress and promoted atherosclerosis progression.[334] The proatherogenic effects of ambient UFPs[331] versus $PM_{2.5}$ in genetically susceptible $ApoE^{-/-}$ mice in a mobile facility close to a Los Angeles freeway have also been compared. Exposure to UFPs resulted in an inhibition of the antiinflammatory capacity of plasma high-density lipoprotein and greater systemic oxidative stress, as evidenced by increased hepatic malondialdehyde and upregulation of Nrf2-regulated antioxidant genes.[331]

Other experiments[294] have suggested that ANS imbalance may play an important role in PM-induced cardiac oxidative stress. Pharmacological inhibition of the ANS could significantly reduce chemiluminescence in the heart after exposure.[303] More recently, an upstream modulator, the transient receptor potential vanilloid receptor-1, within the lung was identified as central to the inhaled CAP-mediated induction of cardiac chemiluminescence.[335] In these studies, capsazepine was able to abrogate ECG alterations in rats during the 5-hour exposure, which suggests that neural ANS pathways are crucial.

Thrombosis and Coagulation

Earlier studies using intratracheal instillation of high concentrations of diesel exhaust particles demonstrated the induction of lung inflammation, platelet activation, and increased peripheral vascular thrombosis in both arteries and veins after photochemical injury.[336,337] Thrombosis susceptibility was ascribed to direct passage of the instilled UFPs in the blood, because large polystyrene particles unlikely to cross the lung-blood barrier did not increase peripheral thrombosis. In a subsequent study, a persistent increase in thrombosis susceptibility to diesel exhaust particles was shown after 24 hours, an effect that was mitigated by pretreatment with sodium cromoglycate, which indicates that this response was secondary to histamine release from basophil degranulation.[338] These same effects, however, were mimicked by 400-nm polystyrene particles with a low likelihood of transgressing the pulmonary barrier, which implicates pulmonary release of histamine as a mediator of thrombosis at the later time point. Because histamine was increased in the plasma at 6 and 24 hours after exposure, and diphenhydramine mitigated diesel PM–induced thrombosis at later time points but not at 1 hour, it was hypothesized that additional direct effects of PM constituents reaching the circulation may be responsible for the earliest prothrombotic effects.[339] No increase in circulating von Willebrand factor was observed after instillation of both particles. Finally, pulmonary instillation of carbon nanotubes produced neutrophil lung influx 24 hours later. Circulating platelet-leukocyte conjugates were elevated 6 hours after exposure, whereas procoagulant microvesicular tissue factor activity and peripheral thrombotic potential were increased 24 hours later. Inhibition of P-selectin abrogated these responses, which demonstrates that rapid activation of circulating platelets by the pulmonary deposition of PM plays a vital role.[340] This series of studies suggests that release of lung cell–derived mediators (eg, histamine) after several hours along with the more rapid activation of circulating platelets by lung inflammation via P-selectin–dependent processes may mediate distant system prothrombotic effects without necessarily inducing systemic endothelial damage.

In a study using C57BL/6J mice, intratracheal PM_{10} particles rich in transition metals decreased bleeding, prothrombin, and activated partial thromboplastin times and enhanced the levels of several coagulation factors as well as thrombosis times in response to experimental $FeCl_3$ injury.[316] This prothrombotic effect was mitigated in $IL\text{-}6^{-/-}$ and macrophage-depleted mice, which suggests that IL-6, lung macrophages, and pulmonary inflammation are necessary initial steps. It is possible, however, that coarse-particle components (eg, endotoxin) could have been important mechanistically via TLR activation. The effect of fine PM or UFPs per se requires more investigation. Chronic ambient exposure to $PM_{2.5}$ has also been shown to increase tissue factor expression in macrophages and smooth muscle cells in atherosclerotic lesions. Complementary in vitro studies with cultured human smooth muscle cells and monocytes demonstrate dose-dependent increases in tissue factor in response to collected ambient particles.[341] Other findings also support potential procoagulant and thrombotic effects of PM.[342,343] These collective studies suggest that both short- and long-term PM inhalation can enhance thrombotic and coagulation tendencies, potentially via increases in circulating histamine and inflammatory cytokines and/or activated white cells and platelets. The plausibility of these pathways is supported by the well-recognized cross talk between inflammation and thrombosis.[344] Potential additional roles for UFPs or soluble constituents that reach the circulation and directly enhance platelet aggregation or systemic oxidative stress (thus activating the endothelium and blunting platelet-derived nitric oxide) require more investigation.

Systemic and Pulmonary Hypertension

Early animal studies suggested small or inconsistent effects of PM on BP,[345–347] sometimes dependent on the season[348] of exposures. A potential explanation may be variations in experimental protocols, including differences in the delivery, duration, and composition of exposure and the methods used to measure BP. Moreover, PM by itself may represent a relatively weak stimulus but may act more robustly in concert with other predisposing factors to affect BP. Sun et al[333] recently demonstrated a significant interactive effect of fine-CAP exposure with the vasoconstrictor angiotensin II in rats. Preexposure to $PM_{2.5}$ for a 10-week period resulted in enhancement of its prohypertensive response measured continuously by intra-arterial radiotelemetry. The exaggerated BP elevation was accompanied by endothelial dysfunction, including blunted endothelium-dependent vasodilation and enhanced vasoconstrictor reactivity, along with upregulation of NAPDH oxidase and Rho-kinase–signaling pathways. In vitro exposure to UFPs and $PM_{2.5}$ was also associated with an increase in Rho-kinase activity, phosphorylation of myosin light chain, and myosin phosphatase target subunit. Pretreatment with the nonspecific antioxidant *N*-acetylcysteine and Rho-kinase inhibitors prevented these responses, which suggests an ROS-mediated mechanism for particle-mediated effects on vascular smooth muscle constriction. Further studies corroborated the role of exaggerated Rho-kinase pathway activity in potentiating the hypertensive response to angiotensin II in mice exposed to $PM_{2.5}$.[349] Moreover, particle exposure augmented angiotensin-mediated cardiac hypertrophy and collagen deposition. Blockade of Rho-kinase abolished these effects. These responses suggest that chronic $PM_{2.5}$ exposure disrupts normal vascular homeostasis and vasoactive mediator balance through ROS-dependent mechanisms in a manner that sensitizes the vessel toward vasoconstrictors. Activation of RhoA/Rho-kinase signaling pathways appears to play an important mechanistic role.

In conscious canines with implanted BP catheters, systemic arterial BP increased and baroreceptor sensitivity was rapidly altered over a few hours during CAP exposure.[350] Interestingly, α-adrenergic antagonism abrogated the responses. The findings support a mechanistic role for acute activation of the sympathetic nervous system by inhaled particles. In a study with Wistar-Kyoto male rats, CAP exposure for 4 days upregulated ET-A receptor expression in the heart. This alteration was also weakly correlated with an increase in BP, which suggests a role for enhance ET activity.[351] PM has also been demonstrated to alter the release of ET-1 and ET-3 from the lungs.[352] Elevation in pulmonary vascular resistance and pulmonary arterial pressure, which suggests constriction of the pulmonary vessels, has also been demonstrated in response to respirable carbon black particles.[353] Recently, ultrafine carbon particles were shown to increase BP in spontaneously hypertensive rats 1 to 3 days after a 24-hour exposure.[354] This response occurred concomitant with increased ET-1 messenger ribonucleic acid levels in lung tissue and small elevations in plasma renin concentration and angiotensin I and II in the systemic circulation. These findings further support the idea that ET may play a role in cardiovascular responses to PM exposure and suggest that activation of the renin-angiotensin system may also be involved. It is not clear whether the elevated circulating ET levels reflect increased release from the lungs and whether this mediates a systemic vasoconstrictor response. Alternatively, the increase may be more indicative of enhanced vascular tissue activity of these systems. Longer-term exposures of carbon black for 4 weeks in Sprague-Dawley rats has also been shown to significantly increase systolic BP concomitant with increases in serum levels of IL-6 and CRP.[355]

Finally, in vitro exposure to soluble and insoluble components of UFPs induces constriction in isolated pulmonary arterial rings and activates intracellular signaling pathways such as phosphorylation of extracellular signal–regulated kinase-1/2 and p38 mitogen-activated protein kinase in pulmonary endothelial cells. These effects were antagonized by losartan, and several metal components (copper and zinc) could replicate the responses.[295] This suggests a possible role for activation of angiotensin II receptor pathways relevant for the maintenance of vasomotor tone and smooth muscle constriction after inhalation of metal constituents within PM.

In sum, the studies demonstrate that long-term PM exposures over a period of weeks are capable of enhancing vasoconstrictive responsiveness of the vasculature (eg, increased Rho-kinase activity and reduced nitric oxide bioavailability) by inflammatory and ROS-dependent cell-signaling pathways. Shorter-term exposures over several hours to days may lead to vasoconstriction and increased pulmonary and systemic BP by pathways dependent on enhanced ET or angiotensin II signaling. Lung cells may release ET into the systemic circulation and thus increase its systemic activity, or the vascular ET system may be relatively upregulated because of increased ROS or reduced nitric oxide. Activation of the renin-angiotensin system may also occur because of systemic oxidative stress or inflammation or as a consequence of ANS imbalance. The very acute increase in BP that occurs concomitant with the inhalation of particles or within only minutes to hours after exposure appears to be mediated by autonomic imbalance that favors a relative activation of the sympathetic nervous system. No study has evaluated the effect of air pollution on renal sodium handling or long-term pressure natriuresis mechanisms, which are fundamental to the generation of chronic hypertension.

Vascular Dysfunction and Atherosclerosis

Many early experiments demonstrated the capacity of PM constituents to blunt nitric oxide–dependent dilation and enhance vasoconstrictor tone in ex vivo vascular studies because of excess ROS formation.[1] The first in vivo experiment demonstrated the proatherosclerotic actions of intratracheal PM_{10} instillation.[356] More recently, the pulmonary instillation of several different PM types was shown to rapidly impair microvascular endothelium-dependent vasodilation within days, likely by proinflammatory or ROS-dependent mechanisms (eg, myeloperoxidase).[332] Several animal studies have now demonstrated that long-term exposure to ambient $PM_{2.5}$, by use of ambient-exposure facilities without direct pulmonary instillation, not only causes endothelial dysfunction but also accelerates the progression of atherosclerosis. Sun et al[334] demonstrated that exposure of atherosclerosis-prone $ApoE^{-/-}$ mice to environmentally relevant levels of CAP, derived from regional northeastern $PM_{2.5}$, for 6 months in conjunction with a high-fat chow diet potentiated plaque development and heightened vascular inflammation (CD68+ macrophage infiltration and inducible nitric oxide synthase expression) and oxidant stress. The atherosclerotic plaque progression was also accompanied by alterations in vasomotor tone, including decreased endothelium-dependent vasodilation and heightened vasoconstriction to adrenergic stimuli. Importantly, the normalized average $PM_{2.5}$ concentration over the entire period was 15.2 $\mu g/m^3$, which approximates the annual NAAQS. Similar findings were reported in other chronic CAP exposures that involved an $ApoE^{-/-}$ model.[357] However, exposures to a double-knockout model of ApoE-deficient and low-density lipoprotein receptor–deficient mice increased plaque cellularity, reflective of inflammation, but did not enhance plaque burden. It is possible that the atherosclerotic severity of this phenotype precluded the observation of more subtle effects of CAP exposures.

Intratracheal instillation of UFP can acutely impair aortic endothelium-dependent vasodilation.[358] Moreover, repeated 10-week-long endotracheal dispersion of UFP carbon black increased atherosclerosis in low-density lipoprotein receptor–

knockout mice.[359] This occurred without evidence of systemic translocation of particles into the cardiovascular tissues. UFP inhalation by use of exposure facilities has also recently been shown to augment atherosclerosis, perhaps to a greater degree than $PM_{2.5}$. When investigating the effects of different PM size fractions, Araujo et al[331] compared the proatherogenic potential of exposure over 40 days to ambient particles <0.18 μm versus $PM_{2.5}$ in $ApoE^{-/-}$ mice. UFPs caused more adverse cardiovascular responses (eg, systemic oxidative stress, impaired high-density lipoprotein function) and greater potency in accelerating atherosclerotic lesion formation, although $PM_{2.5}$ did demonstrate qualitatively similar effects. Recent studies have also demonstrated that PM exposure likely promulgates systemic atherosclerosis by mechanisms that overlap those of other conventional cardiovascular risk factors.[360] Intratracheal instillation of PM_{10} particles caused a rapid impairment in endothelium-dependent vasodilation, stimulation of bone marrow–derived cells, and increased migration of monocytes into atherosclerotic plaques.[361,362] Systemic inflammation (IL-6) was also related to the degree of endothelial dysfunction.[314] Finally, the most compelling evidence for rapid impairment in nitric oxide bioavailability being directly involved in the origin of PM-induced endothelial dysfunction was demonstrated recently. Both fine-PM and UFM inhalation for only a few hours in normal rats blunted agonist-stimulated nitric oxide production within the microvasculature, measured by direct electrochemical sensors, concomitant with an observed impairment in vasomotor relaxation. Inhibition of myeloperoxidase or NADP(H) oxidase partially restored normal nitric oxide bioavailability and endothelial function, which suggests a role of activation of these endogenous radical-generating enzymes in this biological response.[363]

Potentially relevant adverse vascular effects of nonparticulate PM components should not be discounted. There may also exist some synergy between vapor phase, gas, and particle constituents in relation to instigation of cardiovascular responses. Recently,[364] it was demonstrated in $apoE^{-/-}$ mice that whole gasoline engine exhaust over 1 or 7 days increased vascular messenger ribonucleic acid expression of matrix metalloproteinase (MMP)-2 and MMP-9. Levels of ET-1 and ROS were similarly increased. The vascular ROS and MMP-2 elevations were attenuated by tempol. Endothelial receptor antagonism ameliorated the vascular expression of MMP-2, MMP-9, and ROS. In separate experiments, diesel exhaust exposure to rats for 5 hours augmented ET-induced vasoconstriction, potentially via a blunting of ET-B–induced nitric oxide release.[365] The findings suggest that exposure to a fresh mixture of PM, gases, and vapors may play a role in rapidly triggering atherosclerotic plaque vulnerability via ROS and ET-dependent upregulation of MMP levels.

Some studies suggest that predisposed animals may be more susceptible to air pollution–mediated vascular dysfunction. Diesel exhaust particles delivered by intraperitoneal injection impaired nitric oxide–dependent vasodilation only in $apoE^{-/-}$ mice with atherosclerosis and not in healthy control animals.[366] Aortas from prediabetic rats were found to be more susceptible to repeated exposures to oil combustion particles in causing noradrenergic-mediated constriction and impaired endothelium-dependent vasodilation.[367]

Taken together, the available studies suggest that short- and long-term particle exposures (including PM_{10}, $PM_{2.5}$, and UFP) can impair conduit and resistance arterial endothelium-dependent vasodilation. Chronic exposures have been shown to be capable of promoting atherosclerosis progression and enhancing plaque vulnerability. The underlying mechanisms likely involve vascular sequelae of systemic inflammation (due to interactions with innate immune cells and cytokines) or exaggerated oxidative stress pathways. Excess vascular ROS and inflammation will impair endogenous vasodilator bioavailability (eg, nitric oxide), enhance vasoconstrictor tone (eg, ET), and chronically activate multiple intracellular pathways that promote atherosclerosis.[368–370]

Heart Rate Variability

Some of the earliest indications of systemic effects of PM came from ECG studies in rats.[371] In general, reductions in several measures of HRV have been shown.[372–376] Most of the recent research has focused on exploring the roles of susceptibility and exposure characteristics. Decreases in heart rate and HRV indices have been reported to be pronounced in senescent mice, which indicates that aging may be a susceptibility factor.[353] Using an anesthetized model of postinfarction myocardium sensitivity, Wellenius and colleagues[377] did not demonstrate an effect of 1 hour of CAP exposure on heart rate or spontaneous ventricular arrhythmias. In contrast, in a post-MI heart failure model in Sprague-Dawley rats, diesel exhaust emissions reduced HRV in both healthy and heart failure groups and increased the incidence of premature ventricular contractions. Studies in mice have also indicated a potential role for transition metals and nickel in HRV alterations[376] and provide initial clues on the PM components that could influence autonomic tone.[48]

Some beginning insight into the neural pathways involved has been reported recently. PM-induced ECG changes in rats were shown to be prevented by inhibiting the transient receptor potential vanilloid receptor in the lungs. This suggests that the relevant neural mechanism that leads to alterations in HRV or heart rhythm may be induced by activation of receptor-mediated autonomic reflexes in the lung.[335] Circulating particle constituents or inflammatory mediators interacting with myocardial ion channels or electrophysiology did not appear to be a pertinent mechanism, at least in these studies.[335] However, it is unknown whether similar mechanisms can account for the HRV changes observed in humans, and a more detailed understanding of the anatomic pathways involved is required. Finally, it remains unclear whether the changes in cardiac HRV are actually caused by or merely illustrate an underlying alteration in ANS balance. Experiments that clearly define the direct contribution of sympathetic and parasympathetic nervous system activities (eg, microneurography, norepinephrine spillover rates, or autonomic receptor or ganglionic blockade) are needed.

MI and Arrhythmia

PM exposure can increase experimental infarct size and potentiate myocardial ischemia and arrhythmias in experimental MI models. Relatively high concentrations of intratracheal UFP instillation induced pulmonary inflammation and doubled MI size in mice.[358] Conscious dogs exposed to fine CAP for several days experienced greater ST-segment changes during transient coronary artery occlusion.[378] These studies suggested that particulate-related changes in myocardial blood flow may be responsible, a hypothesis recently supported by experiments in chronically instrumented dogs exposed to fine CAP before transient occlusion of the left anterior descending artery. PM exposure was associated with a small but significant decrease in total myocardial flow, especially in the ischemic zone, and increases in coronary vascular resistance without an alteration in rate-pressure product.[379] The abnormalities were inversely related to PM mass, particle number, and black carbon concentration.

Exposure to residual oil fly ash increases arrhythmia frequency in rats with preexisting premature ventricular complexes, which suggests that PM sensitizes ischemic myocardium to abnormal automaticity[372]; however, CAP had no effect in rats.[380] Nevertheless, the data suggest that PM exposure may potentially be capable increasing the sensitivity of the myocardium to ischemia, likely by impairing myocardial blood flow and perfusion. In theory, this could play a role in enhancing the propensity for ventricular arrhythmias.

Insulin Resistance

Recently, Sun et al[319] exposed C57BL/6 mice fed high-fat chow to fine CAP or filtered air for 24 weeks. Mice exposed to $PM_{2.5}$ exhibited marked worsening of whole-body insulin resistance, systemic inflammation (increased IL-6 and TNF-α), and higher levels of adipokines, such as resistin and plasminogen activator inhibitor-1. $PM_{2.5}$ increased visceral adiposity and inflammation (F4/80$^+$ cells), with stromal vascular cells expressing higher TNF-α and IL-6 and lower IL-10 levels. Exposure also induced insulin-signaling abnormalities and reduced phosphorylation of Akt and endothelial nitric oxide synthase in aortic tissue, accompanied by abnormalities in vascular relaxation to insulin. Additionally, there was evidence that $PM_{2.5}$ exaggerated adhesion of monocytes in mesenteric microvessels, culminating in accumulation in visceral adipose. These intriguing findings suggest that longer-term exposure to PM air pollution may promote the chronic development of insulin resistance, obesity, and the metabolic syndrome.

Controlled-Exposure Studies in Humans

Several new human exposure studies have been published, a few of which have even included patients with CVD or risk factors. Similar to the animal studies, large variations among the exposure protocols, measured outcomes, and subject susceptibilities likely explain much of the differences among findings and must be considered when interpreting the results.

Systemic Inflammation

Controlled human exposure studies have measured the effects on circulating inflammatory markers such as CRP, IL-6, and TNF-α. In many of these single-episode short-term exposures, no overt changes in plasma cytokine levels were observed after CAP[381–383] or diesel exhaust.[345,384–386] Similarly, CRP levels have not consistently been found to increase in the time frame and context of most of these studies.[313,384–386]

However, there have also been some positive findings. Increases in IL-6[313] and TNF-α 24 hours after exposure to diesel exhaust in healthy adults have been reported. High levels of ambient particles can stimulate the bone marrow to enhance the release of neutrophils, band cells, and monocytes into the circulation, which causes a cellular inflammatory response.[387,388] Some controlled-exposure studies corroborate the existence of a cellular proinflammatory response that manifests as increases in circulating white blood cell or immune cell counts. In 1 study, increased peripheral basophils in healthy older adults were noted 4 hours after a 2-hour exposure to fine CAP.[389] In a similar study, increased white blood cell counts were observed in healthy young adults 12 hours after exposure.[381] Recently, investigators observed an increased in total white blood cell and neutrophil levels immediately after a 2-hour exposure to CAP in downtown Toronto, Ontario, Canada.[390] Conversely, decreases in blood monocytes, basophils, eosinophils, and CD54 and CD18 adhesion molecule expression on monocytes after exposure to ultrafine carbon (10 to 50 $\mu g/m^3$) among exercising asthmatic individuals and healthy adults have also been reported.[391] The authors suggested in the latter study that these results may represent the sequestration of these cells in tissue compartments such as the lung or vasculature, where there may be selective expression of the corresponding receptors for these ligands.[362] However, other recent human clinical studies have found no association between peripheral blood cell counts and exposure to fine PM or UFPs such as zinc oxide,[392] ultrafine carbon,[393] or diesel exhaust.[313,384,385]

More subtle, yet physiologically relevant or functional proinflammatory changes may be overlooked by the measurement of circulating cytokines or cell counts alone in human studies. Peretz et al[394] recently evaluated gene expression using an expression array in monocytes after 2 hours of exposure to diesel exhaust. Although initially a small study, 10 genes involved in the inflammatory response were modulated in response to exposure (8 upregulated, 2 downregulated). These findings will need to be reproduced in larger studies and raise the possibility that functional changes in inflammatory cells may occur without discernible changes in their levels in the peripheral circulation.[394]

In sum, the findings from controlled human exposures do not demonstrate a robust inflammatory response; however, they have been limited by the fact that they are, by necessity, of short duration and relatively low concentration. Additionally, the results do not preclude an effect of higher exposures, the presence of more subtle responses, or alterations in other cellular inflammatory pathways not measurable by circulating markers.

Systemic Oxidative Stress

The demonstration of systemic oxidative stress is difficult in human studies. Nonetheless, a few studies have reported positive findings. These include an increase in urinary excretion of free 8-iso-prostaglandin-2α among healthy adults after a 4-hour exposure to concentrated wood smoke[395] and an increase in plasma antioxidant capacity 24 hours after a 1-hour exposure to diesel exhaust in a group of healthy volunteers.[313] The investigators speculated that systemic oxidative stress after exposure may have been responsible for this upregulation in antioxidant defense.[313] Other investigators[394] have observed significant differences in expression of genes involved in oxidative stress pathways due to diesel exhaust exposure. Bräuner et al[167] recently investigated the effect of ultrafine traffic particles on oxidative stress–induced damage to DNA in healthy young adults exposed to low concentrations of ambient urban particles ($PM_{2.5}$ and $PM_{10-2.5}$ mass of 9.7 and 12.6 $\mu g/m^3$, respectively) in an exposure chamber above a busy road with high traffic density. The authors observed increased levels of DNA strand breaks and formamidopyrimidine-DNA glycosylase sites in monocytes after exposure to PM but no changes in the DNA repair enzyme 7,8-dihydro-8-oxoguanine-DNA glycosylase. Similar to their previous findings with ambient levels,[168] the results suggest that short-term exposure to UFPs may result in damage to DNA. This may occur through oxidative stress pathways, although there was no increase in messenger ribonucleic acid levels in heme oxygenase-1, a gene known to be regulated by Nrf2, a transcription factor regulated by oxidative stress.[396] Moreover, more recent observations by the same investigators failed to demonstrate significant biomarker signals for lipid or protein oxidative damage after similar near-roadway exposures.[178] Although not entirely consistent, the available studies demonstrate that acute exposure to PM, perhaps even at ambient levels, may be capable of inducing acute systemic oxidative stress in human subjects under certain circumstances. The assays used to assess the footprint of systemic "oxidative stress" or damage may also play a significant role in the results.

Thrombosis and Coagulation

Several new studies of controlled human exposure have evaluated the effects of PM on hemostatic markers (eg, factor VII, fibrinogen, platelet count, D-dimer, and von Willebrand factor). Although some of these studies have not observed changes after acute exposures,[392] others have reported increases in fibrinogen levels at 8 to 24 hours after exposure to CAP.[381,397] Mills and colleagues[384,385] recently demonstrated a significant effect of diesel exhaust on fibrinolytic function in response to intermittent exercise both in healthy men and in men with coronary heart disease. In both groups of volunteers, bradykinin-induced release of tissue plasminogen activator was observed to decrease compared with filtered air at 6 hours after exposure to diesel exhaust. These perturbations in tissue plasminogen activator release did not persist 24 hours after exposure.[313] In a randomized, controlled crossover study involving "at-risk" metabolic syndrome patients, no changes in plasminogen activator inhibitor-1 were noted over a 24-hour duration; paradoxically, a decrease in von Willebrand factor was noted in this study.[398] In a similar experiment conducted in healthy adults, diesel exhaust had no effect on D-dimer, von Willebrand factor, CRP, or platelet counts compared with filtered air up to 22 hours after exposure.[386] Other investigators[395] recently evaluated the effect of wood smoke on markers of coagulation, inflammation, and lipid peroxidation in young healthy subjects. Serum amyloid A and the ratio of factor VIII to von Willebrand factor, an indicator of an increased risk of venous thromboembolism, were increased at 4 hours after exposure.[395] Samet et al[383] reported an association between various coagulation markers and exposure to ultrafine, fine, and thoracic coarse CAP among healthy young adults. Although exposure to coarse CAP did not result in significant changes in hemostatic variables, the overall trend suggested a prothrombotic effect. Exposure to UFPs increased D-dimer levels, whereas fine-CAP effects tended to increase fibrinogen, similar to previously reported findings.[381]

The measurement of blood levels of coagulation factors or biomarkers of thrombosis could potentially miss a relevant biological effect at the vascular wall. Recently, ex vivo thrombus formation was assessed by use of the Badimon chamber after controlled exposures to dilute diesel exhaust in healthy volunteers.[399] This protocol measures thrombus formation in native (nonanticoagulated) whole blood triggered by exposure to a physiologically relevant substrate, under flow conditions that mimic those found in diseased coronary arteries. It may therefore provide a superior estimate of actual in vivo conditions related to thrombosis potential. Interestingly, dilute diesel exhaust exposure increased thrombus formation within 2 hours, in association with increased platelet activation (ie, increased circulating platelet-monocyte aggregates and soluble CD40 ligand). Taken together, these new studies have provided additional evidence that short-term exposure to PM at near-ambient levels may have small yet potentially significant effects on hemostasis in humans. Whether direct interactions of circulating PM constituents with platelets, activation of platelets due to lung inflammation or secondary to elevated systemic cytokine levels, or an increase in procoagulant factors (eg, fibrinogen) as an acute-phase response to inflammation (or a combination of these pathways) is responsible warrants attention in future studies.

Arterial BP

Although several studies have evaluated the BP response to acute exposures, many inconsistencies in results have been reported.[400] This must be considered in the context that BP was not the primary outcome of interest in most studies, nor was it typically assessed with adequate sophistication. In one of the earliest studies, $PM_{2.5}$ increased systolic BP in healthy subjects but decreased it in asthmatic individuals.[401] Three other controlled studies did not report changes among healthy adults.[345,402,403] However, in a more detailed reanalysis of the changes in BP during the actual period of exposure to CAP plus ozone, Urch et al[404] found a significant increase in diastolic BP of 6 mm Hg. The magnitude of response was associated with the concentration of organic carbon within $PM_{2.5}$.[405] Recent follow-up studies redemonstrated an acute prohypertensive response during the inhalation of CAP in 2 separate cities.[390] The $PM_{2.5}$ mass during exposure and decreases in several HRV metrics were associated with the magnitude of the short-lived diastolic BP elevation. This suggested that the most plausible mechanism for this acute response was CAP-induced ANS imbalance that favored sympathetic over parasympathetic cardiovascular tone. Whether this reaction occurred because of a generalized stress response, as a consequence of specific soluble PM constituents directly altering central nervous system activity, or via altered ANS reflex arcs due to the interaction of inhaled particles with lung receptors/nerve endings remains to be elucidated.

The effect of inhaled particulates on BP has also been investigated in several other recent controlled human exposure studies. Two new studies assessed BP changes after a 1-hour exposure to diesel exhaust. Mills et al[384] found a 6-mm Hg increase in diastolic BP 2 hours after exposure, which was of marginal statistical significance (P=0.08); however, this trend did not persist for 24 hours,[384] nor was it found among patients with coronary artery disease.[385] The available data to date suggest that short-term exposure to $PM_{2.5}$ or diesel exhaust is capable in certain circumstances of rapidly raising BP. The most consistent and largest effects were seen concomitant with the inhalation of particles. Thus far, the most likely mechanism for such rapid hemodynamic responses appears to be ANS imbalance. However, it is possible that reductions in nitric oxide bioavailability that modulate basal arterial tone toward vasoconstriction or increases in ET among other hemodynamically active molecules (eg, angiotensin II) also play a role in some circumstances.

Vascular Dysfunction

The first controlled human exposure study related to vascular function reported that CAP plus ozone exposure caused acute conduit arterial vasoconstriction in healthy adults.[1] Endothelium-dependent and -independent vasodilation remained intact. Recent follow-up experiments determined that $PM_{2.5}$, not ozone, was responsible for the adverse vascular effects. However, in these subsequent and larger experiments, fine-CAP exposure did prove capable of diminishing conduit artery endothelium-dependent vasodilation 24 hours (but not immediately) after exposure.[390] Postexposure $PM_{2.5}$ mass and TNF-α level were both associated with the degree of endothelial dysfunction, which suggests that systemic inflammation induced by higher levels of particles was likely responsible. Finally, the CAP-induced endothelial dysfunction occurred during exposures in Toronto, Canada, but not Ann Arbor, Mich, which suggests that the composition of the particles is probably an important determinant of the vascular responses.

An acute alteration in vascular function/tone after short-term controlled PM air pollution exposure was corroborated recently.[406] In 27 adults (10 healthy adults and 17 with the metabolic syndrome), a 2-hour exposure to dilute diesel exhaust caused a dose-dependent constriction of the brachial artery and elevation in plasma ET level without impairing endothelium-dependent vasodilation. Contrary to the hypothesis that metabolic syndrome patients would show greater effects, vasoconstriction was greater in magnitude among the healthy participants. In an additional study, 2-hour exposure to UFPs composed of elemental carbon impaired peak forearm blood flow response to ischemia 3.5 hours later. There were no other vascular changes or alterations at other time points. BP was also not affected.[407]

Several recent studies have also shown that dilute diesel exhaust can impair peripheral resistance vessel responses to acetylcholine, bradykinin, and nitroprusside 6 hours after exposure.[384] The blunted responses to acetylcholine persisted for 24 hours in healthy adults.[313] In contrast, bradykinin and sodium nitroprusside–mediated vasodilation and bradykinin-induced acute plasma tissue plasminogen activator release were not altered 24 hours later. In subsequent studies, patients with stable coronary artery disease exposed to dilute diesel exhaust for 1 hour during intermittent exercise demonstrated reduced bradykinin-mediated tissue plasminogen activator release; however, microvascular endothelial function was not impaired.[385] This may be related to some degree of preexisting endothelial dysfunction in these patients. However, exercise-induced ST-segment depression and ischemic burden were significantly greater during diesel compared with filtered air exposure. These important findings experimentally highlight that PM air pollution exposure can trigger, or augment existing, myocardial ischemia extremely rapidly (in fact, concomitant with exposure). Reduced coronary flow reserve (that was not observed or resolved at the time of the postexposure brachial artery studies) due to rapid alterations in coronary microvascular function may have contributed to the acute myocardial ischemia. Alternatively, acute ANS imbalance induced by diesel exhaust inhalation may have acutely altered coronary tone and impaired myocardial perfusion.

In a study that exposed healthy young adults to 100 $\mu g/m^3$ of diesel exhaust for 2 hours,[364] it was recently demonstrated that this air pollution mixture acutely raised plasma ET-1 and MMP-9 expression and activity within 30 minutes. These results corroborate the animal data that even short-term exposures can rapidly alter factors, such as MMP activity, that are mechanistically linked with causing atherosclerotic plaque disruption (and thus acute MI). The increase in ET levels also corroborates previous studies[406] that showed that diesel exhaust can acutely affect important endogenous regulators of vasomotor tone.

Controlled air pollution exposures have not always been shown to impair endothelial function or vasomotor tone. Despite an increase in exhaled 8-isoprostane concentrations that suggested pulmonary oxidative stress, fine CAP did not affect brachial flow–mediated dilation or basal diameter in northern Scotland exposures.[382] However, the $PM_{2.5}$ consisted of relatively inert ambient sea-salt particles and was extremely low in combustion-derived sources. This is in contrast to the particle chemistry in the investigators' previous diesel exposure studies that showed positive findings.[408,409] Moreover, 24-hour exposure to ambient pollution shunted into a chamber next to a busy street did not impair microvascular endothelial function in 29 healthy subjects, as assessed by digital tonometry.[178] This exposure to near-roadway ambient air, which consisted of ambient UFP and $PM_{2.5}$, did not alter biomarkers of inflammation, hemostasis, or protein and lipid oxidation. The authors speculated that the relatively low concentrations of UFP numbers and PM mass or the young, healthy status of the subjects could explain the null findings. Taken together, these studies suggest that brief PM exposure can trigger conduit arterial vasoconstriction, possibly in relation to increased ET activity or augmented sympathetic ANS tone. Under certain circumstances, conduit and resistance arteriole endothelium-dependent vasodilation can also be impaired within a few hours. This abnormality is more likely due to reduced nitric oxide bioavailability as a consequence of systemic proinflammatory and oxidative responses; however, alternative mechanisms and endogenous vasoactive pathways have not been fully explored. It is also apparent that the composition, source, and concentration of pollution, along with the susceptibility of the human subjects, play important roles in determining the vascular effects of acute air pollution exposure.

Heart Rate Variability

The results of several new controlled human exposure studies provide limited evidence to suggest that acute exposure to near-ambient levels of PM may be associated with small changes in HRV. There are at least 4 studies to support this. In the first study, healthy elderly individuals experienced significant decreases in HRV immediately after exposure.[233] Some of these changes persisted for at least 24 hours. Gong et al[410] studied healthy and asthmatic adults exposed to coarse CAPs with intermittent exercise. HRV was not affected immediately after the exposure but decreased in both groups at 4 and 22 hours after the end of the exposure; greater responses were observed in nonasthmatic individuals.[410] In another study, healthy elderly subjects and patients with chronic obstructive pulmonary disease were exposed to approximately 200 $\mu g/m^3$ CAP and filtered air for 2 hours with intermittent mild exercise. HRV over multihour intervals was lower after CAP than after filtered air in healthy elderly subjects but not in subjects with lung disease. A significant negative effect of CAP on ectopic heartbeats during or after CAP exposure relative to filtered air was noted in the healthy subjects, whereas the group with pulmonary disease experienced an improvement during or after CAP relative to filtered air.[389] Other investigators recently compared the effects of 2-hour exposures with intermittent exercise to ultrafine (average concentration 47 $\mu g/m^3$), fine (average concentration 120 $\mu g/m^3$), and coarse (average concentration 89 $\mu g/m^3$) CAP among healthy subjects.[383] In both the ultrafine and coarse studies, a crossover design was used in which each subject was exposed to both PM and filtered air. In the case of the fine-PM study, subjects did not serve as their own control but were exposed to either PM or filtered air. Thoracic coarse fraction CAP produced a statistically significant decrease in the standard deviation of normal-to-normal heart rate 20 hours after exposure compared with filtered air. No statistically significant effects on HRV were observed after exposure to UFPs as measured during controlled 5-minute intervals. However, the authors did observe a significant decrease in the standard deviation of normal-to-normal heart rate after exposure to UFPs based on an analysis of the 24-hour measurements. No differences were reported in HRV with fine-PM exposures. Although some controlled-exposure studies have reported either no acute changes[390] or, on occasion, increases in HRV metrics in subsets of individuals,[208,393,401] these studies generally demonstrate that acute PM exposure is capable of reducing HRV. More consistent reductions have been found among older adults (compared with younger subjects or those with lung diseases, who show mixed responses) and perhaps with exposures to larger particles.[233,389] Whether pulmonary ANS reflex arcs are activated by the deposition of PM within the lung or whether other pathways are responsible for these physiological changes in human exposure studies requires more investigation.

Table 7. Summary of Level of Evidence Supporting Global Biological Pathways and Specific Mechanisms Whereby $PM_{2.5}$, Traffic-Related, or Combustion-Related Air Pollution Exposure Can Affect the Cardiovascular System

	Animal Studies	Human Studies
General "intermediary" pathways whereby PM inhalation can instigate extrapulmonary effects on the cardiovascular system		
Pathway 1: Instigation of systemic proinflammatory responses	↑↑↑	↑↑↑
Pathway 2: Alterations in systemic ANS balance/activity	↑	↑↑
Pathway 3: PM and/or associated constituents directly reaching the systemic circulation	↑	↑
Specific biological mechanisms directly responsible for triggering cardiovascular events		
Vascular dysfunction or vasoconstriction	↑↑↑	↑↑
Enhanced thrombosis or coagulation potential	↑↑	↑↑
Elevated arterial BP	↑↑	↑↑
Enhanced atherosclerosis or plaque vulnerability	↑↑	↑
Arrhythmias	↑	↑

The arrows are not indicators of the relative size of the association but represent a qualitative assessment based on the consensus of the writing group of the strength of the mechanistic evidence based on the number and/or quality, as well as the consistency, of the relevant studies.

↑↑↑ Indicates strong overall mechanistic evidence.

↑↑ Indicates moderate overall mechanistic evidence.

↑ Indicates some but limited or weak available mechanistic evidence.

Blank indicates lack of evidence.

Evidence Summary and Contextual Framework for Biological Mechanisms

Table 7 provides an outline of the level of evidence supporting the generalized intermediary pathways and specific mechanisms whereby PM exposures can be capable of eliciting cardiovascular events. At the molecular level, oxidative stress as a critically important cause and consequence of PM-mediated cardiovascular effects has a sound experimental basis.[261,290b,294,319,333,334,345–349,351,361–364,411] At the integrated physiological level, the collective body of evidence continues to support the existence of 3 general pathways (Figure 3). Some of these responses, such as systemic inflammation (via pathway 1), likely require antecedent pulmonary oxidative stress or inflammation in order to be initiated. Others, including ANS imbalance (via pathway 2) and PM or its constituents reaching the systemic circulation (via pathway 3), may not. Although PM-associated metals[412] and certain UFPs[261,413–415] might be capable of translocating into the blood stream, some studies have been negative in this regard.[355,416] Many issues related to this pathway are controversial and require resolution.[416] These include the relevance of the dosages delivered to cardiovascular organs, the consequences of particle constituent modifications after interactions with lung tissue/fluids and plasma components, the means of transport within the circulation (eg, protein bound or within cells),[417] and the time course and ultimate sites of PM sequestration. It is also possible that increases in some vasoactive mediators or molecules with adverse effects on cardiovascular tissue, such as ET-1,[351–354] may occur in the lung and systemic circulation without the need for antecedent lung inflammation. Moreover, the 3 general pathways represent a simplification of complicated biological processes. They may not be mutually exclusive, may overlap temporally, and likely exhibit synergies in causing manifest cardiovascular disease events. Many of the biological pathways are also known to exhibit mutual interactions (eg, inflammation with thrombosis/coagulation and with autonomic function). The pathways are also likely to be principally active at differing time points (eg, more rapid cardiovascular effects of autonomic imbalance than systemic inflammation) and likely vary in importance in relation to different durations of exposure and in causing different cardiovascular sequelae. The chemical characteristics and sizes of inhaled PM may also determine the pathways activated. As opposed to UFPs or some particulate components or chemicals, larger fine and coarse PM are not likely transported into the circulation to any large degree and therefore are more apt to require intermediary pathways to cause extrapulmonary effects. It may also be that surface-bound components may be delivered into the circulation, whereas larger particles themselves serve as a means to deliver the responsible constituent into the pulmonary tree.

The hyperacute physiological responses that occur minutes to hours after PM inhalation are likely mediated principally via pathways 2 and 3. These include ANS-mediated changes (eg, elevated BP, arrhythmias, and vasoconstriction), along with direct effects of circulating PM constituents on platelets (eg, procoagulant and thrombotic changes) and the endothelium (eg, oxidative stress and vasoconstriction). These responses are liable to be the dominant mechanisms responsible for the actual triggering of acute cardiovascular events. Clinically meaningful effects undoubtedly become manifest only in the context of a susceptible patient, typified by the individual with "vulnerable plaque" in the case of acute coronary syndromes or strokes, "vulnerable myocardium" in the context of arrhythmias, or the "vulnerable circulation" in the context of a heart failure patient at risk for circulatory overload. On the other hand, the biological consequences of systemic inflammation, such as activated white cells and elevated cytokines (via pathway 1), typically require longer periods. Their penultimate effect is the induction of a chronic underlying vulnerable milieu that leads to atherosclerotic plaque vulnerability, enhanced coagulation/thrombotic and arrhythmia potential, and impaired basal vasomotor balance. These actions thereby predispose individuals for future cardiovascular events, particularly when they occur in conjunction with traditional risk factors or prompt susceptibility to the acute biological actions (via pathways 2 and 3) of later air pollution exposures.

This hypothetical segregation of the biological effects of PM exposure as acute or chronic and into the broad pathways is artificial. It is useful in the broad context of understanding potential pathways; however, there is no doubt a large degree of overlap among the mechanisms and the timing of physiological responses. This is most aptly conveyed as the influence of "acute on chronic" actions of exposure. For example, the activation of circulating platelets by the pulmonary deposition of particles or lung inflammation (eg, by P-selectin–dependent pathways, histamine, or IL-6) could occur within hours and more rapidly than typical of the other consequences of inflammation (eg, progression of atherosclerosis). In the presence of a vulnerable or eroded coronary plaque due to long-term air pollution exposure, this sudden prothrombotic tendency could instigate an acute ischemic event (alone or in conjunction with other effects of short-term PM exposure via pathways 2 and 3). Furthermore, the epidemiological cohort studies demonstrate a larger relative risk for increased cardiovascular-related mortality than for morbidity.[72,73,227,274] If this is a true biological response and not simply a statistical phenomenon or a shortcoming of the available data, it not only suggests that exposures are capable of triggering acute cardiovascular events but that PM air pollution may also exaggerate their severity even if they would have otherwise occurred for reasons unrelated to air pollution. Therefore, exposure to PM could also be responsible for promoting fatal over nonfatal events.

Conclusions and Recommendations

A wide array of new studies that range from epidemiology to molecular and toxicological experiments have provided additional persuasive evidence that present-day levels of air pollutants contribute to cardiovascular morbidity and mortality. Although not unexpected given the numerous and heterogeneous nature of the published studies, all findings related to every single cardiovascular end point have not been consistent. However, the overall weight of scientific evidence now supports several new conclusions since the 2004 statement. These consensus points are given below by the AHA writing group after considering the strength, consistency, and coherence of the epidemiological findings, as well as in the context of evaluating the extent of the studies that provided related mechanistic support.

- The preponderance of findings indicate that short-term exposure to $PM_{2.5}$ over a period of a few hours to weeks can trigger CVD-related mortality and nonfatal events, including myocardial ischemia and MIs, heart failure, arrhythmias, and strokes.
- The increase in risk for acute $PM_{2.5}$-associated cardiovascular morbidity and mortality is principally among susceptible, but not necessarily critically ill, individuals. Several studies suggest that susceptible individuals at greater risk may include the elderly, patients with preexisting coronary artery disease, and perhaps those with diabetes. Recent data suggest that women and obese individuals might also be at higher risk.
- Most studies support the idea that longer-term $PM_{2.5}$ exposures increase the risk for cardiovascular mortality to an even greater extent than short-term exposures. Because most studies have focused on mortality data, the effect of long-term exposures on nonfatal cardiovascular events is less consistent and requires more investigation.
- The $PM_{2.5}$ concentration–cardiovascular risk relationships for both short- and long-term exposures appear to be monotonic, extending below 15 $\mu g/m^3$ (the 2006 annual NAAQS level) without a discernable "safe" threshold.
- Long-term exposure to elevated concentrations of ambient $PM_{2.5}$ at levels encountered in the present-day environment (ie, any increase by 10 $\mu g/m^3$) reduces life expectancy within a population probably by several months to a few years. Given that $PM_{2.5}$ is most strongly associated with cardiovascular deaths in the cohort studies, the reduced life expectancy is most likely predominantly due to excess cardiovascular mortality.
- The available studies are suggestive that reductions in PM levels decrease cardiovascular mortality within a time frame as short as a few years.
- Many potential biological mechanisms exist whereby PM exposure could exacerbate existing CVDs and trigger acute cardiovascular events (over the short term) and instigate or accelerate chronic CVDs (over the long run). Experimental support is increasingly strong for several mechanisms, which lends biological plausibility for the epidemiological findings.
- The existing evidence suggests that PM air pollution is capable of augmenting the development and progression of atherosclerosis. There is some support for a potential effect on several other chronic CVDs, including hypertension, heart failure, and diabetes.
- Most recent studies support the conclusion that the overall absolute risk for mortality due to PM exposure is greater for cardiovascular than pulmonary diseases after both short- and long-term exposures.

There are several additional areas worthy of highlighting in which the study results are reasonably consistent but in which the writing group believed further research was required to formulate firm conclusions.

- Although there is only limited epidemiological evidence directly linking UFPs with cardiovascular health problems,[262] the toxicological and experimental exposure evidence is suggestive that this size fraction may pose a particularly high risk to the cardiovascular system. The likelihood of health effects and the causal pathways mediated specifically by UFP exposure have been debated among experts recently.[418] Future research may help to more fully elucidate whether particles within the ultrafine size range (0.001 to 0.1 μm) and/or their constituents are more harmful to the cardiovascular system or pose a relatively greater cardiovascular risk than particles between 0.1 and 2.5 μm in diameter.
- Similarly, many studies have found a strong association between metrics of traffic-related air pollution exposure and elevated cardiovascular risk. Whether this represents the harmful effects of UFPs or diesel exhaust particulates, major components of the traffic mixture, or other pollution components is unclear. Diesel and UFPs possess toxic properties that instigate harmful biological responses in experimental models. However, the particle size fraction(s) and roles played by other copollutants (gases, VOCs, SVOCs) within the traffic-related mixture have not been fully elucidated. Nevertheless, traffic-related pollution as a whole appears to be a specific source associated with cardiovascular risk. It likely poses a major public health burden, regardless of a putative higher toxicity, because of the commonness of exposure in modern society (eg, accounting for ≈60% of daily UFP exposure; http://www.catf.us/projects/diesel/).
- The importance of other specific sources, regional differences in pollution composition, and other specific constituents remains less clear. However, toxicological studies have identified several transition metals (eg, iron, vanadium, nickel, copper, and zinc), organic carbon species, semiquinones, and endotoxin as specific PM-related components capable of prompting oxidative stress and inflammation and thus likely imparting biological harm. Some source-apportionment studies also demonstrate that attention should be given to these compounds as being among the most likely mediators of clinical CVD. More studies are required in this regard to clarify this issue and to better define these and other potentially responsible constituents and sources.
- Although the focus of the present statement is on PM, we recognize that other air pollutants may also pose cardiovascular risk alone or in conjunction with fine-particle exposure. In this context, we believe additional research is necessary to make firm conclusions regarding the independent cardiovascular risks posed by several gaseous pollutants (eg, ozone and NO_2). Although ozone has been linked to increased cardiopulmonary mortality,[50] strokes,[126] and MIs[419] in some short-term studies, long-term exposure was not associated with cardiovascular mortality after accounting for PM in a recent analysis.[87] The recent finding that small changes in low levels of ambient carbon monoxide concentrations are related to cardiovascular hospitalizations also merits further exploration.[420]
- Several secondary aerosols (eg, nitrate and sulfate) are often associated with cardiovascular mortality; however, whether these compounds are directly harmful or are surrogate markers of toxic sources of exposure requires

more investigation. Similarly, the current literature regarding the independent cardiovascular risks posed by coarse particles is mixed, with most recent findings not supporting an association after accounting for the effects of $PM_{2.5}$.[43,72,104]

- Several recent cohort studies and intermediate end-point experiments suggest that obese individuals (and/or those with the metabolic syndrome) may be a susceptible population at greater risk for cardiovascular events due to $PM_{2.5}$ exposure. This is a tremendously important public health issue to corroborate because of the enormous and growing prevalence of obesity worldwide.

This updated review by the AHA writing group corroborates and strengthens the conclusions of the initial scientific statement. In this context, we agree with the concept and continue to support measures based on scientific evidence, such as the US EPA NAAQS, that seek to control PM levels to protect the public health. Because the evidence reviewed supports that there is no safe threshold, it appears that public health benefits would accrue from lowering $PM_{2.5}$ concentrations even below present-day annual (15 $\mu g/m^3$) and 24-hour (35 $\mu g/m^3$) NAAQS, if feasible, to optimally protect the most susceptible populations. Evaluations of the effectiveness of such efforts would be warranted as well. Within the framework of attempting to establish causality between associated variables in epidemiological studies, there are several generally accepted "aspects" that have been evaluated (the following phrases in italics per the Bradford Hill criteria)[421]: With regard to cardiovascular mortality and $PM_{2.5}$ exposure, there is a *consistent association* that satisfies both a *temporal and exposure-response relationship*. There is *coherence of findings* among several fields of science, including toxicology, human and animal exposures, and different types of epidemiological studies and time frames of exposure. Rigorous experiments demonstrate multiple *plausible biological mechanisms*. Finally, natural experiments have confirmed that a change (ie, reduction) in exposure produces a change (ie, decrease) in cardiovascular mortality. In this case, *specificity of outcomes* and *strength of the observation* are less pertinent, because PM exposure could be capable of causing multiple different types of events (eg, MIs, arrhythmias, and heart failure exacerbations), and the overall cardiovascular mortality relative risk posed for any single individual is expected to be small. Nevertheless, given the ubiquity of exposure, the overall public health consequences can be substantial and observable in population- or large cohort–based studies.

It is the opinion of the writing group that the overall evidence is consistent with a causal relationship between $PM_{2.5}$ exposure and cardiovascular morbidity and mortality. This body of evidence has grown and has been strengthened substantially since publication of the first AHA scientific statement.[1] At present, no credible alternative explanation exists. These conclusions of our independent review are broadly similar to those found in the EPA's Integrated Science Assessment for Particulate Matter final report (http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546). In summary, the AHA writing group deems that $PM_{2.5}$ exposure is a "modifiable factor contributing to cardiovascular morbidity and mortality."

Clinical Recommendations

Several precautionary recommendations can be made for healthcare providers who interact with individuals who are at risk for CVDs. Although they have not been clinically tested or proven to reduce mortality, they are practical and feasible measures that may help to reduce exposures to air pollution and therefore potentially lower the associated cardiovascular risk. Moreover, a recent observational study found that patient awareness of air quality indices and media alerts along with health professional advice can significantly affect reported changes in outdoor activity to avoid exposure to air pollution.[422]

- Evidence-based appropriate treatment of the traditional cardiovascular risk factors should be emphasized. This may also lessen the susceptibility of patients to air pollution exposures.
- All patients with CVD should be educated about the cardiovascular risks posed by air pollution.
- Consideration should also be given to educating patients without CVD but who are at high risk (eg, the elderly, individuals with the metabolic syndrome or multiple risk factors, and those with diabetes).
- Part of patient education should include the provision of information regarding the available sources (local and national newspapers [*USA Today*], EPA World Wide Web site [http://airnow.gov/], and The Weather Channel and its World Wide Web site [http://www.weather.com/]) that provide a daily EPA Air Quality Index.
- On the basis of the forecast Air Quality Index, prudent recommendations for reducing exposure and limiting activity should be provided based on the patient's level of risk. A list of such recommendations is provided on the EPA World Wide Web site (http://airnow.gov/). For example, when the Air Quality Index for PM is "unhealthy" (151 to 200), then the recommendations are as follows: "People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion." The action recommendations are as follows: "You can reduce your exposure to particles by 1) planning strenuous activity when particle levels are forecast to be lower, 2) reducing the amount of time spent at vigorous activity, or 3) choosing a less strenuous activity (eg, going for a walk instead of a jog). When particle levels are high outdoors, they also can be high indoors. Certain filters and room air cleaners are available that can help reduce particles indoors."
- Practical recommendations to reduce air pollution exposure should be given to at-risk patients. Although unproven to reduce cardiovascular events, there are a number of prudent and feasible measures, including reducing optional or unnecessary exposures. Additional measures could include eliminating or reducing nonmandatory travel to highly polluted regions and avoiding exposures or outdoor activities (eg, exercising, commut-

ing) during highly polluted times (eg, rush hours) or in proximity to major sources of pollution (eg, roadways, industrial sources). Choosing to exercise indoors with windows closed and using efficient air conditioning and filtering systems may be prudent for certain high-risk patients, particularly during peak pollution periods. Indeed, not only can central air conditioners reduce the indoor exposure level to PM from outdoor sources, there is some evidence that they might reduce the risk for cardiovascular hospitalizations associated with higher ambient pollution levels.[423] If travel/commutes cannot be avoided, maintaining optimal car filter systems, driving with windows closed, and recycling inside vehicle air may help reduce PM exposures (http://www.catf.us/projects/diesel/).[424,425]

However, at present, no specific recommendations regarding the appropriateness of undertaking more aggressive measures, even those shown to provide some benefits in a few studies (eg, wearing facemasks, installing PM filters in households), can be made based on the limited evidence. Similarly, although measures that decrease long-term PM exposures may produce even greater cardiovascular health benefits than the provided recommendations that focus on reducing short-term exposures, no specific recommendations (eg, moving to less polluted regions) can be prudently made at this time given the limited evidence. We acknowledge that occupational and indoor sources along with secondhand tobacco smoke are additional significant sources of personal PM exposures that should be avoided or reduced as much as possible. Finally, in developing nations, reducing exposure to indoor cooking sources of PM and air pollution from biomass combustion is a major issue of concern.[426] Additional suggestions are available on the EPA World Wide Web site.

Finally, although the existing evidence supports a causal relationship between $PM_{2.5}$ and cardiovascular mortality, we acknowledge the importance of continued research in areas of controversy and uncertainty to further understand the full nature of this issue. Although numerous insights have greatly enhanced our understanding of the PM-cardiovascular relationship since the first AHA statement was published,[1] the following list represents broad strategic avenues for future investigation:

Mechanistic Studies

- Better describe the physiological relevance in humans and the fundamental details of the mechanisms underlying the intermediate general mediating pathways (ie, PM or constituent transport into the circulation versus effects of inflammatory cytokines or activated immune cells versus ANS imbalance or other pathways) through which PM inhalation might mediate cardiovascular effects remote from the site of pulmonary deposition.
- Understand the clinical significance and relative importance of the observed biological responses (eg, vascular dysfunction, thrombosis, arrhythmia, ANS imbalance) in relation to the various causes of PM-mediated cardiovascular morbidity and mortality.
- Examine the efficacy of preventive measures (eg, patient education) and treatment modalities (eg, statins, antioxidants, fish oil, treatment of traditional risk factors, and reducing exposures by engineering controls, including filtration, personal protection via facemasks, or behavior modification) on cardiovascular health outcomes.
- Investigate the interaction between preexisting traditional cardiovascular risk factors (eg, diabetes, hypertension) and PM exposure, as well as the potential of air pollutants to exacerbate or worsen these risk factors. Determine the extent to which treatment of such factors (eg, with statins, aspirin, or angiotensin-converting enzyme inhibitors), especially among patients with known CVD, may modify the risk associated with PM exposure.
- Describe the biological effects of acute on top of chronic exposures (eg, synergistic effects versus reduced susceptibility to acute exposures due to augmented protective mechanisms).
- Determine the ability of long-term exposure to precipitate the development of chronic diseases, including clinically relevant atherosclerosis, hypertension, diabetes, and other vascular, metabolic, renal, or neurological diseases.

Epidemiological and Exposure Studies

- Expand our knowledge related to the "responsible" PM pollution constituents (eg, metals, organic compounds, semiquinones, endotoxin, and VOC and SVOC compounds), size fractions (eg, UFPs), sources (eg, traffic, power generation, and biomass combustion), and mixtures of pollutants.
- Investigate the cardiovascular health implications and importance of regional and intracity differences in composition and combinations of pollutants.
- Better understand the effects of mixtures of ambient pollutants (ie, potential synergism between PM and gaseous or vapor-phase pollutants such as ozone).
- Investigate the feasibility and utility of quantifying risk coefficients (concentration-response functions) according to PM source or relevant indices of pollutant mixtures, as a function of susceptibility (eg, age, preexisting disease), for reliable application in integrated, multipollutant risk assessments.
- Investigate the relative importance of various time frames of exposure in relation to PM causing cardiovascular events, including the relevance of epochs not well described, such as ultra-acute peak PM excursions (eg, 1 to 2 hours) and exposures of intermediate duration (eg, 1 to 12 months).
- Better document the time course and specific cardiovascular health benefits induced by reductions in PM.
- Better define susceptible individuals or vulnerable populations.
- Determine whether any "safe" PM threshold concentration exists that eliminates both acute and chronic cardiovascular effects in healthy and susceptible individuals and at a population level.

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EXHIBIT 4

San Diego UrbDeZine

Urban Planning + Design + Architecture + Historic Preservation

What is a safe distance to live or work near high auto emission roads?

May 28, 2015 by Bill Adams 1 Comment

A nearby roadway may be putting your household's health at risk. The same is true of workplaces, schools, and other places where people spend significant time. This health risk is from the elevated auto emissions near high traffic roadways. It's a health risk separate and in addition to the regional air pollution from auto emissions.

We have come to draw a false sense of security from our collective sharing of regional air pollution and, perhaps, the belief that regulatory agencies protect us. However, research continues to show that air pollution, particularly from auto emissions, has profound effects on health. Moreover, such impacts are unequally distributed among local populations, largely based on nearness to major roadways.

Discussions about whether or not to build or expand roadways are dominated by the topics of traffic congestion relief, urban planning, and greenhouse gasses. The impact of roadways on Americans' health and morbidity is often lost in the discussions. 53,000 U.S. deaths annually are attributable to automobile emission air pollution. (Calazzo, et al., 2013) Many more are ill or incapacitated from auto emissions. Ninety percent of the cancer risk from air pollution in Southern California is attributable to auto emissions. (Hulsey, et al., 2004, par. 10) For comparison, there are 35,000 U.S. deaths a year from auto collisions (NHTSA, 2012), which is the top cause of death for U.S. males between the age of 15 and 24, and in the top ten causes of death of all Americans through the age of 54.

The impact on life and safety generally from road expansion receives little attention. However, auto emission pollution based on proximity to source, i.e. line-source pollution, is one of the most overlooked health threats in the U.S. Current U.S. policies and regulations do little to protect susceptible populations, including children, from the dangers of nearness to auto-emission sources. Undoubtedly, the disproportionate lack of urgency concerning the health impacts of air pollution is attributable to its hidden and delayed impact. Although the health impacts of air pollution on general populations are certain, individual diagnoses of disease rarely identify air pollution as the cause. As a result, the health threat fails to take on the personal dimension of other health threats. The same was true with smoking for many decades. Additionally, awareness of line-source pollution is further hindered by confusion with regional / ambient air pollution, which typically manifests in more noticeable high ozone levels, i.e., smog.

Air pollution monitored by various agencies includes particulate matter (PM), ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, and lead. However, two of these cause the most concern due to their prevalence and health significance: 1) Ozone, which causes the brown smog commonly seen over cities and 2) Particulate matter (PM), also referred to as ultra-fine particulates (UFP). Unlike ozone, PM exposure is directly related to proximity to source – primarily areas near to or downwind from high traffic areas. Moreover, for health impacts, PM pollution may be the worst of the lot. Heart disease, lung function impairment, leukemia, asthma, and lung cancer, are some of the conditions that have been associated with PM exposure resulting from proximity to high traffic sources. (Hulsey, et al., 2004, par. 6; Fuller, et al., 2012, pp. 257 – 265) As stated in a 2002 study about exposure to highway PMs:

PETITION TO STOP DEMOLITIONS IN SAN DIEGO FOR PARKING LOTS.

Click the photo to sign or learn more about the Petition.

Throughout the past decade, epidemiological studies have reported a consistent relationship between increases in particulate matter (PM) exposure and contemporary increases in mortality and morbidity. (Zhu, et al., 2002)

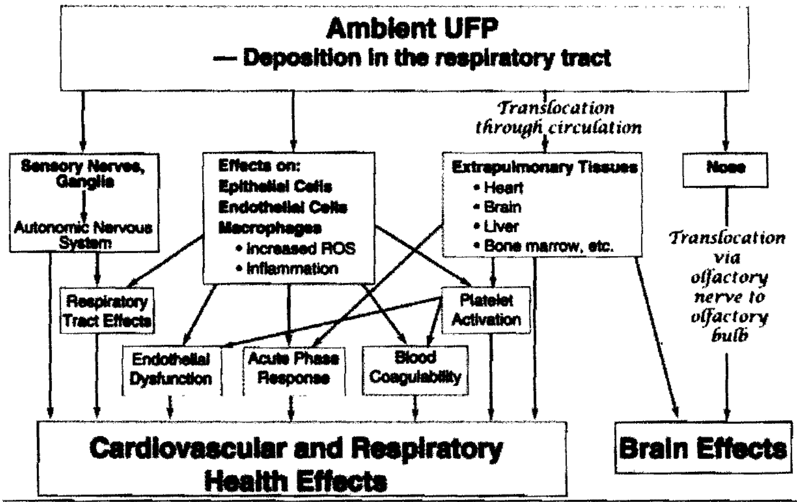

Figure 17. Hypothesized pathways via which inhalation of UFPs may lead to effects on cardiovascular and respiratory systems and on the brain. Reprinted with permission from the Health Effects Institute, Boston MA.

Children are especially vulnerable to auto-emission health impacts because, among other reasons, they breathe more air relative to their body weight than adults, are more physically active, and spend more times outdoors during times when pollutant levels are at their highest. (Hulsey, et al., 2004) Additionally, children have many more years ahead of them in which the cumulative damage caused by auto emissions can manifest itself in disease or disability. Women who live near areas of high automobile traffic during pregnancy have a 20 – 30% higher chance of having children with lung impairment. (Morales, et al., 2014) Auto emission PM exposure from nearness to high traffic during the the third trimester of pregnancy doubles the risk for autism. (Raz, et al., 2014).

11% of U.S. residents, over 30 million people, live within 100 meters of 4 lane or greater highways. (Brugge, et al., 2007; Howard, 2011) Adding in work places, schools, and commuting, it is reasonable to extrapolate that roughly 1/3 of people spend a substantial portion of their day exposed to unhealthy levels of auto emission PMs.

So how can you determine your own exposure level or that of your children? Below are some key distances and other factors:

Ground Zero:

Curbside and in-traffic air contains high levels of all pollutants associated with auto emissions – both PMs and gaseous substances like benzene and carbon monoxide. (Hulsey, et al., 2004, par. 7) PM exposure at intersections is as much as 29 times higher than other portions of the road. (Goel & Kumar, 2015) Cyclists, auto occupants with windows down or vents open, toll booth operators, and roadside residents and businesses receive up to 25 times the level of PM exposure. (Zhu, et al., 2002) Moreover, the air inside a car typically contains higher concentrations of these pollutants than the air outside of the car – as much as 4 times the benzene and 10 times the carbon monoxide. (ICTA, 2000) Keeping the windows closed and the ventilation set to recirculate can reduce in-car pollutants to 20% that of air outside the car. (L.A. Times, 2013)

High Toxicity Zone - 300 - 500 feet:

On average, PM concentration is significantly higher within 330 feet (100 meters) of major highways than it is further away. (Zhu, et al., 2002) The smallest PMs, with a peak concentration of 1.6 x 10(5)/cm3, are the most dangerous. Smaller PMs carry toxic substances deeper into the lungs and body, and as a result, have more profound health effects. (Cal. EPA, Aug. 2014, p.29) They are concentrated in an area within 330 feet from highways. (Zhu, supra) Pregnant women who live within 500 feet of high traffic areas are prone to birth complications, including premature birth, low birth weight children, and children with medical problems. (Wilhelm & Ritz, 2003) A review of a broad range of studies has correlated early mortality — from a wide range of illnesses — with living within 330 feet of a high traffic roadway and related exposure to various auto emission substances. (Beelen, et al., 2008)

Figure 3.2.6-4: Sensitive Receptor Locations (Springdale Street to Warner Avenue) May 2012, I-405 Improvement Project

Elevated Toxicity Zone - 1,000 - 1,500 feet:

PMs from auto emissions are elevated within 1,000 feet (300 meters) of a major highway. (Yifang, et al., 2002, pp. 1038-1039) A Denver study indicated that children living roughly within that distance were eight times as likely to develop leukemia and six times as vulnerable to all types of cancer. (Hulsey, et al., 2004,- par. 1) In another study, children under 5 years of age admitted to hospitals with asthma emergencies were significantly more likely to live within 500 meters (1,640 feet) of a major highway when traffic flow exceeded 24,000 vehicles per hour than those who lived further away or when traffic flow was less. (Edwards & Walters, 1994) Particle levels return to near normal beyond that distance.

Other Factors Influencing Air Pollution Levels Near Roadways:

Wind:

People living "downwind" of highways with 4 or more lanes (2 lanes in each direction) are exposed to higher levels of fine particulate matter. (Brugge, et al. 2007) However, this circumstance does not exempt one side of a highway from PM dangers. In many regions, wind direction changes not only depending on weather conditions, but also between day and night.

Sun, Rain & Humidity:

Areas receiving higher amounts of rain or humidity can experience reduced auto-emission pollution levels, especially ultra-fine particulate pollution. The clean air you sense after a rain storm really is cleaner. This fact is regularly demonstrated in high-pollution Bejing. (USA Today, Aug. 11, 2008) Atmospheric conditions alter the size, distribution, and composition of freshly-emitted PM through condensation, evaporation, and dilution during transport to downwind locations. (Brugge, et al., 2007) Thus, higher humidity levels can tamp down the distribution of PMs. (HEI Review Panel, 2013, p.24) Conversely, sun, heat, and lack of humidity generally favor greater distribution of PM. Additionally, ground level ozone concentration is unhealthiest on sunny and warm days.

Topography:

PM, as well as gaseous air pollutants, tend to concentrate in valleys due to containment by topographical features. (HEI Review, supra) Inversions, in which a layer of cold air is trapped underneath a layer of warm air, keep PM concentrated near ground level and aggravate the concentration of PM in valley and canyon floors. Ibid. Fog is often an indicator of an inversion.

A temperature inversion in a valley – clean air poster from a Teacher's Guide to Clean Air by BC Transit, Nov. 2005 – republished permission Ministry of Environment, British Columbia Canada

Time:

The time of day can influence PM concentrations near highways – both in terms of traffic concentrations and in terms of weather. (HEI Review Panel, supra) Of course, highways experience much higher traffic concentrations at certain times of the day. However, such concentration has become less varied as employers stagger work shifts to alleviate commuting burdens and as continued highway expansion creates induced demand (tendency of freeway expansion to create more demand and congestion in the long run by facilitating sprawl). Additionally, the heating and cooling of day and night effect pollution concentrations at ground level.

Auto Emission Air Pollution as a Social Justice Issue:

The unavoidable conclusion from the research is that each time a major highway is built or expanded, some of the residents living nearby will pay with their health or lives. Nevertheless, compared to industrial uses that pose potential health risks, roadway construction projects remain relatively unregulated as a direct air pollution health risk. (Hulsey, et al., 2004) The same is true of the siting of residential, employment, senior, or educational uses near highways.

Cincinnati highway proximity health hazards. Republished permission LADCO

Low income and minority populations are disproportionately impacted by air pollution health risks. (Beleen, 2008) Suburban expansion creates a demand for road expansion through existing neighborhoods. Lower income neighborhoods and ethnic minority populations least often wield the political influence necessary to resist road expansion projects. Additionally, multifamily and affordable housing is more likely to be sited near high traffic areas than is more expensive detached housing. More recently, the construction of high density "transit oriented developments" (TODs), which are intended to reduce auto reliance and which often include affordable housing, are frequently sited near high traffic areas. There has been little acknowledgement in U.S. transportation policy of the social inequality and the ethical issues related to sacrificing the health of members of one community to facilitate the growth and commuting of another community.

Property condemned for a road expansion project results in monetary compensation to the owner based on fair market value. However, residents put at risk by the additional traffic emissions as a result of living adjacent to or near the road project cannot recover compensation or assistance to relocate.

Construction and expansion of roadways may involve some public disclosure of health impacts via environmental reporting documents but the reporting tends to assume that "no build" highway expansion options will simply result in ever increasing congestion. However, more than a half century of highway building has demonstrated that congestion relief from road expansion tends to be temporary, and that the long term impact is increased automobile use and traffic congestion. Such "induced demand" is increasingly recognized as the long term effect of expanding roadways to relieve current traffic congestion.

Increasingly, line-source proximity to auto emission pollution and the refinement and improved accuracy of roadway air pollution dispersion modeling is being used in legal and political challenges to highway expansion proposals. Given the stakes, its hard to justify the continued expansion of roadways in urban areas, the slowness of conversion to non-combustible fuel automobiles, or the proportionately small investment in public transit. If such decisions were based solely on health criteria proportionate to other identified public risks, highways might be quarantined as an acutely elevated health hazard to those who live or work near them. Of course, such action is impractical as it would result in vast tracts of existing homes, schools, and places of employment being abandoned.

It is clear that the public is still not fully aware of the difference between ambient air pollution effecting the

general populace of a city and line-source air pollution impacting health based on nearness to highways. Perhaps, if the public was more aware of the direct and unequal health impacts of high-traffic roadways, transitioning from roadway expansion to transportation alternatives would receive more urgency. One proposal for an air quality district plan in California required that builders of homes, schools, or day care centers provide notice to their customers of toxic emissions, including those emanating from busy roads, within 1,000 feet. (Hulsey, 2004, p.13)

Areas within 1,000 feet of major roadways contain substances known to cause respiratory illness, heart disease, cancer, and reproductive harm.

Without a better understanding of line-source proximity exposure by the general public, its hard to foresee substantial changes. It may take activism and information campaigns, such as posting warning notices in neighborhoods within the 1,000 foot zone, to catch the public's attention and educate it on this health issue.

Notes:

While this article cites a number of scientific articles, some "rounding" is used for the purpose of readability. In other words, this article attempts to organize and summarize current available data into a general conceptual framework for general public understanding rather than to provide new data.

References:

Caiazzo, F., Ashok, A., Waitz, I.A., Yim, S.H.L., Barrett, S.R.H. (2013) Air pollution and early deaths in the United States. Part I: Quantifying the impact of major sectors in 2005, Laboratory for Aviation and the Environment, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, August 2013.

Zhu, Y., Hinds, W.C., Seongheon Kim, S., and Sioutas, C. (2012) Concentration and Size Distribution of Ultrafine Particles Near a Major Highway, Journal of the Air & Waste Management Association, vol. 52

Fatality Analysis Reporting System (2012) fars.NHTSA.dot.gov

Morales, E., Garcia-Esteban, R., Asensio de la Cruz, O., Basterrechea, M., Lertxundi, A., Martinez Lopez de Dicastillo, M.D., Zabaleta, C., Sunyer, J. (2014) Intrauterine and early postnatal exposure to outdoor air pollution and lung function at preschool age. Thorax, 2014; See also, BMJ-British Medical Journal; See also Exposure to traffic pollution during pregnancy can damage future child's lungs. ScienceDaily, 20 October 2014.

Howard, E. (2011) Every Breath You Take, Tufts Now, November 2, 2011

Brugge, B., Durant, J.L., Rioux, C. (2007) Near-highway pollutants in motor vehicle exhaust: A review of epidemiologic evidence of cardiac and pulmonary health risks, Environmental Health, Autust 9, 2007, 6:23

Goel, A. and Kumar, P. (2015) Characterisation of nanoparticle emissions and exposure at traffic intersections through fast-response mobile and sequential measurements Atmospheric Environment, Vol. 107, April 2015, pp. 374–390

Hulsey, B., Hopkins, E., Olson, E., Burg, E., and Carlson, M. (2004) Highway Health Hazards: How highways and roads cause health problems in our communities—and what you can do about it, Sierra Club, 2004, 6

Draft Environmental Impact Report/ Environmental Consequences, and Environmental Impact Statement Avoidance, Minimization, And/Or Mitigation Measures, I-405 Improvement Project, May 2012 3.2.6-22

Fuller, C.H., Brugge, D. Williams, P., Mittleman, M., Durant, J.L., and Spenglera, J. D.

(2012) Estimation of ultrafine particle concentrations at near-highway residences using data from local and central monitors, Atmospheric Environment, Volume 57, September 2012, Pages 257–265

Yifang, Z, Hinds, W.C., Seongheon, K., Shen, S., Sioutas, C. Concentration and size distribution of ultrafine particles near a major highway. Journal of the Air and Waste Management Association. September 2002, pp. 1038-1039.

Beelen,R., Hoek, G., A. van den Brandt, P., Goldbohm, R.A., Fischer, P., Schouten, L.J., Jerrett, M., Hughes, E., Armstrong, B., and Brunekreef, B., Long-Term Effects of Traffic-Related Air Pollution on Mortality in a Dutch Cohort (NLCS-AIR Study), Environmental Health Perspectives (vol. 116, no. 2, Feb. 2008)

Rain, rain: Beijing air pollution washes away, August 11, 2008 – USA Today

In-Car Air Pollution: The Hidden Threat to Automobile Drivers. International Center for Technology Assessment (ICTA). July 2000 , page 5.

Borboza, T., For cleaner air, set car vents to 'recirculate,' study says September 12, 2013, LA Times.

California Communities Environmental Health Screening Tool, Version 2.0 (Calenviroscreen 2.0) Guidance And Screening Tool, California Environmental Protection Agency (August 2014), p.29.

HEI Review Panel on Ultrafine Particles. 2013. Understanding the Health Effects of Ambient Ultrafine Particles. HEI Perspectives 3. Health Effects Institute, Boston, MA, p. 24

Wilhelm, M. and Ritz, B., Residential Proximity to Traffic and Adverse Birth Outcomes in Los Angeles County, Environmental Health Perspectives (vol. 111, No. 2, Feb. 2003)

Edwards, J.; S. Walters, et al., Hospital admissions for asthma in preschool children: relationship to major roads in Birmingham, United Kingdom. Archives of Environmental Health. (49(4): 223-7 1994)

San Diego Freeway (I-405) Supplemental Draft Environmental Impact Report / Environmental Impact Statement, Figure 3.2.6-4 Sensitive Receptor Locations, California Dept. of Transportation (2013) (freeway widening project)

Raz, R., Roberts, A.L., Lyall, K., Hart, J.E., Just, A.C., Laden, F., and Weisskopf, M.G., Autism Spectrum Disorder and Particulate Matter Air Pollution before, during, and after Pregnancy: A Nested Case–Control Analysis within the Nurses' Health Study II Cohort, Environmental Health Perspectives (2014)

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About Bill Adams

Bill Adams is the founder and chief editor of UrbDeZine. He is also a partner in the San Diego law firm of Norton, Moore, & Adams, LLP. He has been involved with land use and urban renewal for nearly 25 years, both as a professional and as a personal passion. He currently sits on the Boards of San Diego Historic Streetcars, The San Diego Architectural Foundation, The Food and Beverage Association of San Diego County, and The Gaslamp Quarter Association Land Use Planning Committee.

Norton, Moore, & Adams, LLP is a boutique land use firm which handles a wide range of land and building related matters, from permitting to litigation, including:

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Comments

Saam says:
May 28, 2015 at 8:39 am

Thanks for consolidating so much material and data into one place! This was truly informative.

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EXHIBIT 5

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4182
(909) 396-2000 • www.aqmd.gov

SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds [a]		
Pollutant	**Construction [b]**	**Operation [c]**
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
PM2.5	55 lbs/day	55 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day

Toxic Air Contaminants (TACs), Odor, and GHG Thresholds	
TACs (including carcinogens and non-carcinogens)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Cancer Burden > 0.5 excess cancer cases (in areas ≥ 1 in 1 million) Chronic & Acute Hazard Index ≥ 1.0 (project increment)
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402
GHG	10,000 MT/yr CO2eq for industrial facilities

Ambient Air Quality Standards for Criteria Pollutants [d]	
NO2 1-hour average annual arithmetic mean	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 0.18 ppm (state) 0.03 ppm (state) and 0.0534 ppm (federal)
PM10 24-hour average annual average	 10.4 $\mu g/m^3$ (construction)[e] & 2.5 $\mu g/m^3$ (operation) 1.0 $\mu g/m^3$
PM2.5 24-hour average	 10.4 $\mu g/m^3$ (construction)[e] & 2.5 $\mu g/m^3$ (operation)
SO2 1-hour average 24-hour average	 0.25 ppm (state) & 0.075 ppm (federal – 99th percentile) 0.04 ppm (state)
Sulfate 24-hour average	 25 $\mu g/m^3$ (state)
CO 1-hour average 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 20 ppm (state) and 35 ppm (federal) 9.0 ppm (state/federal)
Lead 30-day Average Rolling 3-month average	 1.5 $\mu g/m^3$ (state) 0.15 $\mu g/m^3$ (federal)

[a] Source: SCAQMD CEQA Handbook (SCAQMD, 1993)
[b] Construction thresholds apply to both the South Coast Air Basin and Coachella Valley (Salton Sea and Mojave Desert Air Basins).
[c] For Coachella Valley, the mass daily thresholds for operation are the same as the construction thresholds.
[d] Ambient air quality thresholds for criteria pollutants based on SCAQMD Rule 1303, Table A-2 unless otherwise stated.
[e] Ambient air quality threshold based on SCAQMD Rule 403.

KEY: lbs/day = pounds per day ppm = parts per million $\mu g/m^3$ = microgram per cubic meter ≥ = greater than or equal to
MT/yr CO2eq = metric tons per year of CO2 equivalents > = greater than

EXHIBIT 6

A Section 508–conformant HTML version of this article
is available at http://dx.doi.org/10.1289/ehp.1408565.

Associations of Mortality with Long-Term Exposures to Fine and Ultrafine Particles, Species and Sources: Results from the California Teachers Study Cohort

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BACKGROUND: Although several cohort studies report associations between chronic exposure to fine particles ($PM_{2.5}$) and mortality, few have studied the effects of chronic exposure to ultrafine (UF) particles. In addition, few studies have estimated the effects of the constituents of either $PM_{2.5}$ or UF particles.

METHODS: We used a statewide cohort of > 100,000 women from the California Teachers Study who were followed from 2001 through 2007. Exposure data at the residential level were provided by a chemical transport model that computed pollutant concentrations from > 900 sources in California. Besides particle mass, monthly concentrations of 11 species and 8 sources or primary particles were generated at 4-km grids. We used a Cox proportional hazards model to estimate the association between the pollutants and all-cause, cardiovascular, ischemic heart disease (IHD), and respiratory mortality.

RESULTS: We observed statistically significant ($p < 0.05$) associations of IHD with $PM_{2.5}$ mass, nitrate, elemental carbon (EC), copper (Cu), and secondary organics and the sources gas- and diesel-fueled vehicles, meat cooking, and high-sulfur fuel combustion. The hazard ratio estimate of 1.19 (95% CI: 1.08, 1.31) for IHD in association with a 10-$\mu g/m^3$ increase in $PM_{2.5}$ is consistent with findings from the American Cancer Society cohort. We also observed significant positive associations between IHD and several UF components including EC, Cu, metals, and mobile sources.

CONCLUSIONS: Using an emissions-based model with a 4-km spatial scale, we observed significant positive associations between IHD mortality and both fine and ultrafine particle species and sources. Our results suggest that the exposure model effectively measured local exposures and facilitated the examination of the relative toxicity of particle species.

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Introduction

Several cohort studies have reported associations of long-term exposure to fine particles ($PM_{2.5}$; particulate matter ≤ 2.5 μm in diameter) with cardiovascular mortality (Hoek et al. 2013; Laden et al. 2006; Lipsett et al. 2011; Pope et al. 2002). Because $PM_{2.5}$ is a heterogeneous mix of particle sizes and chemistry and is generated from multiple sources, the specific constituents and sources of concern have not been fully elucidated. Until recently, among the constituents of $PM_{2.5}$, long-term exposures (i.e., ≥ 1 year) for cohort studies have been generated only for sulfates and black carbon (Dockery et al. 1993; Pope et al. 1995; Smith et al. 2009). In addition, because of the difficulty in measuring exposure, there has been little focus to date on the health effects of long-term exposure to ultrafine (UF) particles (particles ≤ 0.1 μm in diameter).

Epidemiologic analysis of the effects of particulate matter constituents is hindered by their spatial heterogeneity and the reliance on a few fixed-site monitors to represent exposures in large metropolitan areas. For example, for PM_{10} (particles ≤ 10 μm in diameter), many metropolitan areas have only a small proportion of their total population within 15 km of a monitor, such as New York, New York (3.5%), Detroit, Michigan (23%), Boston, Massachusetts (39%), Seattle, Washington (31%), and Philadelphia, Pennsylvania (35%) [U.S. Environmental Protection Agency (EPA) 2009]. The proportion for those > 65 years of age, a well-documented susceptible subgroup, who are within 15 km are only slightly higher: New York (4%), Detroit (27%), Boston (41%), Seattle (32%), and Philadelphia (38%). Although coverage for $PM_{2.5}$ is much higher given its spatial homogeneity, its constituents are known to be spatially variable and often very localized (Kim et al. 2005). The exposure misclassification will be even greater for measurement of mass and constituents of UF particles given their spatial heterogeneity (Sakurai et al. 2003; Sioutas et al. 2005). Some cohort studies have made use of land use regression (LUR) models to estimate $PM_{2.5}$ or nitrogen dioxide (Beelen et al. 2014) at finer spatial scales, but LUR models for particle sources or species are not widely available.

In a previous study, we examined the relation between mortality and long-term exposure to constituents of $PM_{2.5}$ using data from the California Teachers Study (CTS) cohort (Ostro et al. 2010). Started in 1995, the CTS is a prospective study of > 130,000 current and former female teachers and administrators identified through the State Teachers Retirement System. Because of limited data on particle species, this earlier report relied on $PM_{2.5}$ data collected and further analyzed by the U.S. EPA at eight fixed-site monitors as part of the Speciation Trends Network (U.S. EPA 2008). The 24-hr averaged measurements were usually obtained on an every third- or sixth-day basis. To minimize exposure misclassification, catchment buffer areas of 8 and 30 km were drawn around each monitor. The 30-km buffer is likely too large to capture exposure contrasts of many of the species, while the 8-km buffer significantly reduced the sample size, resulting in more unstable estimates and reduced statistical power. Although these buffers were an improvement over studies using a single or multiple monitors to represent exposure over large metropolitan areas, they may not sufficiently measure concentrations of many of the PM constituents, such as elemental carbon (EC) and transition metals that are known

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to exhibit high spatial variance. Specifically, Hu et al. (2014a, 2014b) reported significant bias for several species of fine and UF particles when comparing the central-site monitor readings applied to the entire metropolitan area population versus our estimated population-weighted concentrations. The latter are derived as the product (both at the 4-km grid scale) of the population and our model-based estimates of the pollutants.

Model estimates are highly correlated ($r > 0.8$) with observations at the monitoring locations. But for the seven major California Metropolitan Statistical Areas that had available data, the estimated population-weighted concentrations for EC were generally lower than central-site monitor predictions, with a maximum bias of −50% in Los Angeles, California, and an average bias of −33%. Although measurement and model predictions were in good agreement at the monitor locations, the bias was introduced by spatial variability around the monitor.

For the present study, we combined data from the CTS with newly developed exposure data generated from the UCD/CIT (University of California Davis/California Institute of Technology) Source Oriented Chemical Transport model. The UCD/CIT chemical transport model uses calculated meteorological fields and emissions estimates for different sources to predict airborne particulate matter concentrations. Particulate matter emissions are assigned a size and composition distribution based on measurements in source-testing experiments. The source-identity of all particulate matter emissions is retained through the simulated atmosphere. In the present study, ground-level mass concentrations for 50 PM constituents were estimated over the major population regions in California at a 4-km resolution for the period of 2000–2007. For many species of fine and UF particles, model predictions are highly correlated with measured values, particularly for longer averaging times (> 2 weeks). For example, correlations were > 0.8 for comparisons between annual modeled and measured concentrations of 10 different $PM_{2.5}$ components for five of the seven metropolitan regions with available monitoring data (Hu et al. 2014b).

Below, we report our findings of an analysis of the associations of long-term exposure to 19 constituents and sources of both $PM_{2.5}$ and UF particles on mortality from all natural causes, cardiovascular disease, ischemic heart disease (IHD), and pulmonary disease.

Methods

Data. The CTS is a prospective study of 133,479 current and former female teachers and administrators who completed baseline questionnaires mailed to them in 1995 to investigate the incidence of breast cancer in public school teachers and administrators, as described in detail by Bernstein et al. (2002). Subsequent questionnaires were mailed to CTS participants in 1997 and 2000. The design and ongoing follow-up of the CTS cohort is a multi-institutional collaboration involving researchers with diverse and complementary areas of expertise. Record linkage is conducted annually to mortality files administered by the California Department of Public Health. In addition, residential addresses of each CTS participant were updated annually for the mailing of newsletters. The mean age of CTS participants at enrollment was 54 years, with 90% between 30 and 80 years. The cohort is multi-ethnic but primarily non-Hispanic white (86.7%) and born in the United States (93.6%). For this study, we used cohort follow-up data from January 2001 through July 2007. Women < 30 years of age at the start of the study were excluded to focus on mid-life and older women. Use of data on human subjects in the main CTS cohort study was reviewed and initially approved by the California Committee for the Protection of Human Subjects, Health and Human Services Agency, and by the institutional review boards (IRB) for each participating institution in June 1995 and annually thereafter. Informed consent was obtained upon entry into the cohort. Analysis for this manuscript was approved in August 2013 by the IRB of the Cancer Prevention Institute of California, the center of one of the principal investigators.

Health outcomes. In this analysis, we focused on associations between long-term exposures and mortality. Deaths were assigned codes based on the *International Classification of Diseases, 10th Revision* (ICD-10) for the following outcomes: all-cause deaths excluding those with an external cause (A00–R99), cardiovascular deaths (I00–I99), IHD deaths (I20–I25), and pulmonary deaths (C34, J00–J98). Person-days at risk were calculated as the number of days starting from 1 January 2001 until the earliest of three dates: *a*) the date of death; *b*) a move out of California for at least 4 months; or *c*) 31 July 2007, the end of follow-up for this analysis. If a woman moved out of state for < 4 months, exposures during that time were not included in the calculations of the long-term average. Women who died from a cause other than the outcome of interest during the follow-up period were censored at the time of their deaths.

Air pollution exposure estimates. The UCD/CIT model was used to estimate ground-level concentrations of 50 PM constituents over the major population regions in California using a 4-km grid resolution for the period from 2000 through 2007 (Hu et al. 2014a, 2014b). A sensitivity analysis conducted at 250-m resolution over Oakland, California (Joe et al. 2014), indicated that 4-km resolution captures 55–70% of concentration variability within the urban area.

Using the extensive emissions inventory in California, the model calculations track the mass and number concentrations of the PM constituents in particle diameters ranging from 0.01 to 10 μm through calculations that describe emissions, transport, diffusion, deposition, coagulation, gas- and particle-phase chemistry, and gas-to-particle conversion (Hu et al. 2014b). The model solves the coupled set of differential equations that describe how atmospheric processes change pollutant concentrations in regularly spaced atmospheric grid cells. Thus, the predicted exposure concentrations primarily reflect the balance between emissions inventories of fresh particles and meteorological fields that drive dispersion and chemical reaction.

Model predictions were saved at hourly time resolution and averaged to longer times as needed. Predicted concentrations were evaluated against ambient measurements at all available locations and times. $PM_{2.5}$ mass predictions had a mean fractional bias within ± 0.3 (meeting accepted performance criteria) at 52 sites of the total 66 sites across California after correcting for bias in the dust emissions because many studies have shown that dust emissions in the current emission inventory are overestimated (Hu et al. 2015). Good correlations between predictions and measurements ($r > 0.8$) were demonstrated for many of the $PM_{2.5}$ and UF species at most of the monitoring stations, particularly for the monthly, seasonal, and annual averages. For example, monthly $PM_{2.5}$ nitrates were correlated with measurements with $r = 0.76$ (15 sites), monthly $PM_{2.5}$ EC was correlated with measurements with $r = 0.94$ (8 sites), and monthly $PM_{2.5}$ concentrations of potassium, chromium, zinc, iron, titanium, arsenic, calcium, manganese, and strontium were correlated with measurements with $r \geq 0.8$ (5 sites of a total of 8). For EC in the UF range, the correlation was above $r = 0.9$ for 117 available measurements made at 13 locations during nine intensive field campaigns that each lasted several weeks (Hu et al. 2014b). The quality of the model predictions summarized above reflects the accuracy of the emissions inventories that have been refined over three decades in California, the development of reactive chemical transport models that include important aerosol transformation mechanisms, and the development of prognostic meteorological models that allow for long simulations of historical meteorology.

Coarse particle predictions (2.5 μm < Dp < 10 μm) have undergone only preliminary comparisons to measurements and were not used for exposure estimates in the present study. Likewise, UF number concentrations were not used because our modeling did not include nucleation, the process by which particles are formed directly from gas molecules, which would greatly impact this parameter. UF mass concentrations are highly correlated with particle surface area (Kuwayama et al. 2013) and serve as a good metric for the potential exposure to UF particles. The measured correlation between UF mass and particle surface was 0.97 in Sacramento, a typical city in central California. For many of the fine and UF species, Hu et al. (2014a) observed strong spatial variability within metropolitan areas (Figure 1).

On the basis of previous studies (Ostro et al. 2007, 2010; Peng et al. 2009; Zanobetti et al. 2009), we chose to examine a subset of the available constituents. Additionally, some constituents were eliminated given their high intercorrelation or low concentrations.

Thus, for each particle size, we analyzed the following constituents: copper (Cu), iron (Fe), manganese (Mn), nitrate, EC, organic carbon (OC), "other" species (i.e., mineral dusts and constituents not measured), "other" metals (those besides Cu, Fe, and Mn that were explicitly resolved), and secondary organic aerosol (SOA). SOA formation was simulated with the mechanism in the U.S. EPA's Community Multi-scale Air Quality (CMAQ) model version 4.7 (Carlton et al. 2010). SOAs were divided into anthropogenic (SOA_ant: derived from long-chain alkanes, xylenes, toluenes, and benzene and their oligomers) and biogenic (SOA_bio: derived from isoprenes, monoterpenes, and sesiquiterpenes and their oligomers). Nitrate was not estimated for the UF size fraction. Once the constituent concentrations were obtained, Positive Matrix Factorization was used to develop source profiles. Estimates were provided for sources of primary aerosols including on-road gasoline, off-road gasoline, on-road diesel, off-road diesel, wood smoke, meat cooking, high-sulfur fuel combustion (including distillate oil, marine vessel fuel, aircraft jet fuel, liquid and solid waste fuel), and "other anthropogenic."

Ultimately, the exposure metrics were combined with the updated addresses. Monthly individual exposure estimates were developed through spatial linkage of the geocoded residential addresses. All residences within a given grid in a given month were assigned the modeled pollutant value for that grid for that period. The average long-term pollution exposure for a participant was obtained by calculating the mean of her monthly averages. At the time of each death, the long-term average for each individual remaining in the cohort was recalculated, allowing comparison between the decedent's long-term average exposure and those of the members remaining in the risk set.

Covariates. The individual-level covariates included as explanatory variables in the regression models were based on previous results from air pollution studies for this cohort (Lipsett et al. 2011). Specifically, the covariates included twenty individual-level covariates (a total of 58 terms): age (divided into 2-year categories between 30 and 79 years of age, 3-year categories between 80 and 88 years, and one category for women ≥ 89 years); race [non-Hispanic white, other (African American, Hispanic, Asian, Pacific Islander, and Native American), or unknown]; marital status (married/living with partner, not married, and

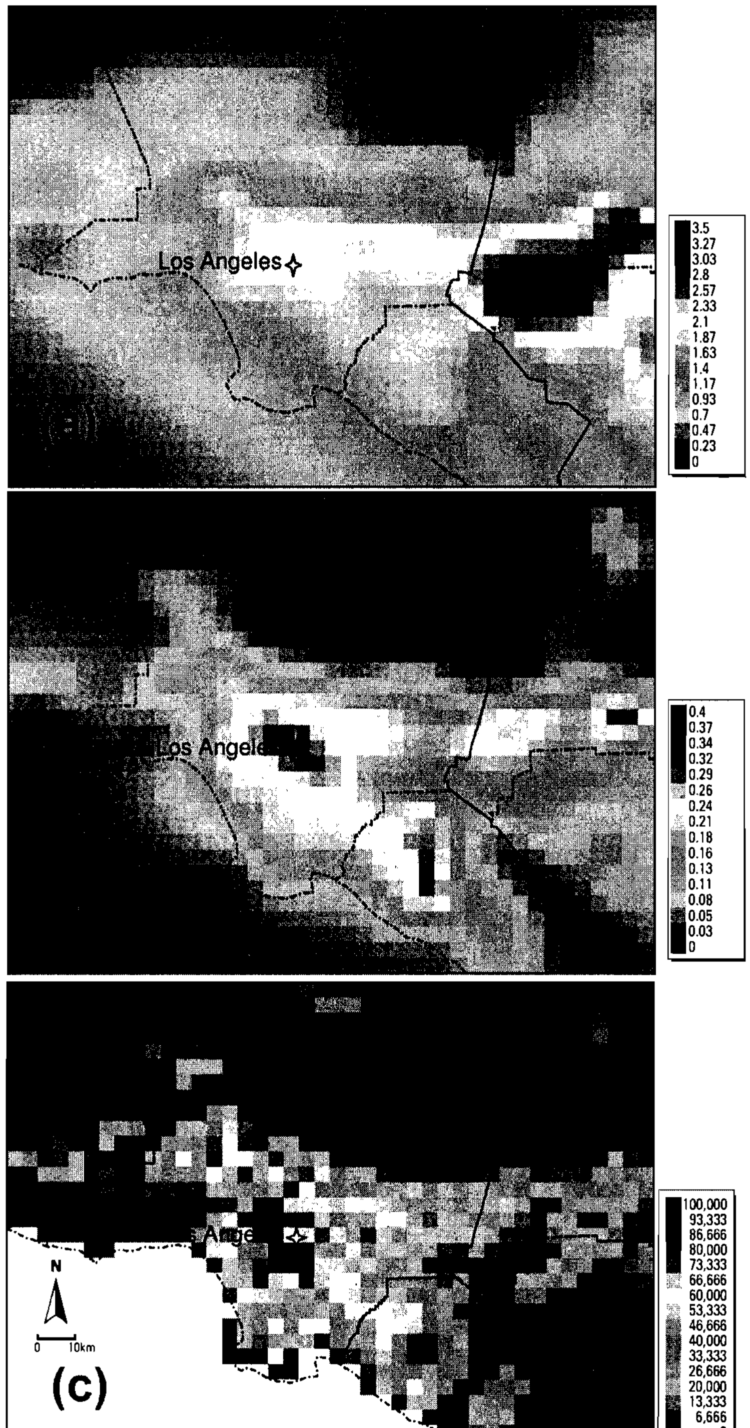


Figure 1. Modeled concentrations (µg/m³) of $PM_{2.5}$ nitrate (*A*), ultrafine anthropogenic secondary organic aerosols (*B*), and population in the Los Angeles Basin (*C*) using 4-km grids (the star in the figures indicates the site of the U.S. EPA monitor).

unknown); smoking status (never, former, and current smokers) and pack-years of smoking (continuous variable for former and current smokers); secondhand smoke exposure (none, household exposure, unknown); body mass index (BMI) (16–19, 20–24, 25–29, 30–39, 40–55 kg/m^2); lifetime physical activity (tertiles, unknown); alcohol consumption [beer (no/yes/unknown), wine (no/yes/unknown), liquor (no/yes/unknown)]; average daily dietary intake of fat (tertiles, unknown), fiber (tertiles, unknown), and calories (tertiles, unknown); menopausal status and hormone replacement therapy use combined (premenopausal, peri/postmenopausal and no HT use, peri/postmenopausal and past HT use, peri/postmenopausal and current use of estrogen, peri/postmenopausal and current use of estrogen plus progestin, and unknown menopausal status or HT use); family history of myocardial infarction (yes/no) or stroke (yes/no); and use of blood pressure medication (low, medium, high, unknown) or aspirin (low, medium, high, unknown). Data on all individual-level variables except marital status (which was assessed in the 2000 questionnaire) were obtained from the baseline questionnaire.

Statistical methods. We fitted Cox proportional hazards models to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for associations between each pollutant and the outcomes of interest. We examined each pollutant with a separate regression model adjusted for the covariates described above. The Cox model was stratified by age and race/ethnicity. To ensure that we would be examining associations with chronic rather than acute exposures, study exposures began in January 2000, the cohort follow-up began in January 2001, and both continued until July 2007. Two additional sensitivity analyses were conducted. First, we reran the models after including six census-derived contextual (neighborhood) variables including income (median household income), income inequality (percent below poverty level), education (percent with college degree), population size, racial composition (percent white, percent black, percent Hispanic), and unemployment (percent unemployed). These variables were derived from the 2000 census at the block-group level based on the subject's residence at the time of the baseline questionnaire. These variables represent social, economic, and environmental settings at a group level that may be associated with disease outcomes at the individual level. As such, they may provide additional control for residual confounding. The second sensitivity analysis involved two-pollutant models for a selected set of constituents for the outcome IHD mortality. Specifically, we took the constituent of $PM_{2.5}$ and UF particles with the highest HR and ran additional regressions that included each of the other constituents in the same particle size. The HR and CIs are presented for a change in their respective interquartile ranges (IQRs) unless otherwise noted. Statistical significance was based on a p-value < 0.05, and model goodness-of-fit was based on the Akaike information criterion (AIC). The analysis was conducted using PHREG in SAS software (SAS Institute Inc., Cary, NC).

Table 1. Descriptive statistics for health and covariate variables for women in the analysis.

Covariate	Percent or mean ± SD
Age at January 2001 (years)	57.3 ± 13.8
Race (% non-Hispanic white)	86.4
Smoking status	
Never smoker	68.4
Former smoker	26.9
Current smoker	4.7
Total pack-years	14.7 ± 17.1
Adult secondhand smoke exposure	48
BMI (kg/m^2)	24.9 ± 5.1
Married/living with partner	46.6
Nondrinker	32.2
Menopausal status and HT use	
Premenopausal	41.0
Peri/postmenopausal and no hormone therapy use	11.9
Peri/postmenopausal and current/past hormone therapy use	33.9
Unknown menopausal status/hormone therapy use	13.2
Dietary fat (g/day)	56.3 ± 26.8
Dietary fiber (g/day)	15.2 ± 6.4
Dietary calories (kcal/day)	1595.4 ± 556.4
Physical activity (hr/week)	4.41 ± 4.0
Family history of heart disease	54.4
Taking hypertension medication/aspirin	34.3

All characteristics were reported on baseline questionnaire, except marital status, which was reported on the 2000 questionnaire.

Results

Of the 133,479 women who completed a baseline questionnaire, we excluded 21,302 with no pollution data (of whom 14,670 had a lack of information on residential addresses and 6,632 lived in areas for which exposure estimates were not available); 1,363 women who had died or moved before the start of follow-up; 406 who were < 30 years of age in January 2001; 4,684 who had unknown or outlier BMI; 3,609 who were missing smoking data; 14 who were excluded because they consented to be included only in breast cancer studies; and 217 who had < 6 months of pollution values during January 2000 through December 2000. The final total was 101,884 women eligible for the study. The average length of follow-up was 6.3 years, with total person-years of 642,269. A total of 6,285 deaths occurred during the follow-up from January 2001 through July 2007; of these, 2,400 were due to cardiovascular diseases, 1,085 were due to IHD, and 929 were due to pulmonary diseases. As indicated in Table 1, the average age of eligible cohort members at the start of follow-up was 57 years, 86% of these women were non-Hispanic white, and 5% were current smokers. Table 2 summarizes the mean and distributions of the concentrations of $PM_{2.5}$ and UF constituents used in the analysis. For example, the mean of $PM_{2.5}$ was 17.9 μg/m^3 with OC (3.9 μg/m^3) and nitrate (3.7 μg/m^3) the largest constituents. For UFs, the mean was 1.3 μg/m^3 with OC the largest contributor at 0.9 μg/m^3.

A majority of the species were moderately to highly correlated (r = 0.5–0.8) (see Supplemental Material, Tables S1 and S2). $PM_{2.5}$ nitrates had correlations of 0.55, 0.43,

Table 2. Distribution of fine and UF particles species and sources.

	$PM_{2.5}$ (μg/m^3)				UF (ng/m^3)			
	Mean	25th	Median	75th	Mean	25th	Median	75th
Pollutant								
Mass	17.9	13.1	18.2	22.8	1,293	778	1,214	1,747
Cu	0.5[a]	0.2[a]	0.4[a]	0.6[a]	0.03	0.01	0.01	0.03
Fe	0.4	0.3	0.4	0.5	1.3	0.9	1.3	1.6
Mn	7.7[a]	5.7[a]	7.9[a]	9.8[a]	0.05	0.02	0.03	0.05
Nitrate	3.7	1.5	3.5	5.4	—	—	—	—
EC	1.1	0.6	1.0	1.5	113	63	103	156
OC	3.9	2.4	3.7	5.2	908	507	845	1,238
Other compounds	2.9	2.1	2.9	3.6	36	18	29	47
Other metals[b]	1.0	0.7	1.0	1.2	21	12	19	28
SOA_bio	0.1	0.1	0.1	0.1	17	9	16	24
SOA_ant	0.1	0.05	0.1	0.1	23	11	23	34
Sources of primary particles								
On-road gasoline	0.3	0.2	0.3	0.5	109	49	90	157
Off-road gasoline	0.2	0.1	0.1	0.2	34	16	29	49
On-road diesel	0.4	0.2	0.4	0.6	62	33	58	88
Off-road diesel	1.0	1.0	1.0	1.4	93	53	83	126
Wood smoke	1.4	0.5	0.9	1.8	310	105	205	437
Meat cooking	1.1	0.4	0.8	1.6	115	46	86	174
High-sulfur fuel combustion	0.4	0.1	0.3	0.5	49	10	21	64
Other anthropogenic	7.0	5.2	7.2	9.0	502	253	403	653

25th and 75th are percentiles.
[a]Concentrations × 1,000. [b]Metals besides Cu, Fe, and Mn.

0.65, and 0.84 with EC, OC, Cu, and SOA_ant, respectively. For UFs, EC had correlations of 0.67, 0.19, and 0.40 with OC, Cu, and SO_ant, respectively. The average interconstituent correlation for $PM_{2.5}$ was 0.59 and for UFs was 0.64. The implications of these correlations are described in "Discussion."

In the Cox proportional hazards regression analysis for $PM_{2.5}$, the only statistically significant association ($p < 0.05$) observed between sources and constituents and all-cause mortality was for the source of high-sulfur fuel combustion (HR = 1.03; 95% CI: 1.01, 1.05 for a change in its IQR), and there were no statistically significant associations with pulmonary disease mortality (see Supplemental Material, Table S3). For cardiovascular disease mortality, statistically significant associations were demonstrated only for nitrate (HR = 1.10; 95% CI: 1.02, 1.18) and high-sulfur fuel combustion (HR = 1.05; 95% CI: 1.02, 1.09). Associations with p-values < 0.10 were observed for $PM_{2.5}$ mass (HR = 1.05; 95% CI: 0.99, 1.12) and SOA_ant (HR = 1.06; 95% CI: 0.99, 1.13) (see Supplemental Material, Table S3). As summarized in Table 3 and Figure 2, however, there were many statistically significant associations with IHD mortality. Among the constituents, nitrate (HR = 1.28; 95% CI: 1.16, 1.42) and SOA_ant (HR = 1.23; 95% CI: 1.11, 1.36) were the most statistically significant, and both had higher HRs and fit the data slightly better, based on the (lower) AIC, than that of $PM_{2.5}$ mass (HR = 1.18; 95% CI: 1.08, 1.30). Among the emission sources, we found statistically significant associations between IHD and all four of the vehicle sources, meat cooking, and high-sulfur content fuel combustion.

For UFs, no statistically significant associations were observed for either all-cause or pulmonary mortality (see Supplemental Material, Table S4). For cardiovascular mortality, significant associations were noted for Cu (HR = 1.03; 95% CI: 1.00, 1.05), and the sources of high-sulfur fuel combustion (HR = 1.04; 95% CI: 1.01, 1.07). However, many statistically significant associations were again demonstrated for IHD mortality (Table 3). Among the species, this includes Cu, Fe, EC, OC, other compounds and metals, SOA_ant, and SOA_bio. The largest estimated risks were for SOA_ant (HR = 1.25; 95% CI: 1.13, 1.39), EC (HR = 1.15; 95% CI: 1.06, 1.26), and other metals (HR = 1.13; 95% CI: 1.05, 1.21), each of which had lower p-values and slightly better fitting models based on AIC than did UF mass (HR = 1.10; 95% CI: 1.02, 1.18). Many of the other constituents also had better model fits than $PM_{2.5}$. Among the sources, associations were seen for both on and off-road diesel and gasoline, meat cooking, high-sulfur fuel combustion, and other anthropogenic sources.

The analysis of IHD mortality showed that although $PM_{2.5}$ mass had a lower p-value than UF mass, UF mass and each of the UF constituents provided a better fit and had a lower p-value than their corresponding $PM_{2.5}$ constituent (except for Mn, for which there was no statistical significance for either particle size).

In our sensitivity analysis, we found that adding the six contextual variables to the model did not quantitatively alter any of the results (HR or p-value) except in one case where $PM_{2.5}$ SOA_bio became nonsignificant (data not shown). We also examined two-pollutant models with the $PM_{2.5}$ constituent with the largest effect estimate for IHD ($PM_{2.5}$ nitrate) in a regression with each of the other $PM_{2.5}$ constituents. Likewise, we examined two-pollutant models for UF (SOA_ant) with each of the other UF constituents (Tables 4 and 5). For the two-pollutant models with $PM_{2.5}$ nitrate, the HRs for nitrate were basically unchanged and none of the other $PM_{2.5}$ constituents, including mass, were statistically significant. For UFs SOA_ant, the HR was again basically unchanged and only one other constituent, Cu, was also statistically significantly related to IHD mortality.

Discussion

Our analysis of long-term exposure to the mass and constituents of $PM_{2.5}$ and UF particles revealed several statistically significant associations with all-cause, cardiovascular,

Table 3. Hazard ratios (HRs) and 95% CIs for associations of $PM_{2.5}$ and UF particles with IHD Mortality.

	$PM_{2.5}$ (μg/m³)				UF (ng/m³)			
	IQR	HR[a] (95% CI)	p-Value	AIC	IQR	HR[a] (95% CI)	p-Value	AIC
Pollutant								
Mass	9.6	1.18 (1.08, 1.30)	< 0.001	14,011	969	1.10 (1.02, 1.18)	0.01	13,896
Cu	0.4[b]	1.09 (1.04, 1.15)	< 0.001	14,015	0.02	1.06 (1.03, 1.09)	< 0.0001	13,890
Fe	0.2	1.06 (0.97, 1.16)	0.17	14,023	0.8	1.03 (1.00, 1.06)	< 0.05	13,899
Mn	4.0[b]	1.06 (0.99, 1.13)	0.12	14,023	0.03	1.00 (0.99, 1.01)	0.62	13,902
Nitrate	3.9	1.28 (1.16, 1.42)	< 0.0001	14,003	—	—		—
EC	0.8	1.14 (1.05, 1.24)	< 0.01	14,015	93	1.15 (1.06, 1.26)	< 0.001	13,891
OC	2.8	1.08 (0.99, 1.17)	0.07	14,022	731	1.08 (1.01, 1.15)	< 0.05	13,898
Other compounds	1.4	1.07 (0.99, 1.15)	0.08	14,022	29	1.10 (1.04, 1.16)	< 0.001	13,892
Other metals[c]	0.5	1.08 (0.99, 1.18)	0.09	14,022	17	1.13 (1.05, 1.21)	< 0.01	13,892
SOA_bio	0.1	1.08 (1.00, 1.17)	< 0.05	14,021	14	1.10 (1.02, 1.19)	< 0.01	13,896
SOA_ant	0.1	1.23 (1.11, 1.36)	< 0.0001	14,009	24	1.25 (1.13, 1.39)	< 0.001	13,884
Sources of primary particles								
On-road gasoline	0.3	1.12 (1.04, 1.22)	< 0.01	14,017	108	1.12 (1.04, 1.22)	< 0.01	13,894
Off-road gasoline	0.2	1.14 (1.04, 1.24)	< 0.01	14,016	33	1.14 (1.04, 1.24)	< 0.01	13,894
On-road diesel	0.4	1.13 (1.03, 1.23)	< 0.01	14,018	56	1.13 (1.03, 1.24)	< 0.01	13,895
Off-road diesel	0.8	1.13 (1.05, 1.23)	< 0.05	14,015	73	1.14 (1.05, 1.23)	< 0.01	13,892
Wood smoke	1.3	0.97 (0.90, 1.04)	0.38	14,024	332	0.95 (0.89, 1.02)	0.20	13,900
Meat cooking	1.2	1.08 (1.00, 1.17)	< 0.05	14,021	128	1.11 (1.03, 1.20)	< 0.01	13,895
High-sulfur fuel combustion	0.4	1.08 (1.02, 1.13)	< 0.05	14,017	54	1.08 (1.04, 1.12)	< 0.0001	13,888
Other anthropogenic	3.8	1.09 (1.00, 1.19)	0.05	14,021	400	1.06 (1.01, 1.10)	0.01	13,896

[a]HRs were stratified for age and race and adjusted for smoking status, smoking pack-years, adult secondhand smoke exposure, BMI, marital status, alcohol consumption, physical activity, menopausal status and HT use combined, family history of heart disease, hypertension medication/aspirin use, and dietary fat, fiber, and caloric intake. [b]Concentrations × 1,000. [c]Metals other than Cu, Fe, and Mn.

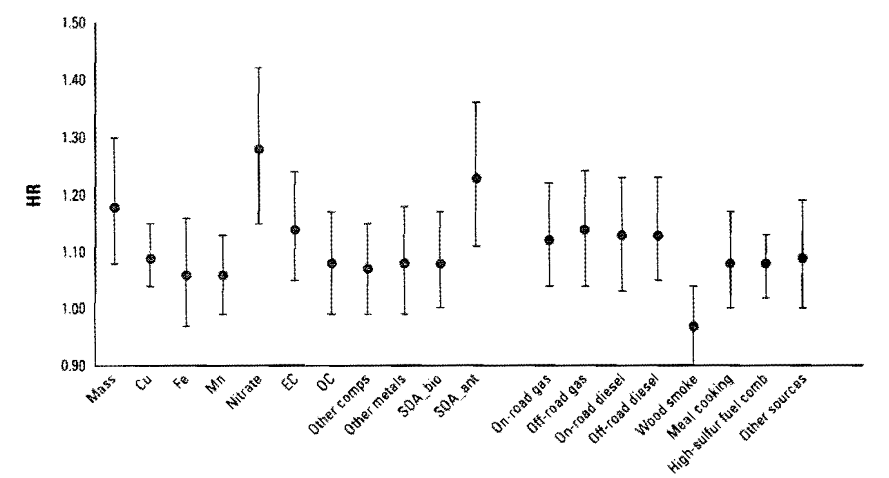


Figure 2. Association of $PM_{2.5}$ constituents and sources with IHD mortality (HRs and 95% CIs using interquartile range. Abbreviations: comb, combustion; comps, components.

and IHD mortality. For $PM_{2.5}$, high-sulfur content fuel combustion was associated with all three end points, and nitrates were associated with cardiovascular and IHD mortality. Several other constituents reached statistical significance with IHD mortality including $PM_{2.5}$ mass, Cu, EC, and the SOAs, as well as the sources including gas- and diesel-fueled vehicles, meat cooking, and high-sulfur fuel combustion. Among the $PM_{2.5}$ constituents, based on their associated IQRs, nitrate had the highest HR and provided the best fit of the data. For UFs, constituents such as SOA_ant, EC, and "other" metals exhibited statistically significant associations with IHD mortality, as did all of the mobile sources and high-sulfur fuel combustion. For both $PM_{2.5}$ and UF particles, several constituents generated higher HRs based on their relevant IQRs than their associated mass measurements and in some cases (e.g., UF mass vs. SOA_ant) the differences were statistically significant based on methodology suggested by Schenker and Gentleman (2001). In addition, for all of the constituents, there were better model fits, based on AIC, for UFs than for $PM_{2.5}$.

In a previous analysis of the CTS (based on 73,489 women), exposures to $PM_{2.5}$ were estimated using data from 77 existing monitors located throughout the state (Lipsett et al. 2011). Smoothed surfaces were produced through inverse distance weighting, and grids of 250 m were created. Monthly concentrations were assigned to residents within each grid with the added constraint that participants were required to be within 30 km of a monitor. That study produced an HR for the association of $PM_{2.5}$ and IHD mortality of 1.20 (95% CI: 1.02, 1.41) for a 10-$\mu g/m^3$ increase in $PM_{2.5}$. This result comports with the HR estimate (converted to 10 $\mu g/m^3$ change) in the present study of 1.19 (95% CI: 1.08, 1.31). Our estimate is also similar to those for IHD mortality based on analyses of the American Cancer Society (ACS) cohort in which the HRs for a 10-$\mu g/m^3$ increase in $PM_{2.5}$ were 1.18 (95% CI: 1.14, 1.23) for the United States and 1.11 (95% CI: 1.05, 1.18) for California (Jerrett et al. 2013; Pope et al. 2002). They were also comparable to those of the Harvard Six Cities Study of 1.26 (95% CI: 1.08, 1.47) (Laden et al. 2006) for a 10-$\mu g/m^3$ increase in $PM_{2.5}$.

We can also compare the estimates of a few constituents of $PM_{2.5}$ with those obtained in a prior analysis of a smaller subset (n = 43,220) of the CTS (Ostro et al. 2010). In this prior analysis, we used a 30-km buffer catchment area around each of eight U.S. EPA Speciation Trends Network monitors. The HR for cardiovascular mortality associated with a 1-$\mu g/m^3$ increase in nitrate in the previous study was 1.03 (95% CI: 1.01, 1.06) versus the present study estimate of 1.02 (95% CI: 1.01, 1.04). For EC, the previous study generated an HR of 1.11 (95% CI: 0.91, 1.36) for a 1-$\mu g/m^3$ change compared with 1.05 (95% CI: 0.98, 1.11) in the present study. Several cohort studies have estimated the effects of EC or its correlates on cardiovascular mortality. For example, Smith et al. (2009) estimated its effects among 352,000 participants in the ACS cohort and reported a relative risk (RR) of 11% (95% CI: 3, 19) per 1 $\mu g/m^3$. The estimated RR of coronary heart disease mortality associated with EC was 1.08 (95% CI: 1.04, 1.12) per 1 $\mu g/m^3$ in a cohort study in Vancouver, Canada (Gan et al. 2011). In addition, the RR of cardiovascular mortality from long-term exposure to black smoke, another EC correlate which measures the light reflectance of particles was reported in cohort studies in the Netherlands and Scotland (Beelen et al. 2008; Beverland et al. 2012). Based on a conversion factor calculated by Janssen et al. (2011), the HRs were 1.04 (95% CI: 0.95, 1.12) and 1.06 (95% CI: 1.0, 1.11) per $\mu g/m^3$ of EC, respectively. Finally, a recent study (Lippman et al. 2013) examined the effect of $PM_{2.5}$ components and sources using a subset of the national ACS cohort. The results of the Cox regression model for IHD were generally supportive of our findings. Among the components measured, the authors observed statistically significant associations with IHD for EC and several of the metals (e.g., iron, lead, nickel, and zinc). Nitrates were not included in the ACS study, but statistical associations were observed for sulfur, likely from the combustion of coal and residual oil, which was not included in our study. In addition, among the sources, traffic was dominant in both studies.

We did not observe any positive associations with long-term exposure to wood smoke, although associations of short-term exposure with respiratory outcomes have been reported (Naeher et al. 2007). This may be attributable to the episodic nature of the wood smoke or to possible confounding by socioeconomic status. In California, most of the population-weighted exposure occurred in relatively high-income counties, such as San Francisco, San Mateo, and Santa Clara, where greater longevity prevails.

Given its large spatial variability, assessing exposure to UF particles among participants in cohort studies has been challenging. Therefore,

Table 4. Hazard ratios (HR) and 95% CIs for ischemic heart disease mortality for two-pollutant models of $PM_{2.5}$ nitrate with each of the other constituents.

	$PM_{2.5}$ constituent ($\mu g/m^3$)			$PM_{2.5}$ nitrate ($\mu g/m^3$)		
Pollutant	IQR	HR[a] (95% CI)	p-Value	IQR	HR[a] (95% CI)	p-Value
Mass	9.6	1.03 (0.91, 1.18)	0.61	3.9	1.25 (1.07, 1.45)	< 0.05
Cu	0.4[b]	1.02 (0.94, 1.10)	0.67	3.9	1.26 (1.11, 1.44)	< 0.001
Fe	0.2	0.92 (0.82, 1.03)	0.14	3.9	1.35 (1.19, 1.54)	< 0.0001
Mn	4.0[b]	0.94 (0.85, 1.04)	0.23	3.9	1.34 (1.18, 1.53)	< 0.0001
Nitrate	—	—	—	3.9	1.28 (1.16, 1.42)	< 0.0001
EC	0.8	1.04 (0.94, 1.14)	0.49	3.9	1.25 (1.11, 1.42)	< 0.001
OC	2.8	1.00 (0.91, 1.09)	0.94	3.9	1.29 (1.15, 1.44)	< 0.0001
Other compounds	1.4	0.96 (0.87, 1.05)	0.34	3.9	1.33 (1.17, 1.51)	< 0.0001
Other metals[c]	0.5	0.93 (0.83, 1.04)	0.21	3.9	1.35 (1.18, 1.53)	< 0.0001
SOA_bio	0.1	0.95 (0.86, 1.05)	0.31	3.9	1.34 (1.17, 1.53)	< 0.0001
SOA_ant	0.1	0.97 (0.78, 1.21)	0.78	3.9	1.32 (1.05, 1.66)	0.02

[a]HRs were stratified for age and race and adjusted for smoking status, smoking pack-years, adult secondhand smoke exposure, BMI, marital status, alcohol consumption, physical activity, menopausal status and HT use combined, family history of heart disease, hypertension medication/aspirin use, and dietary fat, fiber, and caloric intake. [b]Concentrations × 1,000. [c]Metals other than Cu, Fe, and Mn.

Table 5. Hazard ratios (HR) and 95% CIs for ischemic heart disease mortality for two-pollutant models of anthropogenic UF secondary organic aerosols with each of the other constituents.

	UF constituent (ng/m^3)			UF SOA_ant (ng/m^3)		
Pollutant	IQR	HR[a] (95% CI)	p-Value	IQR	HR[a] (95% CI)	p-Value
Mass	969	1.03 (0.94, 1.12)	0.56	24	1.19 (1.08, 1.31)	< 0.001
Cu	0.02	1.39 (1.05, 1.83)	0.02	24	1.16 (1.06, 1.28)	0.001
Fe	0.8	1.01 (0.97, 1.06)	0.63	24	1.20 (1.09, 1.31)	< 0. 001
Mn	0.03	1.00 (0.99, 1.01)	0.95	24	1.21 (1.11, 1.32)	< 0.0001
EC	93	1.04 (0.93, 1.16)	0.52	24	1.18 (1.05, 1.32)	0.006
OC	731	1.02 (0.95, 1.10)	0.61	24	1.20 (1.09, 1.31)	< 0.001
Other compounds	29	1.06 (1.00, 1.13)	0.06	24	1.17 (1.07, 1.29)	< 0.001
Other metals[b]	17	1.07 (0.96, 1.18)	0.22	24	1.17 (1.06, 1.29)	0.002
SOA_bio	14	0.99 (0.92, 1.07)	0.82	24	1.22 (1.09, 1.36)	< 0.001
SOA_ant	—	—	—	24	1.25 (1.13, 1.39)	< 0.001

[a]HRs were stratified for age and race and adjusted for smoking status, smoking pack-years, adult secondhand smoke exposure, BMI, marital status, alcohol consumption, physical activity, menopausal status and HT use combined, family history of heart disease, hypertension medication/aspirin use, and dietary fat, fiber, and caloric intake. [b]Metals other than Cu, Fe, and Mn.

very few studies have measured or estimated long-term exposures to UFs at a fine enough spatial gradient to examine its impact on health. As an alternative, several studies have attempted to estimate the effects of exposure to traffic, often a major source of UFs, using metrics such as nitrogen dioxide, distance to major roadways, and/or local traffic density (Health Effects Institute 2010). In general, within the first 250 m or so of a major roadway, UFs may be highly correlated with other pollutants such as black carbon, nitrogen dioxide, and carbon monoxide. However, the relation between UFs and these other pollutants, especially away from major roadways, is not precise and the correlations may be fairly low (Sioutas et al. 2005; Zhu et al. 2008).

In contrast, several studies have estimated the effects of daily changes in UFs where only the time-varying component is needed (Atkinson et al. 2010; Forastiere et al. 2005; Peters et al. 2009). The previous studies were based on counts of UFs rather than mass, so their estimates are not directly comparable to ours. In support of these and our findings on UFs, Delfino et al. (2009) followed a panel of 60 elderly subjects with coronary artery disease and reported associations between biomarkers of inflammation and several components of UF particles, including EC and primary OC. Other animal and human studies have implicated transition metals in generating inflammation and oxidative stress (Chen and Lippmann 2009; Costa and Dreher 1997; Gurgueira et al. 2002).

Our study has both strengths and limitations. Among the strengths are the relatively large size of the cohort, the low prevalence of active smoking, and the relative similarity of occupational status and activity patterns. These factors all help to reduce residual confounding in our estimates. Second, the study population included a large number of women at risk of developing cardiovascular disease by virtue of their age and postmenopausal status. Third, because of the level of spatial detail in the pollution estimates and the information on residential history, the temporal and spatial resolution of the pollution exposure is enhanced relative to many previous cohort studies.

One limitation is that the study was restricted to women, and these women were not necessarily representative of all women. Second, only about 1,000 women were diagnosed with IHD or pulmonary mortality, which may introduce some instability in the risk estimates. Third, our estimates could be impacted by possibly correlated and unmeasured co-pollutants. Fourth, there was high intercorrelation (most between 0.5 and 0.8) among the particle constituents, different levels of uncertainty and bias in their modeled estimates, and potentially different exposure patterns. These factors could affect the estimates of their relative toxicity. The high correlations reflect *a*) a consistent chemical signature of multiple pollutants associated with PM emitted from major sources, *b*) that some elements are dominated by a small number of sources, and/or *c*) the similarity of certain pollutants from different sources such as gasoline and diesel vehicles. A similar range of intercorrelation among the constituents was reported by Ostro et al. (2010), which used monitored values for the same cohort as the present study, but only included eight metropolitan areas. Thus the high correlations are not simply a result of the modeling methodology. However, this feature does make it difficult to identify unique components and sources that are associated with adverse health effects. Fifth, stationary sources contribute < 15% of the $PM_{2.5}$ in California (Air Resources Board 2013), so sources such as coal burning and industrial processes and their specific constituents are not included in this study. Finally, although our exposure method had some significant enhancements over previous assessments, some misclassification will continue to exist.

Nevertheless, this study represents an innovative effort to estimate the effects of long-term exposure to the constituents of two pollutants, fine and ultrafine particles, that are ubiquitous in our environment. As such, it provides evidence of the public health impact of a subset of these constituents and helps contribute to our understanding of air pollution–related cardiovascular disease.

References

Air Resources Board. 2013. 2012 Estimated Annual Average Emissions. Sacramento, CA:California Environmental Protection Agency. Available: http://www.arb.ca.gov/ei/emsmain/emsmain.htm [accessed 9 March 2014].

Atkinson RW, Fuller GW, Anderson HR, Harrison RM, Armstrong B. 2010. Urban ambient particle metrics and health: a time-series analysis. Epidemiology 21:501–511.

Beelen R, Hoek G, van den Brandt PA, Goldbohm RA, Fischer P, Schouten LJ, et al. 2008. Long-term effects of traffic-related air pollution on mortality in a Dutch cohort (NLCS-AIR study). Environ Health Perspect 116:196–202; doi:10.1289/ehp.10767.

Beelen R, Raaschou-Nielsen O, Stafoggia M, Andersen ZJ, Weinmayr G, Hoffmann B, et al. 2014. Effects of long-term exposure to air pollution on natural-cause mortality: an analysis of 22 European cohorts within the multicentre ESCAPE project. Lancet 383:785–795.

Bernstein L, Allen M, Anton-Culver H, Deapen D, Horn-Ross PL, Peel D, et al. 2002. High breast cancer incidence rates among California teachers: results from the California Teachers Study (United States). Cancer Causes Control 13:625–635.

Beverland IJ, Cohen GR, Heal MR, Carder M, Yap C, Robertson C, et al. 2012. A comparison of short-term and long-term air pollution exposure associations with mortality in two cohorts in Scotland. Environ Health Perspect 120:1280–1285; doi:10.1289/ehp.1104509.

Carlton AG, Bhave PV, Napelenok SL, Edney ED, Sarwar G, Pinder RW, et al. 2010. Model representation of secondary organic aerosol in CMAQv4.7. Environ Sci Technol 44:8553–8560.

Chen LC, Lippmann M. 2009. Effects of metals within ambient air particulate matter (PM) on human health. Inhal Toxicol 21:1–31.

Costa DL, Dreher KL. 1997. Bioavailable transition metals in particulate matter mediate cardiopulmonary injury in healthy and compromised animal models. Environ Health Perspect 105(suppl 5):1053–1060.

Delfino RJ, Staimer N, Tjoa T, Gillen DL, Polidori A, Arhami M, et al. 2009. Air pollution exposures and circulating biomarkers of effect in a susceptible population: clues to potential causal component mixtures and mechanisms. Environ Health Perspect 117:1232–1238; doi:10.1289/ehp.0800194.

Dockery DW, Pope CA III, Xu X, Spengler JD, Ware JH, Fay ME, et al. 1993. An association between air pollution and mortality in six U.S. cities. N Engl J Med 329:1753–1759.

Forastiere F, Stafoggia M, Picciotto S, Bellander T, D'Ippoliti D, Lanki T, et al. 2005. A case-crossover analysis of out-of-hospital coronary deaths and air pollution in Rome, Italy. Am J Respir Crit Care Med 172:1549–1555.

Gan WQ, Koehoorn M, Davies HW, Demers PA, Tamburic L, Brauer M. 2011. Long-term exposure to traffic-related air pollution and the risk of coronary heart disease hospitalization and mortality. Environ Health Perspect 119:501–507; doi:10.1289/ehp.1002511.

Gurgueira SA, Lawrence J, Coull B, Murthy GG, González-Flecha B. 2002. Rapid increases in the steady-state concentration of reactive oxygen species in the lungs and heart after particulate air pollution inhalation. Environ Health Perspect 110:749–755.

Health Effects Institute. 2010. Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. HEI Panel on the Health Effects of Traffic-Related Air Pollution. Special Report 17. Boston, MA:Health Effects Institute. Available: http://pubs.healtheffects.org/getfile.php?u=553 [accessed 29 Alpril 2015].

Hoek G, Krishnan RM, Beelen R, Peters A, Ostro B, Brunekreef B, et al. 2013. Long-term air pollution exposure and cardio- respiratory mortality: a review. Environ Health 12:43; doi:10.1186/1476-069X-12-43.

Hu J, Zhang H, Chen S, Ying Q, Wiedinmyer C, Vandenberghe F, et al. 2014a. Identifying $PM_{2.5}$ and $PM_{0.1}$ sources for epidemiological studies in California. Environ Sci Technol 48:4980–4990.

Hu J, Zhang H, Chen SH, Ying Q, Wiedinmyer F, Vandenberghe F, et al. 2014b. Predicting primary $PM_{2.5}$ and $PM_{0.1}$ trace composition for epidemiological studies in California. Environ Sci Technol 48:4971–4979.

Hu J, Zhang H, Ying Q, Chen SH, Vandenberghe F, Kleeman MJ. 2015. Long-term particulate matter modeling for health effect studies in California—part 1: model performance on temporal and spatial variations. Atmos Chem Phys 15:3445–3461; doi:10.5194/acp-15-3445-2015.

Janssen NA, Hoek G, Simic-Lawson M, Fischer P, van Bree L, ten Brink H, et al. 2011. Black carbon as an additional indicator of the adverse health effects of airborne particles compared with PM_{10} and $PM_{2.5}$. Environ Health Perspect 119:1691–1699; doi:10.1289/ehp.1003369.

Jerrett M, Burnett RT, Beckerman BS, Turner MC, Krewski D, Thurston G, et al. 2013. Spatial analysis of air pollution and mortality in California. Am J Resp Crit Care Med 188:593–599.

Joe DK, Zhang H, DeNero SP, Lee HH, Chen SH, McDonald BC, et al. 2014. Implementation of a high-resolution Source-Oriented WRF/Chem model at the Port of Oakland. Atmos Environ 82:351–363.

Kim E, Hopke PK, Pinto JP, Wilson WE. 2005. Spatial variability of fine particle mass, components, and source contributions during the regional air pollution study in St. Louis. Environ Sci Technol 39:4172–4179.

Kuwayama T, Ruehl CR, Kleeman MJ. 2013. Daily trends and source apportionment of ultrafine particulate mass ($PM_{0.1}$) over an annual cycle in a typical California city. Environ Sci Technol 47:13957–13966.

Laden F, Schwartz J, Speizer FE, Dockery DW. 2006. Reduction in fine particulate air pollution and mortality: extended follow-up of the Harvard Six Cities study. Am J Respir Crit Care Med 173:667–672.

Lippmann M, Chen LC, Gordon T, Ito K, Thurston GD. 2013. National Particle Component Toxicity (NPACT) Initiative: Integrated Epidemiologic and Toxicologic Studies of the Health Effects of Particulate Matter Components. Research Report 177. Boston, MA:Health Effects Institute.

Lipsett MJ, Ostro BD, Reynolds P, Goldberg D, Hertz A, Jerrett M, et al. 2011. Long-term exposure to air pollution and cardiorespiratory disease in the California Teachers Study cohort. Am J Respir Crit Care Med 184:828–835.

Naeher LP, Brauer M, Lipsett M, Zelikoff JT, Simpson CD, Koenig JQ, et al. 2007. Woodsmoke health effects: a review. Inhal Toxicol 19:67–106.

Ostro B, Feng WY, Broadwin R, Green S, Lipsett M. 2007. The effects of components of fine particulate air pollution on mortality in California: results from CALFINE. Environ Health Perspect 115:13–19; doi:10.1289/ehp.9281.

Ostro B, Lipsett M, Reynolds P, Goldberg D, Hertz A, Garcia C, et al. 2010. Long-term exposure to constituents of fine particulate air pollution and mortality: results from the California Teachers Study. Environ Health Perspect 118:363–369; doi:10.1289/ehp.0901181.

Peng RD, Bell ML, Geyh AS, McDermott A, Zeger SL, Samet JM, et al. 2009. Emergency admissions for cardiovascular and respiratory diseases and the chemical composition of fine particle air pollution. Environ Health Perspect 117:957–963; doi:10.1289/ehp.0800185.

Peters A, Breitner S, Cyrys J, Stölzel M, Pitz M, Wölke G, et al. 2009. The influence of improved air quality on mortality risks in Erfurt, Germany. Res Rep Health Eff Inst 137:5–77.

Pope CA III, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, et al. 2002. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. JAMA 287:1132–1141.

Pope CA III, Thun MJ, Namboodiri MM, Dockery DW, Evans JS, Speizer FE, et al. 1995. Particulate air pollution as a predictor of mortality in a prospective study of U.S. adults. Am J Respir Crit Care Med 151(3 pt 1):669–674.

Sakurai H, Tobias HJ, Park K, Zarling D, Docherty KS, Kittelson DB, et al. 2003. On-line measurements of diesel nanoparticle composition and volatility. Atmos Environ 37:1199–1210.

Schenker N, Gentleman JF. 2001. On judging the significance of differences by examining the overlap between confidence intervals. Am Stat 55:182–186.

Sioutas C, Delfino RJ, Singh M. 2005. Exposure assessment for atmospheric ultrafine particles (UFPs) and implications in epidemiologic research. Environ Health Perspect 113:947–955; doi:10.1289/ehp.7939.

Smith KR, Jerrett M, Anderson HR, Burnett RT, Stone V, Derwent R, et al. 2009. Public health benefits of strategies to reduce greenhouse-gas emissions: health implications of short-lived greenhouse pollutants. Lancet 374:2091–2103.

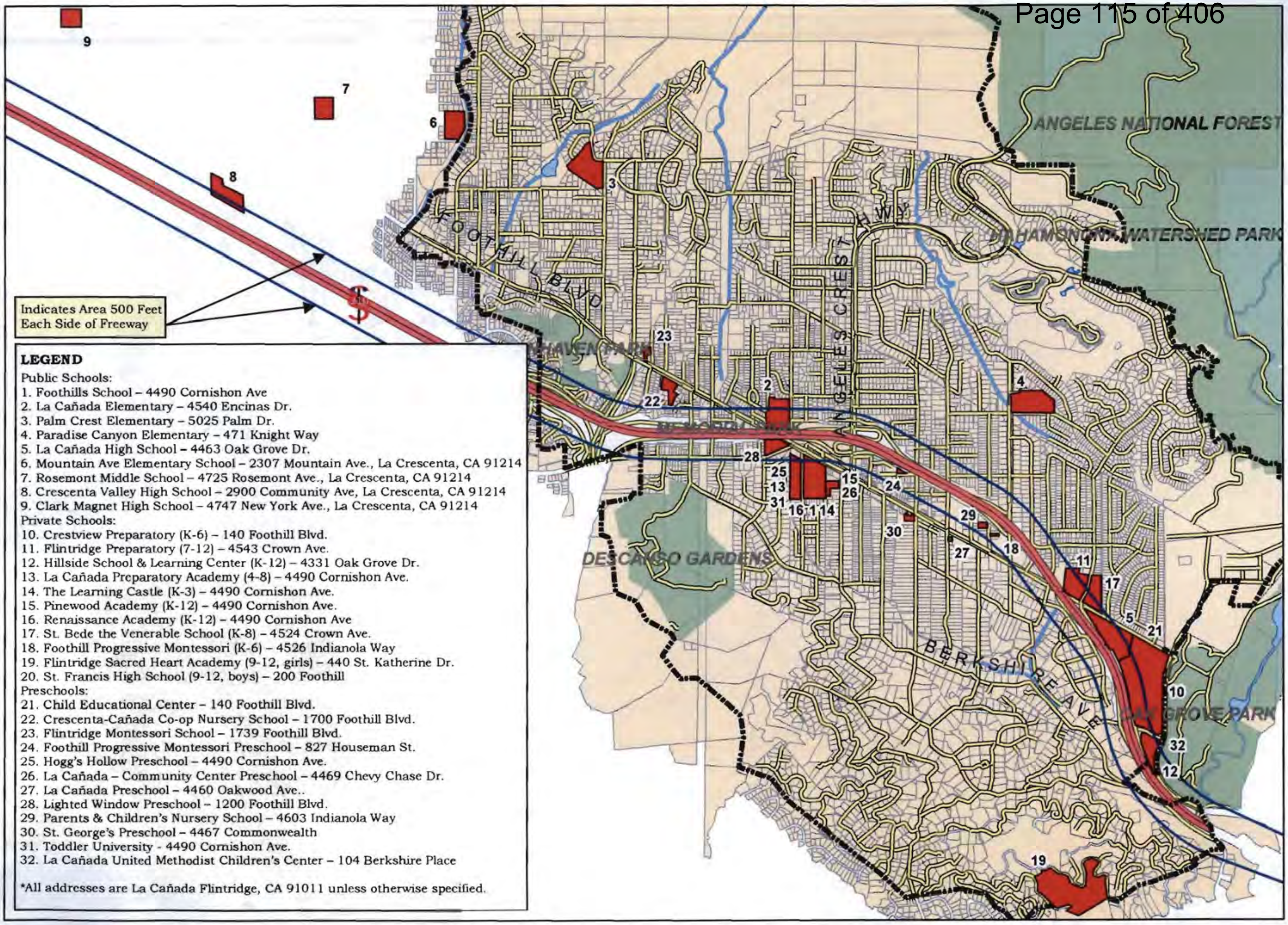
U.S. EPA (U.S. Environmental Protection Agency). 2008. Chemical Speciation. Available: http://www.epa.gov/ttn/amtic/speciepg.html [accessed 19 June 2013].

U.S. EPA (U.S. Environmental Protection Agency). 2009. Integrated Science Assessment for Particulate Matter (Final Report) EPA/600/R-08/139F. Available: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546 [accessed 4 March 2013].

Zanobetti A, Franklin M, Koutrakis P, Schwartz J. 2009. Fine particulate air pollution and its components in association with cause-specific emergency admissions. Environ Health 8:58; doi:10.1186/1476-069X-8-58.

Zhu Y, Fung DC, Kennedy N, Hinds WC, Eiguren-Fernandez A. 2008. Measurements of ultrafine particles and other vehicular pollutants inside a mobile exposure system on Los Angeles freeways. J Air Waste Manag Assoc 58:424–434.

EXHIBIT 7



LEGEND

Public Schools:
1. Foothills School – 4490 Cornishon Ave
2. La Cañada Elementary – 4540 Encinas Dr.
3. Palm Crest Elementary – 5025 Palm Dr.
4. Paradise Canyon Elementary – 471 Knight Way
5. La Cañada High School – 4463 Oak Grove Dr.
6. Mountain Ave Elementary School – 2307 Mountain Ave., La Crescenta, CA 91214
7. Rosemont Middle School – 4725 Rosemont Ave., La Crescenta, CA 91214
8. Crescenta Valley High School – 2900 Community Ave, La Crescenta, CA 91214
9. Clark Magnet High School – 4747 New York Ave., La Crescenta, CA 91214

Private Schools:
10. Crestview Preparatory (K-6) – 140 Foothill Blvd.
11. Flintridge Preparatory (7-12) – 4543 Crown Ave.
12. Hillside School & Learning Center (K-12) – 4331 Oak Grove Dr.
13. La Cañada Preparatory Academy (4-8) – 4490 Cornishon Ave.
14. The Learning Castle (K-3) – 4490 Cornishon Ave.
15. Pinewood Academy (K-12) – 4490 Cornishon Ave.
16. Renaissance Academy (K-12) – 4490 Cornishon Ave
17. St. Bede the Venerable School (K-8) – 4524 Crown Ave.
18. Foothill Progressive Montessori (K-6) – 4526 Indianola Way
19. Flintridge Sacred Heart Academy (9-12, girls) – 440 St. Katherine Dr.
20. St. Francis High School (9-12, boys) – 200 Foothill

Preschools:
21. Child Educational Center – 140 Foothill Blvd.
22. Crescenta-Cañada Co-op Nursery School – 1700 Foothill Blvd.
23. Flintridge Montessori School – 1739 Foothill Blvd.
24. Foothill Progressive Montessori Preschool – 827 Houseman St.
25. Hogg's Hollow Preschool – 4490 Cornishon Ave.
26. La Cañada – Community Center Preschool – 4469 Chevy Chase Dr.
27. La Cañada Preschool – 4460 Oakwood Ave..
28. Lighted Window Preschool – 1200 Foothill Blvd.
29. Parents & Children's Nursery School – 4603 Indianola Way
30. St. George's Preschool – 4467 Commonwealth
31. Toddler University - 4490 Cornishon Ave.
32. La Cañada United Methodist Children's Center – 104 Berkshire Place

*All addresses are La Cañada Flintridge, CA 91011 unless otherwise specified.

La Cañada Flintridge Schools

1" = 1/2 mi

EXHIBIT 8

WILLDAN
Celebrating 50 years of service

June 24, 2015

Mr. Adrian Guerra
Aleshire & Wynder, LLP
Attorneys At Law
2361 Rosecrans Avenue, Suite 475
El Segundo, CA 90245

Subject: SR-710 North Study Draft Environmental Impact Report/Environmental Impact Statement (March 2015) - Transportation-Related Comments

Dear Mr. Guerra:

Willdan Engineering (Willdan) has completed our review of the *SR-710 North Study, Draft Environmental Impact Report/Environmental Impact Statement and Draft Section 4(f) Di Minimis Findings* (DEIR/EIS), dated March 2015, and prepared by State of California Department of Transportation (Caltrans) and Los Angeles County Metropolitan Transportation Agency (Metro).

Our review focused on the traffic-related sections of the DEIR/EIS and found that there are a number of deficiencies that affect the traffic analysis and conclusions. This letter summarizes our findings and notes the impacts of the deficiencies on the City of La Cañada Flintridge. The traffic-related deficiencies in the DEIR/EIS and its *Transportation Technical Report* are presented and discussed below.

1. ***The traffic volumes upon which the traffic analysis is based are not reliable nor valid, particularly those related to the freeway tunnel alternatives, rendering the traffic study inadequate.***

   a. *The study underestimates the project-related increase in vehicular traffic volumes and vehicle miles travelled (VMT) by not accounting for induced travel demand.*

      The transportation planning community recognizes that a project that increases roadway capacity and reduces travel time induces travel on the new facility. Although the *Transportation Technical Report* assumes that the project would induce travel related to the freeway tunnel alternatives, it does not appear to include the typical one-to-one relationship that exists between roadway capacity and vehicle travel. The result is an underestimation of the future traffic volumes. Vehicular traffic volumes are the key element used to determine the level of service (LOS) at which an intersection or roadway segment would operate during the peak hours. Basically, the traffic volumes are compared to the maximum traffic volumes the intersection can handle (capacity).

      For this study, the *Highway Capacity Manual* (HCM) methodology was used to determine the LOS. The LOS is provided in average seconds of delay per vehicle that would be experienced by motorists traversing the intersection. The delay is given letter grades for ease of comparison, ranging from LOS A (no delay) to LOS F (gridlock conditions). The table below shows how the seconds of delay per vehicle translate into LOS.

LOS	HCM Delay (secs/veh)
A	≤ 10.0
B	> 10.0 to 20.0
C	> 20.0 to 35.0
D	> 35.0 to 55.0
E	> 55.0 to 80.0
F	> 80.0

The traffic volumes are one of the primary foundations upon which the level of service analysis and traffic study findings are based. There is a direct correlation between the projected vehicular traffic volumes and the anticipated LOS, in that as traffic increases, so does the delay. <u>If the future traffic volumes are underestimated, the future LOS would appear to be better than it would actually be.</u>

b. *Over half of the validation metrics for the SR-710 North travel demand model provided in Table 3-2 are outside of the recommended ranges.*

Traffic-related validation statistics for the SR-710 North travel model are provided in the study in Table 3-2. The study, as well as the Federal Highway Administration (FHWA) *Travel Model Validation and Reasonableness Checking Manual*, dated 2010, which is referenced in the study, make it clear that measures used to validate models are not "pass/fail". Failing to meet a guideline does not mean that the model is invalid. The validity of the model is based on several factors, which must all be considered.

The study concludes that the travel demand model is "well-validated" regarding forecast traffic volumes. Our review of the validation statistics, however, indicated that many of the guidelines were not met, collectively indicating that the model is not valid.

Table 3-2, shown on the next page, includes the metrics of Count to volume ratio, %RMSE, R^2 and the Percent of count locations within the accepted Caltrans deviation. In the Count to Model Volume Comparison, 5 out of the 9 values are outside of the guidelines. For the %RMSE, 1 of the 3 values are outside of the guidelines. All of the R^2 values are within the target, however, as was pointed out, this metric does not mean much, particularly on its own. For the percent of links within Caltrans Standard Deviation, 2 of the 3 values are greater than the target deviation.

Therefore, as shown in Table 3-2, more than half (8 of 15) of the values of the meaningful metrics are outside of the target ranges/values.

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TABLE 3-2
Aggregate Highway Model Validation Statistics in Study Area
SR 710 North Study, Los Angeles County, California

Agency Guidance	AM Period	PM Period	ADT
SR 710 North Model – Count to Model Volume Comparison			
Caltrans and FHWA Guidance:			
Freeways +/- 7%	3%	5%	14%
Major Arterials +/- 10%	14%	-14%	14%
Minor Arterials +/- 15%	9%	-26%	4%
SR 710 North Model – RMSE			
Caltrans and FHWA Guidance:			
FHWA <40 for Periods, <30 Daily			
Caltrans < 40			
%RMSE	39	34	42
SR 710 North Model – R^2			
Caltrans and FHWA Guidance:			
R2 (Target >=0.88)	0.94	0.95	0.96
SR 710 North Model – % of Links within Caltrans Standard Deviation			
Caltrans Guidance:			
% of Links within Caltrans Standard Deviations (Target >=0.75)	74%	81%	57%

Caltrans criteria are from *Travel Forecasting Guidelines* (Caltrans, 1992).
FHWA criteria were obtained from *Model Validation and Reasonableness Checking Manual* (FHWA, 2010).

Another area of concern is the scatter plots, which were not mentioned in Section 3 of the TTR. Scatter plots comparing the model-generated segment traffic volumes to the counted volumes, for overall AM, PM and daily time periods are provided in Appendix A, Model Validation Report, of the TTR in Figures 6-1 through 6-3. These scatter plots include the freeway volumes, ramp volumes and arterial street volumes. Figures 6-4 through 6-6 limit the scatter plots to the arterial streets. According to the scatter plots, the model overestimates the AM peak hour and daily volumes, but underestimates the PM peak hour volumes. The report provides estimates of the over/under-predicted volumes for the overall scatter plots in Figures 6-1 through 6-3, but does not provide the scatter plots for the arterial streets in Figures 6-4 through 6-6. The report says that, overall, the PM peak hour volumes are under-predicted by about 5%. A visual review of the PM Count vs. Model Volume in Figure 6-5, on the next page, indicates that the PM volumes are also under-predicted for the arterial streets, but at a much larger percentage since the vast majority of the counts are below the line that indicates the volumes are equal.

Figure 6-5 indicates that the traffic volumes used for the PM peak hour intersection LOS analysis could be very low compared to what they should be. The resulting analysis would indicate much better LOS than there actually would be.

To summarize, a large number of the metrics used to validate the traffic volumes generated by the traffic model are outside of the acceptable ranges and seriously bring into question the validity of the model and volumes. Since these model-generated volumes are the foundation of the traffic analysis, the entire analysis and findings are not reliable. Further modifications to the model should be made to provide an acceptable traffic model.

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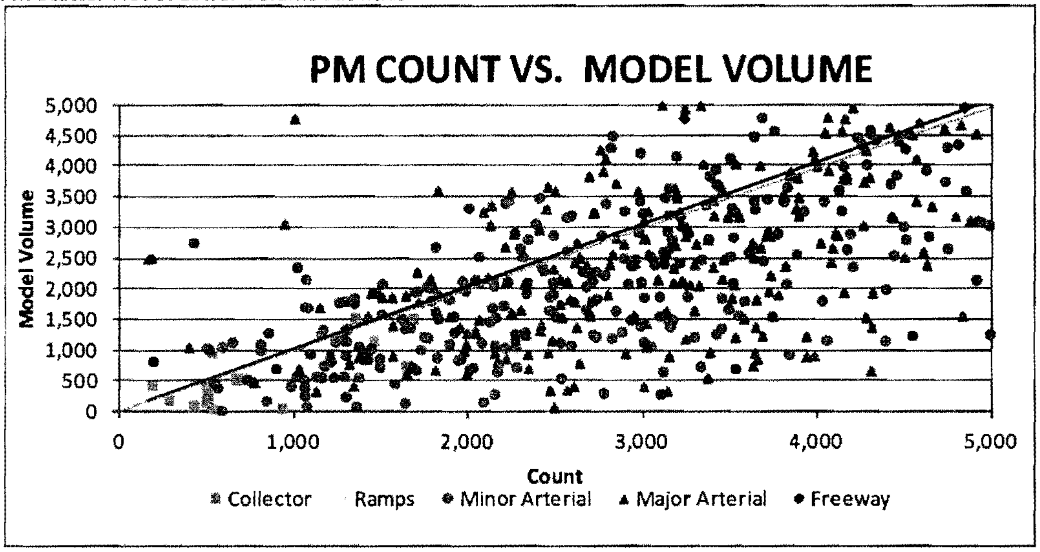
FIGURE 6-5
PM Scatter Plot of Lower Volume Facilities



<u>Effect on the City of La Cañada Flintridge</u>

This impact due to the underestimation of induced traffic particularly relates to the freeway tunnel alternatives. The City would be among the most negatively affected since the tunnels would already guide motorists to and from the I-210 west of the SR-710, as demonstrated by the freeway operations segment analysis (see item 4). With increased traffic using a tunnel, the freeway segments serving the City would have increased congestion and slower speeds. If the congestion was great enough, the tunnel alternative could also result in motorists using Foothill Boulevard to avoid using the freeway.

An invalid traffic model nullifies all of the analysis, study findings and conclusions. It renders the traffic study results, and any environmental studies based on it, useless.

2. ***Metro and Caltrans modified the criteria for identifying adverse effects for intersections from the standard practice followed in Los Angeles County in order to artificially and wrongfully reduce the projected impacts.***

The DEIR/EIS states that the adverse effects criteria used in the study were developed in cooperation with Caltrans and Metro. The criteria, however, are not consistent with Metro or Los Angeles County Department of Public Works (LACO DPW) requirements. The result is that intersections that would otherwise be identified as having an adverse effect due to the project, are found to have no adverse effect.

Page 3.5-4 of the DEIR/EIS lists the study criteria for determining adverse effects at study intersections. The adverse effect criteria used in this study for intersections are as follows:

There would be an adverse effect at an intersection if either of the following occurs:

- *The intersection is projected to operate at LOS E under a Build Alternative and the increase in delay over the No Build Alternative is 5 seconds or more; or*
- *The intersection is projected to operate at LOS F under a Build Alternative and the increase in delay over the No Build Alternative is 2 seconds or more.*

The LACO DPW and Metro adverse effects criteria are for the Intersection Capacity Utilization (ICU) methodology, which is different than the Highway Capacity Manual (HCM) intersection delay methodology used for this study. Federal, state and industry standards for significant impact thresholds for the HCM delay methodology do not currently exist. The thresholds for the ICU methodology can, however, be adapted for the HCM delay methodology, which the study preparers did. *The intersection delay thresholds used in the study, however, are not consistent with LACO DPW or Metro standard ICU thresholds. The inconsistencies are detailed in the paragraphs below.*

Most cities in Los Angeles County do not have their own guidelines for preparing a traffic impact study and follow the LACO DPW's *Traffic Impact Analysis Report Guidelines*, which include requirements for identifying a project's adverse effects on an intersection. The City's General Plan circulation element requirements are also applied, which typically have a goal of LOS C or LOS D for all intersections. Certain Cities allow intersections to operate at LOS E. The requirements that are typically used are the LACO DPW's, as shown below, with the City's added stipulation of a maximum LOS of C or D.

No Build LOS C: 4% or more of capacity (3.2 seconds for signalized, 2.0 seconds for unsignalized)

No Build LOS D: 2% or more of capacity (1.6 seconds for signalized, 1.0 seconds for unsignalized)

No Build LOSE/F: 1% or more of capacity (0.8 seconds for signalized, 0.5 seconds for unsignalized)

Metro's *Guidelines for CMP Transportation Impact Analysis*, state that "a significant impact occurs when the proposed project increases traffic demand by 2% of capacity, causing LOS F; if the facility is already LOS F a significant impact occurs when the proposed project increases traffic demand by 2% of capacity. The lead agency may apply a more stringent criteria if desired." Traffic studies in Los Angeles County are required to analyze CMP (Congestion Management Program) intersections based on the CMP requirements. Nine of the 156 study intersections are CMP intersections.

For the delay methodology, capacity is 80.0 seconds of delay for signalized intersections and 50.0 seconds of delay for unsignalized intersections. Based on these factors, the CMP criteria for the increases in traffic demand would be as follows when the Build Alternative is LOS F:

For signalized intersections

- No Build is LOS A – E: 1.6 seconds or more
- No Build is LOS F: 1.6 seconds or more

For unsignalized intersections

- No Build is LOS A – E: 1.0 seconds or more
- No Build is LOS F: 1.0 seconds or more

The City of Los Angeles Department of Transportation (LA DOT), has developed significant impact thresholds for the HCM delay methodology, apparently based on the LACO DPW requirements. The LA DOT thresholds, however, are based on percentages of the capacity, but not applied in a direct manner.

The significant impact criteria for LACO DPW, Metro, CMP, LA DOT and those used in the study are summarized in the table below. These only apply to signalized intersections.

Comparison of Significant Impact Thresholds

Agency/Source	Significant Impact Threshold (HCM) (ave secs of delay/veh)[1]			
	LOS C	LOS D	LOS E	LOS F
SR-710 North Study[2]	--	--	≥ 5	≥ 2
LACO DPW[3]	≥ 3.2	≥ 1.6	≥ 0.8	≥ 0.8
LACO Metro CMP[4]	--	--	≥ 1.6	≥ 1.6
LA DOT	≥ 6.0	≥ 4.0	≥ 2.5	≥ 2.5

[1] Project-related increase in HCM intersection delay, signifying a significant project impact, requiring mitigation.

[2] Values used in Study

[3] Cities typically modify this to a maximum of LOS C or D.

[4] Applied to CMP intersections only.

It is clear from the table above that the thresholds used in the study are far less restrictive than those for LACO DPW, Metro CMP and LA DOT. Applying LACO DPW's criteria to the report's Table 5-71, Opening Year Intersection Operations Summary Table, shows that 193 additional "new" intersections for the various Build Alternatives would require mitigation. Disregarding the various Build Alternatives, 38 additional intersections would require mitigation for one or more Build Alternatives, with 18 due to LOS C deficiencies and 20 due to LOS D deficiencies. If a City-related maximum LOS of C or D were applied, the numbers would be greater.

Applying LA DOT's criteria would not result in as many additional intersections requiring mitigation, but it would add 132 "new" intersections for the various Build Alternatives. Disregarding the various Build Alternatives, 21 additional intersections would require mitigation for one or more Build Alternatives, with 13 due to LOS C deficiencies and 8 due to LOS D deficiencies.

3. ***Caltrans did not follow its own criteria for identifying adverse effects for freeway segments in order to reduce the project impact.***

Freeway segments that would otherwise be identified as having an adverse effect due to the project, are found to not have an adverse effect and no mitigation is proposed.

Caltrans *Guidelines for the Preparation of Traffic Impact Studies, 2002*, uses Measures of Effectiveness (MOEs) rather than thresholds of significance. For freeway segments as well as intersections, the target MOE is between LOS C and LOS D, which means that the maximum is LOS C. If the Build Alternative LOS exceeds LOS C, it is to be mitigated back to LOS C. If the No Build Alternative is worse than LOS C (LOS D – F), then it is to be mitigated back to the existing LOS.

For this study, the adverse effect for a freeway segment is when:

- *The freeway segment is projected to operate at LOS F under a Build Alternative and the increase in traffic demand compared to the No Build Alternative is 2 percent or more.*

In other words, there is no attempt to meet the LOS C MOE. The result is that greater congestion is allowed on the affected freeways without any attempt to mitigate the increases.

Effect on the City of La Cañada Flintridge

The freeway segments serving the City, listed below, are currently operating at LOS C and would operate at LOS D with one or more Build Alternatives. None of them are included in the study as having an adverse effect due to the project. City residents and visitors would deal with noticeably greater congestion and slower speeds on the freeway serving the community.

Eastbound I-210

a. Ocean View on-ramp to SR-2 on-ramp
b. Angeles Crest Highway off-ramp to SB Angeles Crest Highway on-ramp
c. SB Angeles Crest Highway on-ramp to NB Angeles Crest Highway on-ramp
d. NB Angeles Crest Highway on-ramp to Gould off-ramp
e. Gould off-ramp to Foothill off-ramp
f. Foothill off-ramp to Berkshire off-ramp
g. Berkshire off-ramp to Berkshire on-ramp

Westbound I-210

a. Berkshire off-ramp to Berkshire on-ramp
b. Berkshire on-ramp to Foothill off-ramp
c. Foothill off-ramp to Gould on-ramp
d. Gould on-ramp to Angeles Crest Highway off-ramp
e. Angeles Crest Highway off-ramp to NB Angeles Crest Highway on-ramp
f. NB Angeles Crest Highway on-ramp to SB Angeles Crest Highway on-ramp
g. SB Angeles Crest Highway on-ramp to SR-2 off-ramp

The study includes a total of 30 freeway segments (each direction is considered a separate segment) serving the City. One of the remaining segments would operate at LOS F (see item 5) and the rest would continue to operate at LOS B, C or D.

4. ***The report is deficient regarding mitigation measures. It fails to provide a feasible mitigation measure for each traffic impact and it fails to show that the feasible mitigation measures would actually mitigate the traffic impacts.***

   CEQA requires that a feasible mitigation measure be provided for each identified significant impact created by the project. Accordingly, the following must be provided:

   a. Feasible mitigation measure(s)
   b. Proof that the mitigation measure(s) would actually mitigate the impact, by providing the LOS with the mitigation measure(s), compared to the LOS without the mitigation(s).

   In the DEIR/EIS, Tables 3.5.12 and 3.5.13, for intersections and freeway segments, respectively, summarize the adverse impacts by alternative. Regarding mitigation measures, these tables provide the following:

   a. "Potential Improvements" instead of mitigation measures.
   b. Some "potential improvements" are not well-defined.
   c. Whether or not each "potential improvement" is recommended. If not recommended, a reason is given, which *indicates* it is infeasible, but it *never states that it is infeasible*.
      i. In many cases, it is not clear if it is not recommended due to physical constraints or the cost of dealing with the physical constraints.
      ii. No other "potential improvement" is provided.
   d. Where a "potential improvement" is recommended, no proof is provided, either in the table or elsewhere, that the "potential improvement" would effectively mitigate the adverse impact. Proof would consist of providing and comparing the LOS for the with-mitigation and without mitigation conditions.

   Examples of these deficiencies are noted below:

   A. Table 3.5.12 (intersections), for Dual-Bore with No Tolls, No Trucks, Rosemead Blvd at Mission Rd:
      - Impact: *Increase the LOS from D to E during both the AM and PM peak hours*
      - Potential Improvement: *Add an eastbound left-turn lane, a northbound left-turn lane and an eastbound right-turn lane.*
      - Is Improvement Recommended?: *No, this improvement is not recommended for implementation because it would require one partial right-of-way acquisition from an adjacent business.*

      Example A illustrates where a "potential improvement" is not recommended, but not noted as being infeasible. It appears to be infeasible due to cost. Nor is proof provided that the "potential improvement" would effectively mitigate the impact.

B. Table 3.5.12 (intersections), for Dual-Bore with No Tolls, No Trucks, San Gabriel Blvd at Huntington Dr:

- Impact: *Increase the LOS from D to E during the PM peak hour*
- Potential Improvement: *Optimize the signal system.*
- Is Improvement Recommended?: *Yes, recommended for implementation.*

Example B illustrates where a "potential improvement" is not well-defined, nor is proof provided that the "potential improvement" would effectively mitigate the impact.

C. Table 3.5.13 (freeway segments), for Dual-Bore with No Tolls, No Trucks, I-710 southbound between the Third St off-ramp and the SR-60 on-ramp:

- Impact: *Increase the LOS from E to F during the AM peak hour*
- Potential Improvement: *Add a lane between the Third St off-ramp and the SR-60 off-ramp*
- Is Improvement Recommended?: *No, this improvement is not recommended for implementation due to secondary impacts from the major construction of one bridge structure*

Example C illustrates where a "potential improvement" is not recommended, but not noted as being infeasible. It is also not clear if it is infeasible due to cost or construction. Nor is proof provided that the "potential improvement" would effectively mitigate the impact.

D. Table 3.5.13 (freeway segments), for Dual-Bore with No Tolls, No Trucks, I-210 westbound between the Maclay Ave off-ramp and the Maclay Ave on-ramp:

- Impact: *Increase the LOS from E to F during the PM peak hour*
- Potential Improvement: *Active Traffic and Demand Management*
- Is Improvement Recommended?: *Yes, recommended for implementation.*

Example D illustrates where a "potential improvement" is not well-defined, nor is proof provided that the "potential improvement" would effectively mitigate the impact.

Effect on the City of La Cañada Flintridge

Based on the study's current analysis, one segment in the vicinity of the City, the I-210 eastbound between the La Crescenta Avenue on-ramp and the Ocean View Boulevard off-ramp, would have an adverse effect due to the project for three of the freeway tunnel alternatives. The segment would operate at LOS F during the AM peak hour under all project alternatives and at LOS C or D during the PM peak hour. It currently operates at LOS F during the AM peak hour and at LOS C during the PM peak hour. The potential improvement is to add a lane to the freeway between the two ramps. The improvement is not recommended, however, *due to secondary impacts due to major construction of two tie-back walls at the Ramsdell and Rosemont overcrossings, and a retaining wall along the span of Mayfield Avenue.* No feasible mitigation measures are proposed. The analysis indicates that depending on the tunnel alternative, the AM peak hour eastbound freeway traffic would increase as much as 4.6%, causing City residents and visitors to deal with greater congestion and slower traffic without mitigation.

5. ***The study area is too limited to fully account for all of the projects' impacts on the area circulation system.***

   The project study area does not extend far enough to include all of the freeway segments that would be impacted by the project. In particular, the freeway tunnel alternatives will impact traffic on the I-5 freeway south of the I-210 freeway and the connecting freeways. Other sections of the area freeways would also be impacted as regional travel patterns are modified by the project.

In summary, there are five key traffic-related deficiencies in the SR-710 North Study DEIR/EIS: the traffic volume data is invalid, criteria for evaluating the project's traffic impacts are not consistent with County and Metro standards, many of the mitigation measures are infeasible and they all are unproven, and the study area is too small. Each of these deficiencies on its own casts doubt on the study's findings, particularly for the freeway tunnel alternatives. Taken together, they invalidate the results of the traffic study.

We appreciate this opportunity to be of service. Should you have any questions regarding this letter, please contact me at (657) 223-8525 (new phone number).

Respectfully submitted,

WILLDAN ENGINEERING

Ruth M. Smith

Ruth Smith, TE, PTP
Project Manager

Copy: Mark Steres
Ann Wilson

CITY of LAGUNA NIGUEL
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January 28, 2016

Mr. Hasan Ikhrata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017-3435

RE: City of Laguna Niguel Comments on Draft 2016-2040 Regional Transportation Plan Prepared by SCAG

Dear Mr. Ikhrata:

I would like to thank you for the opportunity to comment on the Southern California Association of Governments (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and the associated Program Environmental Impact Report.

The draft 2016 RTP/SCS and PEIR is a tremendous undertaking. I am also aware that City of Laguna Niguel staff provided input on the land use assumptions as part of this process.

I recently reviewed the comments submitted by the Orange County Council of Government (OCCOG) in association with a number of cities, including our neighboring City of Mission Viejo, and I, as an individual Council Member, would like to express my concurrence with their findings.

I appreciate SCAG's efforts in developing a plan that is critical to the region's ability to receive federal funding for transportation projects, improve mobility, support sustainable development, operate and maintain the transportation system, and meet the region's greenhouse gas emission reduction targets and other air quality standards.

Please feel free to contact me at (949) 362-4315 if you have any questions.

Sincerely,

Fred Minagar

Fred Minagar, MS, RCE, PE, MASCE, FITE
Council Member

cc: Laguna Niguel City Council
City Manager

CITY OF LAKE FOREST

CITY OF LAKE FOREST
DECEMBER 20, 1991

Mayor
Andrew Hamilton

Mayor Pro Tem
Scott Voigts

Council Members
Dr. Jim Gardner
Adam Nick
Dwight Robinson

City Manager
Robert C. Dunek

February 1, 2016

Ms. Lijin Sun, Senior Regional Planner
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017-3435

RE: 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy

Dear Ms. Sun:

Thank you for the opportunity to comment on the 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS).

We appreciate the ongoing coordination on the growth forecast between SCAG and the Center for Demographic Research (CDR) at California State University, Fullerton to ensure that the 2014 Orange County Projections (OCP) and its updates were included in the 2016 RTP/SCS. In addition, we appreciate that all entitlements, development agreements, and projects recently completed or under construction, as provided to you in our July 10, 2015 correspondence, were properly reflected in the 2016 RTP/SCS growth forecast.

Again thank you for the opportunity to comment, and we look forward to working with SCAG and CDR on any future growth forecast needs.

Sincerely,

Gayle Ackerman nw

Gayle Ackerman, AICP
Director of Development Services

City of Los Angeles

CALIFORNIA

ERIC GARCETTI
MAYOR

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INFORMATION
http://planning.lacity.org

January 20, 2016

Ms. Hasan Ikhrata
Southern California Association of Governments
818 W. Seventh St., 12th Floor
Los Angeles, CA 90017

Dear Mr. Ikhrata:

DRAFT 2016-2040 REGIONAL TRANSPORTATION PLAN/SUSTAINABLE COMMUNITIES STRATEGY

The purpose of this letter is to provide comments from the City of Los Angeles Department of City Planning (DCP) regarding the Draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). DCP very much appreciates the collaborative relationship with SCAG in developing this plan, which included extensive cooperation from your staff on the integrated growth forecast and understanding the City's land use plans and programs.
The Department has identified the following issues and recommends changes to the plan in order to better address the regional challenges faced in Southern California:

1. Include a greater emphasis on housing affordability as a key strategy to achieving plan goals;
2. Provide greater clarity in the discussion of gentrification and displacement
3. Provide greater clarity in terms of how local jurisdictions are to determine SCS Consistency of a given project

1. Include a greater emphasis on housing affordability as a key strategy to achieving plan goals

Given the severity of the housing affordability crisis faced by the region, and the direct impact unaffordability has on Plan goals such as mobility, air quality and economic well-being, the City of Los Angeles expected the housing topic to receive a higher overall profile throughout the report. When the topic was addressed in detail, it often did so in ways that may inadvertently be counter-productive to many of the Plan's goals.

SB 375, which established the requirement to create a sustainable communities strategy, is meant to better coordinate planning for transit and housing. Planning for housing is one of the primary purposes of the SCS. Three of the eight statutory requirements in Health and Safety Sec. 65080 (b)(2)(B) involve housing, including a consideration of the state housing goals and the identification of areas within the region sufficient to house "all the population of the region, including all economic segments of the population" as well as "an eight-year projection of the regional housing need for the region."

It is not clear in the Plan how or where these housing-related requirements would be satisfied. The 2016 RTP/SCS acknowledges that the region only built 10% of the housing necessary for those with low incomes during the previous period and missed its targets for above moderate income households as well. The 8-year regional housing needs assessment for the SCAG region is for 412,000 new housing units, more than 270,000 of which are supposed to be affordable for those with moderate income or less. The SCS should help answer how and where the region should grow to ensure the housing needs of more are met and lead on the hard policy choices that need to be made around housing, particularly in this time of limited public funding.

Examples of an overall lack of focus on housing affordability includes:

- The list of nine 2016 RTP/SCS Goals (pg. 60) does not mention housing.
- The sections titled "What Will We Accomplish" and "How Will We Ensure Success" in the Executive Summary (pg. 8 and 9) do not mention any housing related goals.
- There is little discussion of how unaffordability undermines the goals of the RTP/SCS, including suburban sprawl, longer job commutes, higher vehicles mile travelled and greenhouse gas emissions, etc. While the Plan contains a statement that transit investments and strategies will be most effective if "coordinated with land use strategies such as TOD and providing affordable housing" (pg. 92), this discussion should occur earlier in the document and be expanded.
- The scale of the housing problem is not adequately addressed. For example, under the "Challenges We Face" section (pg. 3 - Executive Summary), the Plan summarizes the region's housing problems simply as: "Housing prices are increasing: Housing prices are rising steadily and affordability is declining…" This language simply fails to capture the magnitude of the crisis facing the region. The Los Angeles metro area not only has the lowest affordability rate in the country, but no area of the country has ever seen incomes and housing costs so out of whack as they are today in Los Angeles. When taking into account the high cost of housing, LA County has been recently identified as having the highest effective poverty rates in the State[1].
- The section titled "Our Progress Since 2012" does not mention the progress towards meeting the region's housing needs as expressed through the required Regional Housing Need Assessment (RHNA) allocation. Nor does it describe how past residential growth trends met prior goals. These are two of the primary components of the Sustainable Communities Strategy (per 65080 (b)(2)(B). State legislation around housing funding is mentioned, but not other significant laws such as AB 2222 (2014) and AB 744 (2015).

2. Provide greater clarity in the discussion of gentrification and displacement

Demographic change is an important contributor to regional land use outcomes and equity concerns. The Department appreciates the Plan's interest and concern for the issues of gentrification and displacement, particularly in relation to areas around transit stations (e.g. pgs. 12, 54, 69,), and is grateful for the amount of data and research devoted to this complicated subject. We also agree with the assessment that jurisdictions need to be sensitive to this topic and work to employ strategies that mitigate potential negative impacts on communities.

Unfortunately, some of the discussion and conclusions on these topics, as presently worded, could be misconstrued or cause confusion about intended policy objectives, and potentially result in less housing affordability. Given the importance of the topic, the Department requests that the sections below be reconsidered.

- The definition of "displacement" in the Glossary may be partially responsible for potential confusion. The definition appears to refer only to a process that "drives out" existing

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[1] http://www.ppic.org/main/publication_show.asp?i=261

residents and businesses. It does not include the (much more common) process whereby lower income residents become unable to access properties in certain areas due to increasing housing prices (often referred to as "exclusionary displacement"). This limited definition influences the discussion of the process and strategies to respond.

- There is an apparent disconnect between the evidence on gentrification presented in the Plan and some of the claims being made. The detailed study in the Environmental Justice Appendix found "no statistical significance" in the difference of demographic change occurring in transit-oriented areas of the SCAG region versus outside them. Despite this lack of evidence, the Plan often discusses new investment in transit-oriented communities as a cause for rising home prices and displacement (pgs. 3, 55, 163). This language needs to be carefully worded to avoid inadvertently undermining transit-oriented investment (such as transit infrastructure and housing) that is complementary to the Plan's objectives.
- The Environmental Justice Appendix relies on a variety of indicators to evaluate various equity issues in relation to Plan objectives like growth in transit-oriented communities (jobs-housing balance, median income, median rents, Hispanic population, etc.) We'd suggest adding some additional factors that are worthy of analysis and monitoring. These include cost burdens for renters and owners, transportation costs, the price of single-family homes versus condos and including Black and Asian households (in addition to Hispanic) in this metric.

3. Provide greater clarity on how local jurisdictions are to determine SCS Consistency of a given project

Increasingly, important areas of State land use and environmental policy are requiring a determination of "SCS consistency." Examples include the recent CEQA streamlining efforts mentioned in the Plan but also Cap and Trade mitigation funding, Enhanced Infrastructure Finance Districts and, analyzing greenhouse gases for CEQA purposes. The ability for a local jurisdiction to be able to accurately and efficiently establish whether a project, plan or program is consistent with the SCS has therefore gained prominence.

The current RTP/SCS is a high-level planning document that sets out transportation policies for the region, but does not provide specific policies for local agencies to use in advancing land use strategies. To the limited extent SCS consistency is discussed in the Plan, is the statement that "lead agencies such as local jurisdictions have the sole discretion in determining a local project's consistency with the 2016 RTP/SCS" (for example, pg. 65 and throughout the SCS Background Documentation Appendix). This statement, unfortunately, does not provide much direction or clarity as to how local jurisdictions, or anyone else, should evaluate consistency with the SCS.

SCS consistency is an emerging area of state law without many precedents or interpretations. Other MPOs have provided guidance in their Plans, as well as separate consistency checklists, for their local jurisdictions. The current draft 2016 RTP/SCS offers insufficient information on which to base sound decisions. An unintended result is that projects, plans and programs in the SCAG region could be at a disadvantage with other regions.

As an example, SB 375 references project consistency (for Transit Priority Projects using CEQA streamlining) as whether or not the project matches the "general use designation, density, building intensity, and applicable policies specified for the project area in the SCS." We believe there are several issues associated with the Plan that make this task very difficult for local jurisdictions.

1) In order for a local jurisdiction to claim SCS consistency, it should be shown that a project or plan is in line with the "applicable policies" mentioned in the Plan. While six Land Use Strategies are presented in Chapter 5, the Plan does not clearly identify local policies that could advance its Policy Goals. Policies can be inferred from the Plan's text, but nowhere are they specifically identified or described. Although SB 375 does not empower SCAG to

impose its land use strategies or policies on its member local jurisdictions, SCAG can suggest or recommend the sorts of local policies that would advance the six Land Use Strategies at the local level. This would be useful to the city in its effort to promote the RTP/SCS's vision and benefit from the opportunities established under state law. As such, the utility of the 2016 RTP/SCS Land Use Strategies would be substantially improved by adding a discussion of "Supportive Local Policies" to the discussion of each in Ch. 5.

2) Within the 2016 RTP/SCS, two new concepts are introduced around the idea of creating "complete communities." They are "Livable Corridors," and "Neighborhood Mobility Areas." The discussion of Livable Corridors beginning on page 74 (Chapter 5) is an example of insufficient policy guidance. It states that "The Livable Corridor Strategy *specifically advises* local jurisdictions to plan and zone for increased density at key nodes along the corridor and replacement of single-story under-performing strip retail with well-designed higher density housing and employment centers." (emphasis added) Similarly, the discussion of Neighborhood Mobility Areas that follows states that: "The Neighborhood Mobility Areas strategy represents *a set of state and local policies* to encourage the use of active and other non-automotive modes of transportation, particularly for shorts trips in many suburban areas..." (emphasis added). Unfortunately, the Department does not see that any such advice is actually provided, nor are any state and local policies identified in the RTP/SCS. Further, there are no maps nor figures in the RTP/SCS that identify Livable Corridors or Neighborhood Mobility Areas. Without maps, the city cannot readily determine where Livable Corridors or Neighborhood Mobility Areas are located (or should be located) within its jurisdiction, limiting its ability to apply these strategies. Exhibits to illustrate the general locations of Livable Corridors and Neighborhood Mobility Areas would be helpful.

3) Although not explicit in the RTP/SCS, the City of Los Angeles understands the 2040 "Forecasted Regional Development Types" maps" found in the Background Documentation Appendix (Exhibits 1-33) are to be used in determining whether a project is consistent with the SCS. There are 2012 (baseline) and 2040 (proposed plan) maps for each geographic subregion. A SCS consistency argument for a project should show that a project or plan is aligned with the general use category and density and intensity shown on the 2040 maps. Unfortunately, the Development Type maps for the City of Los Angeles (Exhibit 13 and 14) are presented at such a scale to make them largely illegible from a user's perspective. It simply is not possible to make an accurate determination in what color (i.e. Development Type designation) a given site in the City is located within. As such, the City respectfully requests the following:

   a. The Development Type maps shown for the City of Los Angeles (and perhaps any other geography of a similar large scale) should be broken up into zoomed-in sub-regional quadrants, or at least be made available to local jurisdictions that request them.
   b. Development Type maps should contain additional information such as major streets and transit lines to help orient users.
   c. Even when the correct Development Type can be understood for a given parcel, it is unclear how exactly to interpret such information as to general use, density and intensity. There does not appear to be a guide that translates the three Development Types (Urban, Compact, Standard) into use categories or density and intensity ranges. As far as we can tell, there is only a paragraph description of each of these critical SCS designations (pg. 20 of the Plan). Through use of the Scenario Planning Model, Place Types are the foundation of the forecasted Development Types maps. Place Types do have uses, densities and intensities expressed in a usable manner in the Plan, however local jurisdictions don't have ready access to the information. Therefore, background data on Development Type, including the underlying Place Type should be provided to local jurisdictions

that request it. The information would remain advisory in nature, but could be helpful in supporting a SCS consistency analysis in many critical instances. In addition, more information to translate the three Development Type categories into use categories or density and intensity ranges.

d. It is unclear how gradations between each Development Type category should be treated (e.g. the orange color between Urban red and Compact yellow). The gradations effectively create five Development Type categories, two of which are completely undefined.

4) The footnote at the bottom of each Development Type map in the SCS Background Documentation Appendix (Exhibits 1-3) raises several questions and concerns.

   a. One sentence in the footnote says "Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS." While the Department understands the meaning, this sentence could be read as meaning that the Development Type maps, which are based on the TAZ level data, should not be used as part of establishing SCS consistency. When combined with a lack of other direction in the Plan, the phrase may raise unnecessary confusion.

   b. Another sentence in the footnote says "For the purpose of determining consistency for California Environmental Quality Act (CEQA) streamlining, lead agencies have the sole discretion in determining a local project's consistency with the 2016 RTP/SCS." This sentence should be broadened to include the increasingly diverse areas of state policy that references SCS consistency.

5) The 2016 RTP/SCS Plan appears to use three different terms to refer to the same thing. The Plan uses the term "Development Category", to refer to the Urban Compact and Standard designations, while the SCS Background Documentation Appendix uses the terms "Development Type" on the maps and "Land Development Category." This should be reconciled to avoid confusion.

6) To address many of these concerns, SCAG could create a "SCS Consistency" section of the plan. Key factors should include means to interpret consistency with Development Type maps, a list of key GHG-related policies, a list of relevant SCS EIR GHG mitigation measures, and quantitative analysis that a project does not conflict with the GHG reduction target with the county or region where relevant. Other metropolitan planning organizations have created "SCS Consistency Checklists" and other more helpful information to guide decision-makers.

Thank you for this opportunity to provide comments. If you have any questions or would like additional information, please contact Matthew Glesne at (213) 978-2666 or by email at Matthew.Glesne@lacity.org.

Sincerely,

for Ken Bernstein

MICHAEL J. LOGRANDE
Director of Planning

CITY OF LOS ANGELES

CALIFORNIA

Seleta J. Reynolds
GENERAL MANAGER

ERIC GARCETTI
MAYOR

DEPARTMENT OF TRANSPORTATION
100 South Main Street, 10th Floor
Los Angeles, California 90012
(213) 972-8470
FAX (213) 972-8410

February 11, 2016

Hasan Ikhrata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017

Re: Draft 2016 Regional Transportation Plan / Sustainable Communities Strategy

Dear Mr. Ikhrata:

The City of Los Angeles appreciates the opportunity to review and comment on the Southern California Association of Governments' (SCAG) Draft 2016 Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS). SCAG is to be commended for an unprecedented multi-year effort to develop the 2016 RTP/SCS, which included extensive outreach to the City as well as the region. The development of the RTP/SCS is an outstanding effort led by SCAG technical staff. The City recognizes that the RTP/SCS is critical to the region's ability to improve mobility, support sustainable development, receive federal funding for transportation projects, meet the region's greenhouse gas emission reduction targets, and operate and maintain the transportation system. Included in the multi-modal options described in the plan is a commendable emphasis on walkable neighborhoods and bicycle networks.

After careful review of the draft RTP/SCS, the departments of Transportation, Airports and City Planning have provided comments that clarify the City's position regarding, and request modifications to, certain areas of the RTP/SCS. Accordingly, the Los Angeles Department of Transportation (LADOT) prepared the attached report to the City Council that includes comments on the draft 2016 RTP/SCS by all three City departments. The Los Angeles City Council, on February 9, 2016, adopted the attached report, as amended, as the City's comments on the draft 2016 RTP/SCS.

We look forward to working with SCAG staff to substantially incorporate into the RTP/SCS those elements of the City's comments that are directed to the content of the 2016 RTP/SCS. After review of the attached comments, please contact Miles Mitchell of my staff at (213) 972-8475 for further discussions regarding LADOT's comments, and Claire Bowin or Matthew Glesne regarding comments from the Department of City Planning. We look forward to a continued mutually beneficial collaboration between the City and SCAG as we address future regional challenges and opportunities.

Sincerely,

Seleta J. Reynolds
General Manager

Enclosure

c: Borja Leon, Mayor's Office
Sharon Tso, Chief Legislative Analyst
City Planning Department
Los Angeles World Airports
Port of Los Angeles

FORM GEN. 160 (Rev. 6-80)

CITY OF LOS ANGELES

INTER-DEPARTMENTAL CORRESPONDENCE

Date: January 20, 2016

To: The Honorable City Council, City of Los Angeles
c/o City Clerk, Room 395, City Hall
Attention: Honorable Mike Bonin, Chair, Transportation Committee
Attention: Honorable Jose Huizar, Chair, PLUM Committee

From: Seleta J. Reynolds, General Manager
Department of Transportation

Subject: **DRAFT 2016 REGIONAL TRANSPORTATION PLAN / SUSTAINABLE COMMUNITIES STRATEGY**

Summary

This report recommends that the City Council authorize the Los Angeles Department of Transportation (LADOT) to submit comments on behalf of the City of Los Angeles to the Southern California Association of Governments (SCAG) on the draft 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS).

Recommendations

1) APROVE the comments provided in this report as the City of Los Angeles' comments to the SCAG draft 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS).

2) DIRECT LADOT to transmit comments to SCAG that are substantially consistent with those contained in this report, including the attached comments from other departments.

3) DIRECT LADOT to work with SCAG to incorporate the comments into the final RTP/SCS and related Program Environmental Impact Report (PEIR).

Background

Every four years the Southern California Association of Governments (SCAG) prepares a Regional Transportation Plan (RTP) for the six-county region. The 2016 RTP/SCS includes planned transportation projects and demographic projections through the year 2040. The plan presents a strategy for the investment of $556.5 billion in the region's transportation system between 2016 and 2040 and for a Sustainable Communities Strategy (SCS) for the six-county region.

As required by SB 375, the SCS focuses on reducing greenhouse gas (GHG) emissions from cars and light trucks by means of several strategies, including integration of land use and transportation planning, transit system expansion, and transportation demand management (TDM). The California Air Resources Board (CARB) established regional GHG emission reduction goals of eight percent per capita by 2020 and thirteen percent per capita by 2040, compared with 2005 levels. SCAG's analysis indicates that the draft RTP/SCS would achieve the 2020 target, and would exceed the 2040 target with a GHG emission reduction of twenty-two percent.

According to SCAG's analysis and modeling, the draft RTP/SCS also meets the federal conformity requirements for air quality. It is important to note that reducing GHG emissions is not required for achieving air quality conformity. Therefore, although many of the strategies that achieve air quality conformity also assist with GHG emission reductions, the two analyses are generally independent of each other.

A Regional Transportation Plan (RTP) also requires that there be reasonably available funding sources. The RTP proposes expenditures of $556.5 billion, and SCAG states that without new revenue sources the RTP faces a funding shortfall of approximately $200.4 billion. Various means to make up the shortfall are identified as being reasonably available. The RTP suggests that $130.8 billion of the shortfall could be addressed by action at the State or Federal level to adjust gas excise tax rates over the short-term and replacement of gas taxes over the long-term with mileage based user fees. Specifically, the RTP assumes an additional $0.10 per gallon gasoline tax imposed at the State and the Federal levels starting in 2020 to 2024 to maintain purchasing power. The RTP states the State and Federal government could then replace the gas tax with an indexed mileage-based user fee of about $0.04 per mile beginning in 2025. If the mileage-based fee is not implemented, then there would be a need to further increase fuel taxes to generate the revenues that would have been created by the mileage-based user fee. Although these revenue sources depend primarily on State and/or Federal action, they deserve further discussion within the City as the implementation year of 2020 approaches.

SCAG is to be commended for a multi-year effort to develop the 2016 RTP/SCS, including an extensive outreach effort. The passage of SB 375 has required a continuing public education campaign including outreach to cities, environmental, public health and business groups. SCAG has recently conducted a series of periodic workshops across the region, which included preparation of in-depth graphic and narrative presentation materials. The City appreciates the outstanding outreach effort, both to the City itself and across the region.

In accordance with past practice, LADOT has reviewed the draft 2016 RTP/SCS and compiled proposed comments to SCAG. In addition, LADOT has coordinated the preparation of these comments on the RTP/SCS with other City departments that are most impacted by the RTP. LADOT appreciates the cooperation of the departments of Los Angeles World Airports (LAWA) and City Planning each of which have provided attached comments. The Port of LA has indicated that it will be providing comments under separate cover to SCAG. The Metro staff report containing technical comments on the RTP/SCS is attached as Attachment A, for information purposes only.

Discussion of Policy Concerns and Comments

LADOT has identified areas of concern with regard to the draft 2016 RTP/SCS, which was released for public comment on December 4, 2015.

LADOT has comments and concerns in the following areas:

<u>Project List for RTP/SCS</u>

The RTP includes an extensive project list. As stated in the Project List appendix, the list is divided into three primary sections, as follows: 1) The Federal Transportation Improvement Program (FTIP), which forms the foundation of the RTP project investment strategy and represents the first six years of already committed funding; 2) the Financially Constrained list of projects not included in the FTIP but which have "reasonably available" funding; and 3) Strategic Plan projects representing an unconstrained list of potential projects that the region would pursue given additional funding and commitment.

As with past RTP cycles, LADOT has reviewed all three project lists. As a result of this review, several needed additions and/or revisions to the FTIP and Financially Constrained lists have been identified. The corrections, largely technical in nature, will be provided to SCAG under separate cover.

Regarding the Strategic Plan list, since the approval of the 2012 RTP, the City of Los Angeles has adopted significant mobility-related policy directives aimed at creating a safer and more sustainable City with convenient mobility choices for all users of the transportation system. Namely, Mobility Plan 2035, the Great Streets Initiative, Great Streets for Los Angeles - LADOT Strategic Plan, and the Vision Zero Initiative have been released or adopted since the last RTP cycle. Also, in April 2015, Mayor Eric Garcetti released the City's first ever sustainability plan – the Sustainable City pLAn. The Plan includes mobility and environmental targets including GHG reduction goals (60% reduction by 2035), VMT-per-capita reduction goals (10% reduction by 2035) and mode share targets (50% of all trips by walk, bike or transit by 2035). Together with SCAG's continued leadership at the regional level, these local plans and initiatives will help achieve the goal of a truly sustainable transportation future.

Working with Metro on the update of the Long Range Transportation Plan (last adopted in 2009), the City of Los Angeles has developed a comprehensive list of projects that include rail, transit, shared-use mobility, active transportation, first/last mile solutions, goods movement, and highway and freeway improvements. Collectively, these projects are expected to enhance safety, mobility and accessibility for all transportation users, while helping to achieve the goals of the Sustainable City pLAn. These projects should be included in the RTP Strategic Plan, pending further refinement and funding availability. Inclusion in the Strategic Plan does not obligate the City to implement the projects, but facilitates further consideration of the projects. The project descriptions will be provided to SCAG under separate cover for inclusion in the Strategic Plan.

Eligibility for Funding based upon Consistency with the Sustainable Communities Strategy (SCS)

Consistency with the SCS has recently been a key requirement, and will likely become more so, for proposed affordable housing and other projects to receive State funding. For example, the recent Affordable Housing & Sustainable Communities (AHSC) grants required consistency with the SCS. It is likely that in the future consistency with the SCS for funding opportunities will also apply to certain types of proposed transportation projects. Accordingly, the City requests that the RTP/SCS include language that states that SCS "consistency" for funding and other incentives will be determined using data approved by the local jurisdictions for such purposes. The objective of this comment is that only SCS data that the City has reviewed and approved shall be utilized.

Inserting such language into the SCS is particularly important given the magnitude of funding likely to be available that is linked to consistency with the SCS. It is anticipated that billions of dollars in Cap and Trade funding will be available statewide over the next several years for programs and projects that are consistent with the SCS, pursuant to the goals of AB 32 and SB 375. In addition, other recent laws, including SB 628 pertaining to Enhanced Infrastructure Financing Districts (EIFDs), are also linked to implementation of the SCS. The City wishes to meet the threshold requirements and effectively compete for these types of funding programs and qualify for these incentives.

The Scenario Planning Model of the SCS is based on modeling several datasets, including Tier Two Traffic Analysis Zone (TAZ) demographic data, and Tier Three Scenario Planning Zone (SPZ) land use place types. For the City, there are approximately 2,000 TAZs and 25,000 SPZ place types (about a 1:12 ratio). Each of the 25,000 SPZs is assigned one of 35 possible place types for modeling purposes. The City Planning staff has reviewed the 2,000 TAZ dataset for the City's projected population, housing and employment through 2040, but has not reviewed or approved either the SPZ methodology or actual place type maps for the City. It should also be noted that the Tier 3 SPZ data and place type maps have not been reviewed by staff of SCAG's fifteen subregions.

Therefore, the City requests that language substantially similar to the following be inserted into both the appropriate maps and text of the Background Documentation appendix of the SCS:

> "For purposes of qualifying for future funding opportunities and/or other incentive programs, advisory sub-jurisdictional data used to determine consistency with the Sustainable Communities Strategy should only be used at the discretion and with the approval of the local jurisdiction. Sub-jurisdictional data includes, but is not limited to, the Tier 2 Traffic Analysis Zone (TAZ) dataset and the Tier 3 Scenario Planning Zone (SPZ) data and maps."

Comments from Other City Departments

Los Angeles World Airports (LAWA)
LAWA has provided supportive comments regarding the 2016 RTP/SCS planning process, including SCAG's modeling of the proposed Landside Access Modernization Program in the RTP update. LAWA's comments are attached as Attachment B.

Department of City Planning (DCP):
The Department of City Planning has provided important comments regarding the local input process and SCS consistency for funding eligibility, which are attached as Attachment C.

Conclusion

The draft 2016 RTP/SCS and PEIR, released by SCAG on December 4, 2015, represent an outstanding effort to meet both State and Federal planning requirements, as well as provide for the multifaceted needs of the region. As described in this report, including comments from other departments, City staff has provided comments in the areas of transportation and land use. City staff has provided recommended comments to SCAG for City Council and Mayor review regarding these proposals.

Fiscal Impact

This report contains comments regarding proposed policies and projects included in the draft 2016 RTP/SCS and related PEIR. The comments to be transmitted to SCAG will not impact the City's General Fund.

If we may provide additional information, please contact Miles Mitchell of my staff at (213) 972-8475.

SJR:mm

Attachments

A) Metro technical comments, dated January 20, 2016, regarding the draft RTP/SCS.
B) Los Angeles Work Airports comments, dated January 15, 2016, regarding the draft RTP/SCS.
C) Department of City Planning comments, dated January 20, 2016.

c: Borja Leon, Mayor's Office
Sharon Tso, Chief Legislative Analyst
City Planning Department
Los Angeles World Airports
Port of Los Angeles

Attachment A

Metro Technical Comments on Draft 2016 RTP/SCS
January 20, 2016

Active Transportation Appendix
Pg. 4, column 2, bullet 2 –
Reads: "Utilitarian walkers requiring easy, attractive and safe access to retail, dining and other attractions." Suggested edits: Utilitarian walkers requiring safe access to vital services including medical, grocery, public transit, child care, retail, and other key destinations.

Pg. 4, column 2, bullet 3
Reads: "Recreation and fitness pedestrians requiring good quality infrastructure for fast walking/jogging." Suggested edits: Recreation and fitness pedestrians requiring safe and unobstructed quality infrastructure for unimpeded walking/jogging.

Pg 15
Discussion of LA County does not recognize adopted and current efforts by Metro, e.g.: Complete Streets Policy, First/Last Mile Strategic Plan, Bike Share, LA River Bike Path Gap Closure, etc. and forthcoming Metro Active Transportation Strategic Plan. Also several cities in the San Gabriel Valley have adopted a regional bike plan. The RTP should be updated to reflect current activities for LA County.

Pg 15
Bike lockers and secure bike rooms (self-serve and attended) currently exist for long term.

Need to better define/describe what bike parking stations are as some provide additional attended services to support bike commuters such as at El Monte, Long Beach and Santa Monica. Pasadena does not have a bike station. Also Burbank, Covina and Claremont have self-serve bike stations.

Should note to mention that bicycle lockers also have issues with maintenance and the required space and footprint they take up.

Document should also recognize education on how to properly lock a bicycle. Often time people use cable locks for locking their bike that are easily defeated. Important for people to be responsible for their own property through preventable measures.

Pg. 18
Statement "Bicycle-racks are often located within an office building's parking garage (providing increased security over bicycle racks on public sidewalks)..." This is not necessarily true as bike racks at the street level have more "eyes" on them. Whereas, bike racks in hidden places such as parking garages can be very susceptible to theft.

Pg. 19
Include 2014 existing LA County bikeway conditions not 2012:

Facility Type as of 2014
Class 1 305.29
Class 2 835.5
Class 3 522.26
Cycle Track 4.2

Pg. 18
The 2012 National Household Travel Surveys indicated that bike trips for SCAG region were calculated at 1.9%. In the 2016 draft it indicates that the bike mode share for the CA household survey is 1.12%. This is a significant reduction; please verify that the figures are accurate.

Pg. 20
Same for Pedestrian mode share 2012 NHTS CA SCAG region indicated 19.24% and now for draft 2016 it is 16.8%. Please verify accuracy of figures and/or provide discussion on reduction/change.

Pg. 25
"...has developed a ~~bicycle to transit access plan~~ Bicycle Transportation Strategic Plan (2006)..."

Pg. 28
Verify that preliminary cost estimates are carefully identified. For example, $194 million identified for 755 miles of "Greenways" comes out to $256,954/mile. This is a very low estimate for Class 1 and Class 4 bikeway construction costs. Bike path projects estimated for FHWA by the UNC Highway Safety Research Center in 2013 were between $500K to $4.2 mil/mile (pg. 12).

Pg. 28
Total estimate for active transportation needs seem low. Provide details on the underlying assumptions.

Suggest providing clear performance metrics and benchmarks to evaluate how the region is doing to meet the goals laid out in the 2016 Active Transportation Plan.

Pg. 55 (4th paragraph)
A "plan" for bike share is cited with no reference. These appear to be general statistics for bike share programs worldwide rather than assumptions made for a specific plan and should be reflected as such. Reflect information on Metro's Countywide Bike Share Program.

Pg. 61
Regional bikeways should include those recommended by Metro's ATSP.

Aviation and Airport Ground Access Appendix

Pg. 20, paragraph 6, last line--states that the scenarios and sensitivity tests yielded a range of airfield capacities from 82.9 to 96.6 MAP, but does not state the year(s). Please specify the year(s) for the MAP projections.

Goods Movement Appendix

Pg. 5 (Exhibit 3), the I-210 east of Glendora is not included in the Final Primary Freight Network, yet SCAG's many analyses include this stretch along I-210 to I-15 and indicate serious congestion. SCAG should address this inconsistency.

Pg. 13, under "... Drivers", the Air Quality subject should be expanded to a discussion of CO2 emissions concerns and reference SB2, etc., as developed on Page 40.

Pg. 44, there is no mention of Cap and Trade Program's Greenhouse Gas Reduction Fund as a funding source for the development of vehicle prototypes and infrastructure demonstrations. This should be highlighted as an opportunity for zero-emission technology research and development.

Highways & Arterials Appendix

Pg. 6 - Additional System Initiatives - Recommend adding Caltrans ATM Study on I-105 and the RIITS and IEN Data Exchange efforts.

Overall - Comment - Recommend discussing Freight Signal Priority.

Mobility and Innovations Appendix

Page 7 - First/Last Mile Strategies - Recommend discussing Ride Sourcing as a potential strategy.

Page 7 - Automated/Connected Vehicles - Recommend discussing potential impact of AV/CV on age profile of licensed drivers.

Page 9 - ITS-Roadways - Recommend adding discussion on ATM (Active Traffic Management) strategies.

Natural/Farm Lands Appendix
There is currently policy language supporting urban greening as a component of a larger natural lands strategy. We support this as consistent with Metro's Urban Greening Plan and Toolkit,

but would further request that SCAG include in "Strategies, Next Steps and Recommendations" a commitment to further integrate greening strategies into regional planning efforts.

Passenger Rail Appendix

Pg. 2, First paragraph under Metrolink--The South Perris connection will be in operation in 2016.

Pg. 2, Second paragraph under Metrolink--Metro owns 40% of the Ventura County Line within L.A. County. "Much of the track is owned by the the Member Agencies of Metrolink and/or the freight railroads." Suggest referring to the CTCs that are Member Agencies of Metrolink as being a Member Agency.

Pg. 2, Third Paragraph--Perris Valley will begin operations in 2016. PTC will begin operations in 2016.

Pg. 4, Second paragraph--Metrolink will be operating the efficient locomotives in 2017.

Pg. 4, First paragraph under Metrolink's history--The Ventura line started in 2002.

Pg. 4, Second paragraph under high speed rail--It has been almost 20 years for the development of HSR.

Pg. 7, In the MOU paragraph--The language should state "$1B from Proposition 1A and other funds" That is the language in the MOU.

Pg. 9 and throughout the document--Should state that the projects are for operational efficiency. Although ultimate capacity is a benefit, operational efficiency is the key.

Under the Master Plan--SCRIP preceded the Master Plan. The Master Plan accommodates SCRIP.

Pg. 11, Under the Freight paragraph include language about the agencies owning the right of way that the freights operate on as tenant railroads.

Pg. 13, Add two projects--Bob Hope Airport/Hollywood Way Station; and Bob Hope Airport Station Pedestrian Bridge

Pg. 18, The Perris Valley Line will open for revenue service in 2016.

Pg. 24, The pedestrian bridge at the Bob Hope Airport Station is not Phase 2 of RITC. Add language about the new Bob Hope Airport/Hollywood Way Station.

Pg. 26, The Metro Orange Line is connected to SCRRA in Chatsworth.

Pg. 9, Los Angeles Union Station Master Plan, 1st bullet, add "expanded multi-modal" between "new" and "passenger concourse" and replace "the current tunnel" with "currently called the "tunnel"" ("a new expanded multimodal passenger concourse (the current tunnel currently called the "tunnel") that would be widened)"

Pg. 9, 5th bullet add "accommodating" before "future tracks"—it should read "accommodating future tracks and platforms for the CA HSR project";

Pg. 9, 7th bullet delete "new and" and replace with "3.25 million square feet of" It should read, "3.25 million square feet of improved retail and transit-oriented development (TOD) uses."

Pg. 9, ADD 8th bullet: "improved pedestrian and bike network"

Pg. 12: insert "SCRIP run through tracks and to incorporate the" before larger passenger concourse and replace "has been approved" with "was developed". It should read: "An additional component of the work is to study the effects of raising the entire platform areas in order to accommodate the SCRIP run-through tracks and to incorporate the larger passenger concourse that was developed-as part of the Union Station Master Plan...

Project List Appendix

Pg. 140, RTP ID #1TR1012, California High-Speed Rail Phase I – Env/PE, should have the Lead Agency as "California High Speed Rail Authority". It is currently blank. The completion date is listed as 2011, and SCAG may want to update this.

Pg. 147, RTP ID # 1122005, SR-138 Loop Road – this project is not in the Metro 2009 LRTP, and the Lead Agency is listed as "TBD". This should be clarified that the project is not a Metro-funded project.

Pg. 148, RTP ID #1C0401, "I-710" project, Lead Agency should read "Los Angeles County MTA", as this is a project from Metro's 2009 LRTP. Lead Agency is currently blank.

Pg. 148, RTP ID # 1M1002, "I-710 Early Action Projects", Lead Agency should be "Los Angeles County MTA", as this is a project from Metro's 2009 LRTP. "Lead Agency" is currently blank. The completion year should be "2022" and it is currently "2025".

Pg. 150, RTP ID # 1120005, Metro Green Line Extension—this is a project assumed to be funded with innovative financing, and not a constrained project in Metro's 2009 LRTP.

Pg. 150, RTP Project # 1TR1011, West Santa Ana Branch ROW Corridor -- this is a project assumed to be funded with innovative financing, and not a constrained project in Metro's 2009 LRTP.

Pg. 154., RTP #10M08D01, this is TIP #LA0G159, and is nearly complete. This should be moved into the TIP section.

Pg. 157, RTP #UT101, Metro Purple Line Westside Subway Extension Section 3 – Century City to Westwood/VA Hospital—the completion year should be 2035 (12/31/2015), and the Project Cost is $2,157,100 (YOE). Also, this listing is duplicative of a listing on page 158. Please correct and list only once.

Pg. 157, RTP ID # 1TR0101 (TIP # LA0G1162), Airport Metro Connector, the completion date is 07/01/2023.

Pg. 158, RTP ID #1TR1003 (EIR is TIP # LA0G642) – This appears to be a duplicate of the incorrect entry listed above on page 157. There needs to be only one "Metro Purple Line Subway Extension Section 3", completion date of 12/31/2035 with a project cost of $2,157,100. Please delete one of the duplicates.

Pg. 158, RTP ID #1TR1017 – please delete this project.

Pg., 158, RTP ID #1TR1020 – Please delete this project.

SCS Background Data Appendix

General – The SCS Technical Appendix provides a clear and sound description of how the 2016 RTP/SCS complies with SB 375, both from a content and process standpoint. We are confident that the Plan as presented will be approved by ARB.

Metro explicitly partners with SCAG on SCS development and implementation through the SCAG/Metro Joint Resolution and Work Program, most recently adopted by the Metro Board of Directors on May 28, 2015. The Plan and Appendix could be strengthened through further discussion of Joint Work Programs, including acknowledging completed efforts and identifying future initiatives that will advance the goals of the Plan. For example, the scenario planning exercise described in the appendix prompts preliminary steps in addressing sea level rise and other climate vulnerabilities as well as habitat protection needs. Through the plan, SCAG should describe and commit future planning activities in these areas or others.

Similarly, the Metro Board has adopted various sustainability policies acknowledging climate adaptation needs, and would suggest that sea level rise and climate vulnerabilities be explicitly included as priorities in the adopted plan, as opposed to a factor in a scenario exercise that does not influence policy and future activities.

Also, of note, the updated SCAG/Metro Joint Work Program commits a coordinated effort on deploying future planning funding, particularly from SCAG's Sustainability Planning Grant program. We would request that the Plan clearly acknowledge this commitment and further commit that future planning funding will be allocated in consultation with Metro such that priority activities are given consideration, and that local planning projects are structured appropriately for near term funding opportunities such as the Cap-and-Trade Affordable Housing and Sustainable Communities Program, the California Active Transportation Program, and the Metro Call For Projects.

Among other items, Metro collaborates with SCAG on the development and implementation of the First/Last Mile Strategic Plan. As such, we appreciate the emphasis on first/last mile implementation (transit/active transportation integration) with the Draft RTP/SCS and the SCS Technical Appendix. The appendix could do more to acknowledge and be consistent with Metro's recent work on this subject. In particular the estimated region-wide funding need for first/last mile, as reflected in the Active Transportation Appendix is substantially lower than our own estimates for Los Angeles County alone prepared for the current Active Transportation Strategic Plan effort. We encourage SCAG to coordinate with us on this aspect of the Plan.

We appreciate the inclusion emerging transportation technologies within the scenario planning exercises, as this is consistent with Metro's policies and work products including the Countywide Sustainability Planning Policy, First/Last Mile Strategic Plan and emerging pilot projects. As a technical matter, we are unclear on why the use of ride share and ride hailing services would be reflected in a direct reduction in VMT. It would seem more supportable through data as well as more consistent with policy goals to reflect these travel choices through an assumed reduction in vehicle ownership.

Transportation Finance Appendix

Pg. 10, near bottom of page (concept also applies to page 26): New Starts: "As with the FHWA sources, fuel consumption declines by 0.9 percent (in real terms) annually." We would like to suggest it state that, "As with the FHWA sources, fuel consumption declines by 0.9 percent (in real terms) annually making it increasingly difficult for Congress to back fill with general funds."

Pg. 23, top of page: ...State Transit Assistance (STA) are included under this source (meaning Local Agency Funds for LA County). STA should be included under State sources on page 24.

General Comment Concerning Above Appendix Comments

If any comment above pertains to any section of the main documents of the Draft 2016 RTP/SCS, SCAG may also want to apply the changes beyond the appendices and into the body of the main document.

Attachment B

Los Angeles
World Airports

TM

January 15, 2016

Mr. Hasan Ikhrata
Executive Director
Southern California Association of Governments
818 West 7th Street, 12th Floor
Los Angeles, CA 90017

Dear Mr. Ikhrata:

The Los Angeles World Airports (LAWA) is pleased to have worked with the Southern California Association of Governments (SCAG) and SCAG's Aviation Technical Advisory Committee on the update of the 2016 Regional Transportation Plan (RTP). LAWA is especially appreciative of SCAG's inclusion and modeling of the Los Angeles International Airport (LAX) Landside Access Modernization Program (LAMP) in the draft 2016 RTP.

As you know, LAMP proposes to transform LAX into a world-class airport by improving the travel experience for passengers, relieving traffic congestion, and improving air quality within the Central Terminal Area (CTA) and on the surrounding street network. The LAX Automated People Mover (APM) would connect passengers to off-airport intermodal facilities, a Consolidated Rental Car Facility, and the Metro regional rail system, providing alternative travel modes to and from LAX.

In an effort to further partner with SCAG's Aviation Technical Advisory Committee, LAWA recommends SCAG convene a working group of the region's airports, transportation agencies, SCAG members, and other key stakeholders to help identify strategies and policies aimed at distributing commercial traffic and goods movement across the region. LAWA looks forward to actively participating on such a SCAG Committee.

Should you need additional information or have any questions, please contact Lisa Trifiletti of my staff at LTrifiletti@lawa.org or (424) 646-5186.

Sincerely,

Deborah Flint
Executive Director

cc: Cynthia Guidry
Lisa Trifiletti

Attachment C

DEPARTMENT OF
CITY PLANNING

CITY PLANNING COMMISSION

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RENEE DAKE WILSON
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INFORMATION
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January 20, 2016

Ms. Hasan Ikhrata
Southern California Association of Governments
818 W. Seventh St., 12th Floor
Los Angeles, CA 90017

Dear Mr. Ikhrata:

DRAFT 2016-2040 REGIONAL TRANSPORTATION PLAN/SUSTAINABLE COMMUNITIES STRATEGY

The purpose of this letter is to provide comments from the City of Los Angeles Department of City Planning (DCP) regarding the Draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). DCP very much appreciates the collaborative relationship with SCAG in developing this plan, which included extensive cooperation from your staff on the integrated growth forecast and understanding the City's land use plans and programs.
The Department has identified the following issues and recommends changes to the plan in order to better address the regional challenges faced in Southern California:

1. Include a greater emphasis on housing affordability as a key strategy to achieving plan goals;
2. Provide greater clarity in the discussion of gentrification and displacement
3. Provide greater clarity in terms of how local jurisdictions are to determine SCS Consistency of a given project

1. Include a greater emphasis on housing affordability as a key strategy to achieving plan goals

Given the severity of the housing affordability crisis faced by the region, and the direct impact unaffordability has on Plan goals such as mobility, air quality and economic well-being, the City of Los Angeles expected the housing topic to receive a higher overall profile throughout the report. When the topic was addressed in detail, it often did so in ways that may inadvertently be counter-productive to many of the Plan's goals.

SB 375, which established the requirement to create a sustainable communities strategy, is meant to better coordinate planning for transit and housing. Planning for housing is one of the primary purposes of the SCS. Three of the eight statutory requirements in Health and Safety Sec. 65080 (b)(2)(B) involve housing, including a consideration of the state housing goals and the identification of areas within the region sufficient to house "all the population of the region, including all economic segments of the population" as well as "an eight-year projection of the regional housing need for the region."

It is not clear in the Plan how or where these housing-related requirements would be satisfied. The 2016 RTP/SCS acknowledges that the region only built 10% of the housing necessary for those with low incomes during the previous period and missed its targets for above moderate income households as well. The 8-year regional housing needs assessment for the SCAG region is for 412,000 new housing units, more than 270,000 of which are supposed to be affordable for those with moderate income or less. The SCS should help answer how and where the region should grow to ensure the housing needs of more are met and lead on the hard policy choices that need to be made around housing, particularly in this time of limited public funding.

Examples of an overall lack of focus on housing affordability includes:

- The list of nine 2016 RTP/SCS Goals (pg. 60) does not mention housing.
- The sections titled "What Will We Accomplish" and "How Will We Ensure Success" in the Executive Summary (pg. 8 and 9) do not mention any housing related goals.
- There is little discussion of how unaffordability undermines the goals of the RTP/SCS, including suburban sprawl, longer job commutes, higher vehicles mile travelled and greenhouse gas emissions, etc. While the Plan contains a statement that transit investments and strategies will be most effective if "coordinated with land use strategies such as TOD and providing affordable housing" (pg. 92), this discussion should occur earlier in the document and be expanded.
- The scale of the housing problem is not adequately addressed. For example, under the "Challenges We Face" section (pg. 3 - Executive Summary), the Plan summarizes the region's housing problems simply as: "Housing prices are increasing: Housing prices are rising steadily and affordability is declining..." This language simply fails to capture the magnitude of the crisis facing the region. The Los Angeles metro area not only has the lowest affordability rate in the country, but no area of the country has ever seen incomes and housing costs so out of whack as they are today in Los Angeles. When taking into account the high cost of housing, LA County has been recently identified as having the highest effective poverty rates in the State[1].
- The section titled "Our Progress Since 2012" does not mention the progress towards meeting the region's housing needs as expressed through the required Regional Housing Need Assessment (RHNA) allocation. Nor does it describe how past residential growth trends met prior goals. These are two of the primary components of the Sustainable Communities Strategy (per 65080 (b)(2)(B). State legislation around housing funding is mentioned, but not other significant laws such as AB 2222 (2014) and AB 744 (2015).

2. Provide greater clarity in the discussion of gentrification and displacement

Demographic change is an important contributor to regional land use outcomes and equity concerns. The Department appreciates the Plan's interest and concern for the issues of gentrification and displacement, particularly in relation to areas around transit stations (e.g. pgs. 12, 54, 69,), and is grateful for the amount of data and research devoted to this complicated subject. We also agree with the assessment that jurisdictions need to be sensitive to this topic and work to employ strategies that mitigate potential negative impacts on communities.

Unfortunately, some of the discussion and conclusions on these topics, as presently worded, could be misconstrued or cause confusion about intended policy objectives, and potentially result in less housing affordability. Given the importance of the topic, the Department requests that the sections below be reconsidered.

- The definition of "displacement" in the Glossary may be partially responsible for potential confusion. The definition appears to refer only to a process that "drives out" existing

[1] http://www.ppic.org/main/publication_show.asp?i=261

residents and businesses. It does not include the (much more common) process whereby lower income residents become unable to access properties in certain areas due to increasing housing prices (often referred to as "exclusionary displacement"). This limited definition influences the discussion of the process and strategies to respond.

- There is an apparent disconnect between the evidence on gentrification presented in the Plan and some of the claims being made. The detailed study in the Environmental Justice Appendix found "no statistical significance" in the difference of demographic change occurring in transit-oriented areas of the SCAG region versus outside them. Despite this lack of evidence, the Plan often discusses new investment in transit-oriented communities as a cause for rising home prices and displacement (pgs. 3, 55, 163). This language needs to be carefully worded to avoid inadvertently undermining transit-oriented investment (such as transit infrastructure and housing) that is complementary to the Plan's objectives.
- The Environmental Justice Appendix relies on a variety of indicators to evaluate various equity issues in relation to Plan objectives like growth in transit-oriented communities (jobs-housing balance, median income, median rents, Hispanic population, etc.) We'd suggest adding some additional factors that are worthy of analysis and monitoring. These include cost burdens for renters and owners, transportation costs, the price of single-family homes versus condos and including Black and Asian households (in addition to Hispanic) in this metric.

3. Provide greater clarity on how local jurisdictions are to determine SCS Consistency of a given project

Increasingly, important areas of State land use and environmental policy are requiring a determination of "SCS consistency." Examples include the recent CEQA streamlining efforts mentioned in the Plan but also Cap and Trade mitigation funding, Enhanced Infrastructure Finance Districts and, analyzing greenhouse gases for CEQA purposes. The ability for a local jurisdiction to be able to accurately and efficiently establish whether a project, plan or program is consistent with the SCS has therefore gained prominence.

The current RTP/SCS is a high-level planning document that sets out transportation policies for the region, but does not provide specific policies for local agencies to use in advancing land use strategies. To the limited extent SCS consistency is discussed in the Plan, is the statement that "lead agencies such as local jurisdictions have the sole discretion in determining a local project's consistency with the 2016 RTP/SCS" (for example, pg. 65 and throughout the SCS Background Documentation Appendix). This statement, unfortunately, does not provide much direction or clarity as to how local jurisdictions, or anyone else, should evaluate consistency with the SCS.

SCS consistency is an emerging area of state law without many precedents or interpretations. Other MPOs have provided guidance in their Plans, as well as separate consistency checklists, for their local jurisdictions. The current draft 2016 RTP/SCS offers insufficient information on which to base sound decisions. An unintended result is that projects, plans and programs in the SCAG region could be at a disadvantage with other regions.

As an example, SB 375 references project consistency (for Transit Priority Projects using CEQA streamlining) as whether or not the project matches the "general use designation, density, building intensity, and applicable policies specified for the project area in the SCS." We believe there are several issues associated with the Plan that make this task very difficult for local jurisdictions.

1) In order for a local jurisdiction to claim SCS consistency, it should be shown that a project or plan is in line with the "applicable policies" mentioned in the Plan. While six Land Use Strategies are presented in Chapter 5, the Plan does not clearly identify local policies that could advance its Policy Goals. Policies can be inferred from the Plan's text, but nowhere are they specifically identified or described. Although SB 375 does not empower SCAG to

impose its land use strategies or policies on its member local jurisdictions, SCAG can suggest or recommend the sorts of local policies that would advance the six Land Use Strategies at the local level. This would be useful to the city in its effort to promote the RTP/SCS's vision and benefit from the opportunities established under state law. As such, the utility of the 2016 RTP/SCS Land Use Strategies would be substantially improved by adding a discussion of "Supportive Local Policies" to the discussion of each in Ch. 5.

2) Within the 2016 RTP/SCS, two new concepts are introduced around the idea of creating "complete communities." They are "Livable Corridors," and "Neighborhood Mobility Areas." The discussion of Livable Corridors beginning on page 74 (Chapter 5) is an example of insufficient policy guidance. It states that "The Livable Corridor Strategy *specifically advises* local jurisdictions to plan and zone for increased density at key nodes along the corridor and replacement of single-story under-performing strip retail with well-designed higher density housing and employment centers." (emphasis added) Similarly, the discussion of Neighborhood Mobility Areas that follows states that: "The Neighborhood Mobility Areas strategy represents *a set of state and local policies* to encourage the use of active and other non-automotive modes of transportation, particularly for shorts trips in many suburban areas..." (emphasis added). Unfortunately, the Department does not see that any such advice is actually provided, nor are any state and local policies identified in the RTP/SCS. Further, there are no maps nor figures in the RTP/SCS that identify Livable Corridors or Neighborhood Mobility Areas. Without maps, the city cannot readily determine where Livable Corridors or Neighborhood Mobility Areas are located (or should be located) within its jurisdiction, limiting its ability to apply these strategies. Exhibits to illustrate the general locations of Livable Corridors and Neighborhood Mobility Areas would be helpful.

3) Although not explicit in the RTP/SCS, the City of Los Angeles understands the 2040 "Forecasted Regional Development Types" maps" found in the Background Documentation Appendix (Exhibits 1-33) are to be used in determining whether a project is consistent with the SCS. There are 2012 (baseline) and 2040 (proposed plan) maps for each geographic subregion. A SCS consistency argument for a project should show that a project or plan is aligned with the general use category and density and intensity shown on the 2040 maps. Unfortunately, the Development Type maps for the City of Los Angeles (Exhibit 13 and 14) are presented at such a scale to make them largely illegible from a user's perspective. It simply is not possible to make an accurate determination in what color (i.e. Development Type designation) a given site in the City is located within. As such, the City respectfully requests the following:

   a. The Development Type maps shown for the City of Los Angeles (and perhaps any other geography of a similar large scale) should be broken up into zoomed-in sub-regional quadrants, or at least be made available to local jurisdictions that request them.
   b. Development Type maps should contain additional information such as major streets and transit lines to help orient users.
   c. Even when the correct Development Type can be understood for a given parcel, it is unclear how exactly to interpret such information as to general use, density and intensity. There does not appear to be a guide that translates the three Development Types (Urban, Compact, Standard) into use categories or density and intensity ranges. As far as we can tell, there is only a paragraph description of each of these critical SCS designations (pg. 20 of the Plan). Through use of the Scenario Planning Model, Place Types are the foundation of the forecasted Development Types maps. Place Types do have uses, densities and intensities expressed in a usable manner in the Plan, however local jurisdictions don't have ready access to the information. Therefore, background data on Development Type, including the underlying Place Type should be provided to local jurisdictions

that request it. The information would remain advisory in nature, but could be helpful in supporting a SCS consistency analysis in many critical instances. In addition, more information to translate the three Development Type categories into use categories or density and intensity ranges.

d. It is unclear how gradations between each Development Type category should be treated (e.g. the orange color between Urban red and Compact yellow). The gradations effectively create five Development Type categories, two of which are completely undefined.

4) The footnote at the bottom of each Development Type map in the SCS Background Documentation Appendix (Exhibits 1-3) raises several questions and concerns.

   a. One sentence in the footnote says "Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS." While the Department understands the meaning, this sentence could be read as meaning that the Development Type maps, which are based on the TAZ level data, should not be used as part of establishing SCS consistency. When combined with a lack of other direction in the Plan, the phrase may raise unnecessary confusion.

   b. Another sentence in the footnote says "For the purpose of determining consistency for California Environmental Quality Act (CEQA) streamlining, lead agencies have the sole discretion in determining a local project's consistency with the 2016 RTP/SCS." This sentence should be broadened to include the increasingly diverse areas of state policy that references SCS consistency.

5) The 2016 RTP/SCS Plan appears to use three different terms to refer to the same thing. The Plan uses the term "Development Category", to refer to the Urban Compact and Standard designations, while the SCS Background Documentation Appendix uses the terms "Development Type" on the maps and "Land Development Category." This should be reconciled to avoid confusion.

6) To address many of these concerns, SCAG could create a "SCS Consistency" section of the plan. Key factors should include means to interpret consistency with Development Type maps, a list of key GHG-related policies, a list of relevant SCS EIR GHG mitigation measures, and quantitative analysis that a project does not conflict with the GHG reduction target with the county or region where relevant. Other metropolitan planning organizations have created "SCS Consistency Checklists" and other more helpful information to guide decision-makers.

Thank you for this opportunity to provide comments. If you have any questions or would like additional information, please contact Matthew Glesne at (213) 978-2666 or by email at Matthew.Glesne@lacity.org.

Sincerely,

Ken Bernstein

for, MICHAEL J. LOGRANDE
Director of Planning

City Council Amendment, dated February 9, 2016, to LADOT report pertaining to the draft 2016 RTP/SCS, dated January 20, 2016

5 A

MOTION

I MOVE that the Transportation Committee report relative to comments to be submitted by the City to the Southern California Association of Governments (SCAG) in regard to the draft 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), Item No. 5 on today's Council agenda (C.F. 16-0084), BE AMENDED to add the following new recommendation:

4. DIRECT the Department of Transportation to request that SCAG include the updated project cost estimate of $250 million for the Downtown LA Streetcar project (FTIP ID #LAOG901).

PRESENTED BY: ______________________
JOSE HUIZAR
Councilmember, 14th District

SECONDED BY: ______________________

msr

APPENDIX C. South Bay Mobility Matrix - DRAFT Consolidated Project/Program List

Program	Subprogram	MM Project ID	Jurisdiction	Description
Highway / Arterial Operational Improvement Program	Highway/Arterial Capacity Enhancement Program	2057	LA City - Wilmington-Harbor City	Alameda St: Widen to provide three lanes per direction form I-10 to Henry Ford Avenue
		1076	LA City	Anaheim Street: Farragut Avenue to Dominguez Channel: Widen Anaheim Street from 78' to 84' and restripe to accommodate an additional lane in each direction; this would improve the roadway from 4 lanes to 6 lanes
		2060	LA City - Wilmington-Harbor City	Anaheim Street: Widen between Cushing and I Streets to provide three lanes eastbound and 2 lanes westbound.
		12	LA County	Aviation Boulevard: Aviation Boulevard widening project from Imperial Highway to Rosecrans Avenue
		20	El Segundo	Aviation: Widen southbound Aviation Blvd to increase from two to three lanes between Imperial Ave. and Rosecrans, and improve left turn movements.
		8	Lomita, Torrance	Crenshaw and Lomita Bl: Street widening including ad's ROW: on Crenshaw – add dual NB right-turn and a single SB lane. Lomita – add dedicated WB right-turn lane and 4th through lane
		9	Torrance	Crenshaw and Torrance Bl: Street widening including add’l ROW: – Crenshaw and Torrance Bl. Provide dedicated SB right turn lane
		16	Torrance	Crenshaw Bl and Carson St: Street widening (including add’l ROW: – Crenshaw and Carson St – Add 4th through lane on Crenshaw at intersection; and transition to merge back to 3 NB lanes
		10	Torrance	Crenshaw Bl and Sepulveda Bl: Street widening including add’l ROW: – Crenshaw at Sepulveda Bl. On Crenshaw: add dual NB right-turn on Sepulveda; add dedicated EB right-turn lane and 4th through lane
		1077	LA City	Del Amo Boulevard: from Western Avenue to Vermont Avenue
		1050	LA County	Del Amo Boulevard: from Western Avenue to Vermont Avenue: Reconstruct and widen from one lane in each direction to two lanes in each direction
		23	LA City and County	Del Amo Bl: Complete the missing segment of Del Amo Bl between Denker Av and Normandie Av. Complete missing segment from Normandie to Vermont Av
		22	LA County	Del Amo Bl: Construction of a roadway to close the gap between Normandie Av and Vermont Av
		4002	El Segundo	El Segundo Blvd. Widen the street between Sepulveda Blvd and Douglas Ave. to four lanes in the eastbound direction and install bike lane
		2059	LA City - Wilmington-Harbor City	Henry Ford Avenue: Widen to provide three lanes per direction from Alameda Street to Terminal Island Freeway (Alameda Corridor)
		2062	LA City - Wilmington-Harbor City	Lomita Boulevard: Improvement as a Secondary Highway, east of Eubank Avenue to Alameda Street, with an at-grade intersection at Alameda. [TIMP]
		19	Manhattan Beach	Manhattan Beach Arterial Capacity enhancements
		1042	Redondo Beach	Pacific Coast Highway: from Anita Street to Palos Verdes Boulevard: PCH Study Improvements: Implement PCH Study Recommendations (11)
		14	Torrance	Prairie Av and 190th St: Street widening including add’l ROW: – On 190th add dual NB right-turn and re-striping to provide 3 through lanes for WB and EB. Also prohibit on-street parking
		1088	Lawndale	Redondo Beach Blvd: At I-405, from Hawthorne Boulevard to Prairie Avenue: ROW Acquisition, signal upgrades, concrete pads for transit, ADA ramps
		1034	Lawndale	Rosecrans Avenue: Traffic signal improvements, left-turn improvements and various concrete improvements. From East of Inglewood Ave to Prairie Ave
		18	Carson	Sepulveda Blvd: from Alameda Street to ICTF Driveway: Widen from four lanes to six lanes, rehabilitate bridge. Bridge widening over Dominguez Channel, Street widening, channelization, roadway work, signals, left turning phases, striping, street lighting
		1058	El Segundo	Sepulveda Boulevard: from Imperial Highway to El Segundo Boulevard: Implement PCH Study Recommendations (8)
		24	Torrance	Torrance Bl : Widen to 3 WB through lanes from Crenshaw to Madrona Av

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Highway / Arterial Operational Improvement Program	Highway/Arterial Capacity Enhancement Program	13	LA County, Caltrans	Torrance Bl: Torrance Bl/I-110 undercrossing widening
		1087	Gardena	Various Improvements: 1) Redondo Beach Blvd Arterial Improvements from Crenshaw Blvd to Vermont Ave; 2) Crenshaw Blvd Arterial Improvements from Redondo Beach Blvd to El Segundo Blvd; 3) Normandie Ave Arterial Improvements from El Segundo Blvd to 177th Street
	Highway/Arterial Intersection Improvement Program	1052	Redondo Beach	Aviation Boulevard: at Artesia Boulevard: Construct northbound right-turn lane. Aviation Boulevard Phase 1: Intersection Projects
		184	Torrance	Crenshaw Bl and 190th St: Reconstruct intersection (remove median and re-stripe) – add on Crenshaw NB left turn lane at Crenshaw Bl and 190th St
		15	Torrance	Crenshaw Bl at 182nd St: Widen 182nd St to provide 2 designated WB left turn lanes, 2 WB through lanes and a new EB through right lane. Widen the east side of Crenshaw Bl to provide 3 NB through lanes. Modify signal
		1086	Torrance	Hawthorne Bl: At 182nd Street, Spencer Street, Emerald Street, and Lomita Blvd: for roadway widening to construct new northbound right turn lanes
		6	Rolling Hills Estates	Hawthorne Bl: at Silver Spur Rd.; Add dual EB and WB left turn pockets
		1070	Redondo Beach	Inglewood Avenue: at Manhattan Beach Boulevard: Add southbound right-turn lane south of railroad tracks to Manhattan Beach Boulevard
		124	Inglewood	La Cienega Bl: La Cienega Bl at La Tijera Bl & Centinela Av
		3001	Carson	Main St at Del Amo Blvd: Intersection improvement to support major development
		1039	Inglewood	Manchester/La Cienega : Channelize and raise median Manchester Blvd from Ash Ave to La Cienega Blvd, Improve turn radii La Cienega Blvd at Manchester Blvd, Improve turn radii and through-right lane La Cienega Boulevard at Florence Avenue
		2063	Manhattan Beach	Marine Avenue at Cedar Way: Half-Signal and Reconfiguration
		1068	Hermosa Beach	Pacific Coast Highway: at Aviation Boulevard: Add southbound dual left turn lanes
		1045	Torrance	Pacific Coast Highway: at Crenshaw Avenue operational improvements
		1046	Torrance	Pacific Coast Highway: At Hawthorne Boulevard add northbound, eastbound, and westbound right-turn lane, add eastbound left-turn, signal upgrades
		1044	Redondo Beach	Pacific Coast Highway: at Palos Verdes Boulevard: Install westbound right-turn lane
		1043	Redondo Beach	Pacific Coast Highway: at Torrance Boulevard: Add northbound right-turn lane
		1069	Torrance	Pacific Coast Highway: At Vista Montana/Anza Avenue, restripe to add southbound through lane & signal modification for protected northbound/southbound left-turn phasing. Modify striping to accommodate a longer northbound left-turn lane
		7	Rolling Hills Estates	Palos Verdes Dr: North at Rolling Hills Rd.: Add second WB and EB lanes and protected left turn phasing
		1036	Manhattan Beach	Valley Drive/Armore: Intersection Improvements at Manhattan Beach Boulevard and 15th Street. Construction of traffic circles at the intersections of Valley/Armore at Manhattan Beach Boulevard and 15th Street
		11	Torrance, Los Angeles	Western /Sepulveda: Add northbound left-turn lane; widen and restripe for dual eastbound left-turn lanes and westbound right-turn lanes, modify signals and WB double left turn lanes
	Highway/Arterial School-Related Safety Improvements	1079	Torrance	Pacific Coast Highway: From Calle Mayor to Janet Lane. Safety guardrail, fencing and landscaping project to prevent illegal mid-block pedestrian crossing and vehicle incursion onto PCH from a frontage road on the south side of PCH used as a student drop off area for South High School which is on the north side of PCH.
		3	Rolling Hills Estates	Palos Verdes Dr: North at Dapplegray School; add EB merge lanes
	Highway/Arterial TSM Program	69	Torrance	190th St / Van Ness Ave Intersection Improvement
		70	Torrance	190th St/Crenshaw Blvd Intersection Improvement
		113	LA City	Anaheim St Roundabout @ Gaffey / Vermont / PV Drive North

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Highway / Arterial Operational Improvement Program	Highway/Arterial TSM Program	71	El Segundo	Aviation Blvd / El Segundo Blvd Intersection Improvement
		72	Torrance	Crenshaw Blvd/ Carson St TSM Intersection Improvement
		73	Torrance	Crenshaw Blvd/ Sepulveda Blvd TSM Intersection Improvement
		74	Torrance	Crenshaw Blvd/ Torrance Blvd TSM Intersection Improvement
		75	Carson	Del Amo Blvd. / Santa Fe Ave Intersection Improvement
		77	LA City	Gaffey St / 1st St Intersection Improvement
		67	Lawndale	Hawthorne Bl and PCH: Add dedicated right turn lanes and left turn pockets
		112	Lawndale, Redondo Beach	Inglewood Av: Widen Inglewood Av from Manhattan Beach Bl to I-405 to add right-turn lane, SB – Redondo Beach, NB – Lawndale
		122	Inglewood	La Cienega Bl: Corridor Improvement Project, concept to I-10
		79	Torrance	Pacific Coast Highway/Crenshaw Blvd intersection improvement
		1080	Caltrans, Torrance	Pacific Coast Highway: Madison Ave: Signal upgrades to provide left-turn phasing
		66	Torrance	Van Ness Av and 190th St: Widen signalized intersection. On 190th, restripe to add 3 through lanes for both WB and EB and prohibit on-street parking and upgrade traffic signal
	Parking Restrictions Program	2056	LA City - Wilmington-Harbor City	Anaheim Street and Western Ave: Additional PM parking restrictions and striping for an additional lane are proposed on: • Anaheim Street between Alameda Street and east of Dominguez Channel [TIMP] • Western Avenue between Sepulveda Boulevard and Capitol Avenue [TIMP]
		2045	LA City - San Pedro	San Pedro Priority Motorized Vehicle Routes. The San Pedro Community Plan identifies motorized vehicle priority streets. Street improvements for may include peak hour parking restrictions for use of curb lanes, turn lane channelization and traffic signal coordination and other traffic management techniques to facilitate motorized vehicle flow and discourage cut-through traffic on local neighborhood streets. Motorized vehicle priority streets include: Western Avenue between 25th Street and north San Pedro border; Gaffey Street between 25th Street and north San Pedro border; 25th Street between Rancho Palos Verdes border and Gaffey Street; and Capitol Drive between Western Avenue and Gaffey Street.
	Regional Facilities Arterial Improvements	5008	Port of Los Angeles	Harbor Blvd - As part of the San Pedro Waterfront Development Project, Harbor Blvd will be restriped, and the median removed/reconstructed as needed to provide three NBT and SBT lanes between the reconstructed Sampson Way/Harbor Blvd intersection and the WB on ramp/Front Street intersection. This will result in the removal of parking and the bike lane on the northbound side. The parking and 5' bike lane on the southbound side, south of O'Farrell Street will be preserved. North of O'Farrell Street, the parking and the parking lane on the southbound side would need to be removed to accommodate the northbound dual left-turn lane. The innermost northbound through lane at the EB off-ramp intersection would become a forced left-turn lane at the SR 47 WB on-ramp. This improvement is projected to be needed by the year 2024.
		5009	Port of Los Angeles	Harbor Blvd. & 7th Street Intersection- The project includes a reconfigured intersection at the junction of Harbor Blvd, Sampson Way, and 7th Street. Work includes retaining wall, street work, grading, paving, lighting, restriping and a new signalized intersection.
		5010	Port of Los Angeles	Sampson Way to 22nd Street & Miner Street - Sampson Way would be realigned and expanded to two lanes in each direction and would curve near the Municipal Fish Markets to meet with 22nd Street in its westward alignment east of Miner Street. In the proposed project, Harbor Blvd. would remain in place at its current capacity with two lanes in each direction. Proposed enhancements would be consistent with design standards for the Community Redevelopment Agency (CRA) Pacific Corridor and the City of Los Angeles Planning Department Community Design Overlay.

Program	Subprogram	MM Project ID	Jurisdiction	Description
Freeway Operational Improvement Program	I-105 Freeway Operational Improvements	1102	Caltrans	I-105: Add Aux lane on EB I-105 from Nash Avenue to Van Ness Avenue. PM 0.99/5.23
		1101	Caltrans	I-105: Add Aux lane on WB I-105 from Wilton Place to Hawthorne Blvd. PM 3.05/5.48
	I-110 Freeway Operational Improvements	189	Caltrans, SBCCOG	I-110: Add auxiliary lane SB I-110 between Sepulveda and PCH
		1038	Caltrans, Carson, Los Angeles, Los Angeles County	I-110: Auxiliary Lane on SB I-110 from WB SR-91 Connector from Torrance Boulevard off-ramp.
		205	Caltrans, SBCCOG	I-110: Implement Interagency Integrated Corridor Management System on I-110 from Artesia Blvd and Pacific Coast Hwy. The project will integrate freeway, arterial and transit operations, implement a Decision Support System for coordinated agency operations and traveler information systems.
	I-105 Freeway Operational Improvements; I-405 Freeway Operational Improvements	1061	Caltrans	I-405 and I-105: I-405 from I-110 to I-105 and I-105 from I-405 to Crenshaw: Corridor Refinements
	I-405 Freeway Operational Improvements	1100	Caltrans	I-405: Add Aux lane on SB I-405 from Hawthorne to Redondo Beach. PM 17.58/16.90
		1099	Caltrans	I-405: Add Aux lane on SB I-405 from Inglewood to Hawthorne Blvd. PM 18.25/17.58
		144	Caltrans, Lawndale	I-405: Add NB auxiliary lane from Hawthorne to Inglewood Av. PM 17.58/18.25
		147	Caltrans, Lawndale	I-405: Add NB auxiliary lane from Redondo Beach Bl to Hawthorne. PM 16.90/17.58
		149	Caltrans, SBCCOG	I-405: Add northbound auxiliary lane from Inglewood Ave to Rosecrans Ave. PM 18.25/19.22
		150	Caltrans, SBCCOG, LA City	I-405: Add northbound auxiliary lane from Normandie Ave to Western Ave. PM 13.85/9.98
		1018	Caltrans, Hawthorne	I-405: Add northbound auxiliary lane from south of El Segundo Blvd to I-105
		151	Caltrans, SBCCOG	I-405: Add southbound auxiliary lane from Hindry Avenue to Inglewood Ave. PM 19.10/18.25
		179	Caltrans, SBCCOG	I-405: Open and restripe the SB Hawthorne Blvd to northbound I-405 on ramp, bridge widening
		202	Caltrans, LA City, Inglewood	I-405: Realign the SB I-405 south of SR-90 to Manchester where it bends sharply just north of Manchester Bl. PM 25.5/23.7
	Freeway Interchange and Ramp Program	76	Caltrans, LA City, SBCCOG	I-110/Anaheim St: Widen Anaheim Street and reconfigure I-110 ramps at Anaheim St
		1002	Caltrans, Carson	I-110: Figueroa Street Ramps and Aux Lanes: Widening of NB off-ramp (from 1 to 2 lanes) and NB on-ramp (from 1 to 2 lanes) at I-110 freeway (between Torrance Blvd and Del Amo Ave)
		1021	Caltrans, LA City	I-110: Signalize northbound off-ramp, intersection improvements and widen existing ramps at PCH
		190	Caltrans, SBCCOG	I-110: Widen southbound I-110 off-ramp at Pacific Coast Hwy
		1057	Caltrans, Torrance	I-405: I-405 on &off ramps at 182nd St. / Crenshaw Boulevard operational improvements. EA 29360
		195	Caltrans, SBCCOG	I-405: Widen NB I-405 off-ramp to Artesia WB and widen the structure
		172	Caltrans, SBCCOG	I-405: Widen northbound I-405 off ramp at Rosecrans Ave. PM 19.10
		187	Caltrans, Lawndale, Redondo Beach	I-405: Widen SB Inglewood on-ramp to NB I-405. PM 18.40
		173	Caltrans, SBCCOG	I-405: Widen southbound I-405 off-ramp to Rosecrans Ave. PM 19.36
		168	Caltrans, Torrance	I-405: At Artesia Bl, modify NB on-ramp from Artesia Bl WB to add a third lane onto NB I-405
		175	Caltrans, Lawndale	I-405: I-405 ramp improvements at Hawthorne Bl. (1) Reopen SB Hawthorne to NB I-405 (2) Upgrade signalization at I-405 SB and NB off-ramps Hawthorne Bl. PM 17.59
		204	Caltrans, Hawthorne	I-405: Implement I-405 at Rosecrans Access Point improvement project. PM 19.22
		182	Caltrans, Hawthorne	I-405: SB between Hindry Av and Rosecrans Avenue off ramp. PM 19.22/19.11

Program	Subprogram	MM Project ID	Jurisdiction	Description
Freeway Operational Improvement Program	Freeway Interchange and Ramp Program	177	Caltrans, Hawthorne	I-405: Signalize intersection at bottom of SB Rosecrans off-ramp
		178	Caltrans, Lawndale, Redondo Beach	I-405: Widen NB Inglewood loop on-ramp to NB I-405. PM 18.20
		185	Caltrans, LA City	I-405: Widen SB on-ramp at 190th (just west of Western Av) from Western Av to 190th St
		170	Caltrans, LA City	I-405: Widen SB on-ramp from Western Av/190th St and I-405. PM 14.53
		166	Caltrans, SBCCOG, Inglewood	I-405: Widen southbound I-405 on-ramp from southbound La Cienega Blvd by adding a continuous Aux to SB I-405. PM 23.69
		171	Caltrans, SBCCOG	I-405: Widen the SB Inglewood on-ramp to SB I-405. PM 18.06
		901	Caltrans	I-710/Del Amo Interchange Reconfiguration - Reconfigure Interchange at I-710 and Del Amo (includes Del Amo/Susana improvement)
		201	Caltrans	South Bay Ramp and Interchange Improvements : Intersection and interchange improvements, signal synchronizations, ITS corridor improvements, auxiliary lanes, gap closures, and congestion relief, etc. on I-405, I-110, I-105, SR-91, and PCH.
	Regional Facilities Freeway Improvements	1019	Caltrans, LA City, Port of Los Angeles	I-110: Vincent Thomas Bridge 110 Connector: (Port of Los Angeles)
		5003	The Port of Los Angeles, Caltrans	SR 47/Navy Way Interchange: Construction of interchange at SR-47 / Navy Way to eliminate traffic signal and movement conflicts; this project was a S.CA Trade Corridor Tier II TCIF project as submitted to the CTC in 2008; project removes last signal on SR 47 between Desmond and V. Thomas Bridges; NHS Intermodal Connector Route
		1030	Caltrans, Port of Los Angeles	SR 47: V. Thomas Bridge/Front St Interchange: New Westbound SR 47 on- and off-ramps at Front St just West of Vincent Thomas Bridge and eliminate the existing non-standard ramp connection to the Harbor Blvd Off-ramp
Managed Lanes - HOV Lanes / Express Lanes	Express Lane Improvements	1103	Caltrans	I-105: Add HOT Lane on 105 from 405 to 605. PM 1.63/17.82. EA 31450
		2069	Metro, Caltrans	I-110: Express Lane South Extension to I-405
		193	Caltrans, SBCCOG	I-405: Add Express Lanes on I-405 between I-110 and I-105
	HOV Connectors Improvements	163	Caltrans, SBCCOG	I-105/I-405: HOV Connectors from I-105 westbound to northbound and southbound I-405
		162	Caltrans, SBCCOG	I-110/I-105: Add HOV connectors from northbound I-110 to eastbound and westbound I-105
		165	Caltrans, SBCCOG	I-405/I-110: Reconstruct the NB I-405 connector to SB I-110 and HOV connector from SB I-405 to NB I-110
		161	Caltrans, SBCCOG	SR-91/I-110: Add HOV connectors from northbound and southbound I-110 to eastbound SR 91 and from westbound SR-91 to northbound I-110
Freeway Capacity Expansion Improvements	I-405 Freeway Capacity Improvements	197	Caltrans, SBCCOG	I-405: Add 1 or 2 lanes to NB and SB I-405 between Inglewood northern border and I-110; consider inclusion of transit-only fixed guideways
		194	Caltrans, SBCCOG	I-405: Add northbound lane on I-405 from El Segundo Blvd to I-105
		1010	LA City, Caltrans	I-405: Widen from 3 to 4 lanes through interchange at I-110
	I-710 Freeway Capacity Improvements	2085	Caltrans, The Port of Los Angeles, Port of Long Beach, SCAG, GCCOG, SBCCOG, and the I-5 Joint Powers Authority	I-710: Widening and Freight Corridor. Widen to 10 Mixed Flow Lanes (Addition of Lanes Vary with I-710 Segments). Reconfigure Approx. 13 Local Access Interchanges Between Ocean Blvd/Shoreline Dr. and Atlantic Blvd/Bandini Blvd Arterial Improvements. Construction of Freight Corridor on I-710 (4 Truck Lanes with Dedicated Ingress/Egress at Select Locations (Harbor Scenic Drive, Ocean Blvd, Pico Ave, Anaheim Street, South of PCH, North of I-405 at 208TH Street, SR-91, Patata Street, Bandini Blvd, Washington Blvd and Sheila Street)). (Note: Cost not included here, it is represented on the Gateway Cities Mobility Matrix list)

APPENDIX C. South Bay Mobility Matrix - DRAFT Consolidated Project/Program List

Program	Subprogram	MM Project ID	Jurisdiction	Description
ITS / Communications with Motorists Program	Freeway ITS Program	1104	Caltrans	I-105: Along I-105 between I-605 and Route 1 (ATM and TMS improvements)
	Arterial ITS Program	87	LA City	District 15 Intelligent Transportation System Improvements
		82	LA County	Hawthorne Blvd: ITS Improvement from Imperial Hwy to Manhattan Beach Blvd
		2030	Inglewood	Inglewood ITS - Phase IV Part B: Design and installation of fiber-optics on La Cienega Blvd., Centinela Ave., Florence Ave. and Prairie Ave. New CCTV, speed detection systems and web-based traveler information. Upgrade the current Traffic Control System (TCS) to Adaptive TCS and replace 5 Type 170 controllers with Type 2070 controllers on Prairie Ave.
		1075	Inglewood	Inglewood ITS - PHASE V : (1) Designs and constructs computerized traffic control and monitoring systems. (2) Expands central traffic control and advance traffic management at 39 intersections (3) improves 6.13 miles of fiber optic communications, (4) expands Closed Circuit Television Cameras (CCTV) at 10 intersections, (5) installs Changeable Message Signs (CMS) at 2 intersections, and (6) installs new communication hubs at 3 intersections.
		84	LA County	Manhattan Beach Blvd: ITS Improvement from Manhattan Ave to Van Ness Ave
		1083	Various	Metro/various: South Bay Baseline Arterial Performance Monitoring Implementation
		86	LA County	South Bay Forum ITS Improvements: Various
		1118	LA County	South Bay ITS Communications
		88	LA County	South Bay ITS Improvements
		1089	LA County	System Operations
	Other ITS Improvements	1048	Various	Implement South Bay Subregional ITS Plan
		1027	Hawthorne	Various: Municipal Wireless Network for Transportation communications
		290	Torrance Transit	Various: Real-Time Passenger information at all major stops and transfer points (Torrance Transit)
		2072	Redondo Beach: Beach Cities Transit	Various: Real-Time Passenger information at the Transit Center (Redondo Beach; Beach Cities Transit)
Local Streets State of Good Repair	Local Streets State of Good Repair Program	38	Hawthorne	120th St Improvement : Prairie Ave to Inglewood Ave
		39	Gardena	139th St Improvement - Ardath Ave to Budlong Ave
		40	Gardena	166th St Improvement - Berendo Ave to Gramercy Place
		4005	Torrance	Annual maintenance of roadways, citywide, inclusive of pavement, curb & gutter, access ramps, ADA pathways, lighting, ITS, signal equipment, etc…
		49	Redondo Beach	Arterials/Collectors Street Pavement Rehabilitation
		41	Gardena	Artesia Blvd: Street Improvement-Vermont Blvd to Western Ave
		198	SBCCOG	Coordination of Rehabilitation and Improvement of State Highways (non-freeway routes): between Caltrans, Metro and South Bay Cities Council of Governments
		43	Hawthorne	Crenshaw Blvd Improvement : 131st St to Rosecrans Ave
		29	Gardena	Crenshaw Blvd: Street Improvement- Redondo Beach Blvd to El Segundo Blvd, street improvement and signal improvements(6 signals) along the route.
		30	Hawthorne	El Segundo Blvd Improvement : Inglewood Ave to Crenshaw Blvd
		31	El Segundo	El Segundo Blvd Improvement : Sepulveda Blvd to Aviation Blvd
		44	Gardena	Gardena Blvd: Street Improvement - Vermont Ave to Western Ave
		32	Torrance	Hawthorne Blvd Improvement : 182nd St to Lomita Blvd
		63	Hawthorne	Hawthorne Blvd Improvement : El Segundo Blvd to Imperial Hwy
		105	LA County	LA County Traffic Signal Operation Improvements
		1108	El Segundo	Local and Arterial Street Maintenance and Repair and Pavement Rehabilitation
		26	Inglewood, Los Angeles	Manchester Blvd and La Cienega Blvd Corridor Improvement (with City of Los Angeles)

Program	Subprogram	MM Project ID	Jurisdiction	Description
Local Streets State of Good Repair	Local Streets State of Good Repair Program	33	LA County	Normandie Ave: Street Improvement - 95th St to El Segundo Blvd
		60	Gardena	Normandie Ave; Street Improvement- El Segundo Blvd to 177th St
		50	LA County	Pavement Preservation
		46	Hawthorne	Prairie Ave Improvement : Imperial Blvd to Rosecrans Ave
		28	LA City	Redondo Beach Blvd Improvement : I-110 to Figueroa
		61	Gardena	Redondo Beach Blvd Improvement: Crenshaw Blvd to Vermont
		58	Lawndale	Redondo Beach Blvd: From Artesia to Prairie, roadway improvements and signal upgrades
		52	Redondo Beach	Residential Street Pavement Rehabilitation
		34	Manhattan Beach	Sepulveda Blvd Improvement : Rosecrans to Artesia Blvd
		35	El Segundo	Sepulveda Blvd. Improvement : Imperial Hwy to El Segundo Blvd
		25	LA County	Sidewalk, Curb, Parkway Preservation; Repair and Reconstruction
		140	SBCCOG	State Highway Bridge and major arterial seismic retrofit program (Manhattan Overhead) at Route 1. PM 23.70/23.80
		54	Manhattan Beach	Street Improvements - Annual Rehabilitation
		47	Redondo Beach	Traffic Signals and Street Lights - Regular Deferred Maintenance
		36	Gardena	Van Ness Ave: Street Improvement- Redondo Beach Blvd to El Segundo Blvd
		37	Gardena	Western Ave St Improvement : Artesia Blvd to El Segundo Blvd
Bikeways Program	Bikeways Program	211	Hawthorne, LA County	135th St: Isis St to Crenshaw Bl
		240	Torrance, Hermosa Beach, Redondo Beach	190th St/Herondo Anita: South Bay Bike Trail Harbor Drive to Western Ave
		219	LA County	223rd Street; Normandie Ave to I-110; Class 2 Bike Lanes
		212	Inglewood	90th St: Prairie Av to Crenshaw Bl
		207	Torrance	Anza Ave: Sepulveda Bl to PCH Bike/Ped Improvements
		241	LA City, Inglewood	Arbor Vitae St : Crenshaw Bl to Arlington Av
		242	LA City, Inglewood	Arbor Vitae St : LA, Inglewood Arbor Vitae St Sepulveda Bl to Prairie Av
		2012	Manhattan Beach	Artesia Bl. Bike Lane - Sepulveda Bl. to Aviation Bl.
		220	LA County	Aviation Blvd; Imperial Hwy to 124th St; Class 2 Bike Lanes
		2016	Manhattan Beach	Bell Avenue Bike Lane/Path
		213	Torrance	Cabrillo Bikeway: Sepulveda Bl to Torrance Bl
		278	SBCCOG	Car and bike sharing programs
		214	LA County	Compton Creek Bike Trail: Bike Trail Class 1 Facility/Connector between Del Amo Bl and LA River Bike Trail
		236	Inglewood	Crenshaw Bl : I-105 to 90th St
		221	LA County	Crenshaw Bl; in Palos Verdes Peninsula; Class 2 Bike Lanes
		222	LA County	Del Amo Blvd; Normandie Ave to I-110; Class 2 Bike Lanes
		218	LA County	Dominguez Channel Bike Trail: Bike Trail Class 1 Facility/Connector from Main St to Wilmington
		208	LA County	Dominguez Channel: Redondo Beach Blvd to Vermont Ave; Class 1 Bike Path
		209	LA County	Dominguez Creek Bike Path; Main St to Pacific Coast Hwy; Class 1 Bike Path
		244	Gardena, Torrance	Dominguez Creek Channel: Near El Camino College to Western Av
		223	LA County	El Segundo Blvd; Isis Ave to Inglewood Ave; Class 2 Bike Lanes
		1084	El Segundo	El Segundo Commuter Bikeways- Aviation Blvd, Douglas St., and Nash St. Establish three bicycle corridors within the city limits which are near large employers and adjacent to green line stations.
		210	Torrance	Enhanced Bicycle right-of-way and rack
		1031	LA City	Figueroa Street: Bicycle improvements from 146th Street to Redondo Beach Blvd

Program	Subprogram	MM Project ID	Jurisdiction	Description
Bikeways Program	Bikeways Program	206	Various	I-405: Implement bikeway projects throughout the I-405 corridor (approx. 24 miles of Class II and 1.6 miles of Class I: Corridor-wide
		245	LA City and County	Imperial Hwy: Aviation Bl to Arlington Av
		224	LA County	Imperial Hwy; La Cienega Blvd to Inglewood Ave; Class 2 Bike Lanes
		225	LA County	Imperial Hwy; Van Ness Ave to Vermont Ave; Class 2 Bike Lanes
		238	El Segundo	Installation of bike routes and related support facilities throughout El Segundo's major and minor arterials, including Aviation Blvd., El Segundo Blvd., Nash St., Douglas St., Grand Ave., Rosecrans, Mariposa, Imperial Ave. Main St., Loma Vista, Sheldon and Center St.
		250	LA City, Inglewood	La Brea Av: Exposition Bl to Imperial Hwy
		226	LA County	La Cienega Blvd; Imperial Hwy to El Segundo Blvd; Class 2 Bike Lanes
		228	LA County	Local Bikeways; Class 2 & Class 3 Bikeways on Local Streets
		246	Lomita	Lomita Bl (east segment): Crenshaw Bl to Western Av
		215	Torrance	Lomita Bl (west segment) Anza Av to Hawthorne Bl
		216	LA City, Lawndale, Manhattan Beach, Redondo Beach	Manhattan Beach Bl: South Bay Bike Trail to Dominguez Channel
		229	LA County	Manhattan Beach Blvd; Prairie Ave to Crenshaw Blvd; Class 2 Bike Lanes
		2015	Manhattan Beach	Manhattan Beach Citywide Bike Friendly Streets - Redondo Ave, Meadows Ave. Peck Ave. 15th St, 2nd St.
		2018	Manhattan Beach	Manhattan Beach Citywide Bike Racks and Lockers
		267	Manhattan Beach	Manhattan Beach: Bikeway/Pedestrian Improvements - Annual misc non-motorized transportation improvements; (construct crosswalk, bike lances, etc.)
		230	LA County	Marine Av; Gerkin Ave to Crenshaw Blvd; Class 2 Bike Lanes
		2011	Manhattan Beach	Marine Ave. Bike Lanes - Sepulveda Bl. to Aviation Bl.
		231	LA County	Normandie Avenue; 225th St to Sepulveda Blvd; Class 2 Bike Lanes
		2014	Manhattan Beach	Parkway Dr. and Redondo Ave. Bike Lane/Paths
		217	Torrance	Prairie Av: Artesia to Redondo Beach Bl
		232	LA County	Prairie Ave; Redondo Beach Blvd to Marine Ave; Class 2 Bike Lanes
		247	LA County, Lawndale, Gardena, Torrance	Redondo Beach Bl : Hawthorne Bl to Western Av
		233	LA County	Redondo Beach Blvd; Prairie Ave to Crenshaw Blvd; Class 2 Bike Lanes
		2017	Manhattan Beach	Rosecrans Ave. Bike Lanes/Path-Sepulveda Bl. to Aviation Bl.
		5000	LA City - San Pedro	San Pedro Community: Complete Bike Network in City of LA, San Pedro Community, including connections on 1st Street, 25th Street, 9th Street, Grand Avenue, Gaffey Street, and Westmont Drive, as well as the Greenway Network reference in the General Plan Framework.
		2000	LA City - Harbor Gateway	San Pedro: City initiation of the development of proposed Bikeways along power line rights-of-way, flood control channels and abandoned railroad property. Landscaping of street medians is also proposed, where feasible.
		2013	Manhattan Beach	Valley Dr./Ardmore Ave. Bike Path - Sepulveda Bl. to Longfellow Ave.
		239	Torrance	Western Av: 223rd St to 190th St
		235	LA County	Western Ave; 120th Street to El Segundo Blvd; Class 2 Bike Lanes
		5001	City of Los Angeles	Wilmington-Harbor City Area Bikeway System: Complete the City of LA, Wilmington-Harbor City Area Bikeway System: (1) Implement the proposed Bikeway Master Plan in the Bikeway Five Year Program and the 20- year Plan for the Wilmington-Harbor City area along the Dominguez Channel, Anaheim Street, Avalon Blvd, and Figueroa Street.

APPENDIX C. South Bay Mobility Matrix - DRAFT Consolidated Project/Program List

Program	Subprogram	MM Project ID	Jurisdiction	Description
Pedestrian Program	Pedestrian Program	259	SBCCOG	Beach access/circulation improvements and parking visitor information/way-finding
		2024	Manhattan Beach	Bell Ave./Blanche Ave./24th St./25th St. Crossing Realignment
		4007	El Segundo	High Pedestrian Crossing Improvements - Main St, near schools
		2019	Manhattan Beach	Highland Ave. Walk Street Crossings
		260	LA County	LA County Pedestrian Improvements; Construct New Sidewalk
		264	LA County	Los Angeles County: Pedestrian Improvements
		263	Manhattan Beach	Manhattan Beach Annual Pedestrian Improvements
		2020	Manhattan Beach	Manhattan Beach Downtown Pedestrian Crossing Enhancements
		265	Manhattan Beach	Manhattan Beach New Pedestrian Improvements
		3006	Torrance	Pedestrian overpass across Hawthorne Blvd at Del Amo Fashion Center and Financial Center
		258	Redondo Beach	Pedestrian Path of Travel Improvements (including sidewalk, curb, gutters, ramps, and storm drain inlet devices)
		2021	Manhattan Beach	Sepulveda Bl. Crossing Treatments
		262	LA County	Sidewalk Curb Parkway Preservation
		261	LA County	Vermont Ave; 92nd St to El Segundo Blvd; Regional Pedestrian Trail
		2023	Manhattan Beach	Veterans Parkway Pedestrian Crossing Enhancements
Complete Streets / Slow Speed Lanes Program	Complete Streets Program	2022	Manhattan Beach	Center Place and 11th St. Walk Streets-Ocean Dr. to Morningside Dr.
		5002	City of Los Angeles	Complete Streets Program for San Pedro. 5th Street: Conversion of 5th Street from Harbor Boulevard to Pacific Avenue into a one lane one-way westbound with angled parking. 7th Street: Conversion of 7th Street from Harbor Blvd to Pacific Ave into a one lane one-way eastbound with angled parking. 6th Street create a Pedestrian Priority Street from Pacific to Harbor N. Pacific Ave. Pedestrian street between 3rd St - 9th Street. 8th Street: Pedestrian Street: Between S. Weymouth Ave + S Walker Ave.
		271	SBCCOG	Develop "complete streets" designed to accommodate Neighborhood Electric Vehicles
		3000	Lawndale	Develop and Implement Citywide Mobility Plan and Complete Streets Guidance
		4001	El Segundo	El Segundo Blvd - Complete Street between Whiting and Sepulveda Blvd.
		2053	LA City - San Pedro Ports O'Call	Sampson Way: proposed expansion of Sampson Way into a scenic boulevard along the west perimeter of Ports O'Call Village, and the creation of an extensive network of public promenades, bikeways, and Coastal Trail connections will facilitate public access throughout the waterfront area to better connect the waterfront with downtown San Pedro and the surrounding community.
		2044	LA City - San Pedro	San Pedro priority transit routes. The San Pedro Community Plan identifies transit priority streets. Transit priority streets are arterials where bus use is prioritized. The design of these streets should support the comfortable use of transit, utilizing wide sidewalks, landscaping, attractive street furniture and well designed bus stops/shelters. Pedestrian amenities, such as trash cans and benches, and safety measures, such as pedestrian lighting and special crosswalk paving, help support a pedestrian-friendly environment along these streets. Roadway construction features should include concrete bus pads and other features to address the extra maintenance issues associated with high volumes of bus traffic. Transit priority streets include: Western Avenue between 25th and North San Pedro boundary ; Harbor Boulevard between Vincent Thomas Bridge and 17th Street; Pacific Avenue between Bluff Pl and John S. Gibson Boulevard; 5th Street between Pacific Avenue and Harbor Boulevard; and 7th Street between Harbor Boulevard and Weymouth Street.
		4000	Rancho Palos Verdes, LA City, Caltrans	Western Ave (SR213) - Complete Street Project
	Slow Speed Implementation Program	266	SBCCOG	Slow Speed Lane Implementation Program

Program	Subprogram	MM Project ID	Jurisdiction	Description
Transportation Management Systems (Traffic Operations Centers, Traffic Signals, Emergency Management)	Freeway TMS Program	1106	Caltrans, Los Angeles, Hawthorne, Inglewood	I-105: From Imperial Hwy to Rte 110, Post Mile 0.0/7.264, upgrade Transportation Management System
		1105	Caltrans, Los Angeles	I-110: From 9th Street to I-5, PM 0.00/25.75, Install Transportation Management System and upgrade for life cycle replacements of the TMS for the connected corridor
		181	Caltrans, Los Angeles, LA County, Inglewood	I-405/I-105/SR-90: NB and SB I-405 "Add connector metering and ramp metering between I-105 and SR-90 interchanges". PM R21.18/25.94
		2029	Caltrans, Los Angeles, Inglewood, Culver City	I-405: From Rte 105 to Rte 10, Postmile 21.175/29.5, Upgrade Transportation Management System
		200	Caltrans, Metro	I-405: Expand operations of FSP Corridor-wide (yearly)
		199	Caltrans, Metro	I-405: Expand operations of FSP throughout Segment B of I-405 Yearly
		1107	Caltrans, Los Angeles, Carson, Torrance, Lawndale, Redondo Beach, Hawthorne	I-405: From Alameda Street to Rte 105, Postmile 8.78/21.175, upgrade transportation management system
	Subregional Traffic Management Center	203	SBCCOG	Implement a Sub-Regional Traffic Management Center
	Arterial Messaging System	3003	Various	Arterial Messaging System
	Event/Emergency Management System Program	3002	Various	Community Notification System
		3004	Hawthorne, El Segundo, Redondo Beach, Hermosa Beach, Gardena, and Manhattan Beach	Emergency Vehicle Priority System
		3005	El Segundo, Gardena, Hawthorne, Hermosa Beach, Manhattan Beach, Redondo Beach	Emergency Vehicle Priority System Upgrades. Implement adding emergency vehicle dynamic signing at 100 intersections equipped with emergency vehicle priority equipment in the cities of Hawthorne, El Segundo, Redondo Beach, Hermosa Beach, Gardena and Manhattan Beach.
		116	Carson	StubHub Arena Event Management System
		2046	LA City - San Pedro	Tsunami evacuation route. Work with the Emergency Management Department and the Fire Department to change the tsunami evacuation route from 6th Street to 7th Street, should 6th Street be closed to motorized vehicles in the future.
	Traffic Signal Synchronization Projects	1110	LA County	120th Street (EAST) TSSP; Western Ave to Vermont Ave; Traffic Signal Synchronization
		1111	LA County	120th Street (WEST) TSSP; Aviation Bl to Van Ness Ave; Traffic Signal Synchronization
		1112	LA County	135th Street TSSP; Yukon Ave to Avalon Bl; Traffic Signal Synchronization
		1113	LA County	182nd Street/Albertoni Street; Inglewood Ave to Avalon Bl signal synchronization
		111	LA County	Anza Av: 190th St to Pacific Coast Hwy signal synchronization
		97	LA County	Avalon Boulevard TSSP; 126th St to Sepulveda Bl; Traffic Signal Synchronization
		1114	LA County	Crenshaw Boulevard (NORTH) TSSP; Manchester Ave to Rosecrans Ave signal synchronization
		107	LA County	Del Amo Bl : Avalon Bl (EAST) to Susana Road signal synchronization
		1115	LA County	Del Amo Boulevard (WEST) TSSP; Prospect Ave to Western Ave signal synchronization
		98	LA County	El Segundo Boulevard TSSP; Illinois St to Vermont Ave; Traffic Signal Synchronization

APPENDIX C. South Bay Mobility Matrix - DRAFT Consolidated Project/Program List

Program	Subprogram	MM Project ID	Jurisdiction	Description
Transportation Management Systems (Traffic Operations Centers, Traffic Signals, Emergency Management)	Traffic Signal Synchronization Projects	1109	LA County	Hawthorne Bl : 104th St to Imperial Hwy signal synchronization
		110	LA County	Hawthorne Bl : 244th St to Palos Verdes Dr W signal synchronization
		92	LA County	Hawthorne Bl : Imperial Hwy to Manhattan Beach Bl signal synchronization
		99	LA County	Imperial Highway TSSP; Sundale Ave to Budlong Ave; Traffic Signal Synchronization
		93	LA County	Inglewood Av : 104th St To 111th Pl signal synchronization
		94	LA County	La Brea Av : Centinela Av to Century Bl signal synchronization
		1116	LA County	La Cienega Boulevard TSSP; Slauson Avenue to El Segundo Blvd signal synchronization
		1066	Lawndale	Lawndale Various Citywide Traffic Signal Improvements Citywide
		108	LA County	Lennox Bl : Inglewood Av to Freeman Av signal synchronization
		109	LA County	Manhattan Beach Bl : Manhattan Av to Van Ness Av signal synchronization
		95	LA County	Normandie Av : 89th St to El Segundo Bl signal synchronization
		101	LA County	Redondo Beach Boulevard; Artesia Bl to Vermont Ave; Traffic Signal Synchronization
		102	LA County	Rosecrans Avenue TSSP; Highland Ave to Ocean Gate Ave; Traffic Signal Synchronization
		103	LA County	Rosecrans Avenue TSSP; Ocean Gate Ave to Vermont Ave; Traffic Signal Synchronization
		104	LA County	South Bay Arterial Operational Improvements, Signal Synchronization, Backbone network redundancy, CCTV @ 16 locations
		1117	LA County	Van Ness Ave TSSP; Imperial Hwy to Torrance Bl signal synchronization
		106	LA County	Western Av : 104th St to 111 St signal synchronization
		2055	LA City - Wilmington-Harbor City	Wilmington-Harbor City's signalized intersections are integrated with the City's ATSAC system
Goods Movement	Regional Goods Movement Program	5004	Port of Los Angeles and Port of Long Beach	New Cerritos Channel Rail Bridge
		5005	Port of Los Angeles	Pier 400 Second Lead Track
		5006	Port of Los Angeles	Port of Los Angeles Improvements: 1) WBCT On-Dock Rail: Addition of 2 new loading tracks; 2) YTI On-Dock Rail: Addition of 1 new loading track; 3) Pier 400 Rail Expansion-Phase 1; 4) Pier 300 Rail Expansion: Addition of 2 new loading tracks; 5) Seaside Yard: Dedicated on-dock rail yard for Berth 226-236 terminal (Evergreen); 6) Terminal Island Support Yard; 7) Berth 200 Railyard Expansion: Additional Storage/working tracks; 8) Port of LA Container Movement Enhancement Program: WBCT wharf improvements, YTI wharf improvements and Pier 300 wharf improvements
		139	SBCCOG	South Bay Goods movement projects related to Port of Los Angeles and LAX
		5007	Port of Los Angeles and Port of Long Beach	Triple Track S.O Thenard
Grade Separation and Crossing Projects	Grade Crossing Improvement Projects	131	Carson, LA City, LA County, Torrance	Carson St : Improve striping
		132	El Segundo	Imperial Hwy: Additional signage and improved striping; roadway improvements at crossing
		135	Redondo Beach, Lawndale	Inglewood Av : Adjust signal timing and install raised median
		133	Inglewood	La Brea Av : Installation of a pre-signal, additional signage and improved striping
		134	Inglewood	La Cienega Bl : Additional signage and improved striping
		136	Lawndale	Manhattan Beach Blvd: Improve drainage to prevent failure of crossing gates
		129	Redondo Beach, Hawthorne	Marine Av: Additional signage and improved striping (and intersection modification). Goods movement and safety enhancement at RR tracks.
		137	LA City, Torrance (Caltrans)	Sepulveda Bl: Adjust signal timing at Western Av/Sepulveda Bl to reduce queuing over tracks

APPENDIX C. South Bay Mobility Matrix - DRAFT Consolidated Project/Program List

Program	Subprogram	MM Project ID	Jurisdiction	Description
Grade Separation and Crossing Projects	Grade Crossing Improvement Projects	130	Torrance	Torrance Bl: Adjust signal timing to relieve queuing at Torrance Bl crossing: Torrance Crenshaw Bl Adjust signal timing to relieve queuing at Torrance Bl crossing
		138	Torrance	Western Av: Revise warning time and gate down operations related to train switching maneuvers
	Subregional Grade Separation Program	125	Manhattan Beach, El Segundo, Hawthorne; SBCCOG	Aviation Bl/Rosecrans Av Grade Separation: Grade sep Aviation Bl under Rosecrans Av for free-flow north-south movements via tunnel & at-grade east-west movements at signalized intersection
		3008	Torrance	Grade Separation between rail and street at: Torrance Blvd, Carson St., Sepulveda Blvd, and Western Ave
		141	Caltrans, SBCCOG	I-405: NB I-405 Construct grade separation at La Cienega Blvd and Manchester Blvd. PM 23.64/23.35
		1033	Inglewood	La Cienega Boulevard: La Cienega Expressway: complete gaps in La Cienega Blvd. grade separation
		127	El Segundo	Park Place: Roadway extension of Park Place and railroad grade separation between Sepulveda Blvd. and Nash St. (roadway does not currently exist - this is a gap closure project) to help relieve traffic on Rosecrans between Sepulveda Blvd. and the I-405, and on Sepulveda between El Segundo Blvd and Marine Ave.
		3007	Torrance	Plaza Del Amo Extension and Grade Separation
Paratransit (Dial-a-Ride, Senior/ Disabled)	Paratransit Program	2086	Torrance	Construct and operate a Regional Mobility Center to assist senior and disabled patrons.
Metro / Municipal Transit Capacity Expansion	Metro Harbor Subdivision/ Green Line Southern Extension to Torrance and Maintenance Facility	296	Metro, SBCCOG	Metro Harbor Subdivision/Green Line Southern Extension to Torrance with Maintenance Facility (underfunded)
	Metro Harbor Subdivision/ Green Line Extension from Torrance to Long Beach Blue Line	4008	Metro	Metro Harbor Subdivision/Green Line Extension from Torrance to Long Beach Blue Line
	Metro Harbor Subdivision/ Green Line Extension from Torrance to San Pedro	4009	Metro	Metro Harbor Subdivision/Green Line Extension from Torrance to San Pedro
	Bus Rapid Transit Program	285	SBCCOG	High frequency South Bay Municipal operator "Rapid" lines for regional connectivity to South Bay Rail and Express Bus Stations
		286	LA City, LA County, Inglewood	Increase Metro Rapid Service To San Fernando Valley
	Bus Expansion Program	300	LA City, Long Beach, Redondo Beach, Torrance	Add transit service connection to downtown Long Beach to South Bay Galleria
		2090	Torrance	Carson Street Corridor service - Del Amo Mall to Del Amo Station

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Program	Subprogram	MM Project ID	Jurisdiction	Description
Metro / Municipal Transit Capacity Expansion	Bus Expansion Program	3012	Torrance	Creation of on-street layover bays in sub-regional HUB areas (add restrooms where possible). Additional Operating funding for service expansion.
		4006	Various	Demand Responsive Transportation Program
		2096	Torrance	Downtown Circulator Service
		2095	Torrance	Expansion and Replacement Buses
		288	El Segundo, Hermosa Beach, Manhattan Beach, Redondo Beach	Increase Airport express bus service from LAX to South Bay
		284	Torrance Transit	Increase Express bus service on I-405
		280	Downey, LA City, LA County, Lynwood, Norwalk, Paramount	Increase feeder bus service to Metro Green line and Harbor Transit way – Metro Green Line (Lines 40, 232, 439:, Harbor Transit way (Lines 442, 445, 550)
		268	SBCCOG, LA City	Municipal and Local Transit Capital and Operations and Paratransit Services (e.g., DASH) Capital and Operations unmet funding needs and expansion of services
		2094	Torrance	Provide additional circulator service within Torrance boundaries to connect with RTC
		2091	Torrance	Sepulveda Corridor service - Redondo Beach Pier to Willow Station
		2089	Torrance	Torrance to Disneyland/Metrolink (Orange County) via CA-91
		2092	Torrance	Torrance to Orange County Metrolink - via I-405 HOT Lane
		2088	Torrance	Torrance to UCLA/West LA Job Centers via I-405
		2054	LA City - Wilmington-Harbor City	Transit improvements [TIMP]: Implement the South Bay Transit Restructuring Study, which will recommend public transit improvements
Metro / Municipal Transit Incremental Operational Costs from Capacity Expansion	Transit Operations Program	2071	Redondo Beach: Beach Cities Transit	Annual maintenance and operations funding for RB South Bay Regional TC
		306	Torrance Transit	Annual maintenance and operations funding for RTC
		2064	Manhattan Beach, El Segundo	Annual Summertime Beach/Downtown Circulator Bus System
		2075	Redondo Beach: Beach Cities Transit	Operating funds for business districts shuttles to RB South Bay TC
		283	Torrance Transit	Operating funds for RTC to DAFC shuttle
		282	Torrance Transit	Reduce peak period headways on selected local and express transit at various locations to be determined
Metro / Municipal Transit Maintenance and Rehab	Green Line: Miscellaneous capital and operational improvements to existing line	301	Metro, El Segundo, Hawthorne, City of LA City, LA County	Green Line: Miscellaneous capital and operational improvements to existing line. Improvements include adding tail tracks and crossovers at the Redondo Beach Station and extending station platforms to allow for 3-car trains at Aviation/LAX, Mariposa, Douglas, and Redondo Beach stations.
	Transit Maintenance and Rehab Program	2097	Torrance	Bus Stop Improvements
		2065	Manhattan Beach	Citywide Bus Shelters and Amenities
		3011	Torrance	Increase Maintenance Capacity - Add Mechanics, Paint & Body Personnel, Hardware Electronics Expert, new Maintenance Bays.

APPENDIX C. South Bay Mobility Matrix - DRAFT Consolidated Project/Program List

Program	Subprogram	MM Project ID	Jurisdiction	Description
Metro / Municipal Transit Maintenance and Rehab	Transit Maintenance and Rehab Program	303	SBCCOG	Preventive Maintenance / Rehabilitation of Transit (Bus & Rail)
		304	Manhattan Beach	Public Transit Services Annual Operating
		2073	Redondo Beach: Beach Cities Transit	Rehabilitation of Transit Maintenance and Operations Facility
Transit Centers / Park and Ride	Transit Center/Park and Ride/Multi Modal Center Program	1081	Torrance	Crenshaw Blvd Torrance Transit Center Roadway Improvements - From Del Amo to Dominguez: 3 Southbound turn lanes @ Del Amo Blvd, 208th St, Transit Center Entrance, Signal Improvements at 2 and new signal @ Transit Center
		2033	LA City - San Pedro	Develop multi modal center in or near downtown San Pedro.
		277	Metro	Expand Artesia Station park-and-ride facility
		273	Torrance	Furniture and Equipment to complete Phase I of the Regional Park and Ride Facility (RTC)
		1020	LA County, LA City - Harbor Gateway	Harbor Freeway Transit way and Transit Center (Artesia Transit Center): Expand park & ride facility.
		275	Torrance	Pacific Coast Highway/Hawthorne Blvd Park and Ride structure
		276	Gardena	Park and Ride facility - southwest corner of El Segundo/Vermont and southwest El Segundo/Western
		1082	Torrance	PCH/Hawthorne Park and Ride
		274	Torrance	Phase II of the Regional Parking and Ride Facility (Parking Structure)
		1054	Torrance	Torrance Regional Transit Center- 465 Crenshaw Boulevard: Construct a regional Transit Center including an 8 bus berth transit center building, a kiss-n-ride passenger drop-off, and a park-and-ride vehicle lot for 250 vehicles for the initial parking space provision
		2070	Redondo Beach: Beach Cities Transit	Upgrade to Transit Center parking lot for Green Line extension
		2087	Torrance	Work with LACMTA (Metro) to rehab the Torrance Transit Park and Ride Regional Terminal (RTC)
Car Sharing / Ride sharing / Vanpool / Telecommuting Programs	Car Sharing / Ride sharing / Telecommuting / Vanpool Program	278	SBCCOG	Car and Bike Sharing Programs
		4004	Various, SBCCOG	Telecommuting Program
Sustainability SB Plan (Neighborhood-Oriented Development, 1st/Last Mile)	First/Last Mile Program	252	SBCCOG	"First/Last-mile" connections for transit; Metro Green Line, I-110 Express Lanes station
		253	SBCCOG	"First/Last-mile" connections for transit; Transit hubs for ease of transfers. Up to 12 new/upgraded stations
		254	LA County	Aviation Blvd/LAX Green Line Station: Transit Oriented District; First Mile/Last Mile Active Transportation Access Improvements
		255	LA County	Hawthorne/Lennox Green Line Station; Transit Oriented District; First Mile/Last Mile Active Transportation Access Improvements
		256	LA County	I-110/West Carson Transit Center; Transit Oriented District; First Mile/Last Mile Active Transportation Access Improvements
		1098	Redondo Beach: Beach Cities Transit	Improve access to/from Transit Center/Green Line Extension station near Artesia Blvd/Kingsdale Ave/South Bay Galleria areas
		307	Torrance	Pedestrian walkway and elevators from proposed rail station to bus bay
		257	LA County	Vermont/Athens Green Line Station; Transit Oriented District; First Mile/Last Mile Active Transportation Access Improvements

APPENDIX C. South Bay Mobility Matrix - DRAFT Consolidated Project/Program List

Program	Subprogram	MM Project ID	Jurisdiction	Description
Sustainability SB Plan (Neighborhood-Oriented Development, 1st/Last Mile)	Mobility/Sustainability Education and Incentive Program	3009	Various	Enhance Mobility/Sustainability Education and Incentive Program
	Neighborhood-Oriented Development Program	279	SBCCOG	Establish and implement "Neighborhood-Oriented Development" Program
	Subregional Sustainability Transportation Program	272	SBCCOG	Sub-regional Sustainability Transportation Program
Vehicle Conversion (Electric Vehicle, Slow Speed Vehicle)	Vehicle Conversion (Electric Vehicle, Slow Speed Vehicle) Program	3010	Torrance	Alternative Fueling Infrastructure (Program at various locations)/Electric Charging Stations at City facilities and parks
		269	Torrance	CNG Station (Madrona Site) upgrade
		2074	Redondo Beach: Beach Cities Transit	CNG Station at Transit Maintenance and Operations Facility
		281	Torrance Transit	Fleet modernization project-replacement of diesel buses with hybrid buses by the end of 2015
		270	SBCCOG	South Bay Plug-in Electric Vehicle Public Infrastructure Program throughout the subregion
Transportation Enhancement / Beautification Programs	Transportation Enhancement / Beautification Program	1	LA County	LA County Aesthetics Beautification
		2048	LA City - San Pedro	San Pedro Scenic Highways. Improvements on 25th Street between the westerly Plan area boundary and Western Avenue; Paseo Del Mar; Harbor Blvd; and Western Ave between 25th Street and Paseo Del Mar
		2049	LA City - San Pedro	San Pedro Streetscapes. Implement a streetscape plan for 6th Street between Pacific Blvd. and Harbor Blvd. Implement streetscape plans for N. and S. Gaffey St.
		305	Torrance Transit	Solar lighting at RTC, Bus Shelters and stops

* Jurisdiction” may refer to the lead project sponsor, the jurisdiction where the project exists, or the agency that proposed the addition of the project. Projects without specified jurisdictions were sourced from other planning documents (e.g., Metro Long Range Transportation Plan and others) where no lead or proposing agency was listed.

Financially-Constrained RTP Projects										
County	System	Lead Agency	RTP ID	Route #	Route Name	From	To	Description	Completion Year	Project Cost ($1,000's)
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1ITS01	0	CITYWIDE	CITYWIDE	CITYWIDE	ITS PLATFORM UPGRADES-THIS PROJECT INCLUDES TWO PARTS: COMPUTER NETWORK ARCHITECTURE UPGRADE (CNA) AND COMMUNICATIONS SYSTEM & CENTRAL COMPUTER CORE UPGRADE (CSC). THE CNA WILL INCREASE CAPACITY OF THE ATSAC CENTRAL COMPUTER NETWORK. THE CSC INVOLVES UPGRADE OF NEW SOFTWARE COMMUNICATIONS STACKS TO INCREASE CAPABILITY OF EACH COMMUNICATIONS CHANNEL TO TRANSMIT VARIOUS TRAFFIC DATA.	2019	$2,875
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LA0B7330	0	SAN FERNANDO RD.	FIRST ST.	BRANFORD ST.	SAN FERNANDO RD ROW BIKE PATH PHSE II-CONSTRUCT 2.75 MILES CLAS I FRM FIRST ST TO BRANFORD ST,ON MTA-OWND ROW PARLEL TO SAN FERNANDO RD. LINK CYCLSTS TO NUMROUS BUS LNE. PPNO 2868.	2014	$10,198
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LA0G709	0	EL DORADO AV	BROMWICH ST	MONTAGUE ST	EL DORADO & BROMWICH SIDEWALK IMPROVEMENTS - IMPROVEMENTS WILL BE ON: 1) EL DORADO AV-BROMWICH ST TO MONTAGUE ST; AND 2) BROMWICH ST-EL DORADO AV TO SAN FERNANDO RD. CONSTRUCTION ELEMENTS WILL INCLUDE CONCRETE CURB, GUTTER, SIDEWALKS, ADA-COMPLIANT ACCESS RAMPS AND ASPHALT CONCRETE PAVING.	2014	$586
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LA0G710	0	ECHO PARK AREA	SUNSET BLVD	SUNSET BLVD	ECHO PARK/SUNSET BL STREETSCAPE BEAUTIFICATION - PROJECT WILL PROVIDE FOR CONSTRUCTION OF PEDESTRIAN AND STREETSCAPE IMPROVEMENTS ALONG SUNSET BL IN THE ECHO PARK AREA.PROJECT ELEMENTS WILL INCLUDE SIDEWALK IMPROVEMENTS, STREET TREES, TRANSIT AMNENITIES, AND PARKWAY LANDSCAPING.	2015	$708
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LA0G860	0	OXFORD AVE. X ROMAINE ST.	VARIOUS	VARIOUS	LEMON GROVE LIGHTING PHASE 2 - LEMON GROVE AREA BOUNDED BY SANTA MONICA BLVD(NORTH), WESTERN AVE (WEST), LEMON GROVE AVE (SOUTH) AND THE HOLLYWOOD FREEWAY 101(EAST). INSTALL NEW STREET LIGHTING SYSTEM - INSTALLATION OF NEW CONDUIT, WIRING, PULLBOXES, FOUNDATIONS, STREET LIGHTING ELECTROLIERS. THIS PROJECT WILL USE $31 OF TOLL CREDITS TO $3 IN PE AND $28 IN CONSTRUCTION IN FY2015.. TOLL CREDITS OF $3 WILL BE USED TO MATCH FY15 FEDERAL FUNDS FOR THE PE PHASE, TOLL CREDITS OF $28 WILL BE USED TO MATCH FY15	2015	$267
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1524	0	SAN FERNANDO RD.	BRANFORD ST.	TUXFORD ST.	SAN FERNANDO RD. BIKE PATH PH. IIIA/IIIB - CONSTRUCTION. RECOMMEND PHASE IIIA-CONSTRUCTION OF A CLASS I BIKE PATH WITHIN METRO OWNED RAIL RIGHT-OF-WAY ALONG SAN FERNANDO RD. BETWEEN BRANFORD ST. AND TUXFORD ST INCL BRIDGE. 2 MILE BIKEPATH.	2017	$12,714
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1535	0	CITYWIDE - VARIOUS LOCATIONS	N/A	N/A	BICYCLE WAYFINDING SIGNAGE PROGRAM. WAYFINDING SIGNS TO DIRECT BICYCLISTS, AND EDUCATE MOTORISTS, TO THE LOCATIONS OF DEDICATED BIKE PATHS, LANES AND ROUTES, DESTINATIONS, AND TRANSIT HUBS THROUGHOUT LOS ANGELES.	2015	$504
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1611	0	CESAR CHAVEZ	110 FREEWAY	ALAMEDA	CESAR CHAVEZ TRANSIT CORRIDOR (110 FWY TO ALAMEDA). INSTALLATION OF PEDESTRIAN/TRANSIT RIDER AMENITIES INC. BUS STOP GARDENS AT THREE INTERSECTIONS, NEW PEDESTRIAN LIGHTING, STREET TREES IN A LANDSCAPED PARKWAY & WAYFINDING SIGNAGE.	2016	$2,350
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1612	0	N/A	N/A	N/A	CENTURY CITY URBAN DESIGN AND PEDESTRIAN CONNECTION PLAN. PROJECT WILL IMPLEMENT SIDEWALK IMPROVEMENTS, DECORATIVE CROSSWALKS, MEDIAN ISLAND, CURB RAMPS, PEDESTRIAN LIGHTING, SHELTERS, BENCHES, TRASH RECEPTACLES & STREET TREES. THE PHYSICAL IMPROVEMENTS WILL CONSIST OF A MEANDERING PEDESTRIAN WALKWAY, SOLAR-POWERED PEDESTRIAN SCALE LIGHTING, STREET LIGHTING, TRASH RECEPTACLES, BUS BENCHES, (10)BICYCLE RACKS.	2016	$3,342
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1613	0	EXPOSITION BL	CRENSHAW	JEFFERSON	EXPO LINE STN STREETSCAPE PROJECT-EAST CRENSHAW TO JEFFERSON. DESIGN & CONSTRUCTION OF PEDESTRIAN RELATED STREETSCAPE IMPROVEMENTS WITHIN 1/4 MILE FROM EACH OF 3 LIGHT RAIL STATIONS ALONG EXPOSITION BLVD BETWEEN CRENSHAW & JEFFERSON.	2015	$3,262
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1615	0	1ST ST	SOTO ST	CONCORD ST	EASTSIDE LIGHT RAIL PEDESTRIAN LINKAGE. IMPROVE PEDESTRIAN LINKAGES TO METRO'S GOLD LINE LRT ON 1ST ST BETWEEN SOTO ST TO RIVERA ST AND FRESNO ST TO CONCORD ST. PEDESTRIAN LINKAGE ELEMENTS TO INCLUDE SIDEWALK IMPROVEMENTS, STREET TREES, CROSSWALK ENHANCEMENTS, PEDESTRIAN LIGHTING, AND STREETSCAPE AMENITIES. THE PROJECT'S PURPOSE IS TO PROMOTE AND FACILITATE PEDESTRIAN ACTIVITY AND INCREASE PEDESTRIAN SAFETY LEADING TO METRO'S GOLD LINE EASTSIDE EXTENSION STATIONS.	2015	$2,990
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1617	0	HOLLYWOOD BLVD	HIGHLAND	VINE	HOLLYWOOD PEDESTRIAN/TRANSIT CROSSROADS PHASE II. DESIGN AND INSTALL PEDESTRIAN AND TRANSIT USER ENHANCEMENTS, EXTENDING THE ORIGINAL HOLLYWOOD PEDESTRIAN/TRANSIT IMPROVEMENT PROJECT TO INCLUDE HIGHLAND AVENUE AND VINE STREET.DISTANCE 0.56 MILES.	2016	$860
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1639	0	LOS ANGELES ST	7TH ST	OLYMPIC BL	FASHION DISTRICT STREETSCAPE PHASE II. STREETSCAPE IMPROVEMENTS ENHANCING THE PEDESTRIAN ENVIRONMENT TO FACILITATE INCREASED PEDESTRIAN USAGE BETWEEN LA FASHION DISTRICT'S CORE AND THE 7TH ST TRANSIT CORRIDOR FOR A DISTANCE OF 1 MILE.	2015	$1,971

LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1844	0	CRENSHAW BL	EXPOSITION	VERNON	ANGELS WALK CRENSHAW. TO PROMOTE PEDESTRIAN ACTIVITY WITHIN THE PROJECT LIMITS WITH A GUIDEBOOK AND 15 ON-STREET INFORMATION MARKERS (HISTORIC STANCHIONS) AT STRATEGIC LOCATIONS.	2015	$764
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1845	0	FIGUEROA ST	AVENUE 52	YORK BL	ANGELS WALK HIGHLAND PARK. TO PROMOTE PEDESTRIAN ACTIVITY WITHIN THE PROJECT LIMITS WITH A GUIDEBOOK AND 15 ON-STREET INFORMATION MARKERS AT STRATEGIC LOCATIONS.	2015	$784
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF1846	0	LANKERSHIM BL	MAGNOLIA	CHANDLER	ANGELS WALK NORTH HOLLYWOOD. TO PROMOTE PEDESTRIAN ACTIVITY WITHIN THE PROJECT LIMITS WITH A GUIDEBOOK AND 15 ON-STREET INFORMATION MARKERS AT STRATEGIC LOCATIONS.	2014	$714
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3514	0	NORTHVALE RD.	MOTOR AVE.	500 FEET EAST OF DUNLEER DR.	DESIGN AND CONSTRUCT 0.28 MILES CLASS I BIKE FACILITY NORTH OF I-10 FROM MOTOR AVE. TO 500 FEET EAST OF DUNLEER DR. (CONTINUOUS BIKEWAY FROM EXPOSITION PARK TO SANTA MONICA BEACH).	2017	$5,521
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3515	0	SAN FERNANDO RD.	TUXFORD ST.	COHASSET ST.	SAN FERNANDO RD. BIKE PATH PH. IIIB CONSTRUCTION. CONSTRUCT 2.75 MILE CLASS I BIKE PATH WITHIN METRO RIGHT-OF-WAY ALONG SAN FERNANDO RD. BETWEEN TUXFORD ST. AND COHASSET ST. TO COMPLETE 12-MILE BIKEWAY.. THE PROJECT IS LOCATED WITHIN THE CITY OF LOS ANGELES, IN THE COMMUNITY OF SUN VALLEY. THE PROJECT CONSISTS OF A CLASS I FACILITY 12 FEET IN WIDTH AND 2.75 MILES IN LENGTH BETWEEN TUXFORD ST. AND COHASSET ST. (BURBANK CITY LIMIT).	2016	$12,716
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3631	0	3RD STREET	UNION	HOOVER	WESTLAKE MACARTHUR PARK PEDESTRIAN IMPROVEMENT PROJECT. INSTALL PEDESTRIAN IMPROVEMENTS INCL PEDESTRIAN LIGHTING, SIDEWALK ENHANCEMENTS, STREET FURNITURE & TREES, ENHANCED CROSSWALKS, & BUS STOP AMENITIES.	2017	$1,674
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3632	0	WESTERN AVENUE	EXPOSITION	I-10	WESTERN AV BUS STOP & PEDESTRIAN IMPROVEMENT PROJECT. INSTALL PEDESTRIAN AND TRANSIT AMENITIES TO ENHANCE THE PEDESTRIAN ENVIRONMENT ALONG WESTERN AV BTW EXPOSITION BL & I-10 FREEWAY.	2017	$1,472
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3640	0	1ST STREET	EVERGREEEN	SOTO	LANI - EVERGREEN PARK STREET ENHANCEMENT PROJECT. INCREASE PEDESTRIAN SAFETY AND ACCESS BY PROVIDING IMPROVED CROSSWALKS, NEW BUS SHELTERS AND STREET TREES TO ENHANCE CONNECTIVITY BETWEEN TRANSIT AND AREA LANDMARKS.. THE PROPOSED PROJECT IS LOCATED IN THE BOYLE HEIGHTS COMMUNITY OF LOS ANGELES.	2017	$1,075
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3646	0	S. LOS ANGELES ST. TO N. ALAMEDA ST.	E. TEMPLE ST.	E. 3RD ST.	ARTS DISTRICT/LITTLE TOKYO GOLD LINE STATION LINKAGES. PEDESTRIAN ENHANCEMENTS INCLUDING SIDEWALK/PATH PAVING; PED LIGHTS; STREET TREES/PLANTING; DISTRICT SIGNAGE; ENTRY ELEMENTS; STREET FURNITURE; CROSSWALK PAVING; AND BIKE PARKING. (10 BIKE RACKS)	2016	$4,439
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3647	0	W. MLK JR. BLVD. AND MENLO AVE.	S. FIGUEROA ST.	S. VERMONT AVE.	MENLO AVE/MLK VERMONT EXPO STATION PEDESTRIAN IMPROVEMENTS. IMPROVE PEDESTRIAN ACCESS TO THE NEW EXPO STATION ON VERMONT AVE BY INSTALLING SIDEWALKS, LANDSCAPING, AND LIGHTING ALONG MENLO AVE. AND MLK JR. BLVD. PLUS A MEDIAN ON MLK BLVD.	2016	$3,302
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3650	0	WESTERN AVE	MLK BLVD	EXPO BLVD	WESTERN AVE EXPO LINE STATION LINKAGE PROJECT (SOUTH). PROJECT WILL DESIGN AND CONSTRUCT PEDESTRIAN & SAFETY ENHANCEMENTS INTENDED TO INCREASE THE USAGE OF PUBLIC TRANSPORTATION AND CREATE A LINK TO METRO EXPO LR STATION AT WESTERN & EXPOSITION. PROPOSED IMPROVEMENTS INCLUDE SIDEWALK IMPROVEMENTS, SAFETY LIGHTING AT BUS STOPS, STREET FURNITURE, AND ENHANCED CROSSWALKS.	2017	$858
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3651	0	FIRST ST.	PECAN ST.	MOTT ST.	EASTSIDE LIGHT RAIL PEDESTRIAN LINKAGES, PHASE II. ENHANCE MULTI-MODAL ACCESS TO THE MARIACHI & SOTO GOLD LINE STATIONS, FOCUSING ON 1ST STREET. PEDESTRIAN IMPROVEMENTS TO ENHANCE MULTI-MODAL ACCESS TO THE MARIACHI & SOTO GOLD LINE STATIONS, FOCUSING ON FIRST ST. & INTERSECTING CORRIDORS OF BOYLE, ST. LOUIS, STATE, AND SOTO STREETS (ENCOMPASSING APPROXIMATELY 0.5 MILES ON EACH CROSS STREET). PROJECT ELEMENTS TO INCLUDE NEW PEDESTRIAN CROSSING SIGNALS.	2016	$3,651
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF3653	0	PASADENA AVENUE	BROADWAY	FIGUEROA ST	PASADENA AVE PED CONNECTION TO GOLD LINE HERITAGE SQ STATION. THIS PROJECT WILL IMPLEMENT SIDEWALK IMPROVEMENTS, STREET FURNITURE, SAFETY LIGHTING, STREET TREES, AND ENHANCED CROSSWALKS ALONG PASADENA AVE BETWEEN BROADWAY TO TO FIGUEROA ST. THIS PROJECT WILL IMPROVE PEDESTRIAN CONNECTIVITY TO THE GOLD LINE HERITAGE SQUARE STATION.	2017	$2,567
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1NL04-LAF5624	0	WASHINGTON BLVD	HOOPER AVE.	ALAMEDA ST.	WASHINGTON BLVD PEDESTRIAN TRANSIT ACCESS(HOOPER/ALAMEDA) II, LOCATED ON WASHINGTON BL BETWEEN HOOPER AV AND ALAMEDA ST AND ON LONG BEACH AV BETWEEN WASHINGTON BL AND 20TH ST. PEDESTRIAN IMPROVEMENTS, PEDESTRIAN LIGHTING, CROSSWALK ENHANCEMENTS, CURB EXTENSIONS, NEW RAILROAD CROSSING SIGNALS, AND NEW ACCESS TO THE STATION FROM THE SOUTH. DISTANCE 0.59 MILES.	2019	$2,296
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1OM0702-LA0G686	0	FIGUEROA BLVD	AVENUE 50	AVENUE 60	HIGHLAND PARK PEDESTRIAN IMPROVEMENTS ALONG FIGUEROA BETWEEN AVENUE 50 AND AVENUE 60	2015	$250
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1OM0702-LAE0427	0	CENTRAL AVE	103RD ST	IMPERIAL HWY	IMPLEMENT STREETSCAPE PROJECT ON CENTRAL AVE. FROM 103RD STREET TO IMPERIAL HIGHWAY NEAR THE WATTS/103RD STREET STATION, WATTS.	2016	$4,000

LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1OM0702-LAF3148	0	NORTH MAIN STREET	WILHART	LAMAR	NORTH MAIN ST. GRADE SEPARATION: CONSTRUCT A NEW GRADE SEPARATION OVER UPRR AND METROLINK & LA RIVER WHILE PRESERVING THE EXISTING HISTORIC N. MAIN ST. BRIDGE. BIKE LANES WILL BE ADDED AT THE SHOULDERS OF THE BRIDGE. OTHER WORK COMPONENTS INCLUDE REALIGNING ALBION STREET AND MODIFYING THE INTERSECTIONS OF NORTH MAIN AND MESNAGER STREET AT THE WEST END.	2020	$91,280
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1OM0702-LAF7125	0	SHERMAN WAY	WHITSETT AVENUE	HOLLYWOOD FREEWAY	SHERMAN WAY WIDENING BETWEEN WHITSETT AVENUE TO HOLLYWOOD FREEWAY : (1) WIDEN A SOUTH SIDE OF SHERMAN WY BY APPROX 20 FT TO PROVIDE A THROUGH AND DEDICATED RIGHT-TURN ONLY LANE ONTO THE HOLLYWOOD FWY SOUTHBOUND ON-RAMP. (2) INSTALLS PEDESTRIAN FACILITIES AND LANDSCAPING. (3) WIDENS THE OUTSIDE CURB LANE BY 6 FT TO ACCOMMODATE SAFER BIKE TRAVEL.	2019	$1,499
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1TDL04-LAF3726	0	ALAMEDA	CHAVEZ	1ST	FIRST AND LAST MILE TRANSIT CONNECTIVITY OPTIONS. IMPLEMENT A PILOT SHARED FLEET VEHICLE PROGRAM THAT INCLUDES, BIKES, ALTERNATIVE GREEN VEHICLES FOR FIRST & LAST MILES FROM UNION STATION TO AND OTHER DOWNTOWN LOCATIONS.	2017	$1,641
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1TDL04-LAF3731	0	BROADWAY	2ND	OLYMPIC	DOWNTOWN LA INTER-MODAL TRANSIT INFORMATION AND WAYFINDING. INSTALL TRANSIT INFORMATION MONITORS, VARIABLE MESSAGE SIGNS, INTERACTIVE KIOSKS & PARKING AVAILABILITY SIGNAGE ALONG BROADWAY CORRIDOR TO OLYMPIC.	2014	$1,612
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8036	0	HYPERION AVE	ROWENA AVE	LA RIVER	HYPERION AV UNDER WAVERLY DR BRIDGE, RE-CONFIGURE SIDEWALKS ALONG HYPERION. RE-ALIGN I-5 NB OFF-RAMP AT GLENDALE BLVD. PROVIDE ALTERNATIVE BIKEWAY ACCESS TO LA RIVER. PPNO 3092.	2018	$14,422
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8037	0	SOTO ST	MULTNOMATH ST	RADIUM DR	SOTO ST BRIDGE OVER MISSION RD & HUNTINGTON DR WILL DEMOLISH EXISTING BRIDGE AND REALIGN THE STREET TO INCREASE TRAFFIC FLOW ADDING A 0.5 BIKE LANE. PPNO 3093 3380 (BRIDGE #53C0013)	2016	$24,221
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8042	0	VANOWEN ST	MASON AVE	WINNETKA AVE	VANOWEN ST BRIDGE (BR NO. 53C1362) WIDENING & REHAB. PROJECT WILL WIDEN EXISTING BRIDGE TO MATCH THE STREET IT WILL ALLOW INC TRAFFIC FLOW AND SAFETY. CONSTRUCT BIKE PATH UNDER. PPNO 3095 3378 AB 3090	2014	$14,917
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8046	0	BURBANK BLVD	LANKERSHIM BLVD	CLEON AVE	BURBANK BLVD WIDENING-LANKERSHIM BLVD TO CLEON AVE. FROM VARYING ROADWAY WIDTH TO MODIFIED MAJOR HIGHWAY STANDARDS. FROM 1 LN TO 2 LNS IN EACH DIRECTION. PPNO 3097.	2018	$15,417
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8055	0	MOORPARK ST	WOODMAN AVE	MURIETTA AVE	MOORPARK ST WIDENING - WOODMAN AVE TO MURIETTA AVE.- WIDEN EXISTING ROADWAY FROM VARYING WIDTH TO 70 FTEET TO PROVIDE ON ADDTL TRAFFIC LANE IN EA DIR & UPGRADE HIGHWAY TO SECONDARY HWY STANDARDS. THIS PROJECT IMPROVES 2080 LF OF MOORPARK AVE. PPNO 3103.	2016	$6,495
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8063	0	RIVERSIDE DR	BARCLAY ST	SAN FERNANDO RD	RIVERSIDE DR. VIADUCT REPLACEMENT. REPLACEMENT OF EXISTING 2-LANE BRIDGE WITH 2 THROUGH LANES BRIDGE FLARING 4 LANES AT SAN FERNANDO ROAD WITH NEW ROUNDABOUT. BIKE LANE ADDED COMBINED WITH 53C-1932 - WILL RESULT IN INCR. CIRCULATION. PPNO 3105 (53C-0160)	2016	$57,077
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8064	0	SAN FERNANDO MISSION BLVD	SEPULVEDA BLVD	I-5 FWY.	SAN FERNANDO MISSION BLVD WIDENING, WHERE NECESSARY, BET SEPULVEDA BLVD & I-5 FWY. FROM 1 LANE TO 2 LANES IN EACH DIRECTION.PPNO 3106.	2017	$2,472
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8075	0	CESAR CHAVEZ AV	LORENA ST	INDIANA ST	CESAR CHAVEZ AVE/ LORENA ST / INDIANA ST INTERSECTION IMPROVEMENTS. RECONSTRUCTION OF A FIVE-LEGGED SIGNALIZED INTERSECTION INTO A MODERN ROUNDABOUT. THE CONSTRUCTION OF THE ROUNDABOUT WILL REDUCE THE COMPLEXITY OF THE INTERSECTION AND WILL IMPROVE TRAFFIC FLOW AND SAFETY.	2017	$10,933
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8084	0	WINNETKA AVE BRIDGE	VANOWEN ST	VICTORY BLVD	WINNETKA AVE BRDGE WIDEN & REHAB. - WIDEN THE RIVER CROSSING FROM 4 TO 6 LANES, CONSTRUCT BIKE UNDERPASS. PPNO 3108 3377 AB 3090 REP (53C1388)	2014	$10,519
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8086	0	N SPRING ST	WILHARDT ST	BROADWAY	NORTH SPRING ST, OVER LOS ANGELES RIVER .4 MILES WEST OF I-5. REHABILITATE AND WIDEN 4 LANE BRIDGE (NO ADDED LANES) ADD SIDEWALKS UPGRADE BRIDGE RAILINGS (53C0859). HIGH COST PROJECT AGREEMENT REQUIRED.	2016	$48,267
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0C8089	0	BARHAM / CAHUENGA	N/A	N/A	BARHAM / CAHUENGA / INTERSECTION WIDEN IMPROVEMENT, FOR LEFT/RIGHT TURN IMPROV. PPNO 3111.	2016	$2,412
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0F007	0	HYPERION AVE	ETTRIC ST	GLENHURST AVE	GLENDALE BLVD.-HYPERION AVE. COMPLEX OF BRIDGES OVER LA RIVER, I-5 AND RIVERSIDE DR, REHABILITATION/SEISMIC RETROFIT; UPGRADE BRIDGE RAILING; INCLUDES BRIDGES 53C-1881, 53C-1882, 53C-1883, 53C-1884, 53C-1179 AND 53-1069. NO ADDITIONAL LANES. REALIGN I-5 N	2022	$41,056
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0F008	0	GLENDALE BLVD	RIVERSIDE DR	GLENHURST AVE	GLENDALE BLVD. OVER L.A RIVER, REHABILITATE / RETROFIT BRIDGE AND WIDEN BY 12 FEET, UPGRADE BRIDGE RAILINGS. NO ADDED LANES. PRELIMINARY ENGINEERING ONLY. CONSTRUCTION TO BE DONE UNDER LA0F007 (53C1881) GLENDALE-HYPERION COMPLEX OF BRIDGES. (#53C-1883)	2022	$1,930
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0F009	0	GLENDALE BLVD	RIVERSIDE DR	GLENHURST AVE	GLENDALE BLVD. OVER LA RIVER. REHABILITATE / RETROFIT BRIDGE AND WIDEN BY 12 FEET. UPGRADE BRIDGE RAILINGS. NO ADDED LANES. PRELIMINARY ENGINEERING ONLY. CONSTRUCTION TO BE DONE UNDER LA0F007 GLENDALE-HYPERION COMPLEX OF BRIDGES. (BRIDGE #53C1884, BHLS-50	2022	$2,350
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA0F073	0	WORLD WAY	WORLD WAY NORTH	WORLD WAY SOUTH	PROJECTS WITHIN AND NEAR LOS ANGELES INTERNATIONAL AIRPORT TO ELIMINATE TRAFFIC BOTTLENECKS. (LOS ANGELES WORLD AIRPORTS) SEC. 336 FUNDING	2015	$5,067
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA98STIP3	0	ALAMEDA ST AND SPRING ST	N/A	N/A	ALAMEDA ST AND N SPRING ST ARTERIAL REDESIGN -REALIGN ALAMEDA/N.SPRING ELIMINATING INEFFICENT INTERSECTN WITH MAIN ST/N. MAIN STREET. 3 NB LANES & 3 SB LANES.	2014	$8,555

LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LA996425-LA996425	0	SEPULVEDA BL	MULHOLLAND TUNNEL	MULHOLLAND TUNNEL	INSTALL REVERSIBLE LANE ON SEPULVEDA BL THROUGH TUNNEL AT MULHOLLAND DR, INSTALL BIKE FACILITIES FROM SKIRBALL CENTER DR TO BEL AIR CREST RD, IMPLEMENT INTERSECTION IMPROVEMENTS AT SKIRBALL CENTER DR, I-405 FWY SB ON-RAMP, MORAGA DR, WILSHIRE BL. BIKE FACILITIES LESS THAN A MILE.	2018	$8,301
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE0180	0	LAUREL CANYON BL	HAMLIN	VICTORY	LAUREL CANYON BLVD NEAR VICTORY BLVD. PROJECT WILL PROVIDE FOR PEDESTRIAN SAFETY AND BEAUTIFICATION TREATMENT. ELEMENTS INCLUDE LANDSCAPED MEDIAN ISLANDS.	2015	$1,200
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE0346	0	N/A	N/A	N/A	LIGHTING, AND SAFETY IMPROVEMENTS ON ROAD LEADING TO HANSEN DAM RECREATION AREA. ACCESS IMPROVEMENTS INCLUDING HILLSIDE STABILIZATION AND PARKING LOT REHABILITATION ALONG OSBORNE STREET BETWEEN GLENOAKS BOULEVARD AND DRONFIELD AVENUE [REF P.L. 110-244, SEC 105(A)(234)] (CHANGE PER H.R.1195-6/6/08)	2015	$6,500
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE0388B	0	N/A	N/A	N/A	CONSTRUCTION OF A TRAFFIC SIGNAL AT THE INTERSECTION OF INDEPENDENCE AVE. AND SHERMAN WAY.	2015	$125
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE0518	0	BROADWAY	4TH	3RD	IN THE CITY OF LOS ANGELES, ON BROADWAY W/S FROM 4TH ST. TO 235 N/O 4TH ST, AND 4TH ST FROM BROADWAY TO 120 W/O BROADWAY. REMOVE AND REPLACE SIDEWALKS INCLUDING PORTIONS THAT SPAN.	2016	$2,500
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE0550	0	CEDROS	BURBANK	MAGNOLIA	REHABILITATE STREET SURFACE OF CEDROS AVE BETWEEN BURBANK BLVD AND MAGNOLIA BLVD. WILL PROVIDE FOR ASPHALT CONCRETE RESURFACING. NON CAPACITY ENHANCING AND ALL ON LA ROW	2015	$43
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE0732	0	RIVERSIDE DRIVE	VAN NUYS BLVD	TILDEN AVE	RIVERSIDE DRIVE NON-CAPACITY IMPROVEMENTS BETWEEN VAN NUYS BLVD AND TILDEN AVE.	2015	$400
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE0937	0	VARIOUS	VARIOUS	VARIOUS	REHABILITATE STREET SURFACES IN SHERMAN OAKS; PROJECT WILL PROVIDE ASPHALT CONCRETE RESURFACING OF VARIOUS STREETS IN THE SHERMAN OAKS AREA. PROJECT WILL NOT ENHANCE TRAFFIC CAP.	2015	$123
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE1093	0	SAN FERNANDO ROAD NORTH	ASTORIA	SAYRE	SAN FERNANDO RD NORTH - FROM ASTORIA ST TO SAYRE ST. WIDEN ROADWAY AND CONSTRUCT CONCRETE SIDEWALK, CURB, GUTTER, ACCESS RAMPS, AND BULKHEAD.	2015	$1,060
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE1440	0	SAN FERNANDO ROAD	FLETCHER DR	I-5 FWY	RECONFIGURE SAN FERNANDO RD. FROM FLETCHER DR. TO I-5 FWY.INSTALL LEFT-TURN CHANNELIZATION, IMPROVE PEDESTRIAN AMENITIES, INSTALL WIDER SIDEWALKS, MEDIAN ISLANDS AND LANDSCAPING WHERE FEASIBLE BETWEEN CAZADOR STREET TO JUST SOUTH OF ALICE STREET.	2017	$6,450
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE1531	0	ARMINTA ST / MASON AVE	N/A	N/A	CONSTRUCTION OF A SMART CROSSWALK SYSTEM AT THE INTERSECTION OF ARMINTA ST. AND MASON AVE.	2015	$50
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE1601	0	HANSEN DAM REC AREA	FOOTHILL BL	OSBORNE ST	TRANSPORTATION ENHANCEMENT TO CHILDREN'S MUSEUM OF LOS ANGELES. THIS PROJECT WILL PROVIDE FOR NEW SIDEWALKS, CURB, GUTTER, ADA-COMPLIANT ACCESS RAMPS, AND STREET TREES ALONG FOOTHILL BL AND OSBORNE ST, ADJACENT TO THE FUTURE CHILDREN'S MUSEUM OF LOS ANGELES.	2014	$1,200
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE1816	0	BURBANK BLVD	HAYVENHURST AVE	HAYVENHURST AVE	BURBANK BLVD & HAYVENHURST AVE INTERSECTION IMPROVEMENTS - REDUCE WIDTH OF MEDIAN ISLANDS ON BURBANK BLVD TO INSTALL ADDITIONAL LEFT TURN LANE FROM W/B BURBANK TO S/B HAYVENHURST, AND EXCLUSIVE RIGHT TURN LANE FROM E/B BURBANK TO S/B HAYVENHURST; MODIFY TRAFFIC SIGNAL & STREET LIGHTING.	2015	$1,081
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE1867	0	TOPANGA CANYON / GAULT ST.	N/A	N/A	CONSTRUCTION OF SMART CROSSWALK AT THE INTERSECTION OF TOPANGA CANYON AND GAULT ST.	2015	$50
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE1933	0	PICO	HOOVER	N/A	ENHANCE BYZANTINE LATINO QUARTER TRANSIT PLAZAS AT NORMANDIE AND PICO, AND HOOVER AND PICO, LOS ANGELES BY IMPROVING STREETSCAPES, INCLUDING EXPANDING CONCRETE AND PAVING	2015	$500
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE2147	0	DEVONSHIRE ST	DEVONSHIRE	WOODLEY	NORTHWEST SAN FERNANDO VALLEY RD & SAFETY IMPROVEMENT. LINDLEY AVE. (STRATHERN TO CHASE), ROSCOE BLVD. CONSTRUCTION OF NEW ROADWAY LIGHTING ON MAJOR TRANSPORTATION CORRIDORS.	2014	$1,000
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE2279	0	CENTRAL AVE	WASHINGTON BLVD	VERNON AVE	STREETSCAPE IMPROVMENTS ALONG CENTRAL AVE FROM WASHINGTON BLVD TO VERNON AVE INCLUDING PED LIGHTING, NEW BUS STOPS AND STREET FURNITURE, SIDEWALK WIDENING, CROSSWALK ENHANCEMENTS, TREES ETC.	2017	$4,000
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE2299	0	HASKELL AVE	CHASE ST	ROSCOE BLVD	WIDEN HASKELL AVENUE BETWEEN CHASE ST. AND ROSCOE BLVD - SAFETY IMPROVEMENTS.	2015	$200
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE2515	0	BUNDY DR	WILSHIRE BL	SANTA MONICA BL	WIDEN BUNDY DR. BETWEEN WILSHIRE AND SANTA MONICA BLVD - WIDEN FROM 2 LANES TO 4 LANES.	2017	$4,250
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE2538	0	NORMANDIE	OLYMPIC	N/A	KOREATOWN PAVILION GARDEN-TO ENHANCE THE NORTHEAST CORNER OF NORMANDIE AND OLYMPIC BL. ENHANCE AN EXISTING POCKET PARK AT THE INTERSECTION OLYMPIC AND NORMANDIE/IROLO WITH DECORATIVE CONCRETE PAVING AND IMPROVE STREETSCAPE BY ADDING PEDESTRIAN IMPROVEMENTS SUCH AS STREET FURNITURE, LIGHTING, LANDSCAPING, AND COMMUNITY IDENTIFIERS.	2015	$250
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE2634	0	HAMLIN ST	CORBIN AVE	N/A	CONSTRUCTION OF A TRAFFIC SIGNAL AT THE INTERSECTION OF HAMLIN ST. AND CORBIN AVE.	2017	$125

LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE2699	0	ALONG LA RIVER BANK	SEPULVEDA	KESTER	CONSTRUCTION OF NEW MULTI-USE PATH/TRAIL ALONG RIVER BANK BETWEEN SEPULVEDA BLVD & KESTER AVE INCLUDING ACCESS RAMPS, REATAINING WALLS, LANDSCAPING ETC.	2016	$574
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE2828	0	WILBUR AVENUE	VARIOUS	VARIOUS	IMPLEMENT STREETSCAPE IMPROVEMENTS ALONG WILBUR AVE TO ENHANCE TRAFFIC AND PEDESTRIAN SAFETY. PROJECT WILL PROVIDE FOR SIDEWALK IMPROVEMENTS, ADA-COMPLIANT ACCESS RAMPS, AND STREET TREES TO ENHANCE WILBUR AVE AND PROVIDE FOR PEDESTRIAN SAFETY.	2015	$100
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE3157	0	ADDISON	KESTER	LEMONA	REHABILITATE ADDISON ST BETWEEN KESTER AVE AND LEMONA AVE: PROVIDE ASHALT CONCRETE RESURFACING ON THE PROPOSED PROJECT LIMITS. WILL NOT ENHANCE TRAFFIC CAPACITY.	2015	$47
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE3201	0	OSO AVE	VANOWEN ST	N/A	CONSTRUCTION OF A TRAFFIC SIGNAL AT THE INTERSECTION OF OSO AVE. AND VANOWEN ST.	2015	$125
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAE3764	0	JENNY STREET	WESTCHESTER PKWY	96TH STREET	ITS & INTERSECTION IMPROVEMENTS IN AND NEAR LAX AIRPORT, WHICH MAY INCLUDE RESTRIPING, SIGNAL PHASE CHANGES, AND THE ADDITION OF INTELLIGENT TRANSPORTATION SYSTEM EQUIPMENT.	2015	$1,250
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	LAF1205	0	OLYMPIC BLVD.	SANTA FE AVE.	MATEO ST.	OLYMPIC BL AND MATEO STREET GOODS MOVEMENT IMP-PHASE II. IMPROVEMENT OF FREEWAY ACCESS BY WIDENING WB OLYMPIC BL BET MATEO ST & SANTA FE AV FOR A RIGHT-TURN LANE, AND NB MATEO ST BET OLYMPIC BL & PORTER ST FOR INCREASED CURB RETURN.	2016	$4,421
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160008	0				PARKING GARAGE RECONSTRUCTION: THREE PARKING GARAGES WITHIN THE CTA, P2A, P2B AND P5, WOULD BE DEMOLISHED AND RECONSTRUCTED. UP TO 1,100 SPACES WOULD BE ADDED.	2023	$19,600
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160009	0				NEW 'A' STREET: CONSTRUCT TWO NORTH-SOUTH STREET SEGMENTS BETWEEN CENTURY BOULEVARD AND WESTCHESTER PARKWAY. THE FIRST SEGMENT WOULD BE A 1,200-FOOT, SIX-LANE SEGMENT BETWEEN CENTURY BOULEVARD AND W. 96TH STREET, INCLUDING A COMBINATION OF AT-GRADE AND VIADUCT LANES TO CONNECT TO CENTURY BOULEVARD. THE SECOND SEGMENT WOULD BE A 1,600-FOOT, FOUR-LANE, STREET SEGMENT BETWEEN W. 96TH STREET AND WESTCHESTER PARKWAY, INCLUDING MEDIAN, PARKWAY AND SIDEWALKS.	2024	$12,053
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160010	0				NEW 'B' STREET: CONSTRUCT A 1,700-FOOT, FOUR-LANE, EAST-WEST STREET SEGMENT BETWEEN NEW 'A' STREET AND AIRPORT BOULEVARD, INCLUDING MEDIAN, PARKWAY AND SIDEWALKS.	2024	$9,511
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160011	0				NEW 'C' STREET: CONSTRUCT A 1,200-FOOT, FOUR-LANE, NORTH-SOUTH STREET SEGMENT BETWEEN IMPERIAL HIGHWAY AND WEST 111TH STREET, INCLUDING PARKWAY AND SIDEWALKS.	2030	$6,760
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160012	0				NEW 98TH STREET: CONSTRUCT TWO EAST-WEST STREET SEGMENTS TO EXTEND THE EXISTING 98TH STREET TO THE I-405 ON-AND-OFF RAMPS. THE FIRST SEGMENT WOULD BE A 400-FOOT, FOUR-LANE STREET SEGMENT BETWEEN BELLANCA AVENUE AND AVIATION BOULEVARD. THE SECOND SEGMENT WOULD BE A 3,000-FOOT, FOUR-LANE STREET SEGMENT BETWEEN AVIATION BOULEVARD AND LA CIENEGA BOULEVARD. CONSTRUCTION WOULD ALSO INCLUDE A MEDIAN, PARKWAY, AND SIDEWALKS.	2024	$9,420
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160013	0				NEW 'CONCOURSE WAY': CONSTRUCT A 500-FOOT, FOUR-LANE, NORTH-SOUTH STREET SEGMENT BETWEEN NEW 98TH STREET AND CENTURY BOULEVARD, WHICH WILL ALIGN WITH THE ROADWAY ENTRANCE INTO THE ITF EAST/CONRAC AT THE INTERSECTION WITH NEW 98TH STREET.	2023	$8,148
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160014	0				SEPULVEDA BOULEVARD (SEPULVEDA TUNNEL TO W. 96TH STREET): WIDEN THE EXISTING 3,700-FOOT STREET SEGMENT BY UP TO 40 FEET TO PROVIDE UP TO FOUR LANES IN EACH DIRECTION. IMPROVEMENTS WOULD ALSO INCLUDE NEW RAMPS TO SKY WAY, TO/FROM WORLD WAY, TO/FROM CENTURY BOULEVARD, AND TO/FROM NEW 'A' STREET.	2030	$137,700
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160015	0				AIRPORT BOULEVARD (98TH STREET TO WEST ARBOR VITAE STREET): WIDEN THE EXISTING 1,800-FOOT STREET SEGMENT BY 25 FEET TO PROVIDE UP TO THREE LANES IN EACH DIRECTION.	2024	$13,491
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160016	0				WEST ARBOR VITAE STREET (AIRPORT BOULEVARD TO LA CIENEGA BOULEVARD): WIDEN THE EXISTING 2,000-FOOT STREET SEGMENT TO THE SOUTH BY BETWEEN 5-33 FEET TO PROVIDE UP TO THREE LANES IN EACH DIRECTION. CONSTRUCTION WOULD INCLUDE A MEDIAN, PARKWAY AND SIDEWALKS.	2030	$27,633
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160017	0				WEST ARBOR VITAE STREET OVERCROSSING BRIDGE: WIDEN THE EXISTING 450-FOOT STREET SEGMENT BY 6 FEET ON EACH SIDE TO ACCOMMODATE THREE LANES IN THE EAST DIRECTION AND TWO LANES IN THE WEST DIRECTION.	2030	$19,190
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160018	0				96TH STREET (AIRPORT BOULEVARD TO BELLANCA AVENUE): WIDEN AN EXISTING 350-FOOT STREET SEGMENT TO THE SOUTH BY 15 FEET. THE STREET WILL MAINTAIN ONE LANE IN EACH DIRECTION BUT WILL PROVIDE FOR STREET PARKING ON THE SOUTH SIDE OF THE STREET.	2024	$5,973

LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160019	0				98TH STREET (NEW ‘A’ STREET TO BELLANCA AVENUE): WIDEN THE 1,800-FOOT STREET SEGMENT BETWEEN NEW ‘A’ STREET AND AIRPORT BOULEVARD BY UP TO 14 FEET TO PROVIDE TWO LANES IN EACH DIRECTION. THE 1,700-FOOT STREET SEGMENT BETWEEN AIRPORT BOULEVARD AND BELLANCA AVENUE WOULD BE RESTRIPED TO PROVIDE TWO LANES IN EACH DIRECTION.	2030	$12,286
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160020	0				CENTURY BOULEVARD (NEW ‘A’ STREET TO AVIATION BOULEVARD): WIDEN THE 4,000-FOOT STREET SEGMENT TO THE SOUTH BY 16 FEET TO PROVIDE FOUR LANES IN EACH DIRECTION. CONSTRUCTION WOULD INCLUDE A MEDIAN, PARKWAY AND SIDEWALKS.	2030	$18,478
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160021	0				AVIATION BOULEVARD (CENTURY BOULEVARD TO WEST ARBOR VITAE STREET): WIDEN THE 2,800-FOOT STREET SEGMENT TO THE EAST BY UP TO 20 FEET TO PROVIDE THREE LANES IN EACH DIRECTION. CONSTRUCTION WOULD INCLUDE A MEDIAN, PARKWAY, AND SIDEWALKS.	2024	$13,753
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160022	0				LA CIENEGA BOULEVARD (CENTURY BOULEVARD TO WEST ARBOR VITAE STREET): WIDEN THE 2,600-FOOT STREET SEGMENT TO THE WEST BY UP TO 25 FEET TO PROVIDE UP TO THREE LANES IN EACH DIRECTION. CONSTRUCTION WOULD INCLUDE A MEDIAN, PARKWAY, AND SIDEWALKS.	2024	$13,918
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160023	0				AIRSIDE AUTOMATED PEOPLE MOVER (APM) SYSTEM: A RAIL OR FIXED GUIDEWAY BASED TRANSPORTATION SYSTEM OR SYSTEMS THAT MOVES PASSENGERS TO AND FROM THE CENTRAL TERMINAL AREA (CTA) TO THE TOM BRADLEY INTERNATIONAL TERMINAL AND THE MIDFIELD SATELLITE CONCOURSE IN A BELOW-GRADE CONFIGURATION.	2025	$225,000
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160025	0				GATEWAY LAXPRESS EMPLOYEE TRANSPORT: MOBILITY HUBS AT REGIONAL TRANSIT CENTERS (INCLUDES PARKING, TRANSIT CONNECTOR SERVICE WITHIN KEY AREA EMPLOYEE RESIDENTIAL AREAS IN LA COUNTY.	2035	$75,000
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160026	0				GATEWAY LAXPRESS EMPLOYEE IT PLATFORM: DEVELOP WEB-BASED/ APP-BASED PLATFORM THAT INCLUDES RESERVE-A-SEAT, MOBILITY SERVICE OPTIONS FOR GATEWAY TO LA BID/LAX EMPLOYEES TO ACCESS GATEWAY LAXPRESS SERVICES	2035	$250
LOS ANGELES	LOCAL HIGHWAY	LOS ANGELES, CITY OF	1160027	0				GATEWAY LAXPRESS EMPLOYEE TRANSPORT: PARTNERSHIP WITH METRO FOR CAPITAL COST OF EXISTING/NEW TRANSIT VEHICLES FOR EMPLOYEE TRANSIT (NO OPERATING COST)	2035	$50,000
LOS ANGELES	OTHER	LOS ANGELES, CITY OF	1122002					WEST INTERMODAL TRANSPORTATION FACILITY: A FACILITY PROVIDING REMOTE PASSENGER PICK UP AND DROP OFF AREAS, PUBLIC PARKING, AND OTHER CONNECTIONS TO PUBLIC TRANSIT AND OTHER COMMERCIAL VEHICLES (I.E. DOOR-TO-DOOR SHUTTLES AND SCHEDULED BUSES).	2022	$267,625
LOS ANGELES	OTHER	LOS ANGELES, CITY OF	1122003					CONSOLIDATED RENTAL CAR FACILITY (CONRAC): A CONSOLIDATED RENTAL CAR FACILITY TO PROVIDE A CENTRALIZED LOCATION FOR RENTAL CAR OPERATIONS AT LAX. THIS FACILITY WOULD INCLUDE A CUSTOMER SERVICE FACILITY, READY/RETURN GARAGE, RENTAL CAR STORAGE, QUICK TURNAROUND AREA, AND MAINTENANCE SUPPORT.	2023	$772,196
LOS ANGELES	STATE HIGHWAY	LOS ANGELES, CITY OF	1160024	405				I-105/I-405 CONNECTIONS: CONSTRUCT NEW I-105 AND I-405 ON-AND-OFF RAMPS TO CONNECT TO THE CONSOLIDATED RENTAL CAR FACILITY AND OTHER LANDSIDE ACCESS FACILITIES.	2030	$300,000
LOS ANGELES	STATE HIGHWAY	LOS ANGELES, CITY OF	1160028	405				I-405: CONSTRUCT LAX EXPRESSWAY PARALLEL TO I-405 BETWEEN STATE ROUTE 90 (SR-90) AND I-105 / EL SEGUNDO BOULEVARD	2035	$1,120,000
LOS ANGELES	STATE HIGHWAY	LOS ANGELES, CITY OF	1160029	405				I-405 HOV: I-405 DIRECT HIGH OCCUPANCY VEHICLE (HOV) CONNECTOR TO LAX	2035	$135,000
LOS ANGELES	STATE HIGHWAY	LOS ANGELES, CITY OF	1160030	405				I-405 RAMP: PROVIDE AN ON-RAMP TO I-405 NORTHBOUND FROM NORTHBOUND LA CIENAGA BOULEVARD	2035	$90,000
LOS ANGELES	TRANSIT	LOS ANGELES, CITY OF	1NL04-LA0G671	0				HISTORIC FILIPINOTOWN BUS SECURITY LIGHTS, LOS ANGELES	2015	$79
LOS ANGELES	TRANSIT	LOS ANGELES, CITY OF	LA0C53	0	HAWTHORNE AVE	N/A	N/A	HOLLYWOOD INTERMODAL TRANSPORTATION AND PUBLIC PARKING CENTER ON HAWTHORNE AVE. BETWEEN HIGHLAND AVENUE AND NORTH ORANGE DRIVE (EXIST 500 SP PARK STRUCTURE).TCRP#49.2	2020	$41,000
LOS ANGELES	TRANSIT	LOS ANGELES, CITY OF	LA0D109	0				PURCHASE LAND FOR VEHICLE MAINTENANCE TRANSIT FACILITY	2015	$2,062
LOS ANGELES	TRANSIT	LOS ANGELES, CITY OF	LA0D343	0				VEHICLE MAINTENANCE FACILITY	2016	$9,627
LOS ANGELES	TRANSIT	LOS ANGELES, CITY OF	LA0G901	0				HISTORIC LOS ANGELES STREETCAR	2017	$125,000

LOS ANGELES	TRANSIT	LOS ANGELES, CITY OF	1122001			LAX CENTRAL TERMINAL AREA	MANCHESTER SQUARE, LOS ANGELES, CA (BOUNDED BY MANCHESTER BLVD., LA CIENEGA BLVD., AVIATION BLVD., AND CENTURY BLVD.)	LANDSIDE AUTOMATED PEOPLE MOVER (APM) SYSTEM: A FIXED GUIDEWAY-BASED TRANSPORTATION SYSTEM THAT MOVES PASSENGERS TO AND FROM THE CENTRAL TERMINAL AREA (CTA) TO THE LANDSIDE ACCESS FACILITIES (CONRAC AND ITFS) AND OTHER MASS TRANSPORTATION FACILITIES IN AN ABOVE-GRADE CONFIGURATION. A TOTAL OF SIX STATIONS WOULD BE LOCATED ALONG THE ALIGNMENT; PASSENGER WALKWAYS AND VERTICAL CIRCULATION CORES WOULD CONNECT THE APM STATIONS WITH THE AIRPORT TERMINALS AND LANDSIDE ACCESS FACILITIES. THE APM SYSTEM WOULD ALSO INCLUDE A MAINTENANCE FACILITY AND SEVERAL ELECTRICAL SUBSTATIONS TO PROVIDE POWER TO THE SYSTEM. CONSTRUCTION OF THE APM GUIDEWAY AND STATIONS WOULD REQUIRE THE DEMOLITION/RELOCATION OF SEVERAL ENABLING PROJECTS.	2023	$1,705,214
LOS ANGELES	OTHER	LOS ANGELES, CITY OF	1160008					EAST INTERMODAL TRANSPORTATION FACILITY: A FACILITY PROVIDING REMOTE PASSENGER PICK UP AND DROP OFF AREAS, PUBLIC PARKING, AND OTHER CONNECTIONS TO PUBLIC TRANSIT, INCLUDING THE METRO CRENSHAW/LAX LIGHT RAIL, AND OTHER COMMERCIAL VEHICLES.	2022	$156,804

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SGV-462	Transit	Pasadena	Pasadena Bus State of Good Repair: Funding to replace paratransit and fixed route transit vehicles that have met or exceeded their useful life in order to maintain current revenue operating levels (10 year cost)	$ 12,000,000	$ 18,000,000
2	SGV-471	Transit	Pasadena	Tier 2 Operators – Dedicated operations and capital funding to match formula equivalency of Included and Eligible Operators (Annual cost for Tier 2 operators countywide)	$ 43,200,000	$ 64,800,000
3	SGV-2	Transit	La Canada Flintridge	SR-134 Transit Corridor between Metro Red Line North Hollywood Station and Metro Gold Line Del Mar Station	$ 130,000,000	$ 5,000,000,000
4	SGV-468	Transit	Pasadena	Tier 2 and Municipal Bus Operators - Add late night and weekend bus service	$ -	$ -
5	SGV-469	Transit	Pasadena	Tier 2 and Municipal Bus Operators - Operating dollars for expanded service	$ -	$ -
6	SGV-470	Transit	Pasadena	Tier 2 and Municipal Bus Operators – Real-time transit info for Tier 2 bus operators	$ -	$ -
7	SFV-T13	Transit	Burbank, Unincorporated - San Fernando	Burbank to Hollywood BRT: Downtown Burbank to Hollywood via Burbank Media District & Universal City	$ 800,000	$ 20,000,000
8	SFV-T14	Transit	Burbank, Glendale, Los Angeles - San Fernando	Pasadena to North Hollywood BRT: Via SR-134 through Glendale & Burbank	$ 2,650,000	$ 3,970,000
9	SFV-T15	Transit	Glendale, Los Angeles, Unincorporated - San Fernando	Glendale: Provide east-west transit service on Foothill Blvd to provide one-seat ride from Sunland to La Canada Flintridge	$ 2,500,000	$ 4,000,000
10	SFV-T33	Transit	Burbank, Glendale, Los Angeles - San Fernando	Tier 2 Operators: Dedicated operations and capital funding to match formula equivalency of Included and Eligible Operators	$ -	$ -
11	SFV-T17	Transit	Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San	Metrolink Antelope Valley Line Improvements (various)	$ 2,500,000,000	$ 3,700,000,000
12	SFV-T18	Transit	Angeles - San Fernando, Unincorporated - San Fernando	Metrolink Ventura County Line Improvements (various)	$ 190,000,000	$ 290,000,000
13	SFV-T24	Transit	Glendale	Glendale Downtown Streetcar: Brand Blvd from Colorado Blvd to Glenoaks Blvd	$ 23,100,000	$ 44,800,000

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
14	SGV-2	Transit	La Canada Flintridge	SR-134 Transit Corridor between Metro Red Line North Hollywood Station and Metro Gold Line Del Mar Station	$ 130,000,000	$ 5,000,000,000
15	SFV-B17	Transit	Burbank, Glendale, Unincorporated - San Fernando	Glendale: Expand CNG Station and Maintenance Facility for Glendale Beeline Transit Services (potentially shared with Burbank Bus)	$ 1,300,000	$ 1,950,000
16	SFV-B3	Transit	Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San	Improvements to bus stop zones to meet ADA compliance	$ 3,000,000	$ 5,500,000
					$ 3,038,550,000	**$ 14,153,020,000**

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SFV-B18	Modal Connectivity	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Regional: Add/expand park-and-ride facilities	$ 15,000,000	$ 25,000,000
2	SFV-B21	Modal Connectivity	Glendale	Harvey Dr / SR-134 Park-and-Ride: Expand	$ 12,000,000	$ 15,000,000
3	SFV-T29	Modal Connectivity	Glendale	Glendale: Expand Larry Zarian Transportation Center	$ 10,000,000	$ 15,000,000
4	SFV-B12	Modal Connectivity	Glendale	Bicycle access improvements to Larry Zarian Transportation Center, on Los Feliz Rd and Brand Blvd	$ 4,500,000	$ 8,000,000
5	SFV-B25	Modal Connectivity	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Establish a county-wide bike share program (including Santa Clarita)	$ -	$ -
					$ 41,500,000	**$ 63,000,000**

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SGV-11	Highway Efficiency	Pasadena	I-210- Soundwall Construction – North 210 Freeway, Orange Grove to Arroyo Parkway	$ 3,523,182	$ 5,284,773
2	SGV-7	Highway Efficiency	Arroyo Verdugo COG	SR-134/I-210 Interchange Improvements (Arroyo Verdugo COG/La Canada Flintridge)	$ 40,000,000	$ 60,000,000
3	SFV-H49	Highway Efficiency	Glendale	SR-2 - Additional SB lane between 134 and I-5	$ -	$ -
4	SFV-H18	Highway Efficiency	Burbank, Glendale	I-5/SR-134: Interchange improvements - Carpool to carpool transition, "missing" ramp	$ 250,000,000	$ 370,000,000
5	SFV-H38	Highway Efficiency	Unincorporated - San Fernando	I-5/SR-14: Expand Freeway Service Patrol throughout North County subregion	$ -	$ -
6	SFV-H34	Highway Efficiency	Glendale, Unincorporated - San Fernando	I-210: Add soundwalls - Pennsylvania Av to Waltonia Av	$ 13,000,000	$ 23,000,000
7	SGV-8	Highway Efficiency	La Canada Flintridge	I-210 Soundwalls from Berkshire Av to Waltonia Ave	$ 26,400,000	$ 39,600,000
					$ 332,923,182	**$ 497,884,773**

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SFV-H39	ITS/Technology	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Regional: Improve Ramp metering, CCTV cameras, CMS for freeways in subregion as needed	$ 34,000,000	$ 52,000,000
2	SFV-H42	ITS/Technology	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Regional: Upgrade traffic signal system at on- & off-ramp intersections with arterials, connect with ramp metering system, establish communication with fiber system and upgrade communication of Field Device to IP.	$ 34,000,000	$ 52,000,000
3	SFV-H43	ITS/Technology	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Regional: Upgrade TMS: a) I-5: SR-118 to SR-14 (PM 39.3-45.6) b) US-101: I-5 to I-405 (PM 0.0-17.4) c) US-101: SR-27 to Ventura County Line (PM 25.3-38.19) d) SR-118: west of SR-27 to east of SR-210 (PM 0.0-14.8) e) SR-134: SR-170 to SR-210/SR-710 (PM 0.0-13.4) f) SR-170: SR-134 to I-5 (PM 14.5-20.5) g) I-405: south of US-101 to I-5 (PM 39.0-48.65) h) SR-2: SR-134 to SR-210 (PM 14.5-24.6) i) I-210: I-5 to SR-2 (PM 0.0-19.0) - Add CCTV & Comms j) I-5: TSM from SR-2 to SR-134	$ 120,000,000	$ 170,000,000
4	SFV-H44	ITS/Technology	Glendale, Unincorporated - San Fernando	I-210 Interchange Improvement Program in La Crescenta-Montrose: - Modify traffic signals & channelization, add WB on-ramp at La Crescenta Ave - Modify intersection & signals to improve SB to EB move at Pennsylvania Ave	$ 4,000,000	$ 6,000,000
5	SFV-B15	ITS/Technology	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Electric Vehicle charging stations in Public Parking Structures (potentially including photovoltaic panels)	$ 96,000	$ 144,000
					$ 192,096,000	**$ 280,144,000**

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SFV-H24	Demand Based Program	Glendale, Los Angeles - San Fernando	SR-2: Add HOV lane between SR-134 and Glendale Blvd	$ 150,000,000	$ 230,000,000
2	SFV-H47	Demand Based Program	Glendale, Los Angeles - San Fernando, Unincorporated - San Fernando	I-210 HOV lane from I-5 to SR-134/I-710	$ 720,000,000	$ 1,080,000,000
3	SFV-B19	Demand Based Program	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Regional: TDM programs to reduce trips	$ 1,100,000	$ 1,600,000
					$ 871,100,000	**$ 1,311,600,000**

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SFV-G3	Goods Movement	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Improvements to railroads across subregion to better accommodate freight trains without affecting passenger rail service	$ 36,000,000	$ 54,000,000
2	SFV-G1	Goods Movement	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Improvements to at-grade rail crossings across subregion to better accommodate truck turning radii and grades	$ 54,000,000	$ 81,000,000
3	SFV-G2	Goods Movement	Burbank, Glendale, Santa Clarita, San Fernando, Los Angeles - San Fernando, Unincorporated - San Fernando	Improvements to intersections across subregion to better accommodate truck turning radii and grades	$ 60,000,000	$ 90,000,000
4	SFV-A11	Goods Movement	Glendale	Orange St: Extend over SR-134 between Doran St and Goode Ave	$ 53,000,000	$ 80,000,000
5	SFV-A6	Goods Movement	Glendale	Doran St: Grade separation at railroad tracks / San Fernando Rd	$ 48,000,000	$ 72,000,000
6	SFV-A4	Goods Movement	Burbank	Buena Vista St: Grade Separation at railroad tracks (Ventura County Line)	$ 48,000,000	$ 72,000,000
					$ 299,000,000	**$ 449,000,000**

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SGV-249	State of Good Repair Program	Pasadena	Bridge Maintenance and Seismic Retrofit Project	$ 6,400,000	$ 9,600,000

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SFV-B1	Active Transportation	Burbank	Burbank: Bicycle Master Plan projects	$ 6,000,000	$ 12,300,000
2	SFV-B10	Active Transportation	Burbank	Downtown Burbank Metrolink Station: Pedestrian grade crossing improvements	$ 4,000,000	$ 6,000,000
3	SFV-B2	Active Transportation	Glendale	Glendale: Bicycle Transportation Plan projects (including Verdugo Wash bikeway and bridges over LA River)	$ 14,700,000	$ 22,000,000
4	SFV-B24	Active Transportation	Unincorporated - San Fernando	Various projects identified in Metro's and LA County's bike plans for Arroyo Verdugo Cities Subregion: construct Class II and Class II lanes on various streets.	$ 568,000	$ 852,000
5	SFV-B7	Active Transportation	Glendale	Improvements to bike/pedestrian bridges and tunnels over SR-134 -Bridges: Louise, Geneva, Concord, Columbus, Adams -Tunnel: Kenilworth	$ 3,000,000	$ 7,500,000
6	SFV-B9	Active Transportation	Burbank	Downtown Burbank Metrolink Station: Bike/Ped bridge over I-5	$ 7,500,000	$ 9,200,000
7	SGV-269	Active Transportation	South Pasadena	Huntington Drive Bikeway	$ 651,299	$ 976,949
8	SGV-251	Active Transportation	Pasadena	Citywide Safe Route to School Projects	$ 1,000,000	$ 2,000,000
9	SGV-245	Active Transportation	Pasadena	Citywide Bicycle Transportation Plan projects	$ 6,000,000	$ 8,000,000
					$ 43,419,299	**$ 68,828,949**

Arroyo Verdugo Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description	Estimated Minimum Cost	Estimated Maximum Cost
1	SFV-A25	Regional Facilities	Burbank	Hollywood Way: Widen to 6 lanes from Thornton Ave to Glenoaks Blvd	$ 6,540,000	$ 7,470,000
2	SFV-A5	Regional Facilities	Burbank, Los Angeles - San Fernando	Clybourn Ave: Grade separation at railroad tracks / Vanowen St / Empire Ave	$ 48,000,000	$ 72,000,000
3	SFV-B16	Regional Facilities	Burbank	Burbank Airport: CNG Refueling Station	$ 1,200,000	$ 1,800,000
4	SFV-B8	Regional Facilities	Burbank	Hollywood Way/San Fernando Rd Metrolink station pedestrian bridge	$ 7,500,000	$ 9,200,000
5	SFV-H2	Regional Facilities	Burbank	I-5/Buena Vista Ave: Reconfigure ramps and connect with Winona Ave	$ -	$ -
6	SFV-T12	Regional Facilities	Burbank, Los Angeles - San Fernando	Metro Orange Line Extension: North Hollywood to Bob Hope Airport	$ 124,000,000	$ 168,000,000
7	SFV-T20	Regional Facilities	Burbank, Glendale, Los Angeles - San Fernando	Burbank/Glendale LRT: From LA Union Station to Burbank Airport via Antelope Valley Line corridor	$ 800,000	$ 20,000,000
8	SFV-T21	Regional Facilities	Burbank, Glendale	Pasadena to Burbank Airport LRT: Via SR-134 / I-5 through Glendale & Burbank	$ 930,000,000	$ 3,855,000,000
9	SFV-T22	Regional Facilities	Burbank, Los Angeles - San Fernando	Metro Red Line Extension: North Hollywood to Burbank Airport	$ 1,701,000,000	$ 1,929,000,000
					$ 2,819,040,000	**$ 6,062,470,000**

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-19	Transit	Los Angeles - Central	Project Rte: I5 - Expand Metrolink service and capacity on existing trains at various locations to be determined
2	CE-20	Transit	Los Angeles - Central	Increase Metrolink services between Moorpark and Union Station
3	CE-21	Transit	Los Angeles - Central	Burbank/Glendale LRT from LA Union Station to Burbank Metrolink Station
4	CE-22	Transit	Los Angeles - Central, West Hollywood	Crenshaw Bl Corridor Extension (beyond segment funded by Measure R) all the way to West Hollywood/Hollywood
5	CE-23	Transit	Los Angeles - Central, West Hollywood	Metro Purple Line Extension West Hollywood Extension
6	CE-24	Transit	Los Angeles - Central	“Silver” Line LRT between Metro Red Line Vermont/Santa Monica Station and City of La Puente
7	CE-25	Transit	Los Angeles - Central	Vermont Corridor Subway: Vermont "Short Corridor" from Wilshire/Vermont to Exposition/Vermont
8	CE-27	Transit	Los Angeles - Central	West Santa Ana Branch ROW Corridor LRT Alternative based on SCAG Alternatives Analysis study.
9	CE-30	Transit	Los Angeles - Central	SR-134 East-West Transit Corridor Connecting North Hollywood, Burbank, Glendale and Pasadena
10	CE-3137	Transit	Los Angeles - Central	Metro Gold Line Eastside Transit Corridor Phase 2 - Extension from its existing terminus at Atlantic Station in East Los Angeles farther east
11	CE-3161	Transit	Los Angeles - Central	Implement City of LA Transit Enhanced Network as defined in the Mobility Plan 2035.
12	CE-3555	Transit	Los Angeles - Central	Purchase new DASH shuttle buses and expand LADOT DASH operations to enhance intra-community "first mile/last mile" transit connections to regional transit centers.
13	CE-3613	Transit	Los Angeles - Central	Extend Metro Red and Purple Lines to the Arts District with one new station
14	CE-3640	Transit	Los Angeles - Central	Metrolink EMF Additional Storage Tracks: Increase storage capacity at EMF by extending the length of the existing storage tracks and adding a middle crossover.
15	CE-3641	Transit	Los Angeles - Central	Metrolink Locomotives (for base case growth of locomotives and cars: This is the amount needed for the "organic" growth (irrespective of 30 min. service) and is not counted as part of the 30 min. growth scenario
16	CE-3643	Transit	Los Angeles - Central	Metrolink Locomotives (for 30 min. service Expansion): To get to a 30 minute headway, 26 additional locomotives will be needed. The cost of rail cars is assumed to be $7 M/unit. For the "base case" (i.e. non 30 min. service), another 26 locomotives would be needed. The costs for the base case are shown separately.
17	CE-3644	Transit	Los Angeles - Central	Metrolink Rail Cars (for 30 min. service expansion): To get to a 30 min. headway, 90 additional rail cars will be needed. The cost of passenger car is assumed to be #3M/unit. For the "base case" (i.e. non 30 min. service), another 90 passenger cars would be needed. The costs for the base case are shown separately.
18	CE-3645	Transit	Los Angeles - Central	Metrolink Reconfiguration of existing CMF (for 30 min service expansion): Relocate admin office to new CMF location and improve capacity by building a run-through progressive car and loco shop at existing CMF
19	CE-498	Transit	Los Angeles - Central	Downtown Streetcar: Restore the historic streetcar in Downtown LA servicing several key destinations; provide 7 to 15 minute headways; includes late evening service; estimated daily ridership is 10,000
20	CE-96	Transit	Los Angeles - Central	Harbor Subdivision Transit Corridor (connection from Crenshaw Bl to Downtown Los Angeles)
21	CE-288	Transit	Los Angeles - Central	I-10 - I-10 Busway

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-18	Modal Connectivity	Los Angeles - Central	Eastside Light Rail Access (Gold Line) - Improvements to first/last mile connections to stations, including bicycle and pedestrian infrastructure such as bicycle lanes, bicycle racks, curb extensions, crosswalks, enhanced pedestrian lighting, and tree canopies for key pedestrian corridors.
2	CE-3529	Modal Connectivity	Los Angeles - Central	Implement Mobility Hubs: Install a full-service mobility hub at or adjacent to Metro Stations & satellite hubs strategically located surrounding each station, including secure bike parking, car share, bike share, and ride share (including casual carpooling) to bridge the first/last mile gap of a transit user's commute.
3	CE-3531	Modal Connectivity	Los Angeles - Central	Expansion of the LADOT ExpressPark program throughout parking-congested areas in the City of Los Angeles. This on-street intelligent parking program includes vehicle sensors, dynamic demand-based pricing, and real-time parking guidance to reduce VMT and congestion.
4	CE-3557	Modal Connectivity	Los Angeles - Central	Expand the park & ride network in Los Angeles County to meet the current and latent demand of discretionary transit riders to use regional public transportation services.
5	CE-494	Modal Connectivity	Los Angeles - Central	Hollywood ExpressPark: Implement an on-street intelligent parking program that includes vehicle sensors, dynamic demand-based pricing and a real-time parking guidance system to reduce VMT, congestion and to improve flow for cars/buses.
6	CE-88	Modal Connectivity	Los Angeles - Central	Citywide- Add/expand park-and-ride facilities
7	CE-3529	Modal Connectivity	Los Angeles - Central	Implement Mobility Hubs: Install a full-service mobility hub at or adjacent to Metro Stations & satellite hubs strategically located surrounding each station, including secure bike parking, car share, bike share, and ride share (including casual carpooling) to bridge the first/last mile gap of a transit user's commute.
8	CE-3530	Modal Connectivity	Los Angeles - Central	Implement pedestrian and bicycle connectivity improvements at every existing and planned Metro rail and subway station by providing enhanced sidewalk amenities such as landscaping, shading, lighting, directional signage, shelters, curb-extensions, mid-block crosswalks, ADA ramps, lead-pedestrian interval signal phases, etc.
9	CE-3532	Modal Connectivity	Los Angeles - Central	Implement Union Station Linkages Plan
10	CE-3553	Modal Connectivity	Los Angeles - Central	Implement the Metro First/Last Mile Strategic Plan
11	CE-3595	Modal Connectivity	Unincorporated - Central	Establish a County-wide bike share program that interacts with the Metro transit system.
12	CE-3621	Modal Connectivity	Los Angeles - Central	Implement the City of Los Angeles First & Last Mile Transit Plan
13	CE-3630	Modal Connectivity	Los Angeles - Central	Enhanced Pedestrian Access to Metro Stations
14	CE-346	Modal Connectivity	Los Angeles - Central	Crenshaw Exposition Light Rail Station TOD Accessibility: Installation of pedestrian/transit connectivity improvements from Coliseum St to 30th St

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-1	Highway Efficiency	Los Angeles - Central	US-101- Widen Edgeware bridge on SB US-101 between Glendale Bl on-ramp and US-101/I-110 interchange to provide auxiliary lanes
2	CE-14	Highway Efficiency	Los Angeles - Central	I-10- Improve I-110 interchange
3	CE-15	Highway Efficiency	Los Angeles - Central	US-101- Improve I-110 interchange
4	CE-17	Highway Efficiency	Los Angeles - Central	Improve I-5/SR-2 Interchange
5	CE-3027	Highway Efficiency	Los Angeles - Central	To extend the I-110 north from its current terminus at I-10 into Downtown Los Angeles via Central City west area. The Adams/Figueroa flyover study, PSR, will investigate how the construction of a new structure connecting the I-110 northbound HOV lane off-ramp directly to Figueroa Street.
6	CE-3037	Highway Efficiency	Los Angeles - Central	Route 710: study to evaluate technical feasibility and impacts of an alternative to close 710 freeway gap. this study includes environmental studies (ear/eyes) (ea# 187901, ppno# 2215)
7	CE-3487	Highway Efficiency	Los Angeles - Central	Project Rte: I-110 - Between US-101 and I-10, reconfigure freeway ramps to provide additional northbound and southbound lanes in the downtown area
8	CE-75	Highway Efficiency	Los Angeles - Central	I-5- Construct SB auxiliary lane on I-5 from Ditman Av to Calzona St
9	CE-76	Highway Efficiency	Los Angeles - Central	I-5- Construct SB auxiliary lane on I-5 from Marietta St to Lorena St
10	CE-77	Highway Efficiency	Los Angeles - Central	US -101- Add NB and SB auxiliary lanes from Glendale Bl to Cahuenga Bl
11	CE-79	Highway Efficiency	Los Angeles - Central	I-10- Improve I-10/SR-60/I-5 interchange
12	CE-84	Highway Efficiency	Los Angeles - Central	I-5- Improve I-5 and SR-110 interchange

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-224	ITS/Technology	Los Angeles - Central	I-10- Install CCTV and other communications systems
2	CE-225	ITS/Technology	Los Angeles - Central	I-10- Upgrade Surveillance System
3	CE-495	ITS/Technology	Los Angeles - Central	Traffic Signal System Upgrades: Implement traffic signal system upgrades throughout subregion including signal controller upgrades, left-turn phasing at key intersections, sensor loops, additional CCTV cameras to improve LADOT's ability to monitor and respond
4	CE-3103	ITS/Technology	Los Angeles - Central	Metro Gold Line at-grade crossing mobility enhancements. Deployment of ITS at signalized intersections adjacent to Metro Gold Line at-grade crossings to provide adaptive traffic signal control to improve mobility and enhance safety.

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-101	Demand Based Program	Los Angeles - Central	I-10 Carpool Lanes: Lincoln Bl to I-5
2	CE-2998	Demand Based Program	Unincorporated - Central	LA County rideshare services; provide commute info, employer assistance and incentive programs through core & employer rideshare services & MTA incentive programs
3	CE-3021	Demand Based Program	Los Angeles - Central	I-10 and I-110 "HOT" express lanes toll system operations, maintenance, marketing and data collection
4	CE-4	Demand Based Program	Unincorporated - Central	US-101 Corridor: Add carpool lane in each direction between SR-27 (Topanga Canyon Bl and SR-2 in Downtown Los Angeles and restripe for mixed-flow lane in each direction between SR-27 and Ventura County Line
5	CE-6	Demand Based Program	Unincorporated - Central	SR-60 Carpool Lanes: US-101 to I-605
6	CE-78	Demand Based Program	Los Angeles - Central	Implement Countywide High Occupancy Toll (HOT) Lanes Network
7	CE-8	Demand Based Program	Los Angeles - Central	I-5- Add HOV lane in both directions between SR-134 and I-110
8	CE-9	Demand Based Program	Los Angeles - Central	US-101- Add HOV lanes in both directions between 170 and 110 Fwy
9	CE-2999	Demand Based Program	Los Angeles - Central	12 buses for the I-10 El Monte Busway, HOT lane
10	CE-3002	Demand Based Program	Los Angeles - Central	I-10 HOT Lane Operations - New transit services

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-448	Goods Movement	Los Angeles - Central	Alameda St Goods Movement (Downtown): Alameda St. from I-10 to Seventh St - project includes rehabilitation of the roadway, removing embedded rails and ties, installing left turn channelization, spot widening where needed to accommodate truck traffic
2	CE-47	Goods Movement	Los Angeles - Central	Main & Daly- Capacity enhancement at Daly St and Main St. Increase curb returns at NW and SW corners of Daly and Main to facilitate truck movements
3	CE-70	Goods Movement	Los Angeles - Central	Alameda Corridor North- between SR-2 and SR-134 – Grade separation (trench) for commuter and freight rail lines
4	CE-72	Goods Movement	Los Angeles - Central	N. Main St- N Main St Grade Separation with LA River/Metrolink/Union Pacific Railroad

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-3534	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Implement roadway enhancements that enhance mobility and safety for all and strive toward the City of Los Angeles "Vision Zero" goal of zero traffic fatalities by 2025.
2	CE-3556	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Program to fund the conversion of existing transit fleet in Los Angeles County to meet goal of 25% zero-emission or near zero-emission buses by 2025
3	CE-3558	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Program to purchase new transit operations / maintenance facilities, and upgrade existing facilities, with the capacity to accommodate new zero emission and near zero emission buses.
4	CE-3559	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Program to maintain a state of good repair for public transit programs including the replacement and refurbishment of transit vehicles, facilities, and other transit infrastructure.
5	CE-3593	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Improve and retrofit Metro Pico Station to enhance safety and to better serve the heavy ridership demand that occur after major events at LA Live.
6	CE-3594	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Improve and retrofit three Expo Line Stations (Jefferson/USC, Expo Park/USC, and Expo/Vermont) to enhance safety and to better serve the heavy ridership demands that occur after major events at USC and the Los Angeles Memorial Coliseum.
7	CE-3646	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Metrolink Rehab -Short Term: Includes rehab of rail, ties, OTM, structures, communication, Central Train Control (CTC), grade crossing signals, facilities & equipment, vehicles, rolling stock (locomotives & cars)
8	CE-3647	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Metrolink Rehab -Mid Term: Includes rehab of rail, ties, OTM, structures, communication, Central Train Control (CTC), grade crossing signals, facilities & equipment, vehicles, rolling stock (locomotives & cars)
9	CE-3648	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Metrolink Rehab -Long Term: Includes rehab of rail, ties, OTM, structures, communication, Central Train Control (CTC), grade crossing signals, facilities & equipment, vehicles, rolling stock (locomotives & cars)
10	CE-3649	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Metrolink Rehab - Expansion (for 30 min. service on all Metrolink lines): Includes rehab of rail, ties, OTM, structures, communication, Central Train Control (CTC), grade crossing signals, facilities & equipment, vehicles, rolling stock (locomotives & cars)
11	CE-3650	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Metrolink Bring 1 grade crossing to new SCRRA Standards (including active warning devices and civil improvements) 5 xings/yr * 5 years * $2M per xing = $50M Systemwide*: Bring 1 grade crossing to new SCRRA Standards (including active warning devices and civil improvements) 5 xings/yr * 5 years * $2M per xing = $50M Systemwide*
12	CE-3651	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Cameras at Metrolink Grade Crossings: Install cameras at grade crossings
13	CE-3652	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	N. Main St/Albion Street: Metrolink Grade crossing improvements
14	CE-3653	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	North Main Street Metrolink Crossing Improvements: Signage and striping (crossing within 2100 ft of school), possibly install 3rd active gate to NW quad, possible RT turn restriction for business parking in NW quad due to geometry, sight distance and lack of active protection; 4 quad gates
15	CE-3642	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Metrolink Another CMF level facility for heavy maintenance (for 30 min. service expansion): Need 100% size of CMF in approximately 2017. Will include the administrative offices from existing CMF, a run-through progressive car and loco shop, S&I, storage tracks, fuel system, train wash, shop machinery, and expanded warehouse capacity
16	CE-3610	State of Good Repair / Safety, Reliability & Quality of Services	Los Angeles - Central	Implement pedestrian safety and accessibility improvements at and adjacent to LRT and freight rail crossings.
17	CE-3622	State of Good Repair / Safety, Reliability & Quality of Services	Unincorporated - Central	Pavement Preservation
18	CE-3623	State of Good Repair / Safety, Reliability & Quality of Services	Unincorporated - Central	Sidewalk, Curb, Parkway Preservation; Repair and Reconstruction

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-1903	Active Transportation	Los Angeles - Central	Rails-to-trails conversions incorporating bike/ped paths and greenways in place of abandoned, or, alongside active rail lines as well as other underutilized easements and rights-of-way
2	CE-1910	Active Transportation	Los Angeles - Central	Implement streetscape plans for areas of high pedestrian and commercial activity and mixed-use boulevards well-served by transit, as well as the Transit Oriented Development Areas along Metro's Expo, Blue and Green LRT Corridors, such as Washington Bl from Figueroa St to Central Av.
3	CE-3162	Active Transportation	Los Angeles - Central	Implement City of LA Bicycle Enhanced Network as defined in the Mobility Plan 2035
4	CE-3535	Active Transportation	Los Angeles - Central	Implement Los Angeles Safe Routes to School Initiative to provide targeted safety improvements at schools with high collision rates. Improvements may include new traffic signals, curb extensions, wider sidewalks, new crosswalks, traffic calming measures, etc.
5	CE-3544	Active Transportation	Los Angeles - Central	Implement City of LA Pedestrian Enhanced Districts as defined in Mobility Plan 2035.
6	CE-3551	Active Transportation	Los Angeles - Central	Implement the programs identified in the City of Los Angeles Mobility Plan 2035
7	CE-36	Active Transportation	Los Angeles - Central	Park 101 - Freeway Cap Park - Los Angeles St Bridge over US-101: Replace with longer bridge for increased lateral underclearance; cover NB on-ramp with a portal frame for increased open space for proposed park
8	CE-3612	Active Transportation	Los Angeles - Central	Completion of the LA River Bike Path project to connect Downtown Los Angeles to the San Fernando Valley
9	CE-393 (CE-392/ CE-394)	Active Transportation	Los Angeles - Central	Fashion District Streetscape Phase III: Pedestrian environment improvements and enhancements to improve pedestrian access to transit systems within the Fashion District Area (Pico Bl from San Pedro St to Maple Av and San Pedro St from Pico Bl to Washington Bl); This project is an 11-block Pedestrian Corridor that will connect with and continue the Fashion District Streetscape Projects Phase 1 and Phase II. Phase II streetscape improvements will extend and increase pedestrian usage into, out of, and through downtown Los Angeles and the Fashion District by enhancing and improving the pedestrian environment. Typical improvements include new sidewalks, curb ramps, enhanced crosswalks, street furniture, pedestrian lighting, tree maintenance, and decorative tree wells/covers. Pedestrian environment improvements and enhancements at Pico Bl., San Pedro St. and Maple Av. and at San Pedro St., Pico Bl. and Washington Bl. and main St. and Griffith
10	CE-698	Active Transportation	Los Angeles - Central	Develop a System-wide Urban Greening Plan to improve placemaking, increase environmental stewardship, and create livable streets around transit stations with funds awarded by the State Strategic Growth Council.
11	CE-762	Active Transportation	Los Angeles - Central	Implement Mayor's "Great Streets Program": Revitalize up to 40 neighborhood streets to become more pedestrian-friendly
12	CE-766	Active Transportation	Los Angeles - Central	Pedestrian Access: Implementation of several Community Plan Implementation Overlay sub-districts that contain enhanced pedestrian standards as well as include preliminary streetscape plans that call for enhancement of public realm for pedestrians as well as other non-vehicular modes of transportation
13	CE-792	Active Transportation	Los Angeles - Central	Priority Pedestrian Routes: Implement streetscape plans for Crenshaw Bl (between Santa Monica Freeway and Florence Av. as well as within the district boundaries of the following CPIO areas: Crenshaw/Expo TOD, La Brea/Farmdale TOD, Jefferson/La Cienega TOD, Venice/National TOD, Crenshaw/Slauson TOD, West Bl TOD, and Hyde Park Industrial Corridor
14	CE-808	Active Transportation	Los Angeles - Central	Streetscapes: Implement streetscape plans for the Neighborhood Districts along Robertson and Washington Bl, as well as Leimert Park Village and the Crenshaw/Slauson Area as identified, as well as the Transit Oriented Development Areas along the Mid-City Exposition and Crenshaw/LAX transit Corridors
15	CE-87	Active Transportation	Los Angeles - Central	Hollywood Central Park: US-101- Decking over 101 Fwy between Bronson Av and Vermont Av for pedestrian linkage and open space

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
16	CE-1900	Active Transportation	Los Angeles - Central	Develop a prioritized list of pedestrian crossing improvements through pedestrian safety audits throughout the community. Include enhanced features such as bulb-outs, landscaped median refuges and audio/visual warnings where appropriate.
17	CE-1909	Active Transportation	Los Angeles - Central	Expand bicycle networks and link them to those of neighboring areas
18	CE-1929	Active Transportation	Los Angeles - Central	Taylor Yard State Park is now known as Rio de Los Angeles State Park. This project would connect the two communities on opposite sides of the LA River with a bike connection via a bridge over the river. The park is at N. San Fernando Road & Macon Street (east of the LA River) to the LA River Greenway Trail (west of the LA River).
19	CE-1930	Active Transportation	Los Angeles - Central	Taylor Yard Bicycle/Pedestrian Bridge Construction: Per MOU between Metro & LADOT, provide a safe and convenient bicycle and pedestrian link between the LA River Bikeway (on west bank) and the Rio de Los Angeles State Park (on east bank). The project includes the construction of a ped/bikeway bridge to connect the LA River Bike Path to communities and bike infrastructure on the east bank. The project includes a minimum 400' long brigde over the River and an at-grade crossing of the existing UP emergency spur tracks. Scope may be expanded to include bike lanes along Taylor Yard Access Road to San Fernando Road, or to provide linkage to the bike trails in the State Park.
20	CE-1931	Active Transportation	Los Angeles - Central	Downtown Bicycle Service Center: The project would include the development, implementation and management of a Bicycle Service Center in Downtown Los Angeles at or near 1st & Main.
21	CE-1935	Active Transportation	Los Angeles - Central	Av 26 to Gold Line Cypress Station Ped Connection: St tree installation, bio-retention planters, bike lanes, lighting, access ramps, enhanced crosswalks, and bulb-outs. Av. 26 between Pasadena Av. & San Fernando Road
22	CE-1936	Active Transportation	Los Angeles - Central	Beverly Bl. Vermont to Commonwealth: Bike lanes, curb extensions, signs and decorative sidewalks
23	CE-3060	Active Transportation	Los Angeles - Central	Construct crosswalk bump-outs and related streetscape improvements on Temple St between Hoover St & Glendale. Project will provide for various streetscape improvements.
24	CE-3089	Active Transportation	Los Angeles - Central	Implement the Broadway Streetscape Master Plan on Broadway between 1st Street and Olympic Boulevard.
25	CE-3112	Active Transportation	Los Angeles - Central	Pedestrian/Bicycle facilities, landscape, and artwork enhancements adjacent to I-5 & I-10 & LA River
26	CE-342	Active Transportation	Los Angeles - Central	Cesar Chavez Streetscape Improvements: Improve ped connectivity to transit stops along Cesar Chavez including enhanced X-walks, medians, lighting, bus stop amenities, curb cuts, information kiosks, street trees, etc.
27	CE-3552	Active Transportation	Los Angeles - Central	Implement the programs identified in the 2010 Bicycle Plan for the City of Los Angeles (See Appendix for detail)
28	CE-3624	Active Transportation	Unincorporated - Central	Pedestrian Improvements
29	CE-3629	Active Transportation	Unincorporated - Central	Local Bikeways
30	CE-381	Active Transportation	Los Angeles - Central	Expo Line Non-Revenue Connector Enhancements: Install bike lanes and other bike/ped amenities to enhance the quality of the corridor for pedestrians, cyclists and transit users.
31	CE-394	Active Transportation	Los Angeles - Central	Fashion District West Gateway Plaza: Enhance the skewed alignment of this intersection (Pico Blvd and Main St) and implement pedestrian enhancements such as plaza/pocket park at triangular median of intersection and sidewalk improvements that facilitate access to transit
32	CE-395	Active Transportation	Los Angeles - Central	Fletcher Drive Transit & Pedestrian Improvement Project (Fletcher Drive between La Clede Av and San Fernando Road): Enhance pedestrian access to transit by installing bus stops, access ramps, lighting and curb extensions.
33	CE-397	Active Transportation	Los Angeles - Central	Grand Avenue Pedestrian Enhancements: Enhance pedestrian access to transit through new sidewalks, street trees, crosswalks, street furniture, bulb-outs and other amenities (also enhances efficiency & safety of corridor) on Grand Avenue between Washington Blvd and Martin Luther King Jr. Blvd
34	CE-408	Active Transportation	Los Angeles - Central	La Cienega Blvd Pedestrian Enhancement (La Cienega Blvd between Melrose Ave and Waring Ave): Enhance pedestrian environment and access to transit through street trees, controlled crosswalks, street furniture, bulbouts and other amenities (also enhances efficiency & safety of corridor)

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
35	CE-411	Active Transportation	Los Angeles - Central	Los Angeles Neighborhood Initiative - Green St Project along 4th St between Matthews St and Mott St: Planting drought-tolerant and native plants and trees, rain gardens, swales, the installation of permeable pavement and new curbs and enhance sidewalks to improve pedestrian access to transit systems
36	CE-412	Active Transportation	Los Angeles - Central	Los Angeles St Park (Los Angeles St between 7th and 8th Sts): Implement pedestrian and bike enhancement such as hardscaping, signage, trees, trellis structures, park furniture, secure bike parking, bike share kiosks, lighting, etc. to promote multi-modal access to transit system
37	CE-414	Active Transportation	Los Angeles - Central	Main St Transit/Pedestrian Enhancement - 2nd to 4th Street: Enhance the public right-of-way for pedestrians and transit users with improved lighting, shade, trees, and curb extensions.
38	CE-417	Active Transportation	Los Angeles - Central	Olympic Bl Pedestrian Circulation Project: Install bus shelters, benches, trash receptacles, security lighting, decorative crosswalks, and sidewalk improvements on Olympic Bl between Crenshaw Bl and Vermont Av
39	CE-423	Active Transportation	Los Angeles - Central	San Pedro Street Pedestrian Enhancements: Enhance ped access to transit via sidewalk repair, ADA curbs, crosswalks, bulb-outs, storm drain repair, bioswales, and pedestrian signage at key intersections (enhance access to Ricardo Lizarraga School)
40	CE-424	Active Transportation	Los Angeles - Central	Sepulveda Bl Pedestrian Improvements: Implement sidewalk and streetscape improvements, bus stop lighting at transit stops, and enhanced crosswalks on Sepulveda Bl between 76th St and 80th St
41	CE-435	Active Transportation	Los Angeles - Central	Washington Bl Streetscape Improvement (Washington Bl between 110 Fwy and Normandie): Improve ped connectivity to transit stops at key intersections along Washington (@Vermont, Normandie & Hoover) including enhanced crosswalks, medians, lighting, bus stop amenities, information kiosks, street trees, etc.
42	CE-548	Active Transportation	Los Angeles - Central	Angeles Vista Rd - Slauson Av to Vernon Av: Bike and pedestrian improvement projects paralleling an existing roadway facility.
43	CE-767	Active Transportation	Los Angeles - Central	Access Management: Creation of adequate drop-off areas for schools, day care, health care, and other uses with intensive passenger drop-off demand
44	CE-790	Active Transportation	Los Angeles - Central	Priority Bikeways: Mark bikeways in the West Adams-Baldwin Hills-Leimert Community Plan with appropriate signage
45	CE-795	Active Transportation	Los Angeles - Central	Reclaimed Land for Bikeways: Coordinate with other agencies to designate and develop mountain bike trails in the Kenneth Hahn State Recreation Area that complement and connect to the Baldwin Hills Park Master Plan trail system
46	CE-85	Active Transportation	Los Angeles - Central	Arroyo Seco Bike Trail- Bike Trail Class 1 Facility/Connector from Av 26 to San Fernando Rd
47	CE-3611	Active Transportation	Los Angeles - Central	Identify and implement pedestrian safety and bicycle countermeasures at the 10 corridors with the highest severe injuries and collisions.

Central Subregion Project List

Non-Prioritized	Project ID	Project/Program Category	Jurisdiction	Project Description
1	CE-3000	Regional Facilities	Los Angeles - Central	El Monte Busway Improvements, including bike lockers, ticket vending machines at El Monte Busway stations and up to 30 bus bays; Improvements at the El Monte Busway terminus at Union Station include passenger station rehabilitation and upgrades and improved pedestrian connection to Patsaouras Plaza/Union Station
2	CE-3532	Regional Facilities	Los Angeles - Central	Implement Union Station Linkages Plan

ID	Project Description	Jurisdiction	Mobility	Safety	Sustainability	Economy	Accessibility	State of Good Repair	Categorization Timeframe		
			•Reduce Travel Times •Increase Reliability •Improve System Connectivity	•Improve Safety •Reduce Mode Conflicts •Improve Transit Safety/Security	•Reduce GHG Emissions •Improve Quality of Life •Encourage Efficient Mode Share	•Accommodate Goods Movement •Reduce Number and Length of Trips •Enhance Economic Output	•Integrate Transit Hubs •Serve Transit Dependent Populations •Improve First/Last Mile Connections	•Preserve Life of Facility or Equipment •Reduce Goods Movement Impact •Balance Maintenance & Rehabilitation	Short 1-10 yrs	Mid 11-20 yrs	Long 21+ yrs
Arterials											
Tunnel Projects											
A2	Saticoy St: Build tunnel underneath Van Nuys Airport between Woodley St and Hayvenhurst Ave	LA	◑	○	○	○	○	○		X	X
A3	Sepulveda Blvd: Widen tunnel at Mulholland Dr for added bike and traffic lanes	LA	●	◑	○	○	○	○		X	X
Grade Separation Projects											
A4	Buena Vista St: Grade Separation at railroad tracks (Ventura County Line)	Burbank, Metrolink	●	●	◑	◑	○	◔			X
A6	Doran St: Grade separation at railroad tracks / San Fernando Rd	Glendale, Metrolink	●	●	◑	◑	○	◔	X		
A7	Magic Mountain Parkway: Grade separation at railroad tracks / Railroad Ave	Santa Clarita, Metrolink	●	●	◑	◑	○	◔		X	
A8	Saticoy St: Grade separation at railroad tracks (between Van Nuys Ave and Woodman Ave)	LA, Metrolink	●	●	◑	◑	○	◔		X	X
A9	Sunland Blvd: Grade separation at railroad tracks / San Fernando Rd	LA, Metrolink	●	●	◑	◑	○	◔		X	X
Extension or New Road Projects											
A10	Monterey Rd: Extend to Glenoaks Blvd over Verdugo Wash	Glendale	●	○	◔	○	○	○		X	
A11	Orange St: Extend over SR-134 between Doran St and Goode Ave	Glendale	●	○	◔	◔	○	○			X
A12	SR-134 Frontage Road: Construct S of freeway between Brand Blvd and Geneva St	Glendale	●	○	○	◔	○	○			X
A13	Magic Mountain Pkwy: Extend from Railroad Ave to Via Princessa	Santa Clarita, Metrolink	●	○	○	◔	○	○		X	
A14	Via Princessa : Extend from Isabella Pkwy to Circle J Ranch Rd	Santa Clarita	●	○	○	○	○	○	X		
A15	Dockweiler Drive: Extend from Valle del Oro to Railroad Ave	Santa Clarita, Metrolink	●	○	○	○	○	○	X		
A16	Santa Clarita Pkwy: Construct new road from Bouquet Canyon Rd to SR-14	Santa Clarita, Metrolink	●	○	○	○	○	○		X	
A17	Saticoy St: Extend from Van Nuys Blvd to Woodman St	LA, Metrolink	●	○	—	◔	○	○		X	X
A18	Riverside Dr: Extend from Van Nuys Bl to Sepulveda Bl	LA, Metrolink	●	○	—	○	○	○		X	X
A19	Magnolia Bl: Extend from Hayvenhurst Av to Libbit Av and Haskell Av to Sepulveda Bl	LA, Metrolink	●	○	○	○	○	○		X	X
A20	Oxnard St: Extend from Sepulveda Bl to Woodley Av (including I-405 Interchange)	LA, Caltrans	●	○	—	◔	○	○		X	X
A21	Sepulveda Bl: Extend from Rinaldi St to Roxford St	LA, Metrolink	●	○	—	◔	○	○		X	X

High Benefit ● Medium Benefit ◑ Low Benefit ◔ No Benefit/ Neutral ○ Negative Impact —

ID	Project Description	Jurisdiction	Mobility •Reduce Travel Times •Increase Reliability •Improve System Connectivity	Safety •Improve Safety •Reduce Mode Conflicts •Improve Transit Safety/Security	Sustainability •Reduce GHG Emissions •Improve Quality of Life •Encourage Efficient Mode Share	Economy •Accommodate Goods Movement •Reduce Number and Length of Trips •Enhance Economic Output	Accessibility •Integrate Transit Hubs •Serve Transit Dependent Populations •Improve First/Last Mile Connections	State of Good Repair •Preserve Life of Facility or Equipment •Reduce Goods Movement Impact •Balance Maintenance & Rehabilitation	Categorization Timeframe Short 1-10 yrs	 Mid 11-20 yrs	 Long 21+ yrs
Arterials cont.											
Widening Programs/Projects											
A22	Burbank: General Plan intersection improvements	Burbank	◑	○	◔	○	○	◔	X	X	X
A23	Santa Clarita: General Plan arterial improvements	Santa Clarita	◑	○	○	○	○	◔	X	X	X
A24	Warner Center Specific Plan: Intersection and arterial improvements	LA	◑	○	—	◔	○	◔	X	X	X
A26	Glendale Ave: Add 1 NB lane from Doran St to SR-134	Glendale	◑	○	—	◔	○	◔		X	
A27	Golden Valley Rd: Widen from Sierra Hwy to Centre Pointe Pkwy	Santa Clarita	◑	○	○	○	○	◔	X		
A28	Burbank Blvd: Widen from Cleon Av to Clybourn Av to provide 2 lanes in each direction.	LA	◑	○	—	○	○	◔		X	X
A29	Victory Blvd: Widen WB from Canoga to De Soto Av	LA	◑	○	—	○	○	◔	X	X	
A30	Topanga Canyon Blvd: Widen to provide six through lanes all day between US-101 and SR-118	LA, Caltrans	◑	○	—	◔	○	◔	X	X	
A31	Chatsworth St: Widen from De Soto Av to Topanga Canyon Bl	LA, Metrolink	◑	○	—	○	○	◔	X	X	
A32	Van Nuys Blvd: Improve capacity SB from Burbank Bl to US-101	LA	◑	○	—	○	○	◔		X	X
A33	Hayvenhurst Av: Widen from Magnolia Bl to Ventura Bl	LA	◑	○	—	○	○	◔		X	X
A34	Victory Blvd: Widen from White Oak Av to Sepulveda Bl	LA	◑	○	—	○	○	◔		X	X
A35	Osborne St: Widen for pedestrian safety and improved traffic capacity from Foothill Bl to San Fernando Rd	LA, Metrolink	◑	◑	—	◔	○	◔		X	
A36	Foothill Blvd: Widen from Sierra Hwy to Balboa Bl	LA, Caltrans	◑	○	—	○	○	◔		X	
A37	Sepulveda Blvd: Widen from San Fernando Rd to Roxford St, including access to I-5 SB on-ramp	LA, Caltrans, Metrolink	◑	○	—	◔	○	◔		X	
A38	Sierra Hwy: Add two lanes at intersection with San Fernando Rd (bridge over Metrolink tracks)	LA, Caltrans, Metrolink	◑	○	—	○	○	◔	X	X	
A47	The Old Road: Widen The Old Road to provide continuous 4 lanes between Sierra Highway to north of Weldon Canyon Road in Santa Clarita.	LA, LA County, Caltrans, Metrolink	◑	○	—	○	○	◔			X

High Benefit ● Medium Benefit ◑ Low Benefit ◔ No Benefit/ Neutral ○ Negative Impact —

ID	Project Description	Jurisdiction	Mobility	Safety	Sustainability	Economy	Accessibility	State of Good Repair	Categorization Timeframe		
			•Reduce Travel Times •Increase Reliability •Improve System Connectivity	•Improve Safety •Reduce Mode Conflicts •Improve Transit Safety/Security	•Reduce GHG Emissions •Improve Quality of Life •Encourage Efficient Mode Share	•Accommodate Goods Movement •Reduce Number and Length of Trips •Enhance Economic Output	•Integrate Transit Hubs •Serve Transit Dependent Populations •Improve First/Last Mile Connections	•Preserve Life of Facility or Equipment •Reduce Goods Movement Impact •Balance Maintenance & Rehabilitation	Short 1-10 yrs	Mid 11-20 yrs	Long 21+ yrs
Arterials cont.											
State of Good Repair/Safety Programs											
A39	State of Good Repair/Safety Projects for arterials throughout region	Subregional	◑	◑	◔	◔	○	●	X	X	X
TSM											
A40	I-5/SR-134: Implement arterial improvements in interchange area to address movements with ramps missing at interchange	Burbank, Glendale, Caltrans	◑	○	○	○	○	○		X	
A41	La Crescenta Signal Synchronization: -La Crescenta Av: Orange Av to I-210 -Montrose Av: Florencita Av to Del Mar Rd -Oceanview Bl: I-210 to Florencita Av -Foothill Bl: Lowell Av to Briggs Av -Pennsylvania Av: Orange Av to 210 Fwy -Ramsdell Av: Orange Av to Montrose Av -Rosemont Av: Foothill Blvd to Montrose Av	Glendale, LA County	◑	○	◔	◔	○	○	X		
A42	Glendale: Sub-Regional Traffic Management Center Implementation	Glendale	◑	○	◔	◔	○	○	X		
A46	San Fernando: Upgrade traffic signals, video detection systems, and controllers on major corridors	San Fernando	◑	○	○	○	○	○	X		
A43	Santa Clarita: Traffic Signal and Signal Synchronization	Santa Clarita	◑	○	◔	○	○	○	X		
A44	Santa Clarita: ITS Phases V and VI	Santa Clarita	◑	○	◔	○	○	○	X		
A45	Los Angeles: Vehicle Infrastructure Integration – to integrate navigation systems with Intelligent Transportation System (ITS)	LA	◑	○	○	○	○	○	X	X	X
A48	Los Angeles: Traffic Signal Improvement Program. Implement signal controller upgrades, left-turn phasing, sensor, loops, CCTV monitors	LA	◑	○	◔	○	○	○	X		
Goods Movement											
Grade Crossing Safety Improvement Programs											
G1	Improvements to at-grade rail crossings across subregion to better accommodate truck turning radii and grades	Subregional	○	●	○	●	◔	◑	X	X	X
Arterial Programs											
G2	Improvements to intersections across subregion to better accommodate truck turning radii and grades	Subregional	○	◑	○	●	○	◑	X	X	X
Rail Programs											
G3	Improvements to railroads across subregion to better accommodate freight trains without affecting passenger rail service	Subregional	●	◔	◔	●	○	◔	X	X	X

High Benefit ● Medium Benefit ◑ Low Benefit ◔ No Benefit/ Neutral ○ Negative Impact —

ID	Project Description	Jurisdiction	Mobility •Reduce Travel Times •Increase Reliability •Improve System Connectivity	Safety •Improve Safety •Reduce Mode Conflicts •Improve Transit Safety/Security	Sustainability •Reduce GHG Emissions •Improve Quality of Life •Encourage Efficient Mode Share	Economy •Accommodate Goods Movement •Reduce Number and Length of Trips •Enhance Economic Output	Accessibility •Integrate Transit Hubs •Serve Transit Dependent Populations •Improve First/Last Mile Connections	State of Good Repair •Preserve Life of Facility or Equipment •Reduce Goods Movement Impact •Balance Maintenance & Rehabilitation	Categorization Timeframe Short 1-10 yrs	 Mid 11-20 yrs	 Long 21+ yrs
Highways											
Arterial Interchange Progams/Projects											
H1	SR-134 Ramp Widening program in Glendale: - EB&WB off-ramps at Pacific Ave: add a lane - EB off-ramp at Central Ave - WB off-ramp at Brand Blvd: add a lane - WB on- and off-ramp at Harvey Dr: add BRT stop	Glendale, Caltrans	High Benefit	No Benefit/Neutral	Low Benefit	Low Benefit	Low Benefit	Low Benefit		X	
H42	Regional: Upgrade traffic signal system at on- & off-ramp intersections with arterials, connect with ramp metering system, establish communication with fiber system and upgrade communication of Field Device to IP.	Subregional	High Benefit	No Benefit/Neutral	Low Benefit	Low Benefit	No Benefit/Neutral	Low Benefit		X	X
H44	I-210 Interchange Improvement Program in La Crescenta-Montrose: - Modify traffic signals & channelization, add WB on-ramp at La Crescenta Ave - Modify intersection & signals to improve SB to EB move at Pennsylvania Ave	Glendale, LA County, Caltrans	High Benefit	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral		X	
H4	SR-134/Central Ave: Grade separate EB and WB on- and off-ramps between Pacific Ave and Central Ave	Glendale, Caltrans	High Benefit	No Benefit/Neutral	No Benefit/Neutral	Low Benefit	No Benefit/Neutral	Low Benefit		X	
H5	SR-2/Mountain St: Widen NB off-ramp and SB on- and off-ramps	Glendale, Caltrans	High Benefit	No Benefit/Neutral	Low Benefit	Low Benefit	No Benefit/Neutral	Low Benefit	X		
H6	SR-2/Fern Ln: Add NB Off/On Ramp	Glendale, Caltrans	High Benefit	No Benefit/Neutral	Medium Benefit	Low Benefit	No Benefit/Neutral	Low Benefit		X	
H7	SR-2/Holly Dr: Add signals at ramps	Glendale	High Benefit	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	X		
H8	US-101/Hayvenhurst Ave: Add new WB on-ramp and EB off-ramp	LA, Caltrans	High Benefit	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	Low Benefit		X	X
H9	I-5/Roxford St: Widen Roxford at I-5 to facilitate truck movements	LA, Caltrans	High Benefit	No Benefit/Neutral	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	Low Benefit	X	X	X
H10	US-101/Coldwater Canyon Ave: Widen Coldwater Cyn bridge to provide dual left-turns to two on-ramps	LA, Caltrans	High Benefit	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	Low Benefit			X
H11	SR-170/Riverside Dr: Widen Riverside Dr to provide double right turns onto SB Tujunga Av	LA, Caltrans	High Benefit	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	Low Benefit		X	X
H12	US-101/Canoga: Add new WB on-ramp and new EB off-ramp	LA, Caltrans	High Benefit	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	Low Benefit			X
H13	US-101/Fallbrook Ave: Add on- and off-ramps	LA, Caltrans	High Benefit	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	No Benefit/Neutral	Low Benefit		X	X

High Benefit ● Medium Benefit ◑ Low Benefit ◔ No Benefit/ Neutral ○ Negative Impact —

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			•Reduce Travel Times •Increase Reliability •Improve System Connectivity	•Improve Safety •Reduce Mode Conflicts •Improve Transit Safety/Security	•Reduce GHG Emissions •Improve Quality of Life •Encourage Efficient Mode Share	•Accommodate Goods Movement •Reduce Number and Length of Trips •Enhance Economic Output	•Integrate Transit Hubs •Serve Transit Dependent Populations •Improve First/Last Mile Connections	•Preserve Life of Facility or Equipment •Reduce Goods Movement Impact •Balance Maintenance & Rehabilitation	Short 1-10 yrs	Mid 11-20 yrs	Long 21+ yrs
Highways cont.											
Arterial Interchange Progams/Projects cont.											
H14	US-101/Canoga Ave: Widen Canoga under the freeway overpass to full standard width	LA, Caltrans	●	○	○	○	○	◔		X	X
H15	US-101/Canoga Ave: Construct HOV lane connector from 101 Fwy to Metro Orange Line	LA, Caltrans	●	○	○	○	○	◔		X	X
H16	I-405/Oxnard St: Build a interchange for I-405 (include Metro Orange Line to HOV connection)	LA, Caltrans	●	○	○	○	○	◔		X	X
H17	SR-134: EB & WB Off-ramp improvements at Glendale Avenue	Glendale	●	○	○	○	○	◔	X		
H40	I-405/Burbank Blvd: Increase left turn capacity on SB on-ramp	LA, Caltrans	●	○	○	○	○	◔		X	X
H41	I-405/Sepulveda Blvd: Study closing SB on-ramp to reduce congestion at Sepulveda Blvd and Ventura Blvd	LA, Caltrans	●	○	○	○	○	○		X	X
H45	I-5/Hollywood Way: Widen NB and SB off-ramps to Hollywood Way.	LA, Caltrans	●	○	○	○	○	◔	X		
H46	NB 5/14 On from Sierra Highway/Foothill Blvd.: Construct roundabout interchange to replace signalized intersection.	LA, Caltrans	●	○	○	○	○	◔			X
Freeway Interchange Projects											
H18	I-5/SR-134: Interchange improvements - Carpool to carpool transition, "missing" ramp	Burbank, Glendale, Caltrans	●	◔	◔	◔	○	◔			X
H19	US-101/SR-170/SR-134: Interchange improvements - complete two connectors	LA, Caltrans	●	◑	○	○	○	◔			X
H20	I-405/US-101: Interchange Improvements	LA, Caltrans	●	◔	○	○	○	◔		X	X
H21	I-5/I-405: Interchange Improvements	LA, Caltrans	●	◔	○	◔	○	◔		X	X
H22	I-5/I-210: Interchange Improvements - Additional lane on the connector from NB I-210 to NB I-5	LA, Caltrans	●	○	○	○	○	○		X	X
H23	I-5/SR-14/I-210: Modify/rebuild I-210 (EB) transition by braiding over the SR-14 southbound connector ramps	LA, Caltrans	●	○	○	○	○	○		X	X
Freeway Corridor Projects											
H24	SR-2: Add HOV lane between SR-134 and Glendale Blvd	Glendale, LA, Caltrans	●	○	◑	○	○	○		X	
H25	I-5: Add mixed flow, HOV and truck lanes between SR-14 and I-405	Santa Clarita, LA, LA County, Caltrans	●	○	○	◔	○	◔		X	X
H26	I-5: North Capacity Enhancements - Add truck lane and HOV lanes from Pico Canyon Rd to Kern County Line	Santa Clarita, LA County, Caltrans	●	◑	○	●	○	◑		X	X

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Highways cont.											
Freeway Corridor Projects cont.											
H27	SR-14: Widen to provide at least three mixed flow lanes and one HOV lane in each direction from I-5 to Ave L	Santa Clarita, LA County, Caltrans	●	○	—	○	○	○		X	X
H28	US-101: Add HOV lane between SR-27 and SR-2	LA, Caltrans	●	○	—	○	○	○			X
H29	US-101: Add one lane to existing roadway in each direction between SR-27 and the Ventura County line; project widens roadway from 4 to 5 lanes, which could generally be accommodated by restriping within the existing roadway cross-section	LA, LA County, Caltrans	●	—	○	○	○	○			X
H30	US-101: Add 2 lanes to existing roadway in each direction between SR-27 and the Ventura County Line; project widens roadway from 4 to 6 lanes, while aiming to minimize ROW acquisition and local circulation impacts	LA, LA County, Caltrans	●	—	○	○	○	○			X
H31	US-101: Add NB and SB auxiliary lane between Laurel Canyon Bl and Sepulveda Bl	LA, Caltrans	●	○	—	○	○	○			X
H32	US-101: Add NB and SB auxiliary lanes between Hayvenhurst Av and Valley Circle Bl	LA, Caltrans	●	○	—	○	○	○			X
H33	I-210: Add additional WB lane between SR-118 and Hubbard St	LA, Caltrans	●	○	○	○	○	○		X	X
H47	I-210 HOV lane from I-5 to SR-134/I-710	Glendale, LA, LA County, Caltrans	●	○	—	○	○	○			X
H48	I-5- Add HOV lane in both directions between SR-134 and I-110	LA, Caltrans	●	○	—	○	○	○		X	
H49	SR-2 - Additional SB lane between 134 and I-5	Glendale, Caltrans	●	○	—	○	○	○			X
Soundwall Projects											
H34	I-210: Add soundwalls - Pennsylvania Av to Waltonia Av	Glendale, LA County, Caltrans	○	○	◐	○	○	○	X		
H35	US-101: Add Retaining Wall on the Barham/Cahuenga Corridor Transportation Project - Phase IV	LA, Caltrans	○	○	◐	○	○	○	X	X	
State of Good Repair/Safety Programs											
H36	Highway State of Good Repair/Safety Programs	Subregional	◐	◐	◔	◐	○	●	X	X	X
H37	Renovation of Key Sections of the US-101	LA, Caltrans	◐	◐	◔	◐	○	●	X	X	X

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Highways cont.											
TSM											
H38	I-5/SR-14: Expand Freeway Service Patrol throughout North County subregion	LA County	◑	◑	○	○	○	○	X		
H39	Regional: Improve Ramp metering, CCTV cameras, CMS for freeways in subregion as needed	Subregional	◑	○	○	○	○	○	X	X	
H43	Regional: Upgrade TMS: a) I-5: SR-118 to SR-14 (PM 39.3-45.6) b) US-101: I-5 to I-405 (PM 0.0-17.4) c) US-101: SR-27 to Ventura County Line (PM 25.3-38.19) d) SR-118: west of SR-27 to east of SR-210 (PM 0.0-14.8) e) SR-134: SR-170 to SR-210/SR-710 (PM 0.0-13.4) f) SR-170: SR-134 to I-5 (PM 14.5-20.5) g) I-405: south of US-101 to I-5 (PM 39.0-48.65) h) SR-2: SR-134 to SR-210 (PM 14.5-24.6) i) I-210: I-5 to SR-2 (PM 0.0-19.0) - Add CCTV & Comms j) I-5: TSM from SR-2 to SR-134	Subregional	◑	◔	○	○	○	○	X	X	
Active Transportation											
Bicycle/Pedestrian Programs/Projects											
B1	Burbank: Bicycle Master Plan projects	Burbank	◑	◑	●	○	●	○	X	X	X
B2	Glendale: Bicycle Transportation Plan projects (including Verdugo Wash bikeway and bridges over LA River)	Glendale	◑	◑	●	○	●	○		X	
B4	San Fernando: Bicycle Master Plan projects	San Fernando	◑	◑	●	○	●	○	X	X	
B5	Santa Clarita: Non-Motorized Transportation Plan Projects (including Railroad Ave/Metrolink Bicycle Trail, from Lyons Ave to Oak Ridge Dr)	Santa Clarita	◑	◑	●	◔	●	○	X	X	
B6	Los Angeles: Bicycle Plan projects	LA	◑	◑	●	○	●	○	X	X	
B7	Improvements to bike/pedestrian bridges and tunnels over SR-134 -Bridges: Louise, Geneva, Concord, Columbus, Adams -Tunnel: Kenilworth	Glendale	◑	◑	●	○	●	○		X	
B11	Construction of Pedestrian & Bike on the Los Angeles River throughout SFV	LA	◑	◑	●	○	●	○	X	X	
B12	Bicycle access improvements to Larry Zarian Transportation Center, on Los Feliz Rd and Brand Blvd	Glendale	◑	◑	●	◔	●	○	X		
B24	Various projects identified in Metro's and LA County's bike plans for Arroyo Verdugo Cities Subregion: construct Class II and Class II lanes on various streets.	LA County	◑	◑	●	○	●	○	X	X	X
B25	Establish a county-wide bike share program (including Santa Clarita)	Subregional	◑	◑	●	○	●	○	X	X	
B26	Los Angeles: Bicycle/Pedestrian Safety Program. Implement "Vision Zero" roadway improvements, ped/bike countermeasures, Safe Routes to School initiative	LA	○	●	●	◔	●	○	X	X	
ADA Access											
B3	Improvements to bus stop zones to meet ADA compliance	Subregional	○	●	○	○	◑	○	X		

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Active Transportation cont.											
Pedestrian Bridges											
B8	Hollywood Way/San Fernando Rd Metrolink station pedestrian bridge	Burbank, Bob Hope Airport	○	●	○	○	◑	○		X	
B9	Downtown Burbank Metrolink Station: Bike/Ped bridge over I-5	Burbank, Caltrans, Metrolink	◔	●	◔	○	◑	○		X	
B10	Downtown Burbank Metrolink Station: Pedestrian grade crossing improvements	Burbank, Caltrans, Metrolink	○	●	○	○	◑	○	X		
Complete Streets Programs											
B13	Los Angeles: Great Streets program	LA	○	◑	◑	●	●	○	X	X	X
B14	Cerritos Ave Complete and Green Streets Project. Connect LZTC to Glendale Memorial, Cerritos Park/School, Forest Lawn. Improve bike infrastructure, lighting, wayfinding, etc.	Glendale	◑	●	◑	◑	●	○	X		
B27	Los Angeles Complete Streets: implement Complete Streets Enhancements along key arterials as defined in the Mobliy Plan 2035	LA	○	◑	◑	●	●	○	X	X	X
B28	Los Angeles: Mobility Element (transit/vehicle/bicycle enhanced networks, pedestrian enhanced districts)	LA	◑	◑	◔	◔	◔	◔	X	X	X
Sustainability Programs											
B15	Electric Vehicle charging stations in Public Parking Structures (potentially including photovoltaic panels)	Subregional	○	○	●	○	○	○	X	X	
B17	Glendale: Expand CNG Station and Maintenance Facility for Glendale Beeline Transit Services (potentially shared with Burbank Bus)	Burbank, Glendale, LA County	○	○	●	○	○	◔	X		
B29	Los Angeles: ZEV Bus Fleet Program. Convert existing transit fleet in LA County to meet the goal of 25% ZEV by 2025	LA	○	○	●	○	○	◔	X		
Park and Ride Projects/Programs											
B18	Regional: Add/expand park-and-ride facilities	Subregional	◔	○	◑	◑	◑	◔	X	X	
B20	Newhall Avenue / SR-14 Park-and-Ride: Expand	Santa Clarita, Caltrans	◔	○	◑	◑	◑	◔	X		
B21	Harvey Dr / SR-134 Park-and-Ride: Expand	Glendale, Caltrans	◔	○	◑	◑	◑	◔		X	
B30	Los Angeles: Parking Program. Expand ExpressPark and implement valet parking throughout major retail centers	LA	◔	○	◑	●	○	○	X		
TDM Programs											
B19	Regional: TDM programs to reduce trips	Subregional	◑	○	●	●	◑	○	X	X	
Mobility Hubs/First-Last Mile Programs											
B22	Regional: Mobility hubs at major San Fernando Valley transit hubs (bike share, car share, bike stations, etc)	Subregional	●	○	●	○	●	○	X	X	X
B23	Regional: First-mile-last-mile improvements near major San Fernando Valley transit hubs	Subregional	●	◑	●	○	●	○	X	X	X

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Transit											
Bus Programs/Projects											
T1	Metro: Existing bus route improvements	Subregional	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	High Benefit	No Benefit/Neutral	X	X	X
T2	Metrolink Station Shuttle Buses: Expand service	Subregional	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	Low Benefit	No Benefit/Neutral	X		
T3	I-5 / SR-14: Expanded express bus service in HOV lanes	Burbank, Glendale, Santa Clarita, LA, LA County	High Benefit	No Benefit/Neutral	Medium Benefit	Medium Benefit	Low Benefit	No Benefit/Neutral	X		
T4	Municipal & Local Operators: Add late night and weekend municipal bus service	Burbank, Glendale, San Fernando, Santa Clarita, LADOT	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	High Benefit	No Benefit/Neutral	X		
T5	Municipal & Local Operators: Operating dollars for expanded service	Burbank, Glendale, San Fernando, Santa Clarita, LADOT	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	High Benefit	No Benefit/Neutral	X	X	X
T6	Burbank: All day Burbank Bus service on all four existing routes	Burbank	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	X		
T7	Glendale: Increase bus service and improve frequencies for Glendale Beeline Transit Services	Glendale	High Benefit	No Benefit/Neutral	Medium Benefit	Low Benefit	Medium Benefit	No Benefit/Neutral	X		
T8	Santa Clarita Transit: Increase frequency on existing express routes	Santa Clarita, LA, LA County	High Benefit	No Benefit/Neutral	Medium Benefit	Medium Benefit	Low Benefit	No Benefit/Neutral	X		
T9	Santa Clarita: Improve SCT service between Santa Clarita and San Fernando Valleys (headways, additional stops, etc)	Santa Clarita	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	Low Benefit	No Benefit/Neutral	X		
T10	Sepulveda Pass: Increase express bus service over Sepulveda Pass, with collector/feeder service throughout West LA and the San Fernando Valley	LA	High Benefit	No Benefit/Neutral	Medium Benefit	Medium Benefit	Low Benefit	No Benefit/Neutral	X		
T11	Los Angeles: 10 new DASH routes citywide	LA	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	High Benefit	No Benefit/Neutral	X	X	
T31	San Fernando: Public transit improvements, including upgrading bus stop infrastructure and enhancing routes and connections	San Fernando	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	High Benefit	No Benefit/Neutral	X	X	
T15	Glendale: Provide east-west transit service on Foothill Blvd to provide one-seat ride from Sunland to La Canada Flintridge	Glendale, Los Angeles, LA County	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	Low Benefit	No Benefit/Neutral		X	
T32	Improved regional transit connection between Las Virgenes area, Thousand Oaks and San Fernando Valley along US-101 corridor	LA	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	High Benefit	No Benefit/Neutral	X	X	
T33	Tier 2 Operators: Dedicated operations and capital funding to match formula equivalency of Included and Eligible Operators	Burbank, Glendale, LA	High Benefit	No Benefit/Neutral	Medium Benefit	No Benefit/Neutral	High Benefit	No Benefit/Neutral	X	X	X

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Transit cont.											
BRT Projects											
T13	Burbank to Hollywood BRT: Downtown Burbank to Hollywood via Burbank Media District & Universal City*	Burbank, LA County	◑	○	◑	●	●	○		X	X
T14	Pasadena to North Hollywood BRT: Via SR-134 through Glendale & Burbank*	Burbank, Glendale, LA, Caltrans	●	○	●	●	●	○		X	X
T16	Metro Orange Line: Bus operational improvements (shorter headways, grade separations, crossing gates, etc along entire Line)	LA	●	◑	●	●	◑	○		X	X
Commuter Rail Programs											
T17	Metrolink Antelope Valley Line Improvements (various)	Subregional	●	◑	●	●	◔	◑	X	X	X
T18	Metrolink Ventura County Line Improvements (various)	Subregional	●	◑	●	●	◔	◑	X	X	X
Real-Time Travel Information											
T19	Real-time transit info for municipal & local bus operators, Metrolink, airport and other info	Subregional	◑	◔	◔	○	◑	○	X		
Rail Projects											
T23	Metro Red Line Extension: North Hollywood to Sylmar*	San Fernando, LA	●	○	●	●	●	○		X	X
T24	Glendale Downtown Streetcar: Brand Blvd from Colorado Blvd to Glenoaks Blvd	Glendale	●	○	●	●	●	○		X	
T25	Metro Orange Line conversion to LRT	LA	●	○	●	●	◑	○		X	X
Rail or Bus Projects											
T26	Sepulveda Pass Transit Corridor - Consider multimodal tunnel(s) carrying premium transit and tolled highway lanes. P3 being considered.	LA	●	◑	●	◑	●	○		X	X
T27	East San Fernando Valley Transit Corridor - Currently in environmental phase, examining BRT, Tram, LRT Alternatives	San Fernando, LA	◑	◑	◑	◑	●	○		X	X
State of Good Repair/Safety Programs											
T28	Transit State of Good Repair/Safety Programs	Subregional	◑	●	◔	○	○	●		X	X
Transit Center											
T29	Glendale: Expand Larry Zarian Transportation Center	Glendale, Metrolink	○	○	◑	○	◔	○		X	
T30	Vista Canyon Transit Center: New Metrolink Station, Bus Transfer Facility	Santa Clarita, Metrolink	◔	◔	◑	◑	◑	○	X		

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Regional Facilities											
A5	Clybourn Ave: Grade separation at railroad tracks / Vanowen St / Empire Ave	Burbank, Bob Hope Airport, LA, Metrolink	●	●	◑	◑	○	◔		X	
A25	Hollywood Way: Widen to 6 lanes from Thornton Ave to Glenoaks Blvd	Burbank, Bob Hope Airport	◑	○	○	○	○	◔	X		
H2	I-5/Buena Vista Ave: Reconfigure ramps and connect with Winona Ave	Burbank, Caltrans, Metrolink	●	○	○	○	○	◔	X		
B8	Hollywood Way/San Fernando Rd Metrolink station pedestrian bridge	Burbank, Bob Hope Airport	○	●	○	○	◑	○	X		
B16	Burbank Airport: CNG Refueling Station	Burbank, Bob Hope Airport	○	○	●	○	○	○	X		
T12	Metro Orange Line Extension: North Hollywood to Bob Hope Airport	Burbank, Bob Hope Airport, LA	●	○	●	●	●	○		X	X
T20	Burbank/Glendale LRT: From LA Union Station to Burbank Airport via Antelope Valley Line corridor*	Burbank, Bob Hope Airport, Glendale, LA, Metrolink	●	◑	●	◑	●	○		X	X
T21	Pasadena to Burbank Airport LRT: Via SR-134 / I-5 through Glendale & Burbank*	Burbank, Bob Hope Airport, Glendale	◑	◔	◔	◔	◔	○		X	X
T22	Metro Red Line Extension: North Hollywood to Burbank Airport*	Burbank, Bob Hope Airport, LA	◔	◔	◔	◔	◔	○		X	X

* **Costs exclude right-of-way, vehicles, finance changes, and operation and maintenance.**

** **"Jurisdiction" may refer to the lead project sponsor, the jurisdiction where the project exists, or the agency that proposed the addition of the project. Projects without specific jurisictions were sourced from other planning documents (e.g. Metro Long Range Transportation Plan and others) where no lead or proposing agency was listed.**

Changes since 3/5/15 (SFVCOG Transportation Committee Meeting)

Added text to T16 about grade separations and crossing gates along entire Orange Line
Added Subregional to Jurisdiction column for B3
Added text to B5 to specifically call out a segment of Santa Clarita's Railroad Ave bicycle trail
Added following projects:

- A48: Traffic signal program
- B25: County-wide bike share program, including Santa Clarita
- B26: Bike/Ped Safety Program
- B27: LA Complete Streets
- B28: Mobility Element program
- B29: ZEV Bus Fleet conversion
- B30: Parking Program
- T33: Tier 2 Operator funding

High Benefit ● Medium Benefit ◑ Low Benefit ◔ No Benefit/ Neutral ○ Negative Impact —

SUBREGIONAL MOBILITY MATRIX
WESTSIDE CITIES

Project No. PS-4010-3041-U-01

Project Detail Matrix

Prepared for:

Metro

Prepared by:

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600 Wilshire Boulevard
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Los Angeles, CA 90017

February 2015

Project Detail Matrix

Subregional Mobility Matrix
Westside Cities
PS-4010-3041-U-01

Prepared for:

Metro
Los Angeles County
Metropolitan Transportation Authority

Prepared by:
Fehr & Peers

In Association With:
Iteris, Inc
Arrellano Associates, LLC

Quality Review Tracking

Version	Date	Reviewer	Reviewer Signature
Internal Review Draft	2/9/15	FP Reviewer: Rachel Neumann	RMN
Draft		FP Reviewer: Sarah Brandenberg	

The following matrix documents the Preliminary Project List as developed for the Westside Cities subregion during the Mobility Matrix process.

Program	Subprogram	MM Project ID	Agency	Description
Active Transportation	Bicycle Program	257	County of Los Angeles	Centinela Av; Green Valley Cir to La Tijera Bl; Class II Bike Lanes
		258	County of Los Angeles	Fairfax Av; Stocker St to 57th St; Class II Bike Lanes
		260	County of Los Angeles	Marina Del Rey – Continuous Class I Bike Trail; N Marina Limit to S Marina Limit
		261	County of Los Angeles	Marvin Braude Bicycle Trail; Washington Bl to 0.1 mi s/o Yawl St; Class 1 Bike Path
		262	County of Los Angeles	Sepulveda Channel; Washington Bl to Ballona Creek; Class I Bike Path
		263	County of Los Angeles	Stocker St; Fairfax Av to Santa Rosa Av; Class II Bike Lanes
		339	City of Los Angeles	Ballona Creek Bike Path Mid-City Segment: Design and construction of a Class I Bike Path along Ballona Creek from Fairfax Av to Venice Bl, providing enhanced bike access to transit.
		516	City of Culver City	Ballona Creek Bike Path Extension: This project would study and create plans to extend the bike path further east along Ballona Creek between Syd Kronenthal Park and Fairfax
		524	City of Culver City	Overland Bike Facilities: This project will add bike facilities on Overland between Venice and Playa.
		544	City of Santa Monica	Michigan Av Bicycle Facility: Connect beach, civic center, high school, Santa Monica College, Expo Line Stations and Bergamot Center with a high-quality bikeway parallel to I-10. Provides an I-10 crossing at 20th St.
		592	City of Culver City	Develop a bikeway along Culver Boulevard west of Elenda Street that could extend to Marina Del Rey; Develop a Class II bike lane east of Elenda Street to Downtown
Active Transportation	Bicycle Program	593	City of Culver City	Develop a bikeway loop connecting Ballona Creek Path to downtown (Class II bicycle lane along Overland Avenue, Culver Boulevard, and Washington Boulevard through downtown connecting to Ballona Creek and Exposition right-of-way)

Program	Subprogram	MM Project ID	Agency	Description
		621	City of Santa Monica	Construct the 7th St bike/pedestrian bridge over I-10 freeway
		645	City of Santa Monica	Complete 2nd St bike lane
		652	City of Santa Monica	Extend Broadway bike lane – 6th to Ocean
		653	City of Santa Monica	Improve bike lanes on Arizona Av, 6th and 7th Sts
		710	City of Santa Monica	Bikeshare at Bergamot Art Center
		790	City of Los Angeles	Priority Bikeways: Mark bikeways in the West Adams-Baldwin Hills-Leimert Community Plan with appropriate signage
		795	City of Los Angeles	Reclaimed Land for Bikeways: Coordinate with other agencies to designate and develop mountain bike trails in the Kenneth Hahn State Recreation Area that complement and connect to the Baldwin Hills Park Master Plan trail system
		881	City of Los Angeles	Culver Bl - Proposed Bike Lane: Culver Bl from McConnell Av to Playa del Rey
		912	City of Los Angeles	Centinela Creek - Proposed Multi-Use Path from Centinela Creek path from Ballona Creek to Centinela Av east of the I-405 Planned Multi-Use Path
		926	City of Los Angeles	Lincoln Bl - Proposed Cycle Track: Lincoln Bl from Jefferson Bl to Fiji Way. This project would be a feature of the reconstruction of the Lincoln Bl Ballona Creek Bridge project proposed as an element of the Westside Mobility Plan.
		927	City of Los Angeles	Beethoven St - McConnell Av - Proposed Multi-Use Path Connector
		933	City of Los Angeles	McConnell Av - Proposed Enhanced Bike Friendly St
		937	City of Los Angeles	Beethoven St - Proposed Enhanced Bike Friendly St
Active Transportation	Bicycle Program	940	City of Los Angeles	Washington Bl - Proposed Cycle Track: Washington Bl from Admiralty Way to Pacific Av
		947	City of Los Angeles	Venice Bl - Proposed Cycle Track: from Beach to Robertson
		948	City of Los Angeles	Venice Wy - Proposed Bike Lane
		952	City of Los Angeles	McLaughlin Av - Proposed Enhanced Bike Friendly St
		961	City of Los Angeles	Palms Bl - Proposed Enhanced Bike Friendly St
		964	City of Los Angeles	Walgrove Av - Proposed Enhanced Bike Friendly St

Program	Subprogram	MM Project ID	Agency	Description
		970	City of Los Angeles	Military Av - Proposed Enhanced Bike Friendly St
		971	City of Los Angeles	Gateway Bl - Proposed Bike Lane
		973	City of Los Angeles	Barrington Av - Proposed Enhanced Bike Friendly St
		985	City of Los Angeles	Veteran Av - Proposed Enhanced Bike Friendly St
		999	City of Los Angeles	La Grange Tunnel - Proposed Multi-Use Path grade separated at I-405
		1004	City of Los Angeles	Santa Monica Bl - Proposed Cycle Track: Santa Monica Bl in the "parkway" section east of Sepulveda Bl
		1013	City of Los Angeles	Ohio Av - Proposed Enhanced Bike Friendly St
		1030	City of Los Angeles	VA Campus - Proposed Bike Path/Multi-Use Path
		1034	City of Los Angeles	Montana Av - Proposed Enhanced Bike Friendly St
		1037	City of Los Angeles	Gayley Av - Proposed Enhanced Bike Friendly St
		1046	City of Los Angeles	Bikesharing: Provide public bicycle rental in "pods" located throughout the city.
		1058	City of Los Angeles	Gateway Bl to Ocean Park Bike Lane gap closure
		1288	County of Los Angeles	Make more bicycle parking available throughout Marina del Rey
		1296	County of Los Angeles	Provide a direct separated facility through the Marina that links to regional bike facilities
Active Transportation	Bicycle Program	1306	County of Los Angeles	Mindanao Wy – Bike lanes are planned on Mindanao Wy west of Admiralty Wy
		1307	County of Los Angeles	Bali Wy – Bike lanes are planned on Bali Way west of Admiralty Wy
		1308	County of Los Angeles	Via Marina/Via Dolce – A bike route is planned on a portion of Via Marina, continuing on Via Dolce, between the channel and Washington Boulevard.
		1315	County of Los Angeles	Enhance bicycle facilities on the east side of the Marina
		1317	County of Los Angeles	Implement bicycle crossing enhancements to improve the bike path's crossing of Mindanao Wy

Program	Subprogram	MM Project ID	Agency	Description
		1318	County of Los Angeles	Preserve right-of-way to facilitate slower bicycle travel along a future multi-use waterfront promenade, and a future dedicated bicycle side path adjacent to Admiralty Wy
		1319	County of Los Angeles	Implement Parcel 44 bicycle enhancements
		1320	County of Los Angeles	Implement enhancements for the bike crossing of Bali Wy, and the treatment of the bike path through the parking lot of Parcel UR.
		1321	County of Los Angeles	Implement enhancements for the bike crossing of Admiralty Way between Yvonne B. Burke Park and the library, as well as treatments for the library parking lot to minimize conflicts between bikes on the path and motorists using the parking lot.
		1322	County of Los Angeles	Implement Washington Boulevard Gateway Enhancements to improve the wayfindng and visibility of the gateway to the Marvin Braude Bike Path where it meets Washington Boulevard
		1323	County of Los Angeles	East-West Bicycle Connections (i.e. bike path adjacent Admiralty Way or shared bicycle and pedestrian promenade)
		1324	County of Los Angeles	Potential implementation of on-street bike lanes on Via Marina (options include buffered bike lane or wider sidewalk and bike lane); Restripe Via Marina to provide on-street bike lanes and two travel lanes in each direction as funding is available.
Active Transportation	Bicycle Program	1401	City of Santa Monica	Collaborate with Santa Monica College to identify a bicycle route in the 17th Street corridor through the college campus and promote cycling for college students.

Program	Subprogram	MM Project ID	Agency	Description
		1417	City of Santa Monica	Complete major gaps in the bikeway network, including: ƒƒConnections to future rail stations and activity centers; ƒƒA bikeway along the Expo Light Rail right-of-way; ƒƒConnections between Stewart Park and Bergamot Station; ƒƒ"Key Connections" to all schools and major employment centers; ƒƒA bicycle and pedestrian bridge across I-10 at 7th Street ƒƒConnections from Ocean Avenue to the Beach Bike Path, focusing on opportunities at Montana Avenue, the California Incline, Arizona Avenue, Broadway and the Santa Monica Pier; ƒƒEnhancements to Airport Avenue between Airport Park and 23rd Street; ƒƒImproved connections with the City of Los Angeles, including Dewey Street between Marine Park and 23rd Street and improvements facilitating access to UCLA and Santa Monica Boulevard, east of I-405
		1480	City of Santa Monica	Real-time bike parking availability information
		1588	City of W. Hollywood	Install bicycle parking in underserved areas along transit corridors
		3350	City of Culver City	Implement Urban Forest Management Plan
		3357	City of Culver City	Proposed Class III bikeway on Hannum Av
		3358	City of Culver City	Proposed Class III bikeway on Bristol Pky
		3359	City of Culver City	Proposed Class III bikeway on Green Valley Cir
		3361	City of Culver City	Proposed Class III bikeway on Duquesne Av
		3369	City of Culver City	Sign Class II and III bikeways on Washington, Jefferson, and Sepulveda Boulevards, Overland and Duquesne Avenues, Washington Place, Playa Street and any future adopted routes.
		3489	City of W. Hollywood	Beverly Bl: Install dedicated bike lanes (eastbound and westbound)
		3536	COG	Implement Westside Cities COG Bike Share Program
Active Transportation	Bicycle Program	3638	City of Culver City	Develop bicycle connection between Expo/Culver City Station and Downtown Culver City; enhance pedestrian environment to encourage pedestrian movement between Expo and Downtown.
		3562	City of Beverly Hills	Bicycle Planning: Install bicycle parking city-wide.
		3563	City of Beverly Hills	Implement revised Beverly Hills Bicycle Master Plan

Program	Subprogram	MM Project ID	Agency	Description
		3595	County of Los Angeles	Establish a County-wide bike share program that interacts with the Metro transit system.
		3615	City of Santa Monica	Implement additional bicycle facilities on a Bicycle Enhanced Network for the City of Santa Monica, including facilities along San Vicente Blvd, Washington Ave, Broadway, Michigan Ave, Ocean Park Blvd, Ashland Ave, Ocean Ave, Main St, 6th St, 17th St, Stewart St, and 28th St.
	Citywide Bicycle Master Plan Program	2042	City of Los Angeles	Implement the projects identified in the 2010 Bicycle Plan for the City of Los Angeles (See Appendix for detail)
		3162	City of Los Angeles	Implement City of LA Bicycle Enhanced Network as defined in the Mobility Plan 2035
		3526	City of Santa Monica	Implement Santa Monica Bicycle Plan
		3527	City of Culver City	Implement Culver City Bicycle Plan
		3528	City of W. Hollywood	Implement West Hollywood Bicycle Plan
		3551	City of Los Angeles	Implement the programs identified in the City of Los Angeles Mobility Plan 2035
		3552	City of Los Angeles	Implement the programs identified in the 2010 Bicycle Plan for the City of Los Angeles (See Appendix for detail)
	Livable Boulevards and Streetscapes Program	609	City of Santa Monica	Close bike and pedestrian gaps – Pier to Beach, Broadway to Ocean and Expo
		610	City of Santa Monica	Bike and pedestrian bridge improvements and connections across I-10 at 4th St, PCH, 11th St, 14th St, 17th St, 20th St, and Cloverfield.
Active Transportation	Livable Boulevards and Streetscapes Program	624	City of Santa Monica	Construct new streetscapes and sidewalks for the streets that define the edges of Downtown to become obvious and efficient points of entry, so as to encourage every person to become a pedestrian as soon after crossing into Downtown as possible.
		628	City of Santa Monica	Lincoln Bl: Implement streetscape plan to address pedestrian and bus facilities, 1-10 intersection, roadway.
		634	City of Santa Monica	Implement Ocean Av Streetscape Plan from Wilshire to Pico Bl, including consideration to widen sidewalk from Broadway to Ocean Av to accommodate pedestrian surges at Ocean and Colorado Avs

Program	Subprogram	MM Project ID	Agency	Description
		635	City of Santa Monica	Widen Wilshire Bl sidewalk from Ocean Av to 4th St.
		638	City of Santa Monica	Expo Downtown Santa Monica Station access: widen 4th St bridge for bike and pedestrian facilities
		649	City of Santa Monica	Complete Colorado Esplanade Streetscape Project
		654	City of Santa Monica	Improve pedestrian and bicycle access for Pier
		701	City of Santa Monica	Design and construct Stanford streetscape
		705	City of Santa Monica	Centinela Streetscape - Expo bike/ped crossing
		706	City of Santa Monica	Stewart Streetscape - Expo bike/ped crossing
		707	City of Santa Monica	26th Streetscape - Expo bike/ped crossing
		708	City of Santa Monica	Cloverfield Streetscape - Expo bike/ped crossing
		709	City of Santa Monica	Olympic Streetscape - Stewart to 26th South Side - Expo
		714	City of Santa Monica	Nebraska Streetscape - from Centinela to Stewart: design and construct Flex St (1,350') and Shared St (350') types
		716	City of Santa Monica	Design and construct Stewart Streetscape (Including bike lanes from Colorado to Exposition)
		717	City of Santa Monica	Design and construct 26th Streetscape (Including bike lanes from Colorado to Olympic)
Active Transportation	Livable Boulevards and Streetscapes Program	719	City of Santa Monica	Design and construct Exposition Streetscape (Including sharrows from Centinela to Stewart)
		722	City of Santa Monica	Design and construct Berkeley streetscape
		762	City of Los Angeles	Implement Mayor's "Great Streets Program": Revitalize up to 40 neighborhood streets to become more pedestrian-friendly
		792	City of Los Angeles	Priority Pedestrian Routes: Implement streetscape plans for Crenshaw Bl (between Santa Monica Freeway and Florence Av. as well as within the district boundaries of the following CPIO areas: Crenshaw/Expo TOD, La Brea/Farmdale TOD, Jefferson/La Cienega TOD, Venice/National TOD, Crenshaw/Slauson TOD, West Bl TOD, and Hyde Park Industrial Corridor

Program	Subprogram	MM Project ID	Agency	Description
		808	City of Los Angeles	Streetscapes: Implement streetscape plans for the Neighborhood Districts along Robertson and Washington Bl, as well as Leimert Park Village and the Crenshaw/Slauson Area as identified, as well as the Transit Oriented Development Areas along the Mid-City Exposition and Crenshaw/LAX transit Corridors
		859	City of Los Angeles	Abbot Kinney Livable Bl from Main St to Venice Bl
		860	City of Los Angeles	Centinela Livable Bl from SR 90 to Washington Bl
		861	City of Los Angeles	National Bl Streetscape Enhancements from Castle Heights Av to Motor Av
		862	City of Los Angeles	Palms Bl Streetscape Enhancements from Motor Av to National Bl
		863	City of Los Angeles	Motor Av Streetscape Enhancements from Palms Bl to Rose Av
		865	City of Los Angeles	Sepulveda Bl Streetscape Enhancements from Olympic Bl to National Bl
		866	City of Los Angeles	Pico Bl Streetscape Enhancements from Centinela Av to Barrington Av/405 Fwy & Sawtelle Bl/405 Fwy to Patricia Av
Active Transportation	Livable Boulevards and Streetscapes Program	867	City of Los Angeles	Pico Bl Green St Project: transform a 1/2-mile section of Pico Bl between Barrington Av and Sawtelle Bl in West Los Angeles into a green street. This will be accomplished through the planting of green solutions for storm water management and aesthetic improvements
		868	City of Los Angeles	Bundy Dr Streetscape Enhancements from Missouri Av to Pico B
		869	City of Los Angeles	Olympic Bl Streetscape Enhancements from Centinela to Barrington
		870	City of Los Angeles	Sawtelle Livable Bl from Olympic Bl to Santa Monica Bl
		871	City of Los Angeles	San Vicente Livable Bl from Bundy Dr to Bringham Av
		1292	County of Los Angeles	Signage/Wayfinding: Improve throughout Marina del Rey for vehicles, parking, pedestrians, cyclists
		1314	County of Los Angeles	Mole Roads Improvements: Recommend implementing paving treatments in combination with striping treatments to differentiate the pedestrian space from the shared vehicle/bicycle space.

Program	Subprogram	MM Project ID	Agency	Description
		1334	City of Santa Monica	Implement Complete Streets throughout the Memorial Park district.
		1335	City of Santa Monica	Expo to SMC and Hospital Access: Develop a 17th Street Bikeway and Cycle Track: Develop 17th Street as a complete transit-oriented street with bicycle infrastructure integrated with the Expo bikeway and the Michigan Avenue Neighborhood Greenway (MANGo), transit stops for buses, comfortable and safe sidewalks, streetscape and lighting from Wilshire Boulevard to Pico Boulevard.
		1373	City of Santa Monica	Colorado Blvd (North Side) Sidewalk Extensions 15th Court to 17th Street
		1382	City of Santa Monica	Create a plan to enhance alleys citywide to create a Shared St environment. In the Downtown areas, evaluate the creation of "Arts Alleys" as described in Creative Capital, the City's cultural master plan.
Active Transportation	Livable Boulevards and Streetscapes Program	3533	City of Los Angeles	Implement Complete Streets Enhancements along key arterials in the City of Los Angeles as defined in the Mobility Plan 2035
		3121	City of Los Angeles	This project will provide for sidewalk and landscaping improvements in the Westchester area of the City of Los Angeles on the west side of Sepulveda Bl between 80th St and 84th Pl.
		3171	City of Culver City	Streetscape improvements (street trees, landscaping, street furniture, special lighting, decorative paving, screening walls) and facade improvements along commercial corridors that complement each focus area and improve the physical environment.
		3490	City of W. Hollywood	Melrose Av: Install sharrows; widen sidewalks
		3491	City of W. Hollywood	Robertson Bl: Install sharrows; widen sidewalks
		3539	City of Culver City	Facilitate Pedestrian orientation of streetscapes along Commercial Corridors designated as Neighborhood-Serving.
		3540	City of Culver City	Enhance the aesthetic qualities of pedestrian access routes by increasing amenities, such as trees, awnings, lighting, street furniture, and drinking fountains, etc.
		3574	City of Beverly Hills	Implement Street Tree Master Plan

Program	Subprogram	MM Project ID	Agency	Description
		3581	City of W. Hollywood	Implement Design District Streetscape Master Plan
	Mobility Hubs Program	3529	City of Los Angeles	Implement Mobility Hubs: Install a full-service mobility hub at or adjacent to Metro Stations & satellite hubs strategically located surrounding each station, including secure bike parking, car share, bike share, and ride share (including casual carpooling) to bridge the first/last mile gap of a transit user's commute.
	Education and Encouragement Program	1410	City of Santa Monica	Provide classes on bicycle safety and awareness that targets different populations such as seniors, children and commuters.
		1412	City of Santa Monica	Participate and organize events to promote biking, such as National Car Free Day and Bike-to-Work Day with events throughout the City.
Active Transportation	Education and Encouragement Program	1413	City of Santa Monica	Work with the Convention and Visitors Bureau to provide bicycle rentals and information about cycling at hotels and popular tourist attractions and market Santa Monica as a cycling destination.
		1471	City of Santa Monica	Educational videos, Bicycle Campus Opening, Classes offered through City Bike Center, Additional City TV Episodes, Bike Training for adults and additional training for youth and targeted groups like Seniors.
		1472	City of Santa Monica	Develop Core Educational Programming, Ongoing Bicycle Training, Bicycle Repair Skills.
		1473	City of Santa Monica	Bike to Work Day, Bike It! Day, Bike to Park Day, Presence at special events (Glow, Marathon), Technical support for events with bike element (i.e. Tour da Arts)
		3223	City of Culver City	Develop an outreach program to educate those who live or work in Culver City about transit and encourage their use of it.
		3224	City of Culver City	Encourage public transit links to sites of high trip-generating uses to maximize transit use by patrons and employees.
		3538	City of Culver City	Promote public education programs regarding bicycle safety and the City's bicycle resources.
		3543	City of Culver City	Promote public education programs regarding the City's pedestrian resources and pedestrian safety, especially the use of pedestrian signals at street intersections.

Program	Subprogram	MM Project ID	Agency	Description
		3582	City of W. Hollywood	Implement public information and incentive program to encourage use of alternative transportation by local residents and employees.
	First-Last Mile Program	419	City of Los Angeles	Pico Bl Transit/Bicycle Enhancements: Installation of pedestrian & bicycle enhancements including street trees and wells, bicycle racks, information kiosks, wayfinding signs, new bikeway striping and bus stop lighting to promote multi-modal access to transit systems.
		507	City of Beverly Hills	Beverly Hills Park Wayfinding System
Active Transportation	First-Last Mile Program	542	City of Santa Monica	Exposition Light Rail Station Area Improvements: Create pedestrian, bicycle and bus linkages to downtown Expo Station street improvements
		590	City of W. Hollywood	Wayfinding program for peds and bikes: Directional signage with destination, direction and distance for key corridors
		632	City of Santa Monica	Reinforce 4th St station connections through sidewalk and streetscape improvements– Broadway to Olympic Drive.
		646	City of Santa Monica	Create opportunities to access Expo Station by bicycle, such as through 4th Court
		698	City of Los Angeles	Develop a System-wide Urban Greening Plan to improve placemaking, increase environmental stewardship, and create livable streets around transit stations with funds awarded by the State Strategic Growth Council.
		712	City of Santa Monica	Design and construct pedestrian improvements at Olympic near Expo: Two new pedestrian crossings and sidewalks along Olympic
		726	City of Santa Monica	Design and construct bike center at Bergamot Expo Station
		728	City of Santa Monica	Connections to Bergamot Expo Station entrances across Olympic, and completion of Olympic north sidewalk
		767	City of Los Angeles	Access Management: Creation of adequate drop-off areas for schools, day care, health care, and other uses with intensive passenger drop-off demand
		1045	City of Los Angeles	Bicycle Transit Centers: Bike transit centers that offer bicycle parking, bike rentals, bike repair shops, lockers, showers and transit information and amenities

Program	Subprogram	MM Project ID	Agency	Description
Active Transportation	First-Last Mile Program	1278	County of Los Angeles	Park Once Facilities – Mobility Hubs located in or adjacent to a centralized parking facility that can serve the adjacent uses. Potential locations: the Marina Beach Area (District 1), the "Restaurant Row" area along Admiralty Way on the north side of the Marina (District 2), the Chace Park / Waterside Shopping Center area (District 3), and the Fisherman's Village area (District 4).
		1279	County of Los Angeles	Include co-locating transit stops (both ground and water) at Mobility Hubs with clear wayfinding and good schedule coordination to ensure easy transfers between transit modes. If financially feasible, improving service frequency is recommended so the beach shuttle can better serve public parking lots in the Marina.
		1330	City of Santa Monica	Develop linkages and open space infrastructure that connect the Memorial Park plan area and the 17th St/SMC Expo station to neighborhoods to the east and west and north and south, including the Pico neighborhood, Santa Monica College, and the hospital districts.
		1394	City of Santa Monica	Develop and implement a beach access bikeway signage and wayfinding system.
		1398	City of Santa Monica	As funding becomes available, construct and ensure operation of bicycle-transit centers, which provide amenities such as secure bike parking, bike repair, and transit information.
		1457	City of Santa Monica	Implement Safe Access to Transit Program to provide safer bicycle and pedestrian access to transit stops.
		1938	City of Los Angeles	Expo/Bundy Station Multi-Modal Connectivity Enhancements: Bike lanes, bulb outs, enhanced crosswalks, new trees, new concrete sidewalks and roundabouts
Active Transportation	First-Last Mile Program	3530	City of Los Angeles	Implement pedestrian and bike connectivity improvements at every existing and planned Metro rail and subway station by providing enhanced sidewalk amenities such as landscaping, shading, lighting, directional signage, shelters, curb-extensions, mid-block crosswalks, ADA ramps, lead-pedestrian interval signal phases, etc.
		3553	City of Los Angeles	Implement the Metro First/Last Mile Strategic Plan

Program	Subprogram	MM Project ID	Agency	Description
		3567	City of Beverly Hills	Implement a First/Last Mile Plan (eg, La Cienega Bl, Beverly Dr)
		3568	City of Beverly Hills	Implement pedestrian and bicycle connectivity improvements at Metro subway stations.
		3569	City of Beverly Hills	Wayfinding program for peds and bikes
		3621	City of Los Angeles	Implement the City of Los Angeles First & Last Mile Transit Plan
	Pedestrian Program	264	County of Los Angeles	Marvin Braude Pedestrian Walkway Gap Closure; Palisades Park to California Av; Construct Pedestrian Walkway Paralleling Marvin Braude Bike Trail
		266	City of Beverly Hills	Ped improvements to address safety and walkability in Beverly Hills (SE area of City, inc Robertson and Olympic Bls are high priority)
		267	County of Los Angeles	Pedestrian Improvements; Construct New Sidewalks
		513	City of Beverly Hills	Construct controlled midblock crossings on Wilshire Bl/Palm Dr
		594	City of Santa Monica	Pedestrian Scramble Network, including intersections on 2nd & 4th Sts between Wilshire Bl and Colorado Av and the intersections of Ocean Av/Colorado Av and 3rd St/Wilshire Bl
		633	City of Santa Monica	Install pedestrian scaled lighting in phases throughout Downtown
		636	City of Santa Monica	Widen Ocean Av sidewalk– Colorado Av to Broadway
		766	City of Los Angeles	Pedestrian Access: Implementation of several Community Plan Implementation Overlay sub-districts that contain enhanced pedestrian standards as well as include preliminary streetscape plans that call for enhancement of public realm for pedestrians as well as other non-vehicular modes of transportation

Program	Subprogram	MM Project ID	Agency	Description
Active Transportation	Pedestrian Program	1040	City of Los Angeles	Enhance Pedestrian Access to Major Transit Stations: Implement pedestrian connectivity improvements at major Metro transit stations by providing enhanced sidewalk amenities, such as landscaping, shading, lighting, directional signage, shelters, curb extensions, enhanced crosswalks, as feasible. - Green Line Extension & Crenshaw Station - Sepulveda Bl - BRT/LRT Stations in Coastal Area - Lincoln Bl - BRT/LRT Stations in Coastal Area - Expo Phase II Stations - Westside Subway Extension Stations - Sepulveda Bl - BRT/LRT Stations in West LA Area - Lincoln Bl - BRT/LRT Stations in West LA Area
		1281	County of Los Angeles	Implement additional signalized pedestrian crossings, as well as wider sidewalks, and design treatments on shared-mode roads to improve the pedestrian experience in Marina del Rey. On the southern end of Via Marina and on Admiralty Way, it is recommended to implement mid-block crossings with pedestrian-actuated rectangular rapid flashing beacons (RRFBs) and high-visibility crosswalk striping
		1285	County of Los Angeles	Provide for a multi-use waterfront promenade that can serve the Marina. Widen to the County's design standard and run uninterrupted around the Marina, including around Marina Beach, to improve connectivity and the pedestrian experience.
		1287	County of Los Angeles	Resolve locations where pedestrians and bicycles conflict (e.g., on promenade and other pathways)
		1312	County of Los Angeles	Enhancements to existing intersection crossings include reducing crossing distances by constructing curb extensions, narrowing travel and turn lanes to a maximum of 12 ft to facilitate curb extensions and/or sidewalk widening, removal of line-of-sight obstructions in sidewalks, especially at the approach to intersections, and installation of high-visibility crosswalks on all legs of signalized intersections.

Program	Subprogram	MM Project ID	Agency	Description
Active Transportation	Pedestrian Program	1339	City of Santa Monica	To facilitate connectivity between the industrial conservation area to the south of Colorado Avenue and communities to the north, the City will continue to work with Metro to facilitate the construction of safe south to north pedestrian crosswalks along the light rail right-of-way at the following intersections: - 10th Street and Colorado Avenue - 12th Street and Colorado Avenue - Euclid Street and Colorado Avenue
		1379	City of Santa Monica	Develop a destination-oriented pedestrian wayfinding signage program.
		1578	City of W. Hollywood	Continue to implement a street furniture program to manage various pedestrian amenities
		1581	City of W. Hollywood	Enhance pedestrian crossings of arterials and other barriers, as identified in the Enhanced Crossings Priority List and citywide crosswalk study.
		3231	City of Culver City	Continue efforts to eliminate barriers to wheelchairs in the public and private pedestrian rights-of-way.
		3541	City of Culver City	Ensure actual and perceived safety of pedestrian areas through crime prevention measures.
		3542	City of Culver City	Establish pedestrian access across existing barriers such as freeways, Ballona Creek, and long, uninterrupted blocks, and require pedestrian links across potential future access barriers
		3544	City of Los Angeles	Implement City of LA Pedestrian Enhanced Districts as defined in Mobility Plan 2035.
		3571	City of Beverly Hills	Construct controlled midblock crossing on Bedford Drive.
		3617	City of Santa Monica	Pedestrian improvements along Wilshire Blvd and Santa Monica Bl
		3620	City of Santa Monica	Implement Santa Monica Pedestrian Action Plan
	Safe Routes to School Program	1385	City of Santa Monica	Construct pedestrian improvements identified through the Safe Routes to School programs.

Program	Subprogram	MM Project ID	Agency	Description
Active Transportation	Safe Routes to School Program	1386	City of Santa Monica	Develop Safe Routes to School programs such as "walking school buses," walking audits, classroom instruction and promotional events.
		1387	City of Santa Monica	Create a program for educating parents about the benefits of their children walking to school. Emphasize the existing high levels of safety in Santa Monica.
		1411	City of Santa Monica	Organize Safe Routes to School programs with the goal of making them self-supporting.
		1462	City of Santa Monica	Work with School District to identify and improve good bicycle routes to each school and to provide information about these routes to school communities and neighbors of schools.
		1482	City of Santa Monica	Safe Routes to School (Samohi, Middle School bicycle training, Middle and Elementary encouragement), Mobile School Bike Training, Bike Friendly Business Recognition, Support Buy Local, Encourage Bike Local bike to business discounts, Car-Free Tourism support, TMA Formation Planning, Bike Pooling, Partner with SMC on programming
		1582	City of W. Hollywood	Pursue public and private grant funding sources for Safe Routes to Schools programs and street improvements
		3535	City of Los Angeles	Implement Los Angeles Safe Routes to School Initiative to provide targeted safety improvements at schools with high collision rates. Improvements may include new traffic signals, curb extensions, wider sidewalks, new crosswalks, traffic calming measures, etc.
		3572	City of Beverly Hills	Participate and implement recommendations of the SRTS program.
		3635	City of Culver City	Develop Safe Routes to School plans. Implement construction projects around various school sites in Culver City
		145	County of Los Angeles	Sidewalk, Curb, Parkway Preservation; Repair and Reconstruction
		3573	City of Beverly Hills	Repair and construct sidewalk, curb, parkways, transit ameneties on major corridors.
Active Transportation	Sidewalk State of Good Repair Program	3634	City of Culver City	Repair and construct sidewalk, curb, parkways, transit amenities on major corridors.

Program	Subprogram	MM Project ID	Agency	Description
Arterial	Capacity Enhancement Program	123	City of Culver City	Sepulveda Bl - Flyover from NB Sepulveda Bl to WB Centinela Av
		129	City of Culver City	Centinela Bl- Sepulveda Bl to La Cienega Bl – Improve by adding travel lane in peak direction
		134	City of Beverly Hills	Wilshire Bl- Regional street corridor capacity enhancements at appropriate intersections such as Wilshire/Santa Monica
		173	City of Culver City	Highway Local; Road/intersection improvements and median configuration in Culver City
		181	Multi Jurisdiction	HOV/transit bypass lanes at intersections/ramps
		446	City of Los Angeles	Widen and restripe 111th St from Aviation Bl to La Cienega Bl to accommodate two through lanes in each direction
		449	City of Los Angeles	Aviation Bl from Arbor Vitae St to Imperial Hwy: Widen and restripe to accommodate three through lanes in each direction
		450	City of Los Angeles	Bundy Dr Widening - Wilshire Bl to Santa Monica Bl: Widen Bundy Drive to full secondary standards.
		451	City of Los Angeles	Culver Bl Corridor: Improve traffic flow along Culver Bl between Centinela Av and I-405 Freeway including providing left-turn lanes at key signalized intersections (including Inglewood Bl)
		455	City of Los Angeles	Imperial Hwy between Sepulveda Bl and Pershing Dr: Widen to provide continuous three through lanes in each direction
		456	City of Los Angeles	La Cienega Bl from Arbor Vitae St to 111 St: Widen and restripe to accommodate three through lanes in each direction
		457	City of Los Angeles	La Tijera Bl between Airport Bl and La Cienega Bl: Widen and restripe to provide continuous three through lanes in each direction
		463	City of Los Angeles	Sepulveda Bl Street Widening: Widen to major highway standard and increase number of through lanes from two to three lanes
Arterial	Capacity Enhancement Program	470	City of Los Angeles	Beverly Glen Bl Widening (Beverly Glen Bl and Mulholland Dr): Widen south leg of Beverly Glen Bl to create a right turn only lane; ROW acquisition needed
		475	City of Los Angeles	Laurel Canyon Bl & Mulholland Dr: Widen the west side of Laurel Canyon Bl south of Mulholland Dr to carry two southbound lanes through the intersection

Program	Subprogram	MM Project ID	Agency	Description
		506	City of Beverly Hills	Olympic/Beverly/Beverwil intersection improvements
		521	City of Culver City	Add a left-turn phase at Duquesne/Hughes and Washington Bl.
		525	City of Culver City	Overland/Washington Bl Intersection Improvements: Add dual left turns for eastbound and westbound traffic on Washington and add a right turn only lane for westbound to northbound traffic.
		530	City of Los Angeles	Improve Traffic Flow Along Centinela Av: Improve the Centinela Av corridor from Sepulveda Bl to La Cienega Bl (i.e. add a travel lane during peak periods) to relieve traffic congestion along Slauson Av.
		577	City of W. Hollywood	Add a SB exclusive right turn lane and add a protective/permissive phase at Fairfax and Fountain
		578	City of W. Hollywood	Provide SB exclusive right-turn lane at Fairfax & Santa Monica
		579	City of W. Hollywood	Provide a protected/permissive phasing for EB left-turn lane at Gardner & Santa Monica
		585	City of W. Hollywood	Provide protected/permissive phasing for NB and SB movements at the intersection of San Vicente and Beverly
		596	City of Santa Monica	Use curb lanes on Santa Monica Bl eastbound (5th St to Ocean) and Olympic Drive between (4th St to Ocean) for vehicle traffic
		603	City of Santa Monica	New streets and signals: Olympic Drive extension, Expo station site, potentially BBB property
		623	City of Santa Monica	Create a 9th street 1-way northbound connection between Olympic Bl and Colorado Av
Arterial	Capacity Enhancement Program	647	City of Santa Monica	Create new 5th St signalized intersection to facilitate temporary centralized bus facility on TOD site
		650	City of Santa Monica	Use curb lane for vehicle traffic on Olympic Drive between 4th and Ocean (additional east and westbound through-lanes)
		658	City of Santa Monica	Create new street through the transit oriented design site adjacent to Expo station
		659	City of Santa Monica	Build new street through the Big Blue Bus site connecting 5th to 6th Sts (bus and local only)

Program	Subprogram	MM Project ID	Agency	Description
		660	City of Santa Monica	Pursue additional connections across the freeway between 4th St and Main St including potential coordination with the Expo Station and Sears sites
		668	City of Santa Monica	Improve access to Downtown Santa Monica via Lincoln (Including new parking locations)
		715	City of Santa Monica	Design and construct Nebraska/Olympic/Stewart intersection
		718	City of Santa Monica	Design and construct Pennsylvania Streetscape - two-way conversion
		724	City of Santa Monica	Design and construct new "A" St from Olympic to Nebraska
		725	City of Santa Monica	Design and construct Nebraska Extension from Stewart to 26th
		727	City of Santa Monica	Construct Olympic Crossing at "H" St (New Roads) with bus stops
		729	City of Santa Monica	Design and construct new road "E" Av
		845	City of Los Angeles	Olympic Bl Traffic Operations Improvement at I-405: Implement traffic operational improvements such as managed lanes on Olympic Bl immediately adjacent to the I-405
		1049	City of Los Angeles	Major Intersection Improvements: Funding for spot intersection improvements, such as turn-lane or safety improvements
		3160	City of Los Angeles	Implement City of LA Vehicle Enhanced Network as defined in the Mobility Plan 2035.
Arterial	Capacity Enhancement Program	3565	City of Beverly Hills	Implement opportunities for improving traffic flow on major arterials during peak hour.
		3566	City of Beverly Hills	Improve traffic flow and capacity at City intersections to improve traffic flow along major roadways (eg. Wilshire Bl, North Santa Monica Bl.)
	Complete Streets Program	138	County of Los Angeles	Lincoln Blvd.; Jefferson Blvd to Fiji Way; Conduct a study for widening to increase capacity, allow for bike lanes, and potentially future light rail.
		425	City of Los Angeles	Sepulveda Bl Tunnel at Mulholland Dr Phase I: Project includes structural rehabilitation and widening of the tunnel to add an additional northbound lane, improve sidewalk and bike path to promote multi-modal access to transit systems.

Program	Subprogram	MM Project ID	Agency	Description
		526	City of Culver City	Washington Bl Median Re-Configuration: The proposed project is the redesign and rehabilitation of Washington Bl between National Bl and Fairfax Av in order to improve the roadway pavement, provide left-turn pockets, and increase roadway width in order to accommodate bike facilities.
		697	City of Los Angeles	Develop a Sustainable Transportation Demonstration Program to support city partners in implementing innovative capital or operations improvements that apply guidance from the policy. Seek funding from SCAG, AQMD, State Strategic Growth Council, and federal/state grants.
		995	City of Los Angeles	Westwood Bl Bicycle & Transit Corridor
		1286	County of Los Angeles	Provide better access and connectivity to the various modes of travel to ensure ease of movement through the Marina on foot, bicycle, car, and boat.
Arterial	Complete Streets Program	1336	City of Santa Monica	Colorado Av Multimodal Enhancements - Develop Colorado Av as a complete street safe and comfortable for light-rail use, pedestrians, and vehicles, serving businesses and residents along it. Between 14th St and Lincoln Bl on the north side, add'l curbside parking may be provided in future if building entries are relocated from Colorado Av to north/south streets. If new development occurs on the north side of Colorado Av, sidewalks will be widened with sidewalks extensions into cross streets to reduce crossing distance, and existing parkways will be expanded to better infiltrate runoff from sidewalks and allow street trees to mature. If new development occurs on the south side of Colorado Av, sidewalks will be widened. Between 14th St and 11th St, existing parkways, street trees, irrigation and street lights will be relocated south to accommodate a two-way bicycle path along the curb. The new parkway will separate the bike path from the pedestrian walkway.

Program	Subprogram	MM Project ID	Agency	Description
		1337	City of Santa Monica	16th Street Shared Street – improve 16th Street to facilitate pedestrian use, comfort and east to west mid-block crossing, increased curbside parking for Memorial Park users, maintenance of vehicular access to and parking for adjoining properties and enhanced drop-off for the 17th Street/SMC Expo Station.
		1343	City of Santa Monica	Colorado Av Multimodal Improvements: Between 20th St and 17th St, sidewalks will be widened in conjunction with new development, including continuous landscaped parkways that infiltrate runoff from sidewalks and planted with street trees. Street lights to match those installed in conjunction with the Expo Line will be added to unify the district.
Arterial	Complete Streets Program	1344	City of Santa Monica	Colorado Avenue Multimodal Improvements: Adjacent to the Metro station and Memorial Park, between 15th Court and 17th Street, the sidewalk on the north side of the street may be extended into the street to provide space for pedestrian activity or, if the sidewalk is not widened, the curbside parking lane may be designated for loading only or short-term parking with enhanced paving in the curbside parking lane.
		1346	City of Santa Monica	14th Street First-Last Mile Improvements: To improve park access, mid-block roadway striping and signage will be altered to provide drop-off space along the curb. The southbound lane will be modified to include a 7' parking lane, 5' bike lane with 2' buffer from the adjacent travel lane. Northbound, the bike lane buffer will be moved to the east side of the lane to buffer cyclists from vehicles and park users in the adjacent drop-off lane; the drop-off lane will be 9' wide to facilitate loading and unloading of park users and equipment along the sidewalk. One 12' travel lane will remain in each direction. The east sidewalk will include a 12' paved area including a 6' pervious paving zone with connected tree wells and tree grates to facilitate auto access to Memorial Park. To the north of the drop-off zone, parallel parking and a Big Blue Bus transit stop would be provided.

Program	Subprogram	MM Project ID	Agency	Description
Arterial	Complete Streets Program	1347	City of Santa Monica	Olympic Bl Memorial Park Access Improvements: Additional drop-off space for park users is proposed on the park's south side between 14th - 16th Sts by converting the parking lane into a short-term parking and drop-off lane along the north side of Olympic Bl from 14th - 16th Sts. The existing sidewalk and tree lawn would be converted into an 8' expanded sidewalk along the southern border of Memorial Park, with pervious paving and connected tree wells with tree grates to provide more space for a 9' loading and unloading of park users and equipment. On the south side of Olympic Bl a break in the median to accommodate a left turn pocket for a new northbound left turn at 16th St will be provided.
		1348	City of Santa Monica	16th Street Memorial Park and Light Rail Access Improvements: Alter existing striping and signage to make 16th Street one-way northbound and provide angle parking on the west side and designated drop-off, transit zones and curbside parking on the east side. Corner bulb-outs and a raised mid-block "speed table" crosswalk would improve pedestrian conditions and help calm traffic on the street. A new median break at 16th Street and Olympic Boulevard would allow westbound traffic to enter 16th Street, removing turning movements from the more congested 17th Street and Olympic Boulevard intersection. When this improvement is undertaken, one Coral tree will be relocated to another location in the existing Olympic Boulevard median.
		1372	City of Santa Monica	Complete Streets enhancements along Colorado Ave (South Side) from 17th St to 20th St
		3353	City of Culver City	Improve aesthetic, safety and traffic conditions in the area between La Cienega Bl and Fairfax Av, La Cienega and Ballona Creek.
		3363	City of Culver City	Develop location and directional signage for areas of the City with skewed and discontinuous streets, such as the Jefferson-Sepulveda Bl intersections.

Program	Subprogram	MM Project ID	Agency	Description
Arterial	Complete Streets Program	3364	City of Culver City	Provide signs at major City gateways to indicate arrival into Culver City and to indicate the direction to heavily frequented destinations and points of interest, such as the Fox Hills Mall and the Civic Center.
		3564	City of Beverly Hills	Improve aesthetics and traffic conditions of major corridors (eg. La Cienega Bl)
		3614	City of W. Hollywood	La Cienega Corridor Enhancement: Develop consensus between Electeds of affected jurisdictions on desire to take a comprehensive look at opportunities to improve the La Cienega Corridor. Once consensus is developed, and with approved WSCOG funding plan, engage consultant and/or local school design students to develop recommendations to improve physical appearance, traffic movement, transportation, and pedestrian orientation along La Cienega Blvd
	ITS Program	144	City of Beverly Hills	Arterial street improvement, maintenance and streetscape improvements
		158	City of Los Angeles	Corridor-wide – I-10- Santa Monica Smart Corridor System Phase II: Implement direction-based traffic signal coordination on arterials connecting to I-10, arterial reconfiguration to facilitate directional flow such as reversible lanes, restripe various arterials for turn pockets and additional lanes, install CCTV and other communications systems
		159	City of W. Hollywood	ITS/Traveler Information Systems Operation and Maintenance in West Hollywood
		160	City of Santa Monica	Real time traffic and parking improvements
		163	City of W. Hollywood	Traffic Signal Timing in West Hollywood
		174	City of Culver City	Highway Local; Signal upgrade/improvements/modification in Culver City
		176	County of Los Angeles	Traffic Signal Improvements; Operational Upgrades
Arterial	ITS Program	233	City of W. Hollywood	Implement a Sub-Regional Traffic Management Center

Program	Subprogram	MM Project ID	Agency	Description
		315	City of Culver City	Transit Intelligent Transportation Systems (new system/ maintenance/ upgrade)
		485	City of Los Angeles	CMP Monitoring Station #49 (Lincoln Bl and Marina Expressway (SR90)): Install a CCTV camera and necessary infrastructure (including fiber optic & interconnect) to improve DOT's ability to monitor and respond to real-time traffic conditions
		487	City of Los Angeles	CMP Monitoring Station #55 (Pacific Coast Highway and Chautauqua Bl): Install a CCTV camera and necessary infrastructure (including fiber optic & interconnect) to improve DOT's ability to monitor and respond to real-time traffic conditions
		488	City of Los Angeles	CMP Monitoring Station #57 (Pacific Coast Highway and Sunset Bl): Install a CCTV camera and necessary infrastructure (including fiber optic & interconnect) to improve DOT's ability to monitor and respond to real-time traffic conditions
		489	City of Los Angeles	CMP Monitoring Station #59 (Santa Monica Bl and Bundy Dr): Install a CCTV camera and necessary infrastructure (including fiber optic & interconnect) to improve DOT's ability to monitor and respond to real-time traffic conditions
		490	City of Los Angeles	CMP Monitoring Station #62 (Santa Monica Bl and Westwood Bl): Install a CCTV camera and necessary infrastructure (including fiber optic & interconnect) to improve DOT's ability to monitor and respond to real-time traffic conditions
		492	City of Los Angeles	CMP Monitoring Station #70 (Venice Bl and Centinela Av): Install a CCTV camera and necessary infrastructure (including fiber optic & interconnect) to improve DOT's ability to monitor and respond to real-time traffic conditions
Arterial	ITS Program	495	City of Los Angeles	Traffic Signal System Upgrades: Implement traffic signal system upgrades throughout subregion including signal controller upgrades, left-turn phasing at key intersections, sensor loops, additional CCTV cameras to improve LADOT's ability to monitor and respond

Program	Subprogram	MM Project ID	Agency	Description
		546	City of Santa Monica	Santa Monica Wayfinding: Create a comprehensive multimodal wayfinding system that includes real-time trip planning, parking reservations and dynamic signage.
		587	City of W. Hollywood	Improve timing at up to 50 traffic signals in West Hollywood.
		786	City of Los Angeles	Priorities for Capacity Enhancements: Provide information to motorists about alternative routes and modes of travel using changeable message signs, highway advisory radio, or other appropriate traffic management techniques.
		1048	City of Los Angeles	ITS Signal Upgrades: Install signal upgrades as part of the next evolution of ATSAC; Install right-turn detector loops for traffic volume data and monitoring; 211 signalized intersections in CTCSP Area
		1433	City of Santa Monica	Install and maintain real-time signage, especially at freeway exits and in the Downtown, to direct traffic to available parking and reduce congestion.
		1434	City of Santa Monica	Implement an Advanced Traffic Management System to improve signals.
		1435	City of Santa Monica	Develop a Traffic Management Center to optimize motor vehicle flow throughout the City.
		3215	City of Culver City	Relieve artery congestion due to freeway ramp metering through methods such as signage and diverters which direct traffic to alternative routes.
Arterial	ITS Program	3365	City of Culver City	Continue to support the Smart Corridor Demonstration Project along Washington Bl and Washington Place.
		3576	City of Beverly Hills	State-of-the-art traffic signal timing.
	State of Good Repair Program	3109	City of Los Angeles	Palisades Bluff stabilization project
		3208	City of Culver City	Maintain and annually update the Capital Improvement Program Action Plan to effectuate roadway improvements recommended in the Pavement Management Plan.

Program	Subprogram	MM Project ID	Agency	Description
		3577	City of Beverly Hills	Maintain and annually update the CIP Action Plan to effectuate roadway improvements.
		3578	City of Beverly Hills	Develop traffic management techniques to identify, review and implement appropriate neighborhood traffic management.
	Traffic Calming Program	1051	City of Los Angeles	Neighborhood Protection Program: The objective of this Program shall be to discourage through-traffic from using local streets and to encourage, instead, use of the arterial street system. The Program shall establish measures to make the primary arterial routes more attractive and local routes less attractive for through-traffic, and establish measures designed to facilitate vehicular and pedestrian egress from local streets in the adjacent neighborhoods onto the primary arterial street and highways system.
		3246	City of Culver City	Further develop programs for identifying, reviewing, and developing appropriate neighborhood protection plans, including implementation of the Neighhorhood Traffic Management Program.
		3534	City of Los Angeles	Implement roadway enhancements that enhance mobility and safety for all and strive toward the City of Los Angeles "Vision Zero" goal of zero traffic fatalities by 2025.
		3575	City of Beverly Hills	Maintain operations on roadways and intersections within multi-modal districts served by frequent transit, enhanced ped/bike systems.
Arterial	Traffic Calming Program	3611	City of Los Angeles	Identify and implement pedestrian safety and bicycle countermeasures at the 10 corridors with the highest severe injuries and collisions.
Caltrans	I-10 Robertson Interchange Program	3022	Caltrans	I-10 Fwy - Robertson/National Ramps: Final design, engineering and construction of on/ramp system improvements for the I-10 freeway and Robertson/National Bl ramps to improve access and circulation
	I-10 Carpool Lanes (Lincoln Bl - I-5)	101	Caltrans	I-10 Carpool Lanes: Lincoln Bl to I-5
	ITS Program	203	Caltrans	I-405- I-405 Add connector metering at I-105 and SR-90 interchanges

Program	Subprogram	MM Project ID	Agency	Description
		221	Caltrans	I-405- Throughout I-405 corridor – Expand operations of Fwy Service Patrol
		224	Caltrans	I-10- Install CCTV and other communications systems
		225	Caltrans	I-10- Upgrade Surveillance System
		3597	Caltrans	PCH: Install CCTV & Communications System from Temescal Canyon Road to Malibu Rd (Malibu Seafood) (Post Mile 38.11-49.72)
		3631	Caltrans	Implement SCAG congestion pricing pilot program
	Main Line Program	111	Caltrans	SR-90- Extension from Lincoln Bl to Admiralty Way
		112	Caltrans	I-10- Add WB auxiliary lane from Cloverfield to Centinela Av
		179	Caltrans	I-405- Add auxiliary lanes from SR-90 to I-105
		182	Caltrans	I-10- Add #5 lane to EB through LA Brea Av interchange
		185	Caltrans	I-10- Corridor-wide – Redesign on-ramp shoulders to accommodate Express Bus service
		212	Caltrans	Create a connection from the westbound SR-90 to SB I-405
		215	Caltrans	I-10- Add WB lane to I-10 from Harcourt Av to Overland Av
		217	Caltrans	I-405- Construct LAX Expressway parallel to I-405 Fwy between SR-90 and Arbor Vitae St
Caltrans	Main Line Program	288	Caltrans	I-10 - I-10 Busway
		3372	Caltrans	Work with Caltrans to continue soundwalls along I-405.
		3632	Caltrans	I-10 soundwalls
	Ramp Program	12	Caltrans	I-405 Direct HOV Connector to LAX
		122	Caltrans	Lincoln Bl- Flyover from NB Lincoln Bl to WB Washington Bl
		124	Caltrans	Slauson Av- Flyover from WB Slauson Av to WB SR-90
		184	Caltrans	I-10- Centinela Av ramps improvement
		187	Caltrans	I-10- Improve I-10 and I-405 interchange
		189	Caltrans	I-10- Lincoln Bl off-ramp and bridge improvements to provide vehicle, bike and pedestrian accommodations.
		196	Caltrans	I-10- Realign and widen WB off-ramp at Cloverfield Bl

Program	Subprogram	MM Project ID	Agency	Description
		198	Caltrans	I-10- Realign and widen WB off-ramp to National
		199	Caltrans	I-10- Widen EB Barrington on-ramp
		201	Caltrans	I-405- Add additional lane at National on-ramp
		205	Caltrans	I-405- Modify NB and SB collector/distributor from SR-90 off-ramp to SR-90 on-ramp
		206	Caltrans	I-405- NB on-ramp from Jefferson Bl – Widen and extend 2 meter lanes and 1 HOV metered lane and lengthen merging length
		213	Caltrans	I-10 interchange improvements of sub-regional importance including Cloverfield Boulevard, Lincoln Boulevard and 4th/5th Street ramps
		218	Caltrans	I-405- Construct new NB collector-distributor road at Jefferson Bl ramps
		227	Caltrans	I-405- SB off-ramp to WB Jefferson Bl – add acceleration lane to WB Jefferson Bl for free right-turn move
Caltrans	Ramp Program	228	Caltrans	Reconfigure EB SR-90 ramp from NB Sepulveda Bl to wrap under and around the SR-90 and raise up over Sepulveda Bl to create new ramp to NB I-405
		471	Caltrans	Bundy Drive / I-10 Ramp Improvement: Reduce congestion on Bundy by reconfiguring the I-10 WB ramps (consolidate to one ramp location accommodating both the on and off ramps with new signal)
		608	Caltrans	Olympic Crossover – replace existing I-10 westbound off -ramp at 4th St to consolidate freeway entrance and exit to one signalized intersection at Olympic Drive
Goods Movement	Goods Movement Program	779	City of Los Angeles	On-site Loading: Collaborate with business owners/operators in industrial districts to identify deficiencies in access, loading and parking on existing streets
TDM	Technology Program	3570	City of Beverly Hills	Improve citywide operations of existing and future signal controls, real-time parking availability, and real-time transit information.
		3591	City of Culver City	Region-wide (southern California) real-time transit arrival information web portal and smart phone app.

Program	Subprogram	MM Project ID	Agency	Description
		3592	City of Culver City	Smart parking management technology at the rail station parking lots, including a smart phone app and web portal allowing people to see and reserve available parking spaces before arriving at the parking lot.
	Parking Program	330	City of Beverly Hills	Develop a Parking Master Plan and implementation funding tools including parking assessment districts & congestion pricing
		483	City of Los Angeles	Wilshire Park-and-Ride Facilities: Provide parking for transit users at or near existing and planned metro rail station along Wilshire Bl.
		496	City of Los Angeles	Westwood ExpressPark (Westwood Bl between Pico Bl and UCLA): Implement an on-street intelligent parking program that includes vehicle sensors, dynamic demand-based pricing and a real-time parking guidance system to reduce VMT, congestion and to improve flow for cars/buses.
TDM	Parking Program	580	City of W. Hollywood	West Hollywood parking shuttles: implement parking shuttles along Santa Monica Bl and Sunset Bl
		581	City of W. Hollywood	West Hollywood parking utilization improvements: TDM - develop an online system for real-time parking information including GIS database and mapping. Improve parking and wayfinding and guidance throughout commercial areas
		663	City of Santa Monica	Install parking meters on 5th, 6th and 7th Sts to ensure turnover and availability near businesses
		664	City of Santa Monica	Enable the phased development of up to 800 public parking spaces in peripheral locations to address future demand without incentivizing additional vehicle trips in Downtown
		667	City of Santa Monica	Direct drivers to public parking with the most availability, with first priority as soon as they enter the Downtown area, with Signage located at all entrances into the Downtown, including: Lincoln Bl freeway off ramp, 4th/5th St Freeway off ramp along Wilshire Bl as one enters the Downtown, along Pacific Coast Highway and/or at entrances from the Pacific Coast Highway

Program	Subprogram	MM Project ID	Agency	Description
		784	City of Los Angeles	Performance-Based Parking Supply: Where parking needs assessments indicate excess potential, implement a parking program similar to the Eagle Rock Community Pilot Project that encourages use of "pooled" parking resources to satisfy parking requirements for change of use projects.
		1053	City of Los Angeles	Strategic Parking Program: Implement a Westside parking program and update parking requirements to reflect mixed-use developments, shared parking opportunities, and parking needs at developments adjacent to major transit stations.
		1055	City of Los Angeles	Parking Utilization Improvements & Reduced Congestion: Develop an on-line system for real-time parking information, including GIS database and mapping. Improve parking and wayfinding and guidance throughout commercial areas.
TDM	Parking Program	1290	County of Los Angeles	Locate year-round dinghy docks near restaurants to promote travel within the Marina by boat
		1303	County of Los Angeles	Provide convenient parking for boaters/trailers, focusing on short-term parking needs for loading/unloading supplies
		1350	City of Santa Monica	Establish a 17th Street/SMC Expo gateway and Memorial Park Station Plaza: The 17th Street/SMC light rail station includes a planned Park & Ride lot on the south side of Colorado Avenue between 15th Court and 17th Street. A plaza area is proposed that is intended to serve several functions such as a major crossroads of pedestrian and bicycle activity, as well as facilitates the mobility experience for community members and transit patrons, while creating a sense of identity and place for the Memorial Park neighborhood.
		1567	City of W. Hollywood	Develop requirements for alt-fuel vehicle-dedicated parking spaces
		3236	City of Culver City	Reduce pressure on on-street parking through provision of private and public off-street parking facilities.
		3554	City of Los Angeles	Implement Park Once / Universal Valet Parking Programs throughout major retail centers in the City, as appropriate, including the use of City owned parking facilities

Program	Subprogram	MM Project ID	Agency	Description
		3557	City of Los Angeles	Expand the park & ride network in Los Angeles County to meet the current and latent demand of discretionary transit riders to use regional public transportation services.
	Shared Ride Program	508	City of Beverly Hills	Beverly Hills Rideshare Program
		772	City of Los Angeles	Alternatives to Automobile: Coordinate with other agencies that conduct demonstration programs for Local Use Vehicles and identify areas where these vehicles can be used to reduce greenhouse gas emissions, air pollution and gasoline consumption.
TDM	Shared Ride Program	1054	City of Los Angeles	Rideshare Toolkit: The Toolkit would develop an online Transportation Demand Management (TDM) Toolkit with information for transit users, cyclists, and pedestrians as well as ridesharing. It 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.
		1429	City of Santa Monica	Work with larger employers to expand and enhance shared ride access, such as through regional vanpool programs to supplement existing transit service.
		1454	City of Santa Monica	Evaluate the possible implementation of a Carsharing Program.
		1596	City of W. Hollywood	Develop relationships with car share companies to expand carsharing to West Hollywood
		1598	City of W. Hollywood	Identify locations for community ride share stations and develop appropriate infrastructure
		2998	County of Los Angeles	LA County rideshare services; provide commute info, employer assistance and incentive programs through core & employer rideshare services & MTA incentive programs
	TMA Program	614	City of Santa Monica	Create a Downtown Transportation Management Organization serving employees, residents and visitors

Program	Subprogram	MM Project ID	Agency	Description
		1056	City of Los Angeles	Transportation Demand Management (TDM) Program: The program would provide start-up costs for Transportation Management Organizations/Associations (TMOs/TMAs). It would also provide guidance and implementation of a TDM program.
TDM	TMA Program	1284	County of Los Angeles	Mobility enhancements for Boaters: Provide high-quality dedicated facilities (such as parking), avoid conflicts with other modes at boat launch areas and locations where privately-owned vehicles haul trailers, provide opportunities for using small watercraft for personal mobility within the Marina by providing dinghy docks, waterside wayfinding, and other improvements.
		1358	City of Santa Monica	Establish a TMA to implement, coordinate, and advance vehicle trip reduction/TDM and promote alternative transportation on a sub-regional level, including potential shared parking.
		1366	City of Santa Monica	Memorial Park District Parking Facility. A multi-level subterranean parking facility will be constructed in Memorial Park.
		1450	City of Santa Monica	Facilitate the formation of Transportation Management Organizations (TMOs), Business Improvement Districts, or other organizations to help manage vehicle trips at a local level.
		3201	City of Culver City	Reduce automobile travel by establishing a context for TDM programs, capitalizing on the CityBus transit system and the Ballona Creek Bike Path, and studying appropriate limits on the number of parking spaces for specific uses and areas.
		3579	City of Beverly Hills	Develop TDM to reduce single-occupant motor vehicle travel in the City by improving effeciency of existing transportation networks.
		3616	City of Santa Monica	Implement TDM programs as part of the neighborhood plans for Downtown, Memorial Park, and Bergamot Station.
Transit	Crenshaw Line extension to Hollywood	22	Multi Jurisdiction	Crenshaw Bl Corridor Extension (beyond segment funded by Measure R) all the way to Hollywood
	Sepulveda Pass Transit Corridor	282	City of Los Angeles	I-405/Sepulveda Pass - Alternative multimodal linkage from the Westside to the San Fernando Valley and LAX, taking pressure off of the I-405

Program	Subprogram	MM Project ID	Agency	Description
		850	Multi Jurisdiction	Sepulveda BRT: Center running BRT on Sepulveda Bl from Wilshire to LAX.
Transit	Sepulveda Pass Transit Corridor	3547	Multi Jurisdiction	Sepulveda LRT: Potential future upgrade to rail transit in the long term from BRT from Wilshire to LAX.
	Purple Line extension Century City to Westwood/VA	3633	Multi Jurisdiction	Metro Purple Line Extension to Westwood/VA
	Purple Line extension to Downtown Santa Monica	119	Multi Jurisdiction	Metro Purple Line Extension Westwood/VA to City of Santa Monica
	Purple Line West Hollywood Extension	23	Multi Jurisdiction	Metro Purple Line Extension West Hollywood Extension
	Lincoln Bl BRT/LRT	458	City of Los Angeles	Partnering with Caltrans and LA County, improve Lincoln Bl between Jefferson Bl and Fiji Way, incl. removing existing bottleneck by replacing existing bridge to provide a wider bridge with an additional SB lane, transit lanes, and on-street bike lanes.
		3548	Multi Jurisdiction	Lincoln Bl BRT: Center running BRT on Lincoln Bl from Santa Monica Blvd to LAX.
		3549	Multi Jurisdiction	Lincoln Bl LRT: Potential future upgrade to rail transit in the long term from BRT from Santa Monica to LAX.
		3619	City of Santa Monica	Implement additional transit facilities along Lincoln Blvd for a Transit Enhanced Network.
	BRT Program	292	Multi Jurisdiction	Implement Rapid Bus Transit Improvements along major arterials (Lincoln Bl, Sepulveda Bl and Pico Bl).
		307	City of W. Hollywood	Implement exclusive Transit/HOV lanes on key arterials and high-ridership transit corridors
		655	City of Santa Monica	Find ways to prioritize rapid buses (queue jumpers, stop relocation, curb extension)
		847	City of Los Angeles	Olympic Rapid Improvements: Extension of the Metro Rapid 728 from current terminus in Century City to the Metro Expo Line station at Westwood Bl

Program	Subprogram	MM Project ID	Agency	Description
Transit	BRT Program	848	City of Los Angeles	Pico Rapid Improvements: General Rapid enhancements (i.e. increased frequency, stop improvements, and construction) on Big Blue Bus Rapid 7, construction of a new stop in Century City.
		849	Multi Jurisdiction	Santa Monica Bus Rapid Transit: Curb-running bus-only lanes on Santa Monica Bl from the border of the City of Santa Monica to the border of the City of Beverly Hills
		853	City of Los Angeles	Venice Rapid Upgrades: Rapid enhancements & Venice Beach branding of existing Rapid Line. Rebrand existing Metro Rapid 733 service to serve Venice Beach area, increased service frequency, implement stop improvements.
		3161	City of Los Angeles	Implement City of LA Transit Enhanced Network as defined in the Mobility Plan 2035.
	Bus/Shuttle Program	294	Multi Jurisdiction	I-405- Express Bus Improvements (e.g., peak period shoulder lane) on I-405
		297	City of Los Angeles	Implement cross mountain bus service along Coldwater Canyon Dr, Beverly Glen Bl, Benedict Canyon Dr.
		299	City of Santa Monica	On Lincoln Bl – New express bus Big Blue Bus routes and/or facilities
		300	Multi Jurisdiction	Robertson Bl – Increase headways to Airport bus service between Beverly Hills, West Hollywood and LAX.
		301	City of Los Angeles	Sepulveda Pass – Increase express bus service over Sepulveda Pass, with collector/feeder service throughout West LA and the San Fernando Valley.
		306	City of Santa Monica	Increase bus capital and operating funding
		575	City of W. Hollywood	Expand local transit service (CityLine) to include up to 4 new buses
		648	City of Santa Monica	Relocate dedicated bus lanes and transfer nexus from Santa Monica Bl to facilitate increased bus capacity, and align with modified BBB operations, while maintaining service to the Downtown
Transit	Bus/Shuttle Program	657	City of Santa Monica	Establish a circulator that provides trips at a competitive price per passenger and coordinated with Big Blue Bus service planning
		720	City of Santa Monica	Area-wide shuttle to meet demand

Program	Subprogram	MM Project ID	Agency	Description
		793	City of Los Angeles	Priority Transit Routes: Coordinate CityRide transit services and Los Angeles County ACCESS transit services with social service centers
		846	City of Los Angeles	Century City Local Circulator: Circulator service to serve Century City and the planned Century City Metro Purple Line Station.
		851	City of Los Angeles	Sawtelle Circulator: Circulator service on Sawtelle Bl from Wilshire Bl to the Metro Expo Line Sepulveda Station.
		852	City of Los Angeles	Bundy Circulator: Circulator service on Bundy Dr from Wilshire Bl to the Santa Monica Airport.
		855	City of Los Angeles	Marina-Playa-Fox Hills Circulator/Fox Hills to Venice Circulator: Circulator bus/shuttle would connect activity centers to major transit stations.
		856	City of Los Angeles	Loyola Circulator: Provide circulator service to connect to/from Loyola Marymount University and future BRT/rail stations on Lincoln Bl.
		857	City of Los Angeles	Palms Circulator: Circulator service to connect Palms neighborhood activity centers to Metro Expo Line Palms Station.
		1289	County of Los Angeles	Improve frequency and service duration of water transit
		1291	County of Los Angeles	Link parking lots to destinations with shuttles that run around the entire Marina
Transit	Bus/Shuttle Program	1310	County of Los Angeles	To provide increased Marina Beach Shuttle service that would support a Park Once Marina del Rey, it is recommended a service standard of 15-minute headways or better during peak days to be implemented in the long term as the park once system is implemented. Also it is recommended to run some of the Beach Shuttle routes in the Marina only, rather than routing all shuttles to Playa Vista and Playa del Rey, unless ridership demand in those areas is sufficient to warrant the 15-minute service frequency
		1311	County of Los Angeles	Implement a scheduled WaterBus service with defined routing and stop location co-located with Mobility Hubs.

Program	Subprogram	MM Project ID	Agency	Description
		1340	City of Santa Monica	Cross Town Bus – maximize access to and from the 17th Street/SMC Expo Station with enhanced cross town bus routes that serve area employees including those at area hospitals, Santa Monica College, students and community members.
		1420	City of Santa Monica	BBB will regularly update the Service Improvement Plan, with an emphasis on service efficiency and improved regional connections.
		2992	City of Culver City	Culver City funding for articulated bus to expand the passenger capacity of the current Culver City Bus Line
		2993	City of Culver City	Culver City Bus Operation Assistance
		3220	City of Culver City	Expand Culver CityBus routes and service levels to address new potential markets and levels of demand.
		3221	City of Culver City	Support development of a CityShuttle service to link major activity and transit centers during peak demand periods.
		3230	City of Culver City	Expand City Dial-A-Ride services and enhance coordination with adjacent jurisdictions.
		3276	City of Culver City	Extend Culver CityBus routes to Playa Vista, South Bay, Downtown LA and Century City.
		3277	City of Culver City	Expand intracity CityBus Routes.
Transit	Bus/Shuttle Program	3315	City of Culver City	Purchase six (6) 40-foot CNG buses to replace four (4) 30-foot buses and add two (2) additional buses to the CNG fleet
		3316	City of Culver City	Implement the 2015 bus replacement project that will replace 20 40-foot buses reaching the end of their useful life in 2015/2016
		3522	City of W. Hollywood	PickUp Line Ridership Feasibility and Needs Assessment Study - Potential expansion of the weekend transportation service, the PickUp Line, for additional days, hours, or an extended route to the Eastside of the City
		3555	City of Los Angeles	Purchase new DASH shuttle buses and expand LADOT DASH operations to enhance intra-community "first mile/last mile" transit connections to regional transit centers.

Program	Subprogram	MM Project ID	Agency	Description
		3560	Multi Jurisdiction	Improved year-round regional transit connection between Malibu and Santa Monica along PCH, including improved headways for existing bus service
		3561	Multi Jurisdiction	Malibu: seasonal shuttle program to connect Malibu and Westside
		3587	City of Culver City	Culver CityBus: replace SmartBus System at the end of its useful life cycle.
		3588	City of Culver City	Culver City - Citywide Bus Stop Improvement Project. The improvements include some or all of the following: 1) Replace/add/lengthen bus pads, 2) Improve sidewalk conditions or extend the sidewalk, 3) Next bus arrival information system, 4) Enhanced lighting, and 5) Bus stop furniture
		3589	City of Culver City	Culver CityBus: Implement Culver CityBus Line 1 Rapid service - operation funding and new buses.
	Bus/Rail Integration Program	314	City of Culver City	Expo Line- Enhance transit technology for interface with Expo Line
		528	City of Culver City	Culver CityBus: Implement Culver CityBus System-wide Service Change/Expansion to provide new service and enhance subregional connectivity to/from Expo Light Rail - Operations Funding
Transit	Bus/Rail Integration Program	536	City of Culver City	Culver CityBus: Sepulveda Bus Line Expansion Project - Purchase of 6 buses to enhance the capacity of Line 6/Rapid 6 on Sepulveda from UCLA to LAX and Green Line Aviation Station.
		1304	County of Los Angeles	Better integrate the Marina into the regional transit network through improved span of service and service frequency on transit lines
		3227	City of Culver City	Support MTA funding to enhance feeder service to rail stations.
		3583	City of Culver City	Culver CityBus: procure electric buses and construct associated charging infrastructure for service expansion/exhancements to Expo Light Rail and future subway extension.
		3585	City of Culver City	Culver CityBus Maintenance Facility/Yard Expansion: Fund property acquisition and facility expansion to accommodate additional buses for service expansion to Exposition Light Rail stations and future subway extension.

Program	Subprogram	MM Project ID	Agency	Description
		3586	City of Culver City	Improve Bus Stops in the Area (Culver City & City & County LA) for feeder service to Expo Light Rail: The improvements include some or all of the following: 1) Replace/add/lengthen bus pads, 2) Improve sidewalk conditions or extend the sidewalk, 3) Next bus arrival information system, 4) Enhanced lighting, and 5) Bus stop furniture
	Transit Technology Program	1421	City of Santa Monica	Update transit technology systems to maximize use with communication technology.
		1423	City of Santa Monica	Expand the existing transit stop improvement program, including real-time bus arrival displays and schedule information.
		1576	City of W. Hollywood	Adjust signal timing to minimize transit delay along Santa Monica Bl and other transit corridors
		3310	City of Culver City	Implement the Smart Bus Upgrade Project
		3311	City of Culver City	Implement the Real-Time Bus Arrival Information System Project
		3312	City of Culver City	Implement the Citywide Bus Signal Priority Project
Transit	Transit Technology	3590	City of Culver City	Integrated real-time next bus/train arrival information signs at and around all rail stations.
	Rail Program	316	Multi Jurisdiction	Green Line Extension on Florence Av/ BNSF Railway - Build rail to connect Harbor and Crenshaw Corridors to LAX utilizing existing BNSF rail line
		3550	City of Los Angeles	Venice Long Range Streetcar: The enhancement to the Metro Rapid Line 733 on Venice Bl could be transitioned to streetcar to provide a fixed branded connection from the Metro Exposition Line station in Culver City to Venice Beach, with a loop on Abbot Kinney Bl.
	State of Good Repair Program	312	City of Culver City	Preventive maintenance/rehabilitation of transit (bus)
		320	City of W. Hollywood	Preventive Maintenance/Rehabilitation of Transit (Bus & Rail)
		321	City of Culver City	Bus maintenance and storage facility upgrade and expansion
		3556	City of Los Angeles	Program to fund the conversion of existing transit fleet in Los Angeles County to meet goal of 25% zero-emission or near zero-emission buses by 2025

Program	Subprogram	MM Project ID	Agency	Description
		3558	City of Los Angeles	Program to purchase new transit operations / maintenance facilities, and upgrade existing facilities, with the capacity to accommodate new zero emission and near zero emission buses.
		3559	City of Los Angeles	Program to maintain a state of good repair for public transit programs including the replacement and refurbishment of transit vehicles, facilities, and other transit infrastructure.
		3584	City of Culver City	Culver CityBus: Procure buses to replace existing buses that will reach the end of their useful life cycle.
		3636	City of Culver City	Study materials and methods to address overweight bus issues
		3637	City of Culver City	Install enhanced pavement in lanes heavily used by transit buses to address overweight bus issues
	Bus Station/Stop Improvement Program	310	City of Culver City	Bus stop improvements (sidewalk, furniture, dynamic-message signs)
Transit	Bus Station/Stop Improvement Program	538	City of Culver City	Westside Transit Center: Conduct a feasibility study, prepare environmental documents, design, and construct a multimodal transit center to replace the existing Westfield Culver City Transit Center (located on private property). This transit center will serve as a major transit hub on the Westside for riders transferring bus lines.
		639	City of Santa Monica	Create bus pullouts on 4th St near Expo station
		702	City of Santa Monica	Buffer Park at Expo yard
		723	City of Santa Monica	Design and construct Bergamot Art Center Station Plaza
		3278	City of Culver City	Site a new Culver CityBus yard to replace existing overcrowded facility.
		3309	City of Culver City	Implement the Bus Stop Improvements Project

City of Mission Viejo

Office of the City Manager

January 28, 2016

Mr. Hasan Ikhrata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017-3435

Subject: **City of Mission Viejo Comments on the Draft 2016 Regional Transportation Plan/Sustainable Communities Strategy and Program Environmental Impact Report**

Dear Mr. Ikhrata:

The City of Mission Viejo appreciates the opportunity to review and comment on the Southern California Association of Governments' (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and the associated draft Program Environmental Impact Report (PEIR).

In providing these comments, the City of Mission Viejo values the opportunities that SCAG has provided to elected officials and to technical staff, to discuss and receive clarification on preliminary questions and issues relating to the draft RTP/SCS documents.

The City of Mission Viejo comments are as follows:

1) Support for the RTP/SCS Comments Submitted by OCTA and OCCOG:
The City of Mission Viejo supports the comments on the draft 2016 RTP/SCS and draft Program EIR, as outlined in the Orange County Transportation Authority's (OCTA) January 11, 2016 comment letter and the Orange County Council of Government's (OCCOG) January 28, 2016 comment letter. These comments identify policy and technical issues that are of concern to Orange County, and the City of Mission Viejo respectfully requests that SCAG respond to the comments detailed in said referenced transmittals.

2) RTP/SCS Growth Forecasts:

a) 2016 RTP/SCS: The 2016 RTP/SCS incorporates a growth forecast for the City of Mission Viejo that the City of Mission Viejo has reviewed, corrected, and fully supports. Our review concludes that the 2016-2040 RTP/SCS growth forecast accurately reflects the amount and distribution of population, households and employment at the citywide and traffic analysis zone levels for the City of Mission Viejo, from Year 2012 (Existing) through Year 2040.

Further, the 2016-2040 RTP/SCS growth forecast accurately reflects the amount and location of all residential and non-residential entitlements, development agreements, and projects recently completed and constructed within the City of Mission Viejo during the plan timeframe.

The City of Mission Viejo thus fully supports the 2016-2040 RTP/SCS growth forecast, and fully supports the adoption of this growth forecast at a geographic level no lower than the jurisdictional level.

b) Program EIR Project Alternatives: Intensified Land Use Alternative: The draft Program EIR for the 2016 RTP/SCS also includes a discussion and analysis of 2016 RTP/SCS plan alternatives, including an Alternative 3: Intensified Land Use Alternative. The draft Program EIR identifies the Intensified Land Use Alternative as the Environmentally Superior Alternative, an alternative that is expected to generate the fewest adverse environmental impacts, including and as compared to the 2016 RTP/SCS Plan.

According to the draft PEIR, the Intensified Land Use Alternative comprises the same list of financially constrained transportation projects and programs that are included in the 2016 RTP/SCS. However, from a land use perspective, the Intensified Land Use Alternative incorporates a more aggressive growth forecast than the 2016 RTP/SCS. While maintaining the citywide totals of population, households and employment that is represented in the 2016 RTP/SCS Plan, the Intensified Land use Alternative is represented as a more compact growth pattern that shifts growth to existing urban centers around transit centers and activity centers.

The City of Mission Viejo has completed a review of the Intensified Land Use Alternative database at the traffic analysis zone geography, which was made available to the City on December 3, 2015 with SCAG's official release of the draft 2016 RTP/SCS documents.

Based upon a review of the database, the City of Mission Viejo cannot support the Intensified Land Use Alternative as a reasonable PEIR Alternative. The City finds that this Alternative fails to accurately reflect Existing (Year 2012) housing units and employment, and fails to incorporate approved residential and non-residential entitlements, development agreements, and projects that have been recently completed and constructed in the City of Mission Viejo. Because of these deficiencies, the development intensities and land use patterns incorporated in the Intensified Land Use Alternative are speculative, unlikely, and unrealistic.

Examples of the land use deficiencies within the PEIR Intensified Land Use Alternative include the following:

(1) Los Alisos Apartments (SCAG TAZ 33049200): The Intensified Land Use Alternative eliminates a 320-unit residential project, the Los Alisos Apartments, which the City identified for future growth within TAZ 33049200 after Year 2012, as part of the City's Local Input to SCAG. This project was issued building permits on 9/11/2012 and finaled for occupancy on 9/2/2014. This 320-unit apartment project is on-the-ground, and the development is located on an approved RHNA site that is identified in the City's certified Housing Element.

In contrast, the Intensified Land Use Alternative incrementally redistributes the household growth from this existing apartment site to 35 traffic analysis zones within the

City that represent built-out, residential communities, in addition to a traffic analysis zone near the I-5 freeway.

(2) Watermarke Adagio on the Green Apartments (SCAG TAZ 33030100): The Intensified Land Use Alternative eliminates a 256-unit residential project, the Watermarke Adagio on the Green Apartments, which the City identified for future growth within TAZ 33030100 after Year 2012, as part of the City's Local Input to SCAG. This project was approved on March 11, 2013; building permits were issued in 2013, and all the residential units were finaled for occupancy in Year 2015. These units are on the ground, and the development is located on an approved RHNA site that is identified in the City's certified Housing Element.

In contrast, the Intensified Land Use Alternative incrementally redistributes the household growth from this existing apartment site to 35 traffic analysis zones within the City that represent built-out, residential communities, in addition to a traffic analysis zone near the I-5 freeway.

(3) The Ridge Townhomes/Target Retail Site (SCAG TAZ 33027200): The Intensified Land Use Alternative eliminates the balance of household growth (83 households) from a 144-unit townhome site, The Ridge Townhomes, which the City identified for future growth within TAZ 33027200 after Year 2012, as part of the City's Local Input to SCAG. This project has been under construction in phases since 2011, and the remaining units were finaled for occupancy in 2013. The Ridge Townhomes are on-the-ground, and the development is located on an approved RHNA site that is identified in the City's certified Housing Element.

In contrast, the Intensified Land Use Alternative incrementally redistributes the household growth from this existing townhome site to 35 traffic analysis zones within the City that represent built-out, residential communities, in addition to a traffic analysis zone near the I-5 freeway.

(4) Mission Hospital Master Plan (SCAG TAZ 33032100): The Intensified Land Use Alternative eliminates growth representing approximately 851 employees from the Mission Hospital Master Plan, which the City identified for future growth within TAZ 33032100 after Year 2012, as part of the City's Local Input to SCAG. The Mission Hospital Master Plan was approved by the City of Mission Viejo City Council on 1/19/2004. Further, on 2/2/2004, the City of Mission Viejo City Council adopted Ordinance 04-224 approving Development Agreement DA2003-1 between the City of Mission Viejo and the Mission Hospital Regional Medical Center, governing the Mission Hospital Master Plan development. Mission Hospital has been securing city approvals and building and completing medical facilities consistent with the Master Plan, with the additional medical development square footage allowed pursuant to the approved Master Plan and Development Agreement.

In contrast, the Intensified Land Use Alternative fails to recognize the development entitlement allowed per the City's approved Master Plan and Development Agreement for Mission Hospital, and instead redistributes Mission Hospital's entitled growth in employment to a traffic analysis zone across the street in the Shops at Mission Viejo (TAZ 33032300) and to a traffic analysis zone near the I-5 freeway (TAZ 33032400).

In summary, the examples provided above illustrate that the Draft EIR's Intensified Land Use Alternative is unrealistic and speculative, and is based upon a land use pattern that does not honor existing development agreements, entitlements, or areas recently constructed since Year 2012. The City of Mission Viejo thus recommends that applicable sections of the 2016 RTP/SCS and EIR add language that clarifies that the land use pattern of the Intensified Land Use Alternative was built upon a policy growth forecast that does not take into consideration existing development agreements, entitlements, and construction.

3) Priority and Funding Preference for Transportation Projects:
To address the significant impacts of increasing Vehicle Miles Traveled (VMT) and traffic congestion, the draft Program EIR for SCAG's 2016-2040 RTP/SCS proposes project-level mitigation measures that include language allowing for:

a) Giving priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita [Mitigation Measure MM-TRA-1(b)]; and,
b) Giving funding preference to improvements in public transit over other new infrastructure for private automobile traffic [Mitigation Measure MM-TRA-2(b)].

The City of Mission Viejo recommends that these project selection and funding priority provisions in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b) be deleted, unless the language in these provisions is modified to recognize that they would only be considered if they are found by the Lead Agency to be appropriate and consistent with local transportation priorities.

The language in these provisions implies a targeted emphasis towards the prioritization, selection and funding of transportation projects that, to our knowledge, has not been discussed nor endorsed by SCAG's Transportation Committee or Regional Council, as a regional strategy for the implementation of the 2016 RTP/SCS. While the 2016 RTP/SCS recognizes that safety, adequate maintenance and efficiency of operations should be the highest RTP/SCS priorities for any incremental funding in the region (page 61), the City of Mission Viejo does not recall any SCAG policy discussion or actions that would elevate project selection and funding priority to transportation projects that reduce VMT, or to public transit infrastructure over highway infrastructure.

Moreover, the language in these provisions fails to recognize that several counties in the SCAG region implement transportation projects and programs that are mandated through voter-approved sales tax measures (i.e., Renewed Measure M2 in Orange County), and that are identified through long-range transportation plans.

Finally, the language in these provisions could compromise the delivery of committed transportation projects, by creating opportunities for potential delay and legal challenge. To avoid these kinds of potential, unintended consequences, the City of Mission Viejo recommends that SCAG either delete these provisions in language in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b), or modify these provisions to make it clear that they are only for consideration when determined to be appropriate by the Lead Agency.

The City of Mission Viejo appreciates SCAG's work on the 2016 RTP/SCS and associated Program EIR, and welcomes the adoption of revised, final documents that incorporate the considerations, comments and recommendations as noted in this transmittal and in the January 2016 transmittals submitted by OCCOG and

OCTA. Should you have any questions, please do not hesitate to contact Community Development Director Elaine Lister at 949/470-3029 or by email at elister@cityofmissionviejo.org.

Respectfully submitted by,

DENNIS WILBERG
City Manager

c: City of Mission Viejo City Council
Keith Rattay, Assistant City Manager
William Curley, City Attorney
Elaine Lister, Community Development Director
Mark Chagnon, Public Works Director
Larry Longenecker, Planning Manager
Rich Schlesinger, City Engineer
Joe Ames, Assistant City Engineer
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Courtney Aguirre, SCAG (RTPSCS@scag.ca.gov)

MONTCLAIR

BUILD THE GOLD LINE TO MONTCLAIR

January 25, 2016

Ms. Courtney Aguirre
Southern California Association of Governments
818 W. 7th Street, 12th Floor
Los Angeles, CA 90017

SUBJECT: Draft 2016 RTP/SCS Comments

Dear Ms. Aguirre:

We are pleased that Southern California Association of Governments (SCAG) is including the Foothill Gold Line from Glendora to Montclair in the Draft Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) under the financially constrained plan. However, the RTP/SCS forecasts completion of the project in 2040, almost two decades beyond the current plan while also understating the project costs.

The Foothill Gold Line is a critically needed link that will connect a dozen universities, the LA County Fairplex, and LA County with San Bernardino and Riverside Counties at the Montclair Transcenter. The Foothill Gold Line will alleviate traffic on one of the most heavily congested corridors which is expected to assume the majority of the population and employment growth in the coming decades. The Glendora to Montclair segment is estimated to achieve 18,300 daily boardings by reducing Vehicle Miles Traveled (VMT) by 111,000 and reduce emission burden levels resulting in beneficial effect on CO, TOG, $No_{x,}$ PM10, and PM2.5 levels.

The current forecast in the Draft RTP/SCS of completing the Foothill Gold Line in 2040 is too late and should be amended to complete this vitally needed project as soon as possible. No other rail project in Los Angeles County is as ready as this one. The project will be ready in 2017 to break ground and SCAG should find ways to include innovative sources to fully fund the $1,216 million project sooner as they are doing with other unfunded rail projects.

Sincerely

Paul M. Eaton

Paul M. Eaton
Mayor
City of Montclair

CITY OF MONTEREY PARK

320 West Newmark Avenue • Monterey Park • California 91754-2896
www.MontereyPark.ca.gov

January 7, 2016

Mr. Hasan Ikhrata
Executive Director
Southern California Association of Governments
818 West 7th Street, 12 Floor
Los Angeles, CA 90017

Subject: **DRAFT 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy**

Dear Mr. Ikhrata:

I am writing on behalf of the City of Monterey Park to express our strong support for the continued inclusion of the SR-710 Freeway Tunnel Project in the Southern California Association of Governments (SCAG) 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). A freeway tunnel directly comports with several SCAG goals including reduction of time on the road, enhancement of economic opportunities and air quality improvements.

The freeway tunnel has strong local support and is consistent with voter mandate and local plans. A recent poll shows 2-1 support for a tunnel, proving that a vocal minority is not representative of the broader community. Almost two-thirds (65.5%) of voters in the five cities that currently oppose the freeway tunnel also supported Measure R, which explicitly contained the freeway tunnel project. The tunnel, as you know, also was adopted in Metro's Long Range Transportation Plan.

Most importantly, the freeway tunnel would significantly improve air quality and reduce cancer risk for the majority of the study area. Unfortunately, lower income, minority communities near the freeway are more impacted by poor air quality than those in more affluent areas to the north. The SR-710 North Study Draft Environmental Impact Report shows that cities south of the freeway have existing Cancer Risk levels 20% to over 60% higher than their neighbors to the north. This disparity is clearly an unacceptable environmental injustice for the Los Angeles Region.

A freeway tunnel also maximizes mobility and flow of traffic throughout the Los Angeles Region. Traffic must be moved from local streets back onto freeways where it was originally designed to go. A freeway tunnel solves this problem and reduces cut-through traffic on neighborhood streets by 43% or 57,600 vehicles per day.

It is critical that SCAG maintain support for the tunnel and sustain inclusion of the project in the 2016-2040 RTP/SCS. Completion of the freeway is vital to the health and safety of thousands of Los Angeles area residents. We are confident that SCAG, along with the City of Monterey Park, will remain steadfast in support for the tunnel as the best alternative for completion of the 710 freeway.

Sincerely,

Peter Chan

PETER CHAN
Mayor

CITY OF RANCHO MIRAGE
©

January 21, 2016

Via Email

Draft 2016 RTP/SCS Comments
Attn: Courtney Aguirre
Southern California Association of Governments
818 W. 7th Street, 12th Floor
Los Angeles, CA 90017

Re: Draft 2016 RTP/SCS Comments

Dear Ms. Aguirre:

Thank you for providing us with the opportunity to review and comment on the Draft 2016 RTP-SCS. It is quite clear that much time, effort and thought went into the development of said document, and we recognize the challenges that you face in trying to address current and future transportation needs within such a vast and diverse region. The purpose of this letter is to reinforce some of the ideologies which are presented in the Plan (Draft 2016 RTP-SCS), and to promote a more targeted approach to transportation planning in the Coachella Valley.

It is stated multiple times that this Plan seeks to "place a priority on investing in the transportation system that we already have," and "that deferring maintenance of infrastructure leads to costlier repairs in the future." We here at the City of Rancho Mirage also embrace this philosophy. There are many miles of dilapidated streets and sidewalks throughout the Coachella Valley that are in desperate need of repair. A targeted local approach to transportation investment would be much more beneficial to the Coachella Valley than a new large scale regional project (CV-Link), which would only add to the collection of infrastructure that requires ongoing maintenance. Furthermore, by dedicating such large investments to the CV-Link project, in lieu of addressing current deficiencies, existing disparities throughout our region will be intensified, leading to continued deterioration of the system and costlier future repairs. An incremental approach to the repair and maintenance of the current transportation network will do more to strengthen our region than would a large scale project which will be used primarily for recreational purposes.

Thank you again for the opportunity to comment on the Draft 2016 RTP-SCS; we appreciate the chance to be included in the region's visioning and to share our concerns.

Sincerely,

Jeremy Glaim
Planner

CC: Randal K. Bynder, City Manager
Isaiah Hagerman, Director of Administrative Services

City of San Clemente
Community Development

Cecilia Gallardo-Daly, Community Development Director
Phone: (949) 361-8200; Fax: (949) 361-8309
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February 1, 2016

Mr. Hasan Ikhrata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017-3435

Subject: **Comments on the Draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy and Program Environmental Impact Report**

Dear Mr. Ikhrata:

The City of San Clemente appreciates the opportunity to review and provide comments on the Draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS) and Draft Program Environmental Impact Report (PEIR). The City of San Clemente commends the Southern California Association of Governments (SCAG) staff for the tremendous amount of work and effort in preparing the documents. The following general comments and recommendations are offered by the City of San Clemente on the Draft 2016 RTP/SCS, associated appendices, and the Draft PEIR. In support of this letter, please find attached more specific detailed comments from the City of San Clemente that are consistent with the comments provided by the Orange County Council of Governments (OCCOG). The City of San Clemente requests that this letter and all of its attachments be included in the public record as our collective comments on the Draft 2016 RTP/SCS, PEIR, all associated appendices and documents, and online inventory of maps.

<u>RTP/SCS</u>

1. **Concurrence with OCTA/OCCOG comments**

   The City of San Clemente concurs with the comments SCAG will receive from the Orange County Council of Governments (OCCOG) and the Orange County Transportation Authority (OCTA). The City requests that SCAG respond to all of the comments detailed in the OCCOG and OCTA letters and to act upon any changes advocated by OCCOG, of which the City is a member agency.

2. **Growth Forecasts**

Overall, the City of San Clemente supports the 2016-2040 RTP/SCS growth forecast and the adoption of the growth forecast at a geographic level no lower than the jurisdictional level. The City of San Clemente supports The Plan since the growth forecast accurately reflects Orange County's Projections dataset. The Plan growth forecast reflects entitlements, development agreements, and projects recently completed or under construction in Orange County. The City of San Clemente appreciates the ongoing coordination between SCAG and the Center for Demographic Research (CDR) at California State University Fullerton on behalf of all Orange County jurisdictions. The Orange County Projections have been used by the Orange County Transportation Authority (OCTA) in the development of its Orange County Long-Range Transportation Plan demonstrating that Orange County has integrated transportation and land use planning for decades.

OCCOG representatives on the Regional Council and SCAG Policy Committees repeatedly requested that the growth forecasts in the 2016 RTP/SCS and all PEIR alternatives be based on the technically corrected growth forecast submitted to SCAG in August 2015 by the CDR on behalf of all Orange County jurisdictions. Because the draft PEIR's Intensified Land Use Alternative (Alternative 3) does not include the technically corrected growth forecast for Orange County, the City of San Clemente would not support consideration of Alternative 3 as the preferred alternative.

3. **Maintain Unbiased, Objective Tone**

Language throughout the draft 2016 RTP/SCS and the associated appendices has a tendency to be leading and dramatic in its emphasis of certain key issues such as active transportation and public health. While these issues are important, it is recommended that the document utilize a more unbiased, objective tone. For example, the City of San Clemente recommends the removal of "Our Vision" and "Our Overarching Strategy" from the Executive Summary of the document. These two sections are highly speculative and are not necessary to the document. "Our Vision" and "Our Overarching Strategy" go above and beyond the requirements of the RTP. Additional examples of overly emphatic language are outlined in Attachment 1.

General Comments

4. **"Can and Should"**

   As indicated in the PEIR, state law provides that it is appropriate to indicate in mitigation measures that they "can and should" be implemented where the authority to implement the measures rest with agencies other than SCAG. The language conveys to local agencies an affirmative obligation to address each mitigation measure, irrespective of whether such agencies deem the measures applicable to a particular project or duplicative of their own or other governmental agencies' regulatory measures. The City of San Clemente recognizes SCAG's use of the words "can and should" are derived from California Environmental Quality Act (CEQA), at Public Resources Code sections 21081 and 2155.2(b)(5)(B)(ii) and CEQA Guidelines, including section 15091(a)(2). Nevertheless, given the express limitation of SB 375 upon respective local agencies' land use authority, the City of San Clemente deems inappropriate any language seemingly imposing affirmative obligations contrary to SB 375 inappropriate. As such, the use of the language "can and should" for mitigation measures addressed to local agencies is overreaching.

   "Can and Should" Recommendations:

   Change language in all project level mitigation measures to read "~~can and~~ should <u>consider where applicable and feasible</u>." This change will clarify that the project level mitigation measures are a menu of options.

5. **500 foot "Buffer"**

   The Draft RTP assumes that almost no new growth will occur within 500 feet of a freeway or busy transportation corridor. The Draft RTP states that a "buffer" is consistent with the California Air Resources Board's 2005 advisory guidance that housing be discouraged within 500 feet of high volume roadways such as freeways. It is important to note that CARB's guidance is not a prohibition of development near high-volume roadways; nevertheless, SCAG's "buffer" strategy eradicates growth in these areas that are otherwise rich in connections to jobs, retail and housing accessible by many transportation modes. Furthermore, the proposed "buffer" does not reflect the availability of mitigation measures to address near-roadway emissions that remain despite a dramatic reduction of diesel emissions in the last decade. At best, this strategy is a short-term response and problematic because it prevents the kind of density and proximity between land uses that actually reduce trips and associated VMT. As vehicle engines and fuels become cleaner, the "buffer" strategy will become obsolete yet will leave behind a legacy of inefficient land use patterns. Moreover, throughout the SCAG Region, the prevailing existing land use patterns include residential and sensitive receptor uses within

500 feet of a major transportation corridor. In many cases, these areas demonstrate compact development form and serve as affordable housing. Removing this massive portion of land from availability for use is premature and counter to the overarching principles of SB375 to locate housing near job centers and previously urbanized areas.

There needs to be consistency throughout all the documents regarding the 500 foot "buffer":

- The word "buffer" should not be used.
- Clarify the amount of distance (the documents have various ranges from 500 feet to 1,000 feet)
- Clarification on where distance is measured from (e.g. centerline, edge of roadway, edge of right of way)
- Types of transportation corridors being identified (e.g. freeways, high quality transit corridors, high volume corridors, rail etc.)
- Clarify that the emphasis should be on mitigation, not on discouraging development.
    - Resolve the conflict with discouraging development within 500 feet of transportation corridors and regional goals for emission reductions. With reductions in emissions and fleet changes over time, it will be unnecessary and counterproductive to use this mitigation approach.

6. **Remain Neutral on Technology**

Throughout the documents, specific examples of technology are identified. It should be noted that these are only examples and that future technologies should not be ignored or excluded from meeting the goals of the RTP/SCS. This will allow the document, including mitigation measures, to be more flexible.

7. **Roundabouts**

a. Under plan sections of LIVABLE CORRIDORS, NEIGHBORHOOD MOBILITY AREAS, LOOKING AHEAD, and "Encouraging Active Transportation for Short Trips", include roundabouts and Intersection Control Evaluations similar to Caltrans Directive 13-02. Under Livable Corridors and neighborhood mobility areas- Change graphics to replace traffic signal with a modern day roundabout. Refer to the following resources:

- Alternative Intersections/Interchanges: Informational Report (AIIR)
  http://www.fhwa.dot.gov/publications/research/safety/09060/

- FHWA Roundabout Website
  (http://safety.fhwa.dot.gov/intersection/roundabouts/)

- Roundabouts: An Informational Guide, Second Edition (NCHRP Report 672) *(.pdf file)*
  http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf

b. To address all the goals mentioned in the plan, the plan should include a strategy to replace traffic signals with modern day roundabouts where feasible. This one action would do more to further the principal goals mentioned in this Plan more than any other strategy mentioned.

c. Under MOBILITY INNOVATIONS – include in the white paper the analysis and benefits of replacing traffic signals and all way stops with roundabouts.

d. Include Roundabout Intersection Evaluation projects in the project list throughout SCAGs communities.

e. Evaluate the potential environmental benefits of implementing roundabouts.

PEIR

8. **PEIR Mitigation Measures**

a. Please state that in the event a state law referenced in the mitigation measure is updated or changed, the most current state law requirements prevails.

b. For all "Project-level Mitigation Measures", replace the word "require" with "encourage" or "it is recommended". Examples include: MM-AES-3(b), MM-Air-2(b), MM-Air-4(b), MM-BIO-1(b), MM-BIO-2(b), MM-BIO-3(b), MM-BIO-4(b), MM-BIO-5(b), MM-GHG-3(a)(11), MM-TRA-1(b), MM-TRA-2(b), MM-USS-6(b)
A redline version identifying the location of the exact language is provided in the matrix of comments in Attachment 1.

c. Priority and Funding Preference for Transportation Projects:
To address the significant impacts of increasing Vehicle Miles Traveled (VMT) and traffic congestion, the draft Program EIR for SCAG's 2016 - 2040 RTP/SCS proposes project-level mitigation measures that include language allowing for:

1) Giving priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita [Mitigation Measure MM-TRA-1(b)]; and,

2) Giving funding preference to improvements in public transit over other new infrastructure for private automobile traffic [Mitigation Measure MM-TRA-2(b)].

Please delete these provisions in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b), unless the language in these provisions is modified to recognize that they would only be considered if they are found by the Lead Agency to be appropriate and consistent with local transportation priorities.

The language in these provisions implies a specific emphasis towards policy consideration to the prioritization, selection and funding of transportation projects that, to our knowledge, has not been discussed nor endorsed by SCAG's Transportation Committee, or Regional Council, as a regional strategy for the implementation of the 2016 RTP/SCS.

Moreover, the language in these provisions fails to recognize that several counties in the SCAG region implement transportation projects and programs that are mandated through voter-approved sales tax measures (i.e., Renewed Measure M2 in Orange County), and that are identified through long-range transportation plans.

Finally, the language in these provisions could compromise the delivery of committed transportation projects, by creating opportunities for potential delay and legal challenge. To avoid these kinds of potential, unintended consequences, we request that SCAG either delete these provisions, or modify these provisions to make it abundantly clear that they are only for consideration when determined to be appropriate by the Lead Agency.

9. **Fees and Taxes**

Several mitigation measures indicate that local jurisdictions or other entities should implement new fees or propose taxes to pay for a variety of programs or for acquisition of land for preservation. Increases to fees or taxes are issues that could require voter approval, and therefore it should not be assumed that they will be approved.

Fees and Taxes Recommendations:

a. Reword measures to indicate that a new or increased fee, new tax, or other increase is only an option as a way to implement the mitigation.
b. Clarify whether it was assumed that these additional fees were considered feasible and if the new fees that are suggested were considered in the financial plan or economic analysis of the RTP.

10. **Duplicative/Existing Regulations**

It is noted that many of the mitigation measures are duplicative of existing regulation or processes (e.g. CEQA review requirements). Under CEQA, it is intended that measures be identified that will mitigate impacts of the project. Existing regulations are already assumed to be abided by in the evaluation of the impact, and the significance of the impact is after all existing regulation is applied. Therefore, mitigation measures should address those actions that need to be undertaken in addition to existing regulation in order to mitigate the impact. Therefore, mitigation measures that simply restate existing regulation are not valid mitigation for purposes of CEQA. Further, it is possible for regulations to change over time. Because of this, restatement of the regulation in the mitigation measures could result in future conflict between the stated mitigation and regulation. It has become common practice to state that existing regulation will be implemented. When this is done, it is common practice when compliance is used as a mitigation measure to simply state that the responsible entity will simply comply with the regulation. If mitigation measures that restate existing regulation are not removed, then it is requested that the wording of the measures be restated to simply read that compliance with all applicable laws and regulations will be undertaken. Language that could be used is: "Local jurisdictions, agencies, and project sponsors shall comply, as applicable, with existing federal, state, and local laws and regulations." Similar language is included in some mitigation measures.

Examples of existing regulations included as mitigation measures are found within the Hydrology section of the draft PEIR. For example, Section 3.10.6, Mitigation Measures (page 3.10-56): Parts of this section list mitigation measures that are already being required by municipal storm water programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that cities and County employ for requiring a WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-1(b).

Additionally, there are specific mitigation measures included in the Hydrology section that may be in conflict with Storm Water Permits issued by Regional Water Quality Control Boards. In the SCAG region, there are five water quality control boards each with its own Municipal NPDES Storm Water Permit. The regulations and requirements contained in these permits vary from each other. By listing specific measures in the PEIR that are not included in a project's applicable Municipal NPDES Storm Water Permit, the PEIR creates conflicting compliance requirements. To eliminate potential conflict with existing regulations, the mitigation measures regarding specific BMPs should be removed and replaced with a single requirement that each project must comply with its applicable Municipal NPDES Storm Water Permit.

The City of San Clemente appreciates your consideration of all the comments provided in this letter and its attachments and looks forward to your responses. It is a shared goal to have a Regional Transportation Plan and Sustainable Communities Strategy adopted on April 7, 2016 that represents the best in regional planning developed collaboratively with local jurisdictions and stakeholders in a manner that is credible and defensible on all levels. If you have any questions, please do not hesitate to contact me.

Sincerely,

Cecilia Gallardo-Daly
Community Development Director

Enclosures
Attachment 1: Detailed Comments on the RTP/SCS, PEIR, and related Appendices

cc: City Council
James Makshanoff, City Manager (email)
Eric Sund, Assistant City Manager (email)
Bill Cameron, Director of Public Works (email)
Jim Pechous, City Planner (email)
Christopher Wright, Associate Planner (email)
Marnie Primmer, Interim Executive Director OCCOG (email)
Naresh Amatya, Acting Director, Transportation Planning, SCAG (email)
Huasha Liu, Director, Land Use & Environmental Planning, SCAG (email)
Linjin Sun, Senior Regional Planner, SCAG (email)
Courtney Aguirre, SCAG (email)

Detailed comments on RTP/SCS, PEIR, & related appendices

2016 RTP/SCS

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	p.2	Delete Our Vision & Our Overarching Strategy strategies. These sections are highly speculative and not necessary for the rest of the document.
2	Clarification	p.3, column 2, bullet 5	"Millions of people are in poor health… Millions of more people live with chronic diseases, such as asthma, every day." Define 'poor health' Cite numbers or share of population for region instead of saying "millions". Provide reference to what chronic diseases include.
3	Clarification	P. 4, column 2, paragraph 2	"Among the milestones: a one-year demonstration of the tolled Express Lanes in Los Angeles County along Interstate 10 and Interstate 110 was made permanent in 2014…"
4	Clarification	p. 7, column 2, paragraph 1	"In many instances, the additional ~~these~~ chargers will create the opportunity to increase ~~may double~~ the electric range of PHEVs, reducing vehicle miles traveled that produce tail-pipe emissions."
5	Clarification	p. 13, column 2, paragraph 2	"Since 2009, every MPO in California has been required to develop a Sustainable Communities Strategy…Once implemented along with the rest of the Plan, it will improve the overall quality of life for all residents of the region."
6	Clarification	p. 13, column 2, paragraph 3	"But these advances in mobility also have the potential to help Baby Boomers, and the generations that follow them, maintain their independence as they age."
7	Clarification	p. 14, column 1, paragraph 2	"In Southern California, striving for sustainability includes ~~will require~~ achieving state-mandated targets for reducing greenhouse gas emissions from vehicles and federal air quality conformity requirements, and also adapting wisely to a changing environment and climate."
8	Clarification	p. 14, column 2, paragraph 5	"It is particularly important that the Plan consider and minimize the negative impacts ~~consequences~~ of transportation projects, especially on low-income and minority communities ~~and minimize negative impacts~~."

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
9	Clarification	p. 16, column 2	"2. Collaborating with Member Agencies, Jurisdictions and Stakeholders. Implementing the Plan will require SCAG to continue working closely with its all jurisdictions ~~member agencies~~…" "The agency will also have to work with key stakeholders to ensure the Plan benefits the economy and promotes ~~ensures~~ social equity. To ensure that the region makes progress on its goals, SCAG will monitor its own progress toward achieving its targets and will share this information with its ~~relevant~~ partners and the public."
10	Clarification	p. 20, column 1, paragraph 3	"However, of the remaining developable land, only a small portion of it can be developed as transit-ready infill ~~sustainably~~ – meaning it can be reached via planned transit service and that it can readily access existing infrastructure (water resources, sewer facilities, etc.). According to ~~SCAG~~ land use data collected by SCAG, only two percent of the total developable land in the region is located in High Quality Transit Areas (HQTAs). ~~A more compact land development strategy is needed, which will be discussed in Chapter 5.~~"
11	Clarification	p. 20, column 1, paragraph 4	"~~SCAG supports the fact that local jurisdictions conduct much of the planning for land use in our region.~~ ~~However, a~~As the agency prepared the 2016 RTP/SCS, it needed to organize the many different land use types and classifications ~~of land uses~~ in…"
12	Clarification	p. 20, column 1, paragraph 5	"To accurately represent land uses throughout the region, SCAG aggregated ~~reviewed~~ information from jurisdictions and simplified the types and classifications of land use into a consolidated set of land use types. The agency then converted these consolidated land uses into ~~identified~~ 35 "Place Types"… the Urban Footprint Scenario ~~Sustainability~~ Planning Model (SPM), to demonstrate ~~which guided and evaluated~~ urban development in the Plan in terms of form, scale and function in the built environment."
13	Clarification	p. 20, column 2, paragraph 2	"SCAG then classified ~~sorted~~ the 35 Place Types into three Land Development Categories. The agency used these categories to: describe the general conditions that exist and/or are likely to exist within a specific area;~~. SCAG did not intend to have them represent detailed policies for land use, development or growth. Rather, they~~ and, reflect the varied conditions of buildings and roadways, transportation options, and the mix of housing and employment throughout the region."

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	p. 21, column 1, paragraph 3	"~~Conversely, s~~ Some areas, especially near the edge of existing urbanized areas, do not have plans for conservation and may be slated for development ~~are susceptible to development pressure~~. … – meaning these ~~are~~ areas ~~that~~ are home to a high number of species and serve as highly functional habitats." "Some key habitat types are underrepresented within the 35 percent of the region already under protection." Clarify why does there need to be an equal share of types of protected land? If not, delete sentence.
15	Clarification	p. 22, column 1, paragraph 1	"However, although these housing units are planned and zoned for, historical data shows that less than ten percent of the needed affordable housing has been built. In contrast, housing construction measured by building permits issued meets nearly 90 percent of projected market rate housing needs." What is the data source that reports on building finals by income category? What is the time frame for the "less than ten percent"? What is the time period for the data on the market rate housing?
16	Clarification	p. 22, column 2, paragraph 1	"… of our region's jurisdictions have certified ~~adopted~~ housing elements."
17	Define	p. 22, column 2, paragraph 3	Define "high quality" housing
18	Define	p. 23, Figure	Define "demand response" in "Passenger Miles by Mode" figure
19	Clarification	p. 25, column 2, paragraph 2	"This network includes fixed-route local bus lines, community circulators, express and rapid buses, Bus Rapid Transit (BRT), ~~demand response~~paratransit,[3] light rail transit, heavy rail transit (subway) and commuter rail.[4]"
20	Clarification	p. 26, column 1, paragraph 2	"Transit users directly ~~typically~~ pay about 25 percent of the operating and maintenance cost of their travel, with the remaining 75 percent paid for by state and local public subsidies. Most capital expenditures are also funded through various taxes and ~~with~~ public subsidies, including a larger share of federal grants."

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	p. 28, column 1, paragraph 2	"The regional bike network is expanding ~~evolving~~ but remains fragmented. Nearly 500 additional miles of bikeways were built since SCAG's 2012 RTP/SCS, but only 3,919 miles of bikeways exist regionwide, of which 2,888 miles are bike paths/ lanes (see EXHIBIT 2.3). This is compared with more than 70,000 roadway lane miles. ~~One way to quantify bikeway quality and density is to calculate a ratio of bike path to lane miles. SCAG's ratio of bike path/lane miles ratio is 0.039. To put this in perspective, Portland, Oregon and San Francisco have bike path/lane ratios to lane miles at 0.054 and 0.078, which are 38 percent and 100 percent higher than the SCAG region, respectively. Our region's lack of consistent infrastructure discourages all but the most fearless people to bike.~~" Comment: There is typically only one bike lane in each direction whereas there could be multiple traffic lanes in each direction. It is not appropriate to compare lane miles to bike lane miles. Comparison, if any, should be to centerline miles. Comparison of bike path/lane miles ratio for SCAG region to individual cities is not appropriate.
22	Clarification	p. 28, column 1, paragraph 2	"Most walk trips (83 percent) are less than one half mile; walkers are less likely to travel ~~often discouraged from~~ ~~traveling~~ farther. Routes to bus stops and stations are often…"
23	Delete	p. 33, column 1, paragraph 2	"A significant amount of travel in the region is still by people who choose to drive alone (42 percent of all trips and nearly 77 percent of work trips). ~~So, the challenge of getting individuals to seek more environmentally friendly alternatives of travel remains.~~"
24	Clarification	p. 54, column 2, paragraph 4	"~~Certainly, t~~The overall quality of life is expected to ~~will~~ increase for many people."
25	Clarification	p. 55, column 1, paragraph 3	"Chronic diseases including heart disease, stroke, cancer, chronic lower respiratory disease and diabetes are responsible for 72 percent of all deaths in our region. ~~Millions of more people live with chronic diseases every day.~~" Cite number and source or delete sentence.
26	Clarification	p. 56, column 1, paragraph 1	"California is experiencing o~~O~~ngoing drought conditions, water shortages due to less rainfall as well as declining snowpack in our mountains, and an agriculture industry in crisis ~~have become hard realities in recent years~~."
27	Clarification	p. 61, column 1, paragraph 2	Add statement that says "These preliminary scenarios are not the ones modeled in the PEIR."

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
28	Clarification	p. 64, column 1, paragraph 1	Clarification should be made that attendance was self-selected as was the survey participation. Attendees were strongly encouraged by SCAG staff to fill out a survey. A more detailed description should be included that explains that these results are not scientific.
29	Clarification	p. 64, column 2, paragraph 2	"…was also a principal concern, as was access to healthy food." What percentage of respondents elevates an item to a 'principle concern'?
30	Clarification	p. 64, column 2, paragraph 4	"Collectively, the survey responses offered an invaluable guide to help finalize the Plan's investments, strategies and priorities. They reflect how regional stakeholders want us to address priority areas such as transit and roadway investments, system management, active transportation, land use and public health." Did the survey responses change the Plan? Clarify if a higher priority in making changes was afforded to survey respondents' feedback over jurisdictional and CTC input?
31	Clarification	p. 65, column 1, paragraph 4	"~~Jurisdictions were asked to provide input on the growth scenario, including information on specific planned development projects with entitlements, other planned projects, or recently completed developments.~~" Comment: During the local input process, SCAG requested feedback on the distribution of new households and employment. SCAG did not request information from jurisdictions on specific planned development projects with entitlements, other planned projects, and recently completed developments. During review of the draft policy growth forecast (PGF) in summer 2015, technical errors throughout the draft PGF were identified. These "technical errors" in the dataset were that entitlements, development agreements, and projects currently under construction or recently completed were not properly reflected. It was then that SCAG stated that jurisdictions could provide the information if jurisdictions wanted corrections made to the PGF.

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
32	Clarification	p. 65, column 2, bottom note	"*With the exception of the 6 percent of TAZs that have average density below the density range of local general plans." Please clarify the footnote. Did SCAG lower the growth or is General Plan buildout expected after 2040?
33	Clarification	p. 70, column 1, paragraph 1	"In addition, local jurisdictions are encouraged to ~~should~~ pursue the production of permanent affordable housing through deed restrictions or development by non-profit developers, which will ensure that some units will remain affordable to lower-income households."
34	Clarification	p. 70, Table 5.1	Add note to table "Adopted in 2013"
35	Define	p. 73, column 2, paragraph 4	Define "riparian"
36	Clarification	p. 76, paragraph 1	How many of these trips are alone vs. with others? Are these linked trips/trip segments?
37	Clarification	p. 76, paragraph 3	The narrative implies that Neighborhood Mobility Areas (NMAs) are needed for Neighborhood Electric Vehicles (NEVs). If this is not true, reword section to allow for flexibility that one is not tied to another exclusively.
38	Clarification	p. 77	Figure needs title
39	Clarification	p. 79, Figure 5.2	Clarify if the preservation and operations expenditures apply to the SCAG region or California State.
40	Clarification	p. 83, column 2, paragraph 5	"Bus lanes are even more effective at increasing speeds, however in our region there is a dearth of such lanes. ~~Transit agencies should heavily lobby~~ SCAG encourages transit agencies and local jurisdictions ~~in which they operate~~ to implement them, where appropriate~~at least for peak-period operation~~."
41	Clarification	p. 88, column 1, paragraph 4	"The ~~2016~~ Active Transportation portion of the 2016 Plan updates the 2012 ~~Active Transportation~~ Plan…"
42	Clarification	p. 89, column 2, paragraph 2	"SCAG has identified ~~developed~~ 12 regionally significant bikeways that connect the region."
43	Clarification	p. 92, column 1, paragraph 2	"The launch date coincided with the end of daylight savings time ~~decline in daylight hours~~, a period when bicycle and pedestrian collisions peak during the year."
44	Define	p. 93, column 1, paragraph 4	Define "no-maintenance exercise spots"
45	Clarification	p. 103, column 1, paragraph 3	"…figure "2040 Airport Demand Forecasts" on the previous page…" Properly label figure and page reference.

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
46	Clarification	p. 105, column 1, paragraph 1	“In recent years, airport operators, CTCs and SCAG have all undertaken their own initiatives to improve ground access at the region’s aviation facilities.” Clarify what initiatives SCAG has undertaken.
47	Clarification	p. 111, column 1, paragraph 2	“Building on its strong commitment to the environment as demonstrated in the 2012 RTP/SCS, SCAG’s mitigation program is intended to function as a resource for lead agencies to consider in identifying mitigation measures to reduce impacts anticipated to result from future <u>transportation</u> projects as deemed applicable and feasible by such agencies.”
48	Clarification	p.111-119 & PEIR	Update language on the mitigation measures to be consistent with any language changes to the PEIR document.

ACTIVE TRANSPORTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	all	Needs to include statement saying that pedestrians and bikes are also responsible (e.g. distracted walking by cell phones; bikers with headphones) and isn’t always vehicles as cause Everyone needs to be educated and follow the rules and enforcement needs to happen for all modes
2	General Comment	all	Acknowledge the improvement over time of AT usage and the lowering of accident and death rates
3	Clarification	p. 5	“Class I Bikeways …A Class I Bikeway provides a completely separated <u>right-of-</u>way designated for the exclusive use of bicycles and/or pedestrians with cross flows by motorists minimized. Some of the region’s rivers include Class 1 Bikeways. Increasing the number of bikeways ~~in~~ <u>along</u> rivers<u>, utility corridors, and flood control channels</u> may provide additional opportunities for “interested but concerned” cyclists.”
4	Clarification	p.6, column 1	“INTERSECTION TREATMENTS …In the SCAG region, nearly 44 percent of all pedestrian injuries are at intersections.” Define how far away from the intersection an accident may occur to be included in the count of pedestrian injuries at intersections

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
5	Clarification	p.6, column 1	"COMPLETE STREETS In recognition of the need to accommodate various types and needs of roadway users, the State of California adopted the Complete Streets Act of 2008 (AB 1358) requiring cities and counties to incorporate the concept of Complete Streets to any ~~general plan's substantive~~ update to their General Plan's circulation element."
6	Clarification	p.8, column 1	"COLLISIONS AND FATALITIES While the numbers of bicyclists and pedestrians are increasing, so are injuries and fatalities, although not as fast as the growth in active transportation. In California, 64,127 pedestrians were injured and 3,219 were killed between 2008 and 2012. In 2012 alone, ~~702 pedestrians were killed and~~ 13,280 pedestrians were injured and 702 pedestrians were killed."
7	Clarification	p. 17, Table 5	Create separate tables for columns 1 to 3 and columns 3 to 10.
8	Define	p. 24, column 1, paragraph 1	"2012 RTP/SCS PROGRESS The ~~2016~~ Active Transportation portion of the Plan …The Plan examined access to transit, noting that 95 percent of SCAG residents would be within walking (0.5 mile) or biking (2 mile) distance from a transit station." Define what constitutes a 'transit station'
9	Clarification	P. 25, second column, top bullet (last under #4)	"Success of this program depends on cities and counties conducting these counts and providing the data to SCAG." Identify funding source and acknowledge that this is voluntary effort and may not be a priority, especially without funding
10	Add bullet	P. 25, second column, Bullet 6	Add 4th bullet under #6: "OCCOG is working on a comprehensive Complete Streets design manual for the entire county which will be completed in 2016."
11	Correction	P.26, Table 9	Change language for Orange County: ~~Not yet Planned.~~ In Process
12	Clarification	p. 27, column 1, and any other references	Clarify that the '2016 Action Transportation Plan' is not a standalone plan, but is a portion within the RTP.
13	Clarification	P.66-67, Tables 16 & 17	Add note to Table: "These draft scenarios are not the alternatives that were evaluated in the PEIR."

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	P. 71	Delete “Strategic Plan Beyond 2040” section. The inclusion of this section is not consistent with other appendices. It creates confusion as to what the RTP’s Strategic Plan is.

DEMOGRAPHICS/GROWTH FORECAST APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Label Y axis on all figures
2	Clarification	P. 2, column 1, paragraph 3	Add text: “The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data shall not be required for purposes of qualifying for future grant funding or other incentives or for determining a proposed project’s consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA).”

GOODS MOVEMENT

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	p. 4, Exhibit 2	Exhibit is labeled warehouse & distribution centers but shows manufacturing firms total employment. Correct.

PERFORMANCE MEASURES APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.8-10, Table 4	Label all Performance Measures that were new in 2016 Plan
2	Clarification	P.11	Add definition of HQTA to map.
3	Clarification	p.20	LSPT was used for 2012 RTP. Add information on the SPM.
4	Clarification	p. 31, Table 12	Add model sources to bottom of table.

PUBLIC HEALTH APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Final document should contain hyperlinks to other documents.
2	General Comment	All	Spell out Acronyms in Tables/Figures Titles e.g. CHIS
3	Clarification	p.1, column 1	"~~Public health is increasingly an area of emphasis for~~ Metropolitan Planning Organizations (MPOs) and Departments of Transportation (DOTs) across the country, <u>have an opportunity to impact</u> ~~due to~~ the prevalence of chronic diseases such as obesity, hypertension, asthma and heart disease <u>through transportation planning which promotes increased physical activity</u>."
4	Clarification	p.2, column 1	Introduction- first paragraph sentence beginning with "Public health outcomes are the product of Social Determinants of Health….." consider adding "and other factors.
5	Clarification	p.1, column 2	"Climate Adaptation: Support efforts to ~~prevent~~ <u>mitigate</u> climate change and make the region more resilient to future changes with reductions in VMT and greenhouse gas emissions."
6	Correction	p.2, Figure 1	Arrows should go both ways.
7	Clarification	p.3, column 1, paragraph 2	"Evidence shows that healthier lifestyles and improved air quality can improve outcomes, and built environment factors <u>and related conditions</u> can play a role in supporting healthy behaviors."
8	Clarification	p.3, column 2, paragraph 3	"Access to healthy food environments such as grocery stores, farmers' markets and community gardens ~~decreases~~ <u>can play an important role in</u> food insecurity and obesity."
9	Define	p.7, column 1, first line	Define "weather insurance"
10	Clarification	p.7, column 2, paragraph 2	"… Providing access to <u>education and job training aligned with job opportunities in the region</u> ~~jobs with a living wage~~ is critical to ensuring communities become and stay healthy."
11	Clarification	p.7, column 2, paragraph 3	"…Creating infrastructure <u>policies and community conditions</u> and facilities that encourage active transportation such as biking and walking provides opportunities for residents to increase their daily physical activity."
12	Clarification	p.8, paragraph 3	Consider adding the recommendations for children which has a higher standard of one hour per day. This is valuable as jurisdictions look at health co-benefits of safe routes to school infrastructure changes and related programming.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
13	Clarification	p.9, all figures	Recommend using the more current 2014 data. Also, it might be helpful to look at these metrics on a smaller level of geography and/or by poverty and/or by race/ethnicity. Especially since there are often funding set asides to reach disadvantaged communities, it might be interesting to see what each of these indicators looks like at a more refined level. The need is not equally distributed throughout any jurisdiction.
14	Clarification	p.9	Add table with data for walking.
15	Clarification	p.10, column 2	Consider including funding as both a challenge and an opportunity.
16	Clarification	p.10, column 1, last sentence	"Much of our local arterial system is also in need of pavement improvements, as local roadways in the SCAG region average a score of 69 out of 100 in the Pavement Condition Index (PCI), where a score of 70 or less typically translates to conditions that are ~~inadequate~~ more costly to repair."
17	Clarification	p.10, column 2, paragraph 4	"With more than 18 million people, 191 cities, six counties and hundreds of local and regional agencies, Southern California is ~~one of the most complex regions on earth~~ a diverse region. Within the region, health outcomes vary widely based on many things, such as geography, income and race."
18	Clarification	p. 15, column 2, paragraph 3; & throughout all	"500 foot buffer"- be consistent with usage and description throughout all documents in whether this is adjacent to just freeways or freeways, rail, and high frequency transit corridors.
19	Clarification	p. 16, column 1, paragraph 1	"Region-wide, about ten percent of the land area within HQTAs is also within ~~the~~ 500 feet ~~foot buffer~~ of the freeway. To balance regional policy goals, the Plan accommodates the vast majority of growth within HQTAs but beyond ~~outside of~~ ~~the~~ 500 feet ~~buffer~~ of freeways…"
20	Clarification	p. 17, column 1	"Water Consumption" and "Land Consumption" Specify the time period for the change or difference in numbers. Compare this to 2040 Baseline.
21	Clarification	p. 19, column 2	"Public Health Work Program" Clarify if this work program was approved by the RC or SCAG staff is pursuing these tasks under direction of RC to incorporate more public health into RTP.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
22	Clarification	p. 22-29	Are these all "best practices" or are they local examples of promising practices? Since some of these are in process, are the results are there to show that this particular practice has proven efficacy over another? These may have the potential to be best practices. If the project is based upon a best practice, it is recommended to link to the best practice so other jurisdictional leaders could consider for replication. If it is not already a proven practice, suggest calling it something different such as "local promising practices". Add the Complete Streets Guidelines that are being developed in Orange County (which integrates in best practices.)

SCS BACKGROUND DOCUMENTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.42-43	How do the SPM Place Types nest into the Land Development Categories?
2	General Comment	All maps	"Note: The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data shall not be required ~~should not be used~~ for purposes of qualifying for future grant funding or other incentives~~.~~ ~~The data is controlled to be within the density ranges of local general plans and/or input received from local jurisdictions. the purpose of~~ or for determining a proposed project's consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA) ~~streamlining, lead agencies have the sole discretion in determining a local project's consistency with the 2016 RTP/SCS~~."
3	Clarification	p.6/43	Move the definitions of Urban, Compact Walkable, and Standard Suburban from page 43 to page 6 before the maps
4	Clarification	p. 41, column 1, paragraph 4	"Scenario modeling with UrbanFootprint brings meaningful, comprehensible, and timely results to those local jurisdictions wanting to understand how growth and development choices will impact their community, city, or region in the coming years and decades."

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
5	Correction	p. 41, column 2, paragraph 2	"Since 2012… Developers of UrbanFootprint have also met with regional agencies, such as SCAG, Sacramento Area Council of Governments (SACOG), and San Diego Association of Governments (SANDAG)~~, Orange County Council of Governments (OCCOG)~~."
6	Clarification	p. 50, 51, 54, 56 maps	Clarify in map legends if growth refers to population, housing and/or employment.
7	Correction	p. 56 column 1, last paragraph	"~~The scope of t~~These four scenarios were developed in early 2015 by SCAG and their consultant and shared~~, which were developed in consultation~~ with the CEHD Committee and ~~the~~ SCAG's Technical Working Group (TWG)~~, evolved throughout the first five months of 2015~~."
8	Clarification	p. 56 column 2, paragraph 2	"Conversely, growth focused in urban areas often takes advantage of existing infrastructure and more efficient service to higher concentrations of jobs and housing, but sometimes modernization of utilities needs to be considered and completed to accommodate the additional usage."
9	Clarification	P. 58, column 2, paragraph 4	"Saving water also saves on costs, and the RTP/SCS saves about $1.2 billion over the span of the plan, and saves households in the SCAG region $93 million on annual water bills." Add "Notwithstanding, infrastructure operations and maintenance costs require continued funding; further, these costs could offset ratepayer savings resulting from the implementation of RTP/SCS policies, conservation efforts, or installation and use of efficient appliances."
10	Clarification	P. 83, column 2, paragraph 2	"The SPM includes a suite of tools and analytical engines that help to quickly illustrate alternative plans and policies and to estimate their transportation, environmental, fiscal, and public health ~~and community~~ regional impacts."
11	Clarification	P. 83, column 2, last sentence	"~~SPM will serve as a common platform for communications between SCAG and local jurisdictions in the process of local input and public outreach, providing local planners advanced analytical capabilities.~~"

PEIR

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Any changes to mitigation measure language should be updated in both the Executive Summary and the chapters throughout the PEIR, as well as the RTP/SCS document.
2	General Comment	All	Cite original source data, not other documents, e.g. SCAG's Local Profiles
3	Clarification	ES-14	"MM-AES-1(b): Consistent … the Lead Agency ~~can and~~ should consider mitigation measures…"
4	Clarification	ES-14 & 15	"MM-AES-3(b): Consistent …the Lead Agency ~~can and~~ should consider mitigation measures… •~~Require~~ <u>Encourage</u> development of design guidelines… •~~Require~~ <u>Encourage</u> that sites are kept in a… ""
5	Define	ES-16	Define 'Natural Resource Inventory Database and Conservation Framework & Assessment'
6	Define	ES-16	Define 'Conservation Plan'
7	Define	ES-16	Define 'mitigation banks'
8	Clarification	ES-19	MM-Air-2(b): "•~~Require~~ <u>Encourage</u> contractors to assemble… •As appropriate ~~require~~ <u>encourage</u> that…"
9	Clarification	ES-19	MM-Air-4(b): "~~• Require~~ <u>Encourage</u> clean fuels, and reduce petroleum dependency."
10	Clarification	ES-19	"MM-Air-4(b): Consistent with the provisions of Section 15091 of the State CEQA Guidelines, SCAG has identified mitigation measures that are within the jurisdiction and authority of the air quality management district(s) where proposed 2016 RTP/SCS <u>transportation</u> projects ~~or development projects resulting from the land use patterns in the 2016 RTP/SCS~~ would be located."
11	Clarification	ES-20	MM-BIO 1(b): ~~• Require~~ <u>Encourage</u> project design to avoid occupied habitat, potentially suitable habitat, and designated critical habitat, wherever practicable and feasible."
12	Clarification	ES-22	MM-BIO-2(b): "~~• Require~~ <u>Encourage</u> project design to avoid sensitive natural communities and riparian habitats, wherever practicable and feasible."
13	Clarification	ES-22	MM-BIO-3(b): "~~• Require~~ <u>Encourage</u> project design to avoid federally protected wetlands consistent with the provisions of Section 404…" "~~• Require~~ <u>Encourage</u> review of construction drawings by a certified wetland delineator…"
14	Clarification	ES-23	MM-BIO-4(b): "~~• Require~~ <u>Encourage</u> review of construction drawings and habitat connectivity mapping provided by the CDFW or CNDDB…"

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
15	Clarification	ES-24	MM-BIO-5(b): "~~• Require~~ Ensure that no change in existing ground level occur from the base of any protected tree at any time. ~~Require~~ It is recommended that no burning or use of equipment with an open flame occur near or within the protected perimeter of any protected tree." "~~• Require~~ Encourage that no storage or dumping of oil, gas, chemicals, or other substances that may be harmful to trees occur from the base of any protected trees, or any other location on the site from which such substances might enter the protected perimeter. ~~Require~~ It is recommended that no heavy construction equipment or construction materials be operated or stored within a distance from the base of any protected trees. ~~Require~~ It is recommended that wires, ropes, or other devices not be attached to any protected tree, except as needed for support of the tree. ~~Require~~ It is recommended that no sign, other than a tag showing the botanical classification, be attached to any protected tree." "•… ~~require~~ ensure replacement of any tree removed with another tree or trees on the same site deemed adequate by the local agency to compensate for the loss of the tree that is removed."
16	Clarification	ES-31	MM-GHG-3(a)(11): "~~• Require~~ Encourage amenities for non-motorized transportation, such as secure and convenient bicycle parking."
17	Clarification	ES-40	MM-LU-1(a)(3): "SCAG shall work with its member cities and counties to encourage but not require that transportation projects and growth are consistent with the RTP/SCS."
18	Clarification	ES-40	MM-LU-1(a)(4): "SCAG shall coordinate with member cities and counties to encourage but not require that general plans consider and reflect as appropriate RTP/SCS policies and strategies. SCAG will work to encourage but not require consistency between general plans and RTP/SCS policies."
19	Clarification	ES-40	MM-LU-1(a)(8): "SCAG shall continue to use its Intergovernmental Review Process to provide comments to lead agencies on regionally significant projects, ~~that may be considered for determining consistency with the RTP/SCS~~."
20	Clarification	ES-52	MM-TRA-1(b): "•… bicyclist accommodations, and ~~require~~ encourage new development and redevelopment projects to include bicycle facilities…"

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	ES-53	MM-TRA-1(b): "~~• Require~~ Encourage new office developments with more than 50 employees to offer a Parking "Cash-out" Program to discourage private vehicle use."
22	Clarification	ES-53	MM-TRA--2(b) "•Where traffic signals or streetlights are installed, ~~require~~ encourage the use of Light Emitting…"
23	Clarification	ES-54	MM-TRA--2(b) "•Diode (LED) technology, or similar technology.
24	Clarification	ES-55	MM-TRA--2(b) "~~• Require~~ Encourage the development of Transportation Management Associations for large employers and commercial/ industrial complexes;"
25	Clarification	ES-59	MM-USS-6(b): "~~• Require~~ Encourage the reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard)."
26	Clarification	ES-59	MM-USS-6(b): "Discourage exporting of locally generated waste outside of the SCAG region during the construction and implementation of a project. Encourage disposal within the county where the waste originates as much as possible." Comment: Trash disposal should be addressed regionally while considering distance instead of being limited to within the SCAG region. It is possible that disposal could be done nearby while crossing regional boundaries.
27	Delete	P. 3.3-26 Regional Air Quality	It is not appropriate to use the American Lung Association grading system to rate the region's the transportation plan. This section (paragraph and Table 3.3.2-1) should be deleted.
28	Clarification	P. 3.3-29 Sensitive Receptors & Table 3.3.2-3	"Sensitive Receptors by County" Clarify what the source data was and how the tally of sensitive receptors was made.
29	Clarification	Figure 3.3.2-3	Figure needs legend, labels, source of data and definition of sensitive receptors
30	Clarification	P. 3.10-5 Section 3.10.1, Regulatory Framework	The definition of a Municipal Separate Storm Sewer System (MS4) is incomplete and incorrectly cited.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
31	Clarification	p. 3.10-15 Section 3.10.1, Orange County General Plan	Specific mention of the Orange County Stormwater Program's Drainage Area Management Plan (DAMP) should be made under PEIR heading Orange County General Plan. The DAMP is Orange County's principle policy and program guidance document for urban nonpoint source pollution mitigation. The PEIR should reference the DAMP's agreements, structure, and programs, and, at the project level, make note to consider the specific water pollution control elements of the DAMP that apply to land development and redevelopment projects. Transportation infrastructure projects deemed to be Priority Projects, in accordance with DAMP designation (Exhibit 7.1Table 7-1.1), would require the development of a Project Water Quality Management Plan (WQMP) in conformance with Orange County's Model WQMP.
32	Clarification	p. 3.10-17 Section 3.10.2, Existing Conditions	Table 3.10.2-1 lists San Juan Creek as a surface water resource within Santa Ana (Region 8) jurisdiction. San Juan Creek is located within the San Diego Regional Water Quality Control Board (Region 9) jurisdictional boundary.
33	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	Mitigation Measures: Parts of this section list mitigation measures that are already being required by municipal stormwater programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that the cities and County employ for requiring a Project WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-l(b).
34	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	If a proposed project has the potential to create a major new stormwater discharge to a water body with an established Total Maximum Daily Load (TMDL), a quantitative analysis of the anticipated pollutant loads in the stormwater discharges to the receiving waters should be carried out.

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
35	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures & Table ES 4-1 (page ES-37)	The PEIR states that "where feasible, restore or expand riparian areas such that there is no net loss of impervious surface as a result of the project." While the intent with many mitigative measures is to preserve (emphasis added) perviousness, the PEIR should not be establishing performance measures for land development/redevelopment outside of established local stormwater programs.
36	Clarification	3.11-8&9, 3.11-13 3.11-16 & 17	Need to specify the vacant areas that are permanently preserved or undevelopable, even park space that is vacant i. Identify the source of the data used to identify vacant land. ii. What are the following items classified as (e.g. vacant, open space): HOA open space, HOA streets, private parking lots, lakes. Table 3.11.2-2- Break out vacant land category into permanently preserved/undevelopable or developable Figure 3.11.2-7 Need to correctly label national forests as permanently preserved open space. Areas labeled vacant need to be reviewed to correctly allocate lands that are permanently preserved/undevelopable and which are developable.
37	Clarification	3.11-10	Table 3.11.2-1- Define 'Established Communities'; Correct label or number of square miles by county
38	Define	3.11-11	Define 'carbon sinks'
39	Define	3.11-14	Define medium, high, and low density housing within text
40	Clarification	3.11-34	3.11.7 LEVEL OF SIGNIFICANCE AFTER MITIGATION IMPACT LU-1… It is likely that in some instances currently adopted general plans and other adopted plans will not General Plans are not required to be consistent with the 2016 RTP/SCS policies and land use strategies, and they are not required to be consistent for purposes of the SCS pursuant to SB 375. Implementation of mitigation measures MM-LU- 1(a)(1), MM-LU-1(a)(2), MM-LU-1(a)(3), MM-LU-1(a)(4), MM-LU-1(a)(5), MM-LU-1(a)(6), MM-LU- 1(a)(7), MM-LU-1(a)(8), and MM-LU-1(b) would may reduce some of these impacts. However, direct, indirect, and cumulative impacts would remain significant and unavoidable.
41	Correction	3.14-9	Update Table 3.14.2-1 with May 2015 DOF data and label columns as 'Households' not 'Housing Units'
42	Correction	3.14-12	Update Table 3.14.2-3 with May 2015 DOF data
43	Correction	3.14-13	Update Table 3.14.2-5 with May 2015 DOF data

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
44	Define	Figures 3.14.2-1 3.14.2-2 3.14.2-3	Define subjects of maps
45	Clarification	3.14.22, paragraph 4	Clarify if discussion is on new lane miles or existing; Define "additional transportation facilities"
46	Clarification	4-1, 4.1 add after last bullet	"<u>If an alternative is rejected and the project approved, it is the EIR for the proposed project that is to be used for future tiering purposes.</u>"
47	Clarification	P. 4-6, and all related documents' references to Alternative 3.	Alternative 3: Intensified Land Use Alternative "The <u>hypothetical</u> land use pattern in this Alternative build<u>s</u> on the land use strategies as described in the 2016 RTP/SCS and beyond. Specifically, it increases densities and intensifies land use patterns of the Plan, especially around high quality transit areas (HQTAs) in an effort to maximize transit opportunities. The <u>hypothetical</u> growth pattern associated with this Alternative…" Comment: Update all references to Alternative 3 in all RTP/SCS documents where it mentions that the land use pattern was developed based on the Plan to say that Alternative 3's land use plan is hypothetical.

San Gabriel
CITY WITH A MISSION

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January 14, 2016

Hasan Ikhrata, Executive Director
Southern California Association of Governments
818 West 7th Street, 12th Floor
Los Angeles, CA 90017

Subject: **2016-2040 Regional Transportation Plan/Sustainable Communities Strategy**

Dear Mr. Ikhrata:

I am writing to express my strong support for the continued inclusion of the SR-710 Freeway Tunnel Project in the Southern CA Association of Governments (SCAG) 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). A freeway tunnel directly comports with several SCAG goals including to decrease time on the road, enhance economic opportunities and improve air quality.

The freeway tunnel has strong local support and is consistent with voter mandate and local plans. A recent poll shows 2-1 support for a tunnel, proving that a vocal minority is not representative of the broader community. Almost two-thirds (65.5%) of voters in the five cities that currently oppose the freeway tunnel also supported Measure R, which explicitly contained the freeway tunnel project. The tunnel, as you know, was also adopted in Metro's Long Range Transportation Plan.

Most importantly, the freeway tunnel would significantly improve air quality and reduce cancer risk for the majority of the study area. Unfortunately, lower income, minority communities near the freeway are more impacted by poor air quality than those in more affluent areas to the north. The SR 710 North Study Draft Environmental Impact Report shows that cities south of the freeway have existing Cancer Risk levels 20% to over 60% higher than their neighbors to the north. This disparity is clearly an unacceptable environmental injustice for the Los Angeles Region.

A freeway tunnel also maximizes mobility and flow of traffic throughout the Los Angeles Region. Traffic must be moved from local streets back onto freeways where it was originally designed to go. A freeway tunnel solves this problem and reduces cut-through traffic on neighborhood streets by 43% or 57,600 vehicles per day.

It's critical that SCAG maintain support for the tunnel and sustain inclusion of the project in the 2016-2040 RTP. Completion of the freeway is vital to the health and safety of thousands of Los

Angeles area residents. On behalf of the City of San Gabriel, I am confident that SCAG will remain steadfast in support for the tunnel as the best alternative for completion of the 710 freeway.

Sincerely,

JASON PU, MAYOR OF THE CITY OF SAN GABRIEL

Steven A. Preston

by Steven A. Preston
City Manager

City of
SANTA CLARITA

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January 28, 2016

Mr. Hasan Ikhrata, Executive Director
Southern California Association of Governments
818 West 7th Street, 12th Floor
Los Angeles, CA 90017

Dear Mr. Ikhrata:

Subject: 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy

Thank you for the opportunity to provide comments on the 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). The purpose of this letter is to provide the Southern California Association of Governments (SCAG) with comments from the City of Santa Clarita on the draft RTP/SCS document.

- <u>High Quality Transit Areas</u>
  Exhibit 5.1 in the draft RTP/SCS document identifies High Quality Transit Areas (HQTA) within the SCAG region. In the 2012 RTP/SCS, three HQTAs were identified in Santa Clarita. These areas corresponded to the three Metrolink stations located within the City. Exhibit 5.1 in the draft RTP/SCS document appears to have downgraded the three HQTAs in the City to "Rail Stations." It is unclear if these rail stations are considered HQTAs by SCAG. If they are not, the City recommends attaching the HQTA designation to each of the three Metrolink stations located within the City of Santa Clarita.

- <u>California High Speed Rail</u>
  As one of the communities directly impacted by the California High-Speed Rail Authority's (CHSRA) proposed project, the City of Santa Clarita will continue to closely monitor the progress of the overall project and will actively participate in the environmental review process for the Palmdale to Burbank section.

We recognize that SCAG is supportive of Phase I of the proposed High-Speed Rail project, primarily predicated on the Memorandum of Understanding (MOU) in which a $1 billion investment is committed to local rail improvements within Southern California. Inasmuch as there is a lack of agreement among SCAG's membership regarding the proposed High-Speed Rail project, the City of Santa Clarita strongly recommends the inclusion of clarifying language within the 2016 RTP/SCS.

In recognition of concerns by some communities in the SCAG Region, Transportation Committee Chairman Alan Wapner clarified the basis upon which SCAG is supporting the CHSRA project during remarks he made at the December 3, 2015, Regional Council meeting. In essence, Mr. Wapner reiterated that SCAG's support for the project is based upon the commitment contained within the MOU for the expenditure of $1 billion on local rail improvements. We believe that incorporating a statement reflecting Chairman Wapner's clarifying comments would be appropriate. Mr. Wapner stated to the Regional Council, "So once again, I want to remind you that what we are voting on is the inclusion of the portion that falls within the SCAG region in return for the CHSRA's commitment to the expenditure of $1 billion on local rail improvements, which is extremely important to us here in Southern California. And the draft plan includes only support for Phase 1 of the high-speed rail project."

- <u>Santa Clarita Population Data</u>
  The City of Santa Clarita deeply appreciates SCAG staff working with City staff to accurately refine the population numbers contained within the Draft RTP/SCS. The City of Santa Clarita completed significant annexations in 2012 that substantially increased the City's population by well over 10 percent. We are pleased to see that the population numbers contained within the Draft RTP/SCS are consistent with the completed annexations and future City growth forecasts.

  The City of Santa Clarita concurs with population estimates included in SCAG's growth model as follows:

YEAR	CITY POPULATION
2012	202,022
2020	220,586
2035	250,853
2040	262,161

The City of Santa Clarita anticipates the occurrence of annexations between the current date and 2040. Because the nature and extent of these annexations is unknown at this time, it is not possible to estimate how these future annexations will impact the City's population. The City will continue to coordinate with SCAG regarding changes to population data as future RTP/SCS cycles occur.

- High Occupancy Vehicle/High Occupancy Toll Lanes
  Exhibit 5.4 of the draft RTP/SCS document identifies High Occupancy Vehicle (HOV) Lane projects throughout the SCAG region. One of the HOV Lane projects is identified within the Santa Clarita Valley. If the HOV Lane project within the Santa Clarita Valley is considered for change to a High Occupancy Toll (HOT) Lane project, the City strongly recommends that extensive additional public outreach and inter-agency coordination be conducted by SCAG and/or any responsible agency to ensure that the appropriate type of project is ultimately identified. Currently, there is not local consensus on whether a HOT Lane project is appropriate or acceptable in our community.

The City of Santa Clarita looks forward to partnering with SCAG throughout the RTP/SCS process. Thank you for your consideration of our comments. Should you have questions or require any assistance, please contact David Peterson, Associate Planner, with the City of Santa Clarita's Planning Division. Mr. Peterson can be reached at (661) 284-1406 or by email at dpeterson@santa-clarita.com.

Sincerely,

Ken Striplin

Kenneth W. Striplin
City Manager

KS:TC:DGP:kl
S:\CD\!PLANNING DIVISION\Dave Peterson\Green Team\2016 RTP\Comment Letter 2016 RTP 1 8 16.doc

cc: Mayor Kellar and Members of the City Council
Leadership Team
Andrew Yi, City Traffic Engineer
Michael Murphy, Intergovernmental Relations Manager
David Peterson, Associate Planner
Ian Pari, Senior Traffic Engineer

CITY OF SOUTH PASADENA
OFFICE OF THE CITY COUNCIL
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January 29, 2016

Courtney Aguirre and Lijin Sun
Southern California Association of Governments
818 West 7th Street, 12th Floor
Los Angeles, CA 90017

RE: Southern California Association of Governments Draft 2016 Regional Transportation Plan and Sustainable Communities Strategy; and Draft Program Environmental Impact Report (SCH#2015031035) – City of South Pasadena Comments

Dear Ms. Aguirre and Ms. Sun,

The City of South Pasadena (City) appreciates the opportunity to review and comment on the Southern California Association of Governments (SCAG) Draft 2016 Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS); and Draft Program Environmental Impact Report (SCH#2015031035, PEIR). As a member of the 5-Cities Alliance (Glendale, La Cañada Flintridge, Pasadena, Sierra Madre, and South Pasadena), the City adopts the comments provided in the letter submitted by Shute, Mihaly, and Weinberger, LLP on behalf of the 5-Cities Alliance regarding the SCAG Draft 2016 RTP/SCS and PEIR.

The City provides the following additional comments, and requests that SCAG make clear in its Final 2016 RTP/SCS and PEIR that the State Route 710 Tunnel Alternative (SR-710 Tunnel) has been excluded from the list of constrained projects. While the longstanding SR-710 debate spans decades, in the four years since SCAG last developed an RTP/SCS, actions by the Legislature and other agencies now hasten an end to the controversy and point SCAG and the corridor communities toward a series of constructive and non-harmful transportation improvements.

Below, the City reiterates the comments that it made during the 2008 and 2012 RTP/SCS comment periods regarding the lack of "committed, available, or reasonably available" funding for freeway projects; and the adverse air quality impacts associated with the inclusion of the SR-710 freeway in the RTP/SCS, jeopardizing the Clean Air Act (CAA) localized conformity in the San Gabriel Valley. The City also summarizes developments in the intervening four years that reinforce the City's 2008 and 2012 comments, and remove any remaining doubt that the SR-710 Tunnel lacks funds and threatens localized CAA nonconformity. The City next challenges SCAG's assertion that the alignment is "to be determined," establishing from the draft RTP/SCS and PEIR that the true project proposed by SCAG remains the SR-710 Tunnel. The City then details its comments on SCAG's air quality analysis, and concludes with a solution that will work for SCAG and the corridor communities: developing a "Beyond the 710 series of corridor improvements.

The SR-710 Tunnel Should Be Removed from the Constrained List

The following developments establish that it is unrealistic -- legally, economically, and environmentally -- to expect that an SR-710 Tunnel would ever be funded or constructed. For these reasons SCAG should remove the tunnel from its constrained list in the Final RTP/SCS and PEIR, and invest the region's limited financial resources in projects that have earned enthusiastic community support.

Within the past four years the City's ability to veto any freeway construction within its jurisdiction has been restored through the Legislature's repeal of Streets and Highway Code section 100.4 and its restoration of rights under Streets and Highways Code section 100.2. In addition, enactment of Government Code section 54237.8 in 2013 eliminated any further consideration of a surface freeway within the SR-710 North Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The State's commitment terminating the surface freeway has been confirmed in the May 13, 2015 judgment dismissing *City of South Pasadena v. Slater,* United States District Court (U.S.D.C.) no. CV-98-6996-DP.

The formal opposition of the three principal cities (Los Angeles, Pasadena, and South Pasadena) through which the SR-710 Tunnel would course precludes its lawful construction. Indeed, Caltrans has acknowledged that the SR-710 tunnel cannot be constructed without "modifications to freeway agreements from Alhambra, Los Angeles, South Pasadena, and Pasadena." (Caltrans Draft EIR/EIS p. 2-113) Freeway agreements are required by Caltrans regulations whether or not city streets are closed. (Streets and Highways Code, §100.2; Caltrans Project Development Procedures Manual, p. 24-4; *City of South Pasadena v. Department of Transportation* (1994) 29 Cal. App. 4th 1280, 1284.) By formal actions the City Councils and Mayors of Los Angeles, Pasadena, and South Pasadena have explicitly opposed construction of the SR-710 North Tunnel Alternative. (Los Angeles Resolution 12-0002-S82 of August 28, 2012; Pasadena Motion of April 13, 2015; and South Pasadena Resolution 7420 of July 15, 2015.)

Moreover, the SR-710 Tunnel cannot be advanced as "closing the 710 gap", as the Draft RTP/SCS signifies at page 37 of Appendix B; nor can the wishbone construction in Pasadena be described, as the Caltrans Draft EIR/EIS attempted at page 1-5, as "[e]xisting SR-710." By order of the United States District Court for the Central District of California, the wishbone construction was allowed in 1976 as an exception to the 1973 injunction as a component of the I-210 interchange, sponsored by the I-210 contract. The U.S.D.C. opinion records that "only the southern portion of the Long Beach Freeway has been completed and now terminates at Valley Boulevard." *(City of South Pasadena v. Volpe* (C.D. Cal. 1976) 417 F. Supp. 854, 858.)

Only $740 million of Los Angeles County Measure R funds remain for construction of a San Gabriel Valley transportation project. These Measure R funds are *not* specifically designated for the SR-710 Tunnel, as the Second District Court of Appeal found when it denied the claims of the Cities of South Pasadena and La Cañada Flintridge that the Los Angeles County Metropolitan Transportation Authority (Metro) had pre-determined selection of the SR-710 Tunnel in violation of the California Environmental Quality Act (CEQA). In its trial and appellate briefs, Metro represented that "Measure R ... does not commit Metro to any projects," and that "if a 710 Tunnel is not pursued ... the funds 'earmarked" for a possible tunnel can be applied to other projects or programs." The appellate court ruled that, notwithstanding the inclusion of the SR-710 tunnel in the 2008 RTP and in Measure R, "[Metro] did not promise the public a 710 tunnel. Measure R literature includes the I-710 North Gap Closure (Tunnel) in a list of '*Proposed* Projects and Programs.' (Italics added.) Ordinance Section 11, paragraph (a) discloses that [Metro] 'may amend this Ordinance, including Attachment A [the expenditure plan] . . . for any purpose.'" (*City of South Pasadena, City of La Cañada Flintridge v. Los Angeles County Metropolitan Transportation Authority; California Department of Transportation RPI)* (2011) 2d Civil No. B221118, unpublished opinion.)[1]

On August 20, 2015 San Gabriel Valley Council of Governments' (SGVCOG) Governing Board voted to omit the SR-710 Tunnel project from its Mobility Matrix Transportation Project Priority List. This momentous change reflects the SGVCOG's realization that the SR-710 Tunnel project poses a significant drain on future transportation funding in the region. Similarly, the Los Angeles County Metropolitan Transportation Authority (Metro) has omitted the SR-710 from the Subregional Stakeholder Draft Project Priorities list for the potential 2016 sales tax measure. As SCAG moves forward finalizing its Draft 2016 RTP/SCS, SCAG should replace the controversial SR-710 Tunnel with a more financially responsible and sustainable transportation solution.

In sum, beyond the SR-710 Tunnel's legal infeasibility, the funds necessary to design and build the SR-710 Tunnel have not been identified, let alone committed. Continued inclusion of the SR-710 Tunnel fails to meet the federal requirement that any project listed as fiscally constrained must establish that funds for it are "committed, available, or reasonably available." (23 C.F.R. §450.104.) For these reasons the project cannot remain on the constrained list of RTP/SCS projects.

Although the RTP/SCS Claims to be SR-710 Alternative Neutral, It and the PEIR Repeatedly Identify the Project as the SR-710 Tunnel

Perhaps recognizing the legal and political vulnerability of expressly propounding the SR-710 Tunnel as part of the RTP/SCS, Appendix B page 149 describes the project as "SR-710 North Extension (Alignment TBD)." A footnote seeks to explain this agnosticism by claiming that project environmental review will select the project, which will be subsequently amended into the RTP/SCS.

Notwithstanding the purported agnosticism regarding SR-710 alternatives, the body of the RTP/SCS and PEIR reveal that the Appendix B listing is at best inaccurate, and possibly deceptive and dishonest. As shown below, from "alternative neutral," the draft documents actually select the SR-710 Tunnel:

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1 This unpublished opinion may be viewed at http://www.leagle.com/decision/In%20CACO%2020110322011/CITY%20OF%20SOUTH%20PASADENA%20v.%20LOS%20ANGELES%20COUNTY%20METROPOLITAN%20TRANSPORTATION%20AUTHORITY

The draft FTIP, Appendix B page 37, seeks funding "to close the 710 freeway gap." Listing the project as a "freeway gap closure" only maintains the fiction that the project itself is a freeway, the only version of which remains is the SR-710 Tunnel.

The Appendix B "System" designation of the project as a "State Highway," like the "Route #" of SR-710 (appendix B, pp. 37, 149) further defines the actual project as the SR-710 Tunnel, which is the only state highway alternative identified in the Caltrans 710 North Study.

The draft PEIR describes the SR-710 North Project as a toll lane. (See, e.g., Figure 2.4.2-1: Major Highway Projects; Figure 2.4.2-5: Major Toll Projects.) The only Caltrans 710 North Project alternative that calls for a toll road is the Freeway Tunnel.

The draft PEIR relies on tolls received from the SR-710 North Project to partially fund its "financially constrained Plan." (*See* Figure 2.4.2-5.) Specifically, the draft PEIR at page 2-26 identifies $23.5 billion from highway tolls as part of its "innovative funding strategies." Again, only the SR-710 Tunnel is proposed to generate tolls, revealing that the tunnel forms the project included in the 2016 RTP/SCS. In addition to the above references the City submits the attached Supplemental Questions and Comments regarding the Draft RTP/SCS and PEIR as Attachment 1.

SCAG's modeling for the RTP/SCS is premised on an SR-710 project consisting of four toll lanes in each direction -- the SR-710 Tunnel -- and no other project alternative. (Email correspondence between C. Aguirre and M. Lin, included herein as Attachment 2.)

SCAG's RTP/SCS stated project cost of $5.6 billion, at Appendix B page 149 also identifies the SR-710 Tunnel as the selected *alternative*, as that is the only alternative whose estimated cost matches that amount. The other alternatives are less than half that cost. *See* SR-710 North Study, Executive Summary at pp. 5,8,10 and 14.

The SR-710 Tunnel Is Inconsistent with Most Goals Expressed in the Draft 2016 RTP/SCS

SCAG's Initiatives

Inclusion of the Tunnel Alternative in the Final RTP/SCS and PEIR would go against many of the valid major initiatives established by the Draft 2016 RTP/SCS, including:

- Preserving the Transportation System We Already Have (Fixing it First) – continuing to allocate funding towards the study and construction of the Tunnel Alternative diverts scarce funding resources away from important system preservation projects and further expands the highway system beyond what may reasonably be maintained based on current funding projections
- Expanding Our Regional Transit System to Give People More Alternatives to Driving Alone – the proposed Tunnel Alternative fails to expand the regional transit system
- Expanding Passenger Rail – the proposed Tunnel Alternative fails to expand passenger rail and further propagates single-occupancy vehicle usage
- Improving Highway and Arterial Capacity – the Tunnel Alternative does not focus on technology and system/demand management strategies that would effectively increase highway and arterial capacity, rather the expansion of the highway system would further induce demand along already congested highways and arterials causing significant strain on the operations and maintenance of the existing system

- Managing Demand on the Transportation System – contrary to this initiative the Tunnel Alternative would induce demand, resulting in an increase in Vehicle Miles Traveled (VMT)
- Optimizing the Performance of the Transportation System – the high cost of the proposed Tunnel Alternative would reduce available highway funding for Transportation System Management (TSM), Intelligent Transportation Systems (ITS) improvements, and other key transportation projects in the region
- Promoting Walking, Biking and Other Forms of Active Transportation – the proposed Tunnel Alternative would not promote short trips or the use of active transportation in the region
- Strengthening the Regional Transportation Network for Goods Movement – many proponents of the Tunnel Alternative have stated that they would not support the inclusion of truck traffic in the tunnel
- Focusing New Growth Around Transit – development of a highway alternative reduces the amount of opportunities for growth around new transit in the San Gabriel Valley

SR-710 Tunnel is Inconsistent with Recent Legislation

Furthermore, inclusion of the SR-710 Tunnel conflicts with the principles and goals of recent legislation including Assembly Bill 32 (AB 32) and Senate Bill 375 (SB 375). The SR-710 Tunnel would induce demand, increase vehicle miles traveled (VMT), and result in an increase in greenhouse gas (GHG) emissions. This inclusion is contrary to the requirements set forth by AB 32 to reduce GHG emissions. A SR-710 freeway is a mid-20th Century project that is not capable of achieving the state's goals of improved air quality or the transportation demands of the region. Similarly, the California Supreme Court's recent rejection of the EIR for the Newhall Ranch project (*Center for Biological Diversity v. California Dept. of Fish and Wildlife* (2015) 62 Cal.4th 204 indicates that impacts of induced demand and their relation to GHG emissions must be taken seriously.

In addition to conflicting with recent legislation, inclusion of the SR-710 would directly contradict the Caltrans Strategic Management Plan and California Air Resources Board reduction goals to implement AB 32. As the Metropolitan Planning Organization for the region, SCAG should take the lead in developing policies that are able to efficiently and effectively improve air quality, by promoting and advocating transportation projects that would actually reduce VMT and GHG emissions. By including the SR-710 Tunnel in the Draft 2016 RTP/SCS simply because the project was included in the 2012 RTP/SCS or Metro's 2009 Long Range Transportation Plan (LRTP), SCAG is defaulting into a passive role in the planning process.

SR-710 Tunnel Project Cost Is Not Committed, Available or Reasonably Available

Although RTP ID 1M0101 states "Alignment TBD," as stated on page 4 above, the project cost of $5.6 billion identifies the SR-710 Tunnel as the selected alternative. Furthermore, as set forth on pages 2-3 above, the $5.6 billion is not "committed, available, or reasonably available."

Additional tunnel "commitments" are highly unlikely to be forthcoming from the anticipated sales tax measure (Measure R2) on the November 2016 ballot, since Metro has omitted the project from its Subregional Stakeholder Draft Project Priorities list for Measure R2. SCAG'S previous error of including the SR-710 in the 2012 Constrained Plan should be remedied in the Draft 2016 RTP/SCS by moving the project to the Strategic Plan. Even if the remaining $740 million Measure R funds were truly "committed" to the SR-710 Tunnel (which they are not, as discussed earlier), they are woefully inadequate to meet the project cost of the single-bore tunnel, let alone the dual-bore tunnel variation. Thus, the California Transportation Commission (CTC) in its April 1, 2015 letter to former Assemblymember Anthony Portantino pointed to the ongoing lack of a defensible project cost determination, a deficiency that also ignores the Federal Highway Administration (FHWA) further requirement in the 710 corridor to cure "[c]ontinued uncertainty regarding the financing of [the SR-710 freeway] project and the failure to develop a comprehensive financial plan for its implementation." (FHWA environmental re-evaluation withdrawing the 1998 federal approval, p. 7 (December 17, 2003).)

The Highways and Arterials Appendix Consistently Identifies the SR-710 Tunnel as the Transportation Project in the 710 Corridor

The Accuracy of the Transportation Model Results Is in Question

The inappropriate inclusion of the SR-710 Tunnel in the Draft 2016 RTP/SCS further calls into question the accuracy of the SCAG Transportation Model. This error is especially relevant since the SR-710 North Draft EIR/EIS was released many months before the Draft RTP/SCS and PEIR were issued. Although SCAG does not specifically state that the SR-710 project has been identified as the SR-710 Tunnel as set forth at pages 3-4 above, the exhibits and project descriptions all and uniformly indicate that the project included in the Draft 2016 RTP/SCS is the SR-710 Tunnel. Nevertheless, the SR-710 North Draft EIREIS demonstrates that the SR-710 Tunnel would not improve traffic but would simply shift traffic congestion to other areas in the region. Indeed, certain streets in the cities of Alhambra, Rosemead, Pasadena, San Marino, and South Pasadena would become more congested as a result of cut-through traffic associated with the Tunnel Alternative.

Failure to remove the SR-710 Tunnel from the 2016 RTP/SCS would raise questions regarding the validity of the Transportation Model since the SR-710 Tunnel would induce demand, increase VMT, and worsen air quality in the region. While SCAG staff has cited federal conformity requirements as the reasoning for including the SR-710 Tunnel in the Transportation Model and Draft 2016 RTP/SCS, no state or federal authority requires SCAG to include all of the projects listed in Metro's 2009 LRTP.

Finally, inclusion of the SR-710 Tunnel is not necessary to secure regional air quality conformity. Indeed, comments of the federal and regional air quality authorities, summarized on page 7 below, conclude that the SR-710 Tunnel would produce localized air quality non-conformity.

The Draft 2016 PEIR Is Inadequate for It Fails to Reconcile Contradictory Conclusions Contained in the SR-710 North Draft EIR/EIS

SR-710 North Draft EIR/EIS Comments

The 5-Cities Alliance, Environmental Protection Agency, South Coast Air Quality Management District (SCAQMD), and other organizations have each provided substantial comments on the inadequacies of the Caltrans/Metro SR-710 North Draft EIR/EIS. These comments called into question the air quality, environmental justice, geotechnical, hydrological, legal, and transportation findings that were provided.

Although the Draft 2016 PEIR made the following Air Quality Impact Analysis findings, they are inconsistent with SR-710 North Draft EIR/EIS:

- "Air-1: Potential to conflict with or obstruct implementation of the applicable air quality plan. *Less Than Significant Impact.*" (2016 RTP/SCS PEIR, at p. 3.3-38.) However, inclusion of the SR-710 would increase GHG emissions due to induced demand from the Tunnel Alternative.
- Air-2: "Potential to violate any air quality standard or contribute substantially to an existing or projected air quality violation", Significant and Unavoidable – SCAG has included mitigation measures in the form of Transportation Control Measures (TCMs) such as "Programs for improved use of public transit", and "Programs and ordinances to facilitate non-automobile travel, provision and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel…". South Pasadena notes that inclusion of the SR-710 Tunnel would contradict the goals of the Mitigation Measure and TCMs
- Air-4; "Expose sensitive receptors to substantial pollutant concentrations and harm public health outcomes substantially"; Significant and Unavoidable – However, the Los Angeles County Department of Public Health (LADPH) has found that the SR-710 Tunnel would result in "Potential disease impacts from this project include cancer; cardiovascular disease; asthma and other respiratory diseases, impaired child lung development; adverse pregnancy outcomes such as birth defects and low-birth-weight births; obesity and diabetes; and neurological disease. Automobile-oriented transportation projects often limit active; included herein as Attachment 3 transportation modalities such as walking and bicycling, and raise the risk of injuries to pedestrians and cyclists." (LADPH SR-710 North Draft EIR/EIS Comment letter, p. 2.) SCAQMD stated that "…the tunnel alternative will present a significant health risk to local residents when compared to a No Build scenario…[c]ancer risks could reach up to 149 chances per million at the maximum exposed residential receptor, which is above SCAQMD's recommended CEQA threshold of 10 chances per million for all freeway alternatives." (SCAQMD SR-710 North Draft EIR/EIS Comment Letter, p. 1, 3., included herein as Attachment 4.)

The Environmental Protection Agency (EPA) designated the SR-710 Tunnel Alternative as a "Category 3 (Inadequate)" and stated that the "…preliminary information shared with EPA during interagency coordination indicates that the Freeway Tunnel Alternative may impact the $PM_{2.5}$ NAAQS, and as a result, face conformity challenges" (EPA Comment Letter, p. 2 (emphasis added; included herein as Attachment 5.) EPA additionally found that "There is not enough information in the Draft EIS for EPA to validate the modeling results; and "… the Draft EIS does not clearly describe the potential direct, indirect, and cumulative impact of the [tunnel] project on children's health." (EPA Detailed Comment Letter, pp. 2, 8.)

The Greenhouse Gas Emissions and Climate Change chapter failed to analyze the impacts of induced demand. Implementation of the SR-710 would increase capacity, however, the increased capacity would also result in increased travel demand and GHG emissions. Although there has been some debate regarding the validity of induced demand, the recent Newhall Ranch decision, *Center for Biological Diversity v. California Dept. of Fish and Wildlife, supra,*) reaffirms the need to analyze the generation of increased VMT and GHG emissions must be taken into serious consideration when evaluating environmental impacts. The air quality analysis in the SCAG Draft PEIR must have addressed the degree to which SCAG followed the air quality analysis specified by SCAQMD in its April 2, 2015 response to the SCAG notice of preparation.

The mitigation measures provided under the Transportation, Traffic, and Safety chapter of the Draft 2016 PEIR included giving "...priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita, while maintaining economic vitality and sustainability." Given that the SR-710 Tunnel would increase VMT, the project should be given a low priority and be removed from the constrained plan. In addition, mitigation measure TRA—2(b) states: "Before funding transportation improvements that increase roadway capacity and VMT, evaluate the feasibility and effectiveness of funding projects that support alternative modes of transportation and reduce VMT, including transit, and bicycle and pedestrian access." SCAG should reconsider the inclusion of the SR-710 project and evaluate the possibility of developing a multi-modal alternative that is capable of reducing VMT and promoting active transportation and public transit.

SCAG Should Consider Inclusion of the Beyond the 710 Initiative

As a member of the Connected Cities and Communities (C3) the City has participated in the development of the *Beyond the 710: Moving Forward – New Initiative for Mobility and Community* (Beyond the 710, included herein as Attachment 6). This initiative was developed in collaboration with nongovernmental advocates such as the National Trust for Historic Preservation, Natural Resources Defense Council, 5-Cities Alliance, and other public stakeholders. The Beyond the 710 initiative provides a valid staring point to engage local communities and explores potential solutions to enhance the quality of life for communities through innovative strategies similar to SCAG's 2016 Draft RTP/SCS Land Use Strategies, including:

- Reflect the Changing Population and Demands – most of Los Angeles County is already developed and leaves little room for new forms of development, the Beyond the 710 Initiative provides the cities of Los Angeles and Pasadena with the opportunity to revitalize underutilized land with strategic infill and investment that may benefit the region
- Focus New Growth Around Transit – the Beyond the 710 Initiative promotes the development of compatible land uses around new transit hubs, in areas that currently do not provide substantial public transit
- Plan for Growth Around Livable Corridors – the Beyond the 710 aims to use innovative and sustainable transportation strategies such as "Complete Streets" or "Complete Corridors" to promote the use of active transportation and create more livable communities
- Provide More Options for Short Trips – by replacing the focus on a car dependent mode, such as the SR-710 Tunnel, the Beyond the 710 aims to provide stakeholders with greater mobility options such as transit and active transportation by building up the transit and bicycle network in the area
- Support Local Sustainability Planning– the C3 has worked with local stakeholder groups to develop an understanding of the type of development that is desired around the north and south stub
- Protect Natural Land – the Beyond the 710 includes strategies to create new open space and restoration of the Arroyo Rosa de Castilla creek.

SCAG could take a leadership role with the SR-710 by adopting the Beyond the 710 Initiative as a starting point to further develop an East Los Angeles/Pasadena or West San Gabriel Valley Mobility Plan similar to SCAG's previous Corridor Planning studies. By evaluating the SR-710 corridor SCAG may clearly identify the mobility problems of the region and develop sustainable solutions that adhere to the goals and objectives outlined in the Draft 2016 RTP/SCS.

We appreciate the opportunity to provide comments on the Draft 2016 RTP/SCS and PEIR and look forward to working with SCAG to develop a sustainable, feasible, and community-approved solution to the longstanding transportation needs in our region.

If you have any questions or comments please feel free to contact Sergio Gonzalez, City Manager, at sgonzalez@southpasadenaca.gov or (626)403-7210.

Sincerely,

Diana Mahmud
Mayor

Michael A. Cacciotti
Mayor Pro Tem

Robert S. Joe
Councilmember

Marina Khubesrian, M.D.
Councilmember

Richard D. Schneider, M.D.
Councilmember

Attachments:
1. City of South Pasadena Supplemental Questions and Comments
2. Email Correspondence from C. Aguirre to M. Lin
3. County of Los Angeles Department of Public Health – SR-710 North Draft EIR/EIS Comment Letter
4. South Coast Air Quality Management District – SR-710 North Draft EIR/EIS Comment Letter
5. Environmental Protection Agency – SR-710 North Draft EIR/EIS Comment Letter
6. Beyond the 710 Initiative

cc: Governor Jerry Brown
Secretary Brian P. Kelly, California State Transportation Agency
Will Kempton, Executive Director, California Transportation Commission
The Honorable Carol Liu, Senator, 25th District
The Honorable Chris Holden, Assembly Member, 41st District
Metro Board Members
Phillip A. Washington, Metro Chief Executive Officer
Connected Cities and Communities Members
5-Cities Alliance Members
South Pasadena City Manager

ATTACHMENT 1
City of South Pasadena Supplemental Questions and Comments

City of South Pasadena Supplemental Questions and Comments:

2016 RTP/SCS

- Page 6 – Major Initiatives: Improving Highway and Arterial Capacity; "The 2016 RTP/SCS calls for investing $54.5 billion in capital improvements… This includes focusing on achieving maximum productivity by adding capacity primarily by closing gaps in the system…"
    - Does the $54.5 billion estimate include the $5.636 billion needed to complete the Tunnel Alternative?
- Page 38 – Our Progress Since 2012: Highways; "The expansion of highways has slowed considerably over the last decade because of land, financial, and environmental constraints. Still, several projects have been completed since 2012 to improve access and close critical gaps and congestion chokepoints in the regional network. These include the Interstate 5 South Corridor Project in Los Angeles County;… among others."
    - Clarify; which other projects are considered "highway gaps"? Does SCAG consider the SR-710 North a "highway gap"?
- Exhibit 2.2: 2012 Base Year Transit Network; includes a "Rapid Bus and Bus Rapid Transit" for 2012 Base Year
    - Clarify; is this the BRT alternative from the SR-710 North Project EIR?
- Exhibit 5.2: 2040 Transit Network Planned and Existing; includes a "Rapid Bus and Bus Rapid Transit" for 2012 Base Year
    - Clarify; is this the BRT alternative from the SR-710 North Project EIR?
- Exhibit 5.4: Major highway Projects; includes an "Improvement TBD"
    - Should be removed since the alignment/mode has yet to be determined and may not necessarily be a highway project.
- Page 95 – Highways and Arterials "However, given that critical gaps and congestion chokepoints still existing with the network, improvements beyond TSM and TDM strategies need to be considered. Closing these gaps to complete the system will allow residents and visitors alike to enjoy improved access to opportunities such as jobs, education, recreation and healthcare."
    - Does SCAG consider the SR-710 North a "highway gap"? If so, what is the reasoning it is considered a "gap"? What is the basis for determining if there is a "gap" in the system?
- Page 95 – Highways and Arterials "Although we recognize that we can no longer rely on system expansion alone to address our mobility needs, critical gaps and congestion chokepoints in the network still hinder access to certain parts of the region. County transportation plans have identified projects to close the gaps, eliminate congestion chokepoints and complete the system. Such improvements are included in the 2016 RTP/SCS."
    - Does this mean that ALL projects included in Metro's Long Range Plan will be included in the 2016 RTP/SCS?
- Table 5.5: Sample Major Highway Projects Committed by the Counties
    - Does not include the SR-710 North

- Why does SCAG include the SR-710 in their Exhibit 5.4: Major Highway Projects if it is not included as a County committed project?
- Are there additional projects that are currently not included in this list?

Highways and Arterials Appendix

- Exhibit 3: Major Toll Projects by Counties; includes toll lanes (plan 2040) for the SR-710 North project
  - Should be removed since the alignment/mode has yet to be determined.
- Exhibit 5: Major Highway Projects; includes a "Improvement TBD"
  - Should be removed since the alignment/mode has yet to be determined and may not necessarily be a highway project.
- Exhibit 9: Baseline 2040 to Plan 2040 Freeway Speed Changes, PM Peak; includes a "5.0 or greater increase" in speed along the SR-710 North
  - Clarification regarding which alignment/mode should be provided.
  - Should be removed since the alignment/mode has yet to be determined.
- Exhibit A2: Plan 2040 Number of Freeway Lanes (mixed-flow and toll); includes a 4-lane in each direction freeway along the SR-710 North
  - Should be removed since the alignment/mode has yet to be determined.
- Exhibit A7: Baseline 2040 to Plan 2040 Freeway Speed Changes, AM Peak; includes a "5.0 or greater increase" in speed along the SR-710 North
  - Clarification regarding which alignment/mode should be provided.
  - Should be removed since the alignment/mode has yet to be determined.
- Exhibit A12: Baseline 2040 to Plan 2040 Freeway Speed Changes – PM peak; includes a "5.0 or greater increase" in speed along the SR-710 North
  - Clarification regarding which alignment/mode should be provided.
  - Should be removed since the alignment/mode has yet to be determined.

Project List

- Page 37 – FTIP Project ID: 18790 "to close the 710 freeway gap"
  - Remove "freeway gap" language
  - Change the project description to the SR-710 North Project
- Page 148 – Financially-Constrained RTP Projects ID 18790 "Route 710: Study to perform alternative analysis, engineering and environmental studies to close 710 freeway gap", completion year 2025, $70,454
  - Remove "freeway gap" language
  - Change the project description to the SR-710 North Project
- Page 149 – Financially-Constrained RTP Projects ID 1M0101 "SR-710 North Project Study Alternatives (Alignment TBD)", completion year 2025, $5,636,000
  - Change the System from "State Highway" to "Other"
  - Move the RTP Project ID 1M0101 to the Strategic Project list
  - Why is the Project Cost listed as $5.636 billion? Does this indicate that the project is the Tunnel Alternative?

- Page 340 – Strategic Projects RTP ID S1120082 "SR-710 Transportation Improvement Options"
  - Clarify which improvements? Is this related to the SR-710 North Project?
- Page 345 – Strategic Projects RTP ID S1120031 "North-South Rail Corridor between Port Communities of Los Angeles/Long Beach and Arroyo Verdugo Subregion-SR-710 Transportation Improvement Options"
  - Clarify; is this the LRT alternative from the SR-710 North Project EIR?

PEIR

- Figure 2.4.2-1: Major Highway Projects; includes a Toll Lanes along the SR-710 North
  - Clarification regarding which alignment/mode should be provided.
  - Should be removed since the alignment/mode has yet to be determined.
- Figure 2.4.2-5: Major Toll Projects; includes Toll lanes along the SR-710 north
  - Clarification regarding which alignment/mode should be provided.
  - Should be removed since the alignment/mode has yet to be determined.
- 3.11 Land Use and Planning, Page 681, Impact LU-2: Potential to physically divide an established community, Significant Impact; "Although the 2016 RTP/SCS includes major highway projects that are intended to reduce travel delay by adding capacity or lanes to highways and arterials, and create complete streets such that vehicles and non-motorized transit can both use the streets simultaneously, construction and implementation of new transportation facilities or expansion of existing facilities could disrupt or dive established communities. For example, such impacts could occur as a result of the implementation of the 710 Freeway mixed flow project in Los Angeles County…"
  - Clarification regarding which alignment/mode should be provided.
- 3.17 Transportation, Traffic, and Safety, Page 881 "the SR-710 Gap Closure in Los Angeles County"
  - Remove "Gap Closure" language
  - Change the project description to SR-710 North Project
- Figure 3.17.4-2: Existing and Proposed Toll Projects; includes Toll Lanes along the SR-710 North
  - Should be removed since the alignment/mode has yet to be determined.

Los Angeles County Fact Sheet

- Page 4: County RTP Projects; includes "SR-710 north project (improvements TBD) from Valley Blvd. to California Blvd./Pasadena Ave."; and Cost "$5.3 B".
  - Remove "from Valley Blvd. to California Blvd./Pasadena Ave." language
  - Why is the Project Cost listed as $5.636 billion? Does this indicate that the project is the Tunnel Alternative?

ATTACHMENT 2

Email Correspondence from C. Aguirre to M. Lin

From: Courtney Aguirre
To: Margaret Lin
Subject: RE: Transportation model project list
Date: Monday, December 14, 2015 8:04:36 AM
Attachments: image008.png
image012.png
image013.png
image015.png

Margaret,

To achieve federal conformity, SCAG is required to model regionally significant and federally funded projects contained within the Federal Transportation Improvement Program (FTIP), including the Los Angeles County Metropolitan Transportation Authority's (LA Metro's) SR-710 North Project Study Alternatives project (RTP Project ID: 1M0101). The SR-710 North Project Study Alternatives project is currently modeled as four toll lanes in each direction as a place holder for this project based on its current description in the 2012 RTP/SCS, which is at present the conforming plan for the region. We understand that the project is currently under environmental review and that a preferred alternative is to-be-determined through this process. As with other projects included within the Draft 2016 RTP/SCS Project List, once the SR-710 North Project Study environmental process is complete, the 2016 RTP/SCS will be updated to reflect the Locally Preferred Alternative as identified within the environmental document.

Sincerely,

Courtney Aguirre
Senior Regional Planner
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
818 West 7th Street, 12th Floor, Los Angeles, CA 90017
T: (213) 236-1804
E: aguirre@scag.ca.gov

Stay Connected

From: Margaret Lin [mailto:mlin@southpasadenaca.gov]
Sent: Tuesday, December 8, 2015 3:44 PM
To: Courtney Aguirre <Aguirre@scag.ca.gov>
Subject: Transportation model project list

Courtney,

Would you mind sending me the project details that were included in the transportation model associated with the following projects please:

- FTIP and RTP Project ID: 18790
- RTP Project ID: 1M0101

Please let me know if you have any questions or comments.

Sincerely,

Margaret Lin
Principal Management Analyst
City of South Pasadena
1414 Mission Street
South Pasadena, CA 91030
(626) 403-7236
MLin@SouthPasadenaCA.gov

ATTACHMENT 3

County of Los Angeles Department of Public Health – SR-710 North Draft EIR/EIS Comment Letter

COUNTY OF LOS ANGELES
Public Health

CYNTHIA A. HARDING, M.P.H.
Interim Director

JEFFREY D. GUNZENHAUSER, M.D., M.P.H.
Interim Health Officer

ANGELO J. BELLOMO, REHS, QEP
Director of Environmental Health

5050 Commerce Drive
Baldwin Park, California 91706
TEL (626) 430-5100 • FAX (626) 813-3000

www.publichealth.lacounty.gov

August 5, 2015

Mr. Garrett Damrath
Chief Environmental Planner
Caltrans District 7
Division of Environmental Planning
100 S. Main Street, MS-16A
Los Angeles, CA 90012

SUBJECT: REVIEW OF STATE ROUTE 710 NORTH PROJECT DRAFT EIR/EIS BY THE LOS ANGELES COUNTY DEPARTMENT OF PUBLIC HEALTH

Dear Mr. Damrath,

The Los Angeles County Department of Public Health (DPH) Bureau of Toxicology and Environmental Assessment is submitting this comment letter on the SR-710 DEIR/EIS. DPH has reviewed the DEIR/EIS for potential health impacts that may arise from this transportation project. Our review reveals a number of deficiencies that must be addressed in order to ensure the protection of the public's health.

1) **Environmental exposures**
   a) The DEIR/EIS does not adequately address the production of airborne emissions and noise that may be produced by this project. Particulate pollution from fibers, coarse particles, fine particles, and ultrafine particles from both construction and operation have notable impacts on cardiovascular, respiratory, and neurological health. The DEIR/EIS should include measures specifically to mitigate exposures to particulate pollution.
   b) Excavation during construction may lead to the liberation of radon gas, a known human carcinogen which is formed in soil. The DEIR/EIS does not adequately address the risk of radon exposure during construction, and provides no surveillance for radon after project completion.
   c) The DEIR/EIS does not adequately address dust suppression measures to prevent the transmission of Valley Fever and other soil-borne infectious diseases.

Cyrus Rangan, M.D., F.A.A.P., F.A.C.M.T., Director • Bureau of Toxicology & Environmental Assessment
695 South Vermont Avenue South Tower-14th Floor Los Angeles, CA 90005 TEL (213) 738-3220 · FAX (213) 252-4503

d) The DEIR/EIS does not adequately address the production of noise and vibrations, from construction, traffic, and ventilation/maintenance systems, which present significant short and long-term health risks. Ground vibrations present additional risks, such as amplification of radon migration; and damage to structures such as older housing, historical buildings, and unique facilities such as laboratories.

2) **Worker health and safety**
The DEIR/EIS should implement a comprehensive plan to protect the health and safety of workers during construction and operation of the project. Construction and maintenance workers are at risk for numerous exposures such as asbestos, radon, air & soil emissions, noise, and vibrations. A worker safety plan should be prepared, with review and input from the appropriate state regulatory agencies, to mitigate potential hazards to site workers and the public.

3) **Impacts on human health**
The DEIR should include a broader and more balanced analysis of all of the the health benefits and negative impacts of the project on both workers and community members, with consideration of relevant published scientific and medical research. Potential disease impacts from this project include cancer; cardiovascular disease; asthma and other respiratory diseases, impaired child lung development; adverse pregnancy outcomes such as birth defects and low-birth-weight births; obesity and diabetes; and neurological disease. Automobile-oriented transportation projects often limit active transportation modalities such as walking and bicycling, and raise the risk of injuries to pedestrians and cyclists. Further analysis should be directed to the impact of this project on active transportation and injury risks. The DEIR/EIS should analyze the baseline health status of the surrounding communities, including identification of vulnerable populations, such as children, pregnant females, seniors, and people with disabilities; and assess the impact of the project on the rates of acute and chronic diseases.

4) **Impacts on communities**
The DEIR/EIS includes a community impact assessment but does not adequately address how these impacts may affect the health of the residents of the impacted communities. For example, changes in the community that reduce opportunities for physical activity, reduce access to healthy food options, or reduce access to medical clinics or hospitals all could adversely impact health. In addition, changes to the community that reduce community cohesion and increase social isolation could also profoundly impact health in negative ways. The DEIR/EIS should include an assessment of how the project's impacts on the overall character of the community will in turn impact community health, and provide recommendations for how these health impacts can be minimized.

For further questions, please contact Cyrus Rangan M.D. at (213) 738-3220.

Sincerely,

Cyrus Rangan MD FAAP ACMT

Cyrus Rangan M.D., FAAP, FACMT
Director, Bureau of Toxicology and Environmental Assessment
Los Angeles County Department of Public Health

ATTACHMENT 4

South Coast Air Quality Management District – SR-710 North Draft EIR/EIS Comment Letter

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

South Coast AQMD

SENT VIA EMAIL AND USPS: AUGUST 5, 2015

August 5, 2015

Garrett Damrath, Chief Environmental Planner
Caltrans District 7, Division of Environmental Planning
100 South Main St., MS-16A
Los Angeles, CA 90012

Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the State Route 710 North Study

The South Coast Air Quality Management District (SCAQMD) staff appreciates the opportunity to comment on the above-mentioned document. The following comments are intended to provide guidance to the lead agency and should be incorporated into the Final Environmental Impact Report/Statement (Final EIR/EIS) as appropriate.

The California Department of Transportation (Caltrans), in cooperation with the Los Angeles County Metropolitan Transportation Authority (Metro), proposes transportation improvements to enhance mobility and relieve congestion. The study area for the SR-710 North Study is approximately 100 square miles and generally bounded by I-210 on the north, I-605 on the east, I-10 on the south, and I-5 and SR-2 on the west. The proposed alternatives for the project include the No Build Alternative, the Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative, the Bus Rapid Transit (BRT) Alternative, the Light Rail Transit (LRT) Alternative, and the Freeway Tunnel Alternative. Components of the TSM/TDM Alternative will also be included with the BRT, LRT, and Freeway Tunnel Alternatives.

After reviewing the Draft EIR/EIS, SCAQMD staff is very concerned about the inadequate analysis of two key aspects of the CEQA document. First, the Health Risk Assessment (HRA) for the project shows that the tunnel alternatives will present a significant health risk to local residents when compared to a No Build scenario, however the Draft EIR/EIS concludes that this impact is less than significant, and no mitigation is required. Second, localized air quality impacts are not adequately analyzed, and decision-makers would not be able to use the EIR/EIS as written to determine if the project will adversely affect air quality in the local area. For example, there is no quantitative analysis of localized impacts for the freeway tunnel alternatives to determine if ambient air quality standards are exceeded for NO2 or CO. For these reasons, the analysis should be revised, taking into consideration comments contained in this letter and additional detailed comments presented in the attachment.

Finally, the proposed air pollution control equipment for the freeway tunnel alternatives in the Draft EIR/EIS will require permits from SCAQMD. As a responsible agency, we request that the project proponents meet with SCAQMD staff to discuss details of the permitting requirements so that they can be included in the Final EIR/EIS.

Staff is available to work with the lead agency to address these issues (including the detailed comments in the attachment) and any other air quality questions that may arise. Please contact me at (909) 396-3244, if you have any questions regarding these comments.

Sincerely,

Ian V. MacMillan

Ian MacMillan
Planning and Rules Manager

Attachment
IM:JW:JC
LAC150306-02
Control Number

Attachment

Health Risk Assessment Demonstrates Significant Impact But Draft EIR/EIS Concludes Impacts Are Not Significant

1. SCAQMD staff appreciates that the lead agency chose to include a Health Risk Assessment (HRA) with this Draft EIR/EIS. Table 3-4 of this HRA shows the incremental cancer risk between project alternatives and the No Build alternative. This table shows that cancer risks could reach up to 149 chances per million at the maximum exposed residential receptor, which is above SCAQMD's recommended CEQA threshold of 10 chances per million for all freeway alternatives. Despite this conclusion, the Draft EIR/EIS determines that cancer risks are less than significant, based on an inappropriate consideration of the CEQA baseline.

   The Draft EIR/EIS incorrectly uses a static 2012 year in comparison to project impacts. This approach is inappropriate because existing regulations (e.g., ARB's Truck and Bus Rule) will lower this health risk, even in the absence of this project. By using a static 2012 baseline, the Draft EIR/EIS is taking credit for other projects (e.g., ARB regulations) as a component of the build alternatives for the SR710. This approach is inconsistent with previous LA Metro projects. For example, LA Metro successfully defended a case in the California Supreme Court on this very issue, holding that use of a future baseline was proper in some cases (*Neighbors for Smart Rail v. Exposition Metro Line Construction* (2013) 57 Cal.4th 439). Because the No Build-Build Alternative comparison shows health risk impacts that are substantially above SCAQMD's recommended significance thresholds, SCAQMD staff recommends that the lead agency find that this impact is significant, and identify mitigation to reduce this impact to a less than significant level.

Localized Air Quality Impacts Not Analyzed

2. The proposed project is surrounded by sensitive land uses (i.e., residential dwellings north, south, east and west of the project site); however, the Draft EIR/EIS did not evaluate potential localized air quality impacts that could result from construction and operation of the proposed project. Without this analysis, the lead agency does not have information to make a determination of significance about potential air quality impacts from this project. This lack of analysis is especially concerning as the tunnel alternatives will focus all of the vehicle emissions along the entire tunnel to the portal and ventilation stack areas.

   Therefore, SCAQMD staff recommends that the lead agency revise the air quality analysis to include an assessment of potential localized air quality impacts during construction and operation of the proposed project. This issue was raised in Technical Advisory Committee meetings and in a direct meeting between SCAQMD staff and LA Metro and Caltrans staff. This type of localized analysis is regularly conducted by other lead agencies for CEQA and was also conducted for the I-710 Corridor project Draft EIR/EIS just south of this project site.

   These potential localized air quality impacts should be assessed using SCAQMD's Localized Significance Methodology and compared to the localized significance thresholds specific to the project area[1]. Furthermore, the lead agency should ensure that all future projects include a localized air quality analysis, if warranted. In the event that the lead agency determines the proposed project will result in significant localized construction and operational air quality impacts, the SCAQMD staff recommends that the lead agency require mitigation to minimize these impacts to a less than significant level.

SCAQMD is not Listed as a Responsible Agency

3. The Draft EIR/EIS does not discuss SCAQMD's role as a responsible agency for the tunnel alternatives for this project. These alternatives are proposing to install ventilation stacks with air pollution control devices that require permits from SCAQMD. It is our understanding from discussions at Technical Advisory Committee meetings that the lead agency would meet directly with SCAQMD staff to discuss SCAQMD's role regarding permitting requirements for this project. As a responsible agency, we will need to rely on the EIR/EIS for this project before any permits can be issued. We recommend that the lead agency schedule a meeting with us to discuss the detailed permitting requirements for this project.

Health Risk Assessment Methodology

4. The HRA conducted for this Draft EIR/EIS used an older methodology from the state Office of Environmental Health Hazard Assessment for calculating risks. This older methodology was replaced with a newer version in March 2015. This updated HRA guidance uses more recent scientific findings to evaluate children's greater susceptibility to cancer risks from exposure to air pollution. In general, residential cancer risks from pollutants like diesel particulate matter are found to increase between two and three times compared to the old methodology. The EIR should consider revising the calculated cancer risks using this updated guidance.

Air Quality Analysis Does Not Include All Areas Potentially Impacted by This Project or Cumulative Impacts from Other Projects

5. While the 710-North study area primarily covers northeast Los Angeles and western San Gabriel Valley, the lead agency did not analyze impacts from the tunnel alternatives in the surrounding areas. Completing the SR 710 would result in traffic and air quality impacts throughout wide portions of Los Angeles County. For example, the Draft EIR/EIS states that regardless of build alternatives, passenger vehicles will continue using arterial roads to transverse north and south through the region. This project includes alternatives which will allow trucks to now travel on the SR-710 between I-10 and I-210 and would introduce new truck trips in the area which did not exist without the project. In conjunction with Cumulative Projects such as the I-710 South Corridor Project and Port expansion projects, overall traffic and demand would increase along the I-710. SCAQMD staff recommends that the lead agency expand the study area and provide a more robust analysis of the potential cumulative air quality impacts in the surrounding areas from this project and other reasonably foreseeable projects.

[1] The Localized Significance Threshold (LST) methodology and Mass Rate LST Look Up Tables are available at: http://www.aqmd.gov/ceqa/handbook/LST/LST.html

Transportation Conformity

6. The quantitative transportation conformity analysis contained within the Draft EIR/EIS has not yet been approved or submitted to the Transportation Conformity Working Group (TCWG). The protocol for this project was only submitted July 22, 2015 to the TCWG, but it has not yet been approved. SCAQMD staff identified potential errors in the conformity analysis contained within the Draft EIR/EIS, as identified below. This comment does not preclude any comments we may provide to the TCWG on either the protocol or the conformity analysis.

   The conformity analysis results as presented in Table 5.8 through 5.10 in the Air Quality Assessment Report only show a comparison between maximum concentrations for each scenario, without accounting for where the maximum impact occurs. The conformity analysis must instead demonstrate that there are no increased air quality impacts at any receptor, not just a comparison between the maximum receptors, which may be located miles apart from one another.

Dispersion Modeling

7. Some of the receptors were incorrectly placed within the volume source exclusion zone and their results would be invalid. Since there are modeled volume sources which extend beyond the Project boundary, care should be taken to ensure that no receptors are placed within the volume source exclusion zone. This can be done by using smaller, adjacent volume sources or by using an area source instead to model the freeway emissions.

8. Highway Interchanges were modeled with a 30 foot release height to capture over and under passes of the interchange. The lead agency should instead use an elevated volume release height to properly model emissions from trucks on an interchange.

9. AERMOD file SR710_RoadwaysOperation_DTA_5yrs_OTHER.DTA models the scrubber/ventilation system with a stack velocity ranging from 14.72 – 34 m/s and a flow rate of 565 – 1,312 m^3/s. The Tunnel System Report describes the system as having an exiting stack velocity of 1,780 – 3,690 ft/min (9.04 – 18.75 m/s) and a flow rate ranging from 762,800 – 1,652,700 cfm (360 – 780 m^3/s). The modeled scrubber/ventilation system stack velocities and flow rates are greater than the proposed values identified in the Tunnel System Report. A higher exit velocity and flow rate would tend to result in an underestimation of modeled concentrations. SCAQMD staff recommends the lead agency revise the modeling by using the actual exit velocity and flow rate in the report.

Emission Estimation

10. In the Health Risk Assessment (HRA), when comparing project impacts to a 2012 CEQA baseline, health risks were estimated using a long-term average emission rate based on a weighted average after calculating emissions each year. However, when comparing project impacts to the NEPA No Build baseline, long-term average emissions were linearly interpolated using values only for years 2012, 2020, 2025 and 2035. Because emission

estimates do not follow linear patterns over time, the estimation methodology may underestimate potential health risks. SCAQMD staff recommends using a consistent emission estimate methodology (i.e. analyze emissions every year, rather than just milestone years) for both the CEQA and NEPA baselines.

Scrubber/Ventilation System

Although the DEIR/EIS has scrubber/ventilation system design discussion in the Tunnel Systems Report, specifics are unclear and additional information is required.

11. The proposed air pollution control system does not control gaseous pollutants, and it is not as effective at reducing ultrafine particles as it is with coarser particulate matter. If pollution from the entire tunnel system will be vented through limited release points, then additional controls should be added that will also reduce gaseous pollutants and ultrafine particles. The EIR should review studies prepared for SCAQMD that evaluate different types of controls for roadway tunnel pollution, and implement any that are found feasible for this project.[2]

12. According to the *Development of Electrostatic Precipitator* [ESP] *for Road Tunnel*[3] the type of electrodes (wire or spike plate type) used is a factor for the proper operation of the ESP. A spike plate type electrode provides an optimum electrode configuration with stable and uniform corona discharge. As a result, spike plate electrodes have greater performance, reliability and stability. The Tunnel Systems Report for the Freeway Tunnel Alternative does not discuss or analyze electrode type. SCAQMD staff recommends evaluating and considering both plate styles.

13. The operation of an ESP would generate ground-level ozone (O_3) which adversely affects human health. Since ozone generation is directly related to ESP power consumption, increased ESP power consumption would create higher ozone emissions. SCAQMD staff recommends additional discussion and details on minimizing ozone generated in the ESP[4].

14. With high flow rates indicated in the Tunnel Systems Report for the Freeway Tunnel Alternative, the efficiency is expected to only be as low as approximately 80%. The flow through the ESP should be slow and evenly distributed for adequate particle collection (2-8 ft/sec). Normally gas velocity is reduced by expansion in the inlet plenum.

15. To prevent re-entrainment of the particles, the aspect ratio (length to height of ESP) should be greater than 1. SCAQMD staff recommends maintaining an aspect ratio greater than 1 during the ESP design stages.

16. Additionally, there may be a need to remove the large particles (chunks of rubber, etc.,) to prevent clogging the ESP. SCAQMD staff recommends analyzing particle size distribution found in tunnels. The lead agency should discuss the impacts of large particles on the ESP.

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[2] Near-Road Mitigation Measures and Technologies studies and webcast found here: http://www.aqmd.gov/home/library/technology-research/technology-forums
[3] Miyake, A (2006) Development of Electrostatic Precipitator for Road Tunnel [PDF] http://www.isesp.org/ICESP%20X%20PAPERS/PDFS/Paper%2010B1%20030%20Miyake.pdf
[4] Ibid

17. The Tunnel Systems Report indicates that a waste water treatment system will be required to maintain the air cleaning equipment. The lead agency does not discuss the materials collection and discharge process. Furthermore, the lead agency should provide additional discussion and design specifications of the waste water treatment system and cleaning process.

18. Since moisture can lower the efficiency of the ESP as well as the resistivity and affect the operation, the lead agency should address measures to remove high moisture from the inlet gas stream.

19. The lead agency should discuss and evaluate the potential reduction of NO2 with dry adsorbent that has been used in tunnels with ESP in Japan (Delivery Truck Record).[5]

20. While the Tunnel Systems Report addresses the fire and safety features procedures for the tunnel, it does not explore the potential for explosions due to build-up carbon or carbon monoxide in the ESP (Electrostatic Precipitators).[6] The lead agency should discuss equipment maintenance and equipment breakdown procedures and the risk of upset events. Additionally, the lead agency should evaluate the need for back-up power, redundant systems and any associated equipment.

Modification of Construction Mitigation Measures

21. Section 4.2.3 of the CEQA Evaluation III(b) states that short-term degradation of air quality may occur during construction activities and Measures AQ-1 through AQ-5 would reduce construction emissions to less than significant levels. Table 3.13.4 of the Draft EIR/EIS and Tables 5.1-5.5 of the Air Quality Analysis also indicate that construction emissions exceed the daily maximum construction emission thresholds. While SCAQMD staff appreciates the Green Construction Policy that LA Metro has committed to using for this project, the Draft EIR/EIS did not provide any supporting documentation or emissions calculations to support claims that Measures AQ-1 through AQ-5 would reduce construction emissions to less than significant levels. SCAQMD staff recommends updating the Air Quality Analysis to demonstrate that the mitigation measures are adequate to reduce impacts to a less than significant level. In addition, the mitigation measures proposed for this project should be modified to include the underlined comments in numbers 22-25 below.

22. Measure AQ-1 – Fugitive Dust (applies to all four Build Alternatives)
During clearing, grading, earthmoving, or excavation operations, the Resident Engineer will require the construction contractor to control excessive fugitive dust emissions by regular watering or other dust preventive measures using the following procedures, as specified in the South Coast Air Quality Management District Rule 403. The Construction Contractor will be required to:

---

[5] Delivery Truck Record. Retrieved July 22, 2015.
http://panasonic.net/ecosolutions/air/tunnel/records.html
[6] Buekens, A (Pollution Control Technologies – Vol. I – Electrostatic Precipitators
http://www.eolss.net/sample-chapters/c09/e4-14-01-08.pdf

- Prevent dust from being visible in the atmosphere beyond the property line of the emission source
- Prevent dust emissions from exceeding 20 percent opacity
- Prevent track-out from extending 25 feet or more in cumulative length from the point of origin from an active operation
- Utilize best available control measures included in Table 1, 2, & 3 of SCAQMD Rule 403
- Submit Large Operations Notification (Form 403N)
- Comply with all Large Operations requirements

23. Measure AQ-2 – Equipment and Vehicle Emissions (applies to all four Build Alternatives) During all site preparation, grading, excavation, and construction, either the Resident Engineer for the TSM/TDM, BRT, and LRT Alternatives or the Resident Engineer for the Freeway Tunnel Alternative, as applicable, will require the Construction Contractor to:
    - Require the use of 2010 and newer diesel haul trucks (e.g., material delivery trucks and soil import/export) and if the lead agency determines that 2010 model year or newer diesel trucks cannot be obtained, the lead agency shall use trucks that meet EPA 2007 model year NOx emissions requirements.

24. Measure AQ-4 – California Department of Transportation (Caltrans) Standard Specification for Construction (applies to ~~Freeway Tunnel Alternative~~ all Build Alternatives)

25. Measure AQ-5 – Metro Green Construction Policy (applies to ~~TSM/TDM, BRT, and LRT Alternatives~~ all Build Alternatives)

ATTACHMENT 5
Environmental Protection Agency – SR-710 North
Draft EIR/EIS Comment Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

AUG 27 2015

OFFICE OF THE
REGIONAL ADMINISTRATOR

Carrie Bowen, Director
Department of Transportation, District 7
100 S. Main Street, MS-16A
Los Angeles, California 90012

Subject: EPA Comments on the Draft Environmental Impact Statement for the SR 710 North Study, Los Angeles County, California (CEQ #20150061)

Dear Ms. Bowen:

The Environmental Protection Agency (EPA) has reviewed the above-referenced document pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act. The California Department of Transportation (Caltrans) granted EPA an extension until August 28, 2015 to submit comments on this document. Our detailed comments are enclosed. EPA appreciates Caltrans' consideration of transit and tunnel alternatives that seek to reduce the adverse air quality and health impacts that additional lane capacity may create. Our review of this project has identified missing information that is needed to demonstrate that the project can meet this goal. EPA believes that transit options in conjunction with regionwide zero- and near-zero emissions corridors, can collectively contribute to long term strategies for improved air quality in the South Coast Air Basin, which has some of the worst air quality in the nation. Capturing and controlling roadway emissions through tunneling and ventilation technology may also reduce some of the project's impact.

Freeway Tunnel Alternative
The proposed ventilation system with air scrubbers has the potential to substantially mitigate operational air quality impacts from the Freeway Tunnel Alternative. However, the Draft EIS does not fully evaluate whether the project alternatives could cause or contribute to localized National Ambient Air Quality Standard (NAAQS) exceedances in the project area, such as near the entrances to the tunnel or in the vicinity of the SR 710/I-10 and I-210/SR 134 interchanges. The additional materials provided by Caltrans to EPA during our review of the Draft EIS supported the need for refined analysis and disclosure to the public of impacts in anticipated hotspot locations, as well as the potential need for Freeway Tunnel Alternative design changes to eliminate identified impacts.

For these reasons, and because the project area's existing air quality is so poor, we have rated the Freeway Tunnel Alternative as "3"- *Inadequate Information*, and recommend preparation of a focused Supplemental Draft EIS, to 1) analyze whether or not the project will contribute to NAAQS exceedances, 2) demonstrate how the tunnel design and emissions controls will reduce and capture emissions to the highest extent possible, and 3) commit to mitigation to reduce remaining air quality impacts. We also provide several recommendations to further analyze and disclose impacts related to tunneling, including impacts from construction and haul routes. These issues are common to all design options that include tunneling.

EPA appreciates Caltrans' responsiveness to EPA through interagency coordination during the review period of this Draft EIS and we encourage continued coordination to further address the issues raised in this letter. We note that preliminary information shared with EPA during interagency coordination indicates that the Freeway Tunnel Alternative may impact the $PM_{2.5}$ NAAQS, and as a result, face conformity challenges. We understand that Caltrans intends to demonstrate that the preferred action meets the Clean Air Act requirements of EPA's transportation conformity regulations prior to publication of a Final EIS for this project and we encourage Caltrans to continue working on this issue and consider including a conformity determination in a Supplemental Draft EIS.

Light Rail Transit (LRT) Alternative
We commend Caltrans and Metro on the inclusion of transit alternatives that could address some of the traffic issues in the project area, as well as reduce emissions from single occupant vehicles. However, we have concerns with potential community impacts from the above-ground portions of the Light Rail Transit Alternative, including disruption of community cohesion and the number of displaced businesses. In light of these issues, the enclosed detailed comments recommend including a more robust discussion of the transit alternatives that were considered, but rejected, from further analysis in the Draft EIS. As noted above, we also provide several recommendations to further analyze and disclose impacts related to tunneling, including impacts from construction and haul routes. We have rated the Light Rail Transit (LRT) Alternative as EC-2, *Environmental Concerns, Insufficient Information.*

Transportation System Management/Transportation Demand Management (TSM/TDM) and Bus Rapid Transit (BRT) Alternatives
EPA provides no further comments on the Transportation System Management/Transportation Demand Management (TSM/TDM) and Bus Rapid Transit (BRT) Alternatives and provides a rating of LO, *Lack of Objections* for these alternatives.

We appreciate the opportunity to review this Draft EIS. When the Supplemental Draft EIS and/or Final EIS is released for public review, please send one hard copy and one electronic copy to the address above (mail code: ENF-4-2). If you have any questions, please contact Carolyn Mulvihill, the lead reviewer for this project, at 415-947-3554 or mulvihill.carolyn@epa.gov.

Sincerely,

Jared Blumenfeld

Enclosures:
Summary of EPA Rating Definitions
EPA's Detailed Comments

cc via email: Malcolm Dougherty, Caltrans
Ron Kosinksi, Caltrans
Brenda Powell-Jones, Caltrans
Vince Mammano, FHWA
Bryan Pennington, Metro
Dr. Barry Wallerstein, South Coast Air Quality Management District
Susan Nakamura, South Coast Air Quality Management District
Kurt Karperos, California Air Resources Board
LB Nye, Los Angeles Regional Water Quality Control Board
Hasan Ikhrata, Southern California Association of Governments
Dr. Paul Simon, Los Angeles County Department of Public Health

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

EPA DETAILED COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE SR 710 NORTH STUDY, AUGUST 27, 2015

EPA provides the following comments and recommendations for consideration as Caltrans finalizes the environmental review process for this project.

I. Freeway Tunnel Alternative
II. Light Rail Alternative
III. Other Comments

I. Freeway Tunnel Alternative

Demonstrating Tunnel Design/Effectiveness in Reducing Air Quality Impacts

The Draft EIS does not fully evaluate whether the Freeway Tunnel Alternative could cause or contribute to localized National Ambient Air Quality Standard (NAAQS) exceedances in the immediate project area, such as near the entrances to the tunnel or in the vicinity of the SR 710/I-10 and I-210/SR 134 interchanges. Furthermore, the Draft EIS and Tunnel Systems Report describe the goals and general design of the tunnel ventilation system and controls, but further information is needed for purposes of ensuring air quality mitigation and evaluating the modeling analysis.

Air Quality Modeling –Presentation of Impacts

The Draft EIS presents quantitative modeling results in Tables 5.8-5.10; however, the Draft EIS doesn't provide any information to the public describing what these modeling results mean in terms of air quality. The Draft EIS does not include predicted concentrations for several of the design variations: (1) Single-Bore Tunnel without Tolls, (2) Single-Bore Tunnel without Tolls, without Trucks, (3) Dual-Bore Tunnel with Tolls, without Trucks and (4) Dual-Bore Tunnel with Tolls with express bus. Further, the modeling results presented in the Draft EIS mischaracterize the full impacts of the project. The results presented in the tables do not appear to include background concentrations combined with the predicted modeled concentrations. Based on EPA's understanding of ambient air quality concentrations within the study area, it appears that the total concentrations would be above the NAAQS for particulate matter smaller than 2.5 micrometers ($PM_{2.5}$) standards. Presenting the modeled concentrations without background values does not clearly indicate to the public the full impacts from the project.

In addition, there is no information regarding where the impacts of the projects were predicted and why some design variations show higher or lower PM concentrations. For example, it is not clear why the results from the tunnel variations, without trucks, are higher than with trucks. The Draft EIS should clearly present information showing where localized concentrations will both increase and decrease, such as due to the shifting of traffic from existing roadways to the tunnel. The Draft EIS should explain these results so that the public understands the regional air quality impacts of the project.

We appreciate the additional information that Caltrans shared with EPA during our review of the Draft EIS, including preliminary modeled $PM_{2.5}$ concentrations from the build minus no-build alternatives focused on areas with the largest potential concern, such as the tunnel entrances. We encourage Caltrans to provide these additional maps, analyses, and conclusions to the public and decision-makers.

Recommendations:

- Clearly present information showing where localized concentrations will both increase and decrease and explain these results for the public and decision-makers. Include maps with modeled isopleths showing the full (background plus modeled) concentrations for the study area as well as anticipated changes (future build minus future no-build) in concentrations for 24-hour and annual $PM_{2.5}$ and PM_{10}. In addition to presenting information on the entire study area, include maps that include isopleths targeted to the areas of largest potential impact, such as the tunnel entrances, and provide clear information on the locations of the proposed tunnel and ventilation towers.

- Include more information explaining the differences in modeled concentrations for each of the design variations and why some concentrations are not included
- Please continue to consult with EPA on the emissions and air quality modeling, including the presentation of results for the public and decision-makers.

Air Quality Modeling - Design Assumptions, Modeling Inputs, and Verification of Results

There is not enough information in the Draft EIS for EPA to validate the modeling results. The Draft EIS does not contain maps or figures showing spacing and location of emission sources and tunnel vents, and there are no details regarding how emissions at tunnel entrances and exits were estimated and handled in modeling. It is not clear how fugitive emissions were determined and if centerline miles or VMT were used to predict growth in fugitive $PM_{2.5}$ and PM_{10} emissions.

The Draft EIS states that the tunnel ventilation tower emissions for the north and south tunnel portals were modeled as point sources, however there is no information provided regarding how these point sources were characterized, such as emissions rate, release height, exit temperature, etc. There is also no information about how the emissions at the tunnel entrances and exits were treated in the modeling. The Supplemental Draft EIS or Final EIS should include information on the tunnel entrances and exits displayed with the modeling outputs (e.g. concentration isopleths), to facilitate evaluation of the modeling treatment and performance in the entrance areas.

The Tunnel Systems Report emphasizes that the primary purpose of the tunnel ventilation system is to reduce the level of harmful gases within the tunnel, such as carbon monoxide (CO) from routine tunnel operations, or smoke from a tunnel fire. The Report also acknowledges an additional goal of "avoid[ing] concentration of noxious gases outside the tunnel at the portal areas." While maintaining safe air quality levels within the tunnel is critical, we also encourage Caltrans to consider ambient air quality (i.e. air quality outside of the tunnel) as a primary design goal, to further insure that the predicted effectiveness of the air ventilation system and controls are achieved in practice. Furthermore, while the Draft EIS and Tunnel Systems Report appear to only commit to particulate matter controls via an electrostatic precipitator, we note that it is also critical for the ventilation system to capture and control oxides of nitrogen (NO_x), volatile organic carbons (VOCs), and air toxic emissions, due to the project's location in the air basin with the worst ozone air quality in the U.S.

Recommendations:

- Clarify that ambient air quality is a primary purpose of the tunnel ventilation system, in addition to air quality within the tunnel.
- Commit to implementing tunnel ventilation system controls for particulate matter, CO, NOx, VOCs, and air toxics.
- Provide additional information regarding how emissions from the tunnel ventilation towers were characterized in AERMOD and the resulting modeled concentrations in the vicinity of the towers for each tunnel variation. In the presentation of modeling results, label the sources of emissions.
- Provide additional information regarding the characterization of emissions leading up to and immediately inside of the tunnel entrances and exits and the resulting modeled concentrations in the nearby vicinity.

- Include calculations used to determine the emissions modeled for each alternative.
- Provide information supporting assumptions on the effectiveness of the tunnel's air ventilation system and the control efficiency of the tunnel ventilation towers. To the extent that similar tunnel ventilation systems and controls are in operation in other locations, provide information on the effectiveness of those systems for capturing and controlling air pollutant emissions.

Air Quality Modeling - Potential Incorrect Use of Volume Emission Source
The Draft EIS states that "The operational vehicle exhaust emissions from roadways were modeled as a line of volume sources. The line source spacing, or separation of the volume sources, was twice the width of each individual volume source." While either area or volume sources can be used to represent roadways, in general, we recommend using area sources rather than volume sources as area sources are easier to characterize correctly. Spacing the volume sources twice the width is incorrect; the volume sources should be one source width apart. The additional modeling output isopleths that Caltrans provided to EPA indicate that the volume sources were potentially treated incorrectly in the modeling.

Recommendations:

- Before a Supplemental Draft EIS or a Final EIS is issued, a PM hot-spot analysis that meets the requirements of EPA's transportation conformity regulations is necessary. Please continue to consult with EPA on the development of this analysis. See additional comments about the PM hot-spot analysis below.
- Provide information in the Supplemental Draft, or Final EIS, on the results of the PM hot-spot analysis. Indicate how the emission sources were modeled graphically. The following link contains examples of how to characterize and model the emission sources: http://www.epa.gov/otaq/stateresources/documents/hotspot-leasons-learned-trb.pdf.
- Make AERMOD input and output files available for public review along with these results in the Supplemental Draft or Final EIS.

Construction – Complete Characterization of Construction Impacts
In the Draft EIS, Tables 5.1 – 5.5 indicate that daily construction emissions for the build alternatives increase significantly with the Freeway Tunnel Alternative variations, however a complete characterization of the emissions is not provided. The construction emission tables provided show only the maximum daily emissions in lb/day, but the duration of construction for each alternative is different. Alternatives that take longer to build will produce higher total construction emissions.

Construction of the Freeway Tunnel Alternative would be from 2020-2025. We note that the years 2021 and 2025 are important milestone years for attainment of the 2012 $PM_{2.5}$ standard. Evaluation of whether the area has attained the 2012 $PM_{2.5}$ NAAQS will be based on ambient data from 2019, 2020, and 2021. Minimization and mitigation of emissions impacts from construction will be important to help insure that the area will attain the standard. Compliance with South Coast Air Quality Management District (SCAQMD) Rule 403 and standard construction measures to reduce fugitive emissions should be discussed in the context of what options are appropriate, given the current drought conditions. Additional mitigation should also be considered to reduce NOx emissions.

Recommendations:

- The duration of construction for each alternative should be incorporated into the tables to show the total construction emissions for each alternative.
- Discuss whether, due to current drought conditions, dust control during construction will occur under additional requirements, such as use of recycled water, or use of non-water dust

palliative compounds. If water control methods aren't proposed, then discuss the relative effectiveness of other compounds in dust mitigation.

- Include additional mitigation measures in Chapter 6, including the following as applicable:
  - Meet and ideally go beyond CARB requirements for in-use diesel engines and equipment, particularly for non-road construction fleets.
  - Insure that all construction equipment meets or exceeds equivalent emissions performance to that of U.S. EPA Tier 4 standards for non-road engines.
  - Implement a strong anti-idling policy at *all* construction sites for this project.
  - Provide training for contractors and their employees on air quality impacts from construction activities and potential health risks to nearby receptors, and ways to reduce emissions (e.g., no idling, using PM filters, using alternative fuels, etc.).
  - Solicit construction bids that include use of energy and fuel-efficient fleets and zero-emission technologies.
  - Use lighting systems that are energy efficient, such as LED technology.
  - Use the minimum feasible amount of greenhouse gas (GHG)-emitting construction materials.
  - Use cement blended with the maximum feasible amount of flash or other materials that reduce GHG emissions from cement production.
  - Use lighter-colored pavement where feasible.
  - Recycle construction debris to the maximum extent feasible.
  - Plant shade trees in or near construction projects where feasible.

Tunnel Air Quality

Section 3.13 of the Draft EIS does not address air quality in the tunnel. However, the Tunnel Systems Report provides extensive information about the tunnel ventilation system, tunnel air quality, and standards for the ventilation system. Page 38 of the Tunnel Systems Report states, "When CO emissions are controlled, other air contaminants are also maintained at acceptable levels." More detail should be provided on the other air contaminants in the tunnel and what is defined as acceptable levels, including any relevant ventilation or air quality standards.

Recommendation:

- Section 3.13 should be revised to include a description of air quality in the tunnel, including relevant ventilation and air quality standards and predicted concentrations of CO, NO_x, air toxics, and $PM_{2.5}$.

<u>**Recommendations for Interagency Completion of Project-Level Transportation Conformity Analysis and Associated Consultation**</u>

Discussion of Conformity

As the Draft EIS states, the Freeway Tunnel Alternative with either the Single or Dual-Bore design variations were determined to be projects of air quality concern (POAQC) by the Southern California Association of Government's Transportation Conformity Working Group (TCWG), meaning they require a PM hot-spot analysis. The language in the Draft EIS implies that this analysis has not yet been conducted, yet also seems to indicate that conformity was completed and demonstrated by the modeling results included in the Draft EIS: (see italic text below) and in several other sections of the document.

> If the Freeway Tunnel Alternative with either the single-bore or dual-bore design variation is identified as the preferred alternative, a quantitative PM hot-spot analysis *will be conducted* to demonstrate that the project would not delay attainment of or worsen existing violation of or cause an exceedance of the PM2.5 or PM10 national ambient air quality standards and meets

conformity requirements. *In addition to the demonstration of conformity requirement, PM2.5 and PM10, 24-hour PM2.5, annual PM2.5, and 24-hour PM10 concentration values were calculated* along the existing and proposed roadways within the project area. These values were calculated based on the EPA Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas (EPA Guidance November 2013).

Since this is a major new transportation facility located in an area that is designated as nonattainment for multiple ozone and $PM_{2.5}$ standards as well as maintenance for CO and PM_{10}, it is critically important that impacts to air quality be accurately analyzed, disclosed, and reduced as much as possible. As discussed, the SCAG TCWG has already determined that there are multiple project design variations that have been determined to be POAQCs. However, despite the referenced section of the Draft EIS included above, it has not yet been shown that these design variations meet the Clean Air Act requirements for transportation projects in PM nonattainment areas. Furthermore, the results presented in the Draft EIS are not presented for all receptors, included only the contribution from the project, and do not demonstrate that conformity was met.

Completion of $PM_{2.5}$/PM_{10} Hot Spot Conformity Analysis We understand that Caltrans has just started coordinating with the TCWG to address this issue by sharing a modeling protocol for the project. EPA's quantitative PM hot-spot guidance describes a series of analytical and modeling steps that a project sponsor can follow to ensure that the project meets the statutory and regulatory conformity requirements. First, impacts of the project should be modeled, combined with background concentrations as described in Section 9 of EPA's guidance, and compared to the relevant NAAQS. A hot-spot analysis for this project should consider traffic impacts not only in the tunnel, but also on facilities outside the tunnel, including at the tunnel approaches. The information in Appendix D indicates that some of the largest truck traffic increases are north or south of the tunnel portals, regardless of design variation. If the design values for the build scenario are less than or equal to the relevant NAAQS at all receptors, the project meets the conformity rule's hot spot requirements and no further modeling is needed.

If the build scenario results in design values greater than the NAAQS, then the no-build scenario will also need to be modeled. The modeling results of the build and no-build scenarios should be combined with background concentrations as appropriate. If the design values for the build scenario are less than or equal to the design values for the no-build scenario on a receptor by receptor basis, then the project meets the conformity rule's hot spot requirements.

Once the SCAG TCWG has concurred on the analysis, the quantitative analysis is typically considered as being acceptable for inclusion in the NEPA document.

Recommendations:

- The Supplemental Draft EIS or Final EIS should: 1) state that the conformity analysis is completed and concurred upon by the SCAG TCWG; and 2) accurately assess and disclose whether the proposed tunnel design variations will cause or contribute to any new localized violation of the PM NAAQS.
- Include predicted concentrations for *all* proposed Freeway Tunnel Alternative design variations, including background concentrations at all receptor locations near the tunnel facility.
- If the PM Hot-Spot Analysis is not completed upon publishing a Supplemental Draft EIS or Final EIS, a status of the analysis should be provided.

Construction Emissions Considerations for Conformity
Section 93.123(c)(5) of the conformity rule states that construction-related PM emissions due to a particular project are not required to be included in a hot-spot analysis, if such emissions are considered temporary (i.e., emissions which occur only during the construction phase and last five years or less at any individual site). The Draft EIS states that construction is predicted to last 57-59 months for the Freeway Tunnel Alternative, which is just short of the 5-year limit for including impacts in conformity. Considering that a 1-3 month delay would push the project period beyond 5 years, EPA encourages Caltrans to consider the potential need for construction-related emissions to be addressed in the conformity analysis.

Recommendations:
- In light of the need to include construction emissions in conformity-related analyses if the construction window is in excess of 60 months, EPA recommends that Caltrans provides more information on construction phasing.
- Confirm that there is no likelihood of construction delay. For example, include a schedule or timeline for various construction phases, and a description of how time estimates for each phase were developed. Discuss whether any potential delays have already been accounted for in this timeline.

Tolling
The Draft EIS does not include an equity assessment of the toll lanes included in the tolled variations of the Freeway Tunnel Alternative. In considering the implementation of high-occupancy/toll (HOT) lanes, there are nearby examples where analyses were completed in order to insure that a new toll system is implemented with awareness of possible disproportionate effects. For example, on the I-10 and I-15 corridors, the San Bernardino Association of Governments conducted an equity assessment to determine if the proposed I-10 and I-15 HOT lanes would benefit or adversely affect low-income travelers. For the impacts that were considered adverse, the equity assessment recommended measures to address the identified impacts. Metro also conducted an equity assessment to address concerns about fairness to low-income residents with regard to the proposed HOT lane on the I-5 North corridor.

The Draft EIS is also lacking information on how revenue from the tolls would be used, which could be helpful in describing equitable implementation of a tolling program. The Freeway Tunnel Alternative is included in the Southern California Association of Governments' regional transportation plan (RTP) and the tolled operational variation of the dual bore Freeway Tunnel Alternative is consistent with the scope in the RTP. Forecasted revenues in the RTP's financial plan include toll revenues from the proposed freeway tunnel.

Recommendations:
- If a tolled variation of the Freeway Tunnel Alternative is chosen as the preferred alternative, Caltrans should conduct an equity assessment of the toll lanes to better inform equitable implementation of future tolling. Alternatively, if the equity issues related to the I-10, I-15 and I-5 HOT lanes are similar enough to what is proposed for the Freeway Tunnel Alternative, then the recommendations from the previous equity assessments could be characterized and discussed within the context of this project.
- Describe the range of additional services or improvements that would be funded by possible tolling revenues, including who would benefit from those services or improvements.

Health Effects

Health Effects - Mobile Source Air Toxics During Construction

The Air Quality Assessment Report does not appear to include the quantification of temporarily elevated MSATs during the construction period. While toxic air contaminants are mentioned in the introductory paragraph, they are not mentioned throughout the rest of the section. TACs, and particularly diesel PM, should be mentioned when discussing the pollutants generated by heavy trucks and construction equipment.

Recommendations:

- Reference MSATs (or TACs) as appropriate. For example, in the paragraph that begins, "Site preparation and construction…," the following edit should be made: "If not properly controlled, these activities would temporarily generate PM_{10}, $PM_{2.5}$, ~~and small amounts of~~ *as well as* CO, SO_2, NO_x, VOCs, *and TACs, including diesel particulate matter*." Alternatively, clarify how it was determined that only small amounts of these pollutants would be emitted.
- Include TAC emissions, including diesel PM, in the analysis of construction emissions. Report results along with the other pollutants in Tables 5.1-5.5.
- Discuss TACs, including diesel PM, in the analysis of long-term regional emissions.

EPA recommends removing "Qualitative" from the title of Section 5.4 since there is a quantitative estimation of emissions in this section. However, the quantitative estimation of MSAT emission impacts during the construction phase of each of the build alternatives (Section 5.4.4)) is not presented. The short-term criteria pollutant impacts analysis presented in Section 5.1 (and in Tables 5.1 – 5.5) indicates that concentrations of criteria pollutants in the study area would increase by a significant amount, which suggests that MSAT emissions in these areas would increase as well. An expansion of the existing discussion, by including MSATs in the scope of short-term impacts analysis, would inform the public and decision-makers about possible location-specific increases in MSAT emissions.

Recommendations:

- EPA recommends that MSATs be included in the discussion of short-term impacts related to the construction of each build alternative.
- Specifically, discuss what impacts receptors would experience directly adjacent to the construction sites and how this compares with impacts they may experience currently, in the absence of an adjacent high-intensity construction project. This type of analysis is especially relevant to potential environmental justice communities adjacent to the build alternatives and in determining locations for prioritizing mitigation.

Health Effects - Mobile Source Air Toxics During Operation

Regarding long-term air quality impacts, page 5-29 of the Draft EIS states that MSAT emissions are estimated to decline by as much as 73 percent in the study area due to existing vehicle and fuel regulations coupled with fleet turnover (and not due to the build alternatives). Despite the fact that, as stated in the Draft EIS, with each build alternative, "regionwide MSAT levels [would be] substantially lower than they are today," there would be increases in localized MSAT emissions in each of the build alternatives relative to the no build alternative.

Recommendation:

- Clarify where increases in localized MSAT emissions would result from the build alternatives.

As stated above with regard to decreases in MSATs over time due to vehicle and fuel regulations and fleet turnover, the Health Risk Assessment states that the no build and build alternatives would cause a net decrease in cancer risks compared to 2012 existing conditions. Chapter 4.2.3 is also misleading regarding its conclusions that the build alternatives would "cause" a net decrease in cancer risks impacts. This statement should be rephrased, as discussed above. As demonstrated in the air quality analysis, there would be increases in localized MSAT emissions in each of the build alternatives relative to the no build alternative. Furthermore, in the Health Risk Assessment (see Table 3-4), maximum risks from the Freeway Tunnel Alternative have the potential to be greater than 100-in-a-million compared to the no build alternative. The Supplemental Draft EIS or Final EIS should clarify whether or not the build alternatives truly yield less than significant impacts in light of the information presented.

Recommendation:

- EPA recommends comparing the build alternatives and the no build alternative to determine the incremental impact from the alternatives themselves.
- Text should be revised to state that the build alternatives would not cause the decrease in cancer risks. EPA recommends rephrasing to say that "Cancer risks in both the no build and build alternatives decrease compared to 2012 existing conditions due to existing control requirements and fleet turnover."

Health Effects – Children's Health

Executive Order 13045 on Children's Health and Safety directs each Federal agency, to the extent permitted by law, to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, and to ensure that its policies, programs, activities, and standards address these risks. Analysis and disclosure of these potential effects under NEPA is recommended because some physiological and behavioral traits of children render them more susceptible and vulnerable than adults to environmental health and safety risks. Although the Draft EIS identifies communities and schools located near the proposed project area, the Draft EIS does not clearly describe the potential direct, indirect, and cumulative impacts of the project on children's health.

Recommendations:

- Evaluate the potential direct, indirect, and cumulative health impacts of the construction and operation of the various project alternatives on children's health. Obtain and discuss relevant health data (e.g., asthma data) for children living near the proposed project area, if available. The analysis may consider the following:
    - Potential respiratory impacts, including asthma, from air pollutant emissions and generation of fugitive dust;
    - Potential noise impacts to health and learning, especially in areas where the alternatives are located near homes, schools, childcare centers, and parks; and
    - Potential impacts from the use of chemicals, such as dust suppressants, and hazardous materials to children living near the proposed project areas.
- Further evaluate the proposed project alternatives in order to compare potential impacts to children's health. Clearly identify the project alternatives that have the least impact to children, as well as those alternatives that have the least impact on areas already significantly impacted by existing air pollution, high disease rates, and indicators of social vulnerability.
- Identify mitigation measures to reduce impacts from the proposed project's construction and operation to schools and child care centers near the proposed project area, including measures identified in the voluntary EPA School Siting Guidelines (http://www.epa.gov/schools/guidelinestools/siting/), and voluntary EPA Guidelines for States: Development and Implementation of a School Environmental Health Program

(http://www.epa.gov/schools/guidelinestools/ehguide/). Engage local school districts, child care providers, and others to discuss mitigation measures.

On March 6, 2015, California's Office of Environmental Health Hazard Assessment (OEHHA) adopted a new "Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments," which can be found here: http://oehha.ca.gov/air/hot_spots/hotspots2015.html. The guidance was updated to reflect advances in science which have shown that early-life exposures to air toxics contribute to an increased lifetime risk of developing cancer or other adverse health effects, compared to exposures that occur in adulthood. Children are typically more sensitive than adults to chemicals and this is true of air toxics. Children's defenses are not as developed, they breathe more air and eat and drink more per pound of body weight, and they are far more active than adults. In addition, they have a longer lifetime ahead of them, during which delayed health effects may become apparent. We also note that the Health Risk Assessment in the Draft EIS does not include an assessment of the risks associated with the construction impacts of each build alternative.

Along with the updated guidance, OEHHA and CARB updated its "Hotspots Analysis Reporting Program" (HARP) to reflect the updates. The latest version of HARP can be downloaded here: http://www.arb.ca.gov/toxics/harp/harp.htm.

Recommendations:
- The Health Risk Assessment may incorporate the updates identified above into the health risk analysis.
- The analysis may also be revised to include health impacts during construction.

Integration of Tunnel Alternative with 710 South Corridor Project
Because the proposed project is located directly north of the proposed 710 South Corridor Project and that project has the potential to directly affect the proposed project, the analysis should be more clear regarding the integration of the two projects.

Recommendation:
- If the Freeway Tunnel Alternative is selected as the preferred alternative, discuss how this project will integrate with the proposed I-710 South Corridor Project. For example, discuss how infrastructure to support zero emissions vehicles, which is being discussed for I-710 South, could be integrated into this project.

II. Light Rail (LRT) Alternative Comments
Property Acquisition and Business Displacement
EPA notes that the LRT Alternative will result in a large amount of property acquisitions. The Draft EIS states that because the LRT Alternative would result in a minimal number of nonresidential displacements, it would not adversely affect the character or cohesion of most of the communities in which the project would be located. It also states that the LRT Alternative would not result in permanent adverse effects related to relocations and real property acquisitions.

Table 3.3.6 indicates that Property Acquisitions Required for the LRT Alternative would result in the displacement of 73 businesses and 645 employees. The Draft EIS states that the LRT Alternative would result in the displacement of 15 neighborhood-oriented businesses in the community of East Los Angeles, adversely affecting community character and cohesion, and disrupting the social fabric of the community, due to the lack of relocation opportunities in the immediate vicinity and the high percentage of transit-dependent residents in the area. However, the Draft EIS concludes that most of the business displacements in other cities (Monterey Park, Pasadena, South Pasadena) "would not disrupt the social fabric of the communities" due to the nonessential nature of businesses or other businesses offering the same services in the vicinity. EPA has concerns about the displacements that would result from construction of the LRT Alternative in all of the communities discussed. These displacements would likely adversely impact both businesses and customers as relationships likely exist between neighboring businesses and neighboring residents. Regardless of the nature of the services, the displacement of many businesses in these communities could adversely affect community character and cohesion and negatively impact businesses that would have to relocate.

Recommendations:

- EPA recommends that Caltrans consider a more comprehensive analysis of community character and cohesion that includes other impacts, including visual, noise, and transportation, including the impacts of haul trucks during construction.
- If the LRT Alternative is chosen as the preferred alternative, additional efforts should be made to avoid and minimize property acquisition and business displacement. We encourage Caltrans to work with the local communities to encourage transit oriented development that could accommodate displaced businesses.
- The Final EIS should include information about whether partial acquisitions of property would impact the operations of businesses that exist on those properties, including information from business owners.

The Draft EIS states that the southern portion of the LRT Alternative is elevated due to the difficulty of getting a tunnel boring machine in to the area and the necessity of excavating a hill if the southern portion were to be tunneled. Due to the significant impacts to properties that would result from the elevated section of the LRT, if LRT is chosen as the preferred alternative, Caltrans should describe the other LRT alternatives that were considered and why they were eliminated from further study.

Recommendation:

- If the LRT Alternative is chosen as the preferred alternative, include a discussion in the Final EIS of the other LRT alternatives that were considered and why they were eliminated from further study, including quantitative information about what impacts led to those alternatives being eliminated.

III. Other Comments

Transportation Impacts

The Draft EIS states that in 2035, the TSM/TDM, BRT, and LRT Alternatives would all result in minor increases in AM and PM peak-hour vehicles miles traveled (VMT) in the project study area. The Freeway Tunnel Alternative single-bore variation would result in a 1 percent increase in combined AM and PM peak-period VMT and the dual-bore variation would result in a 2 percent increase. The Draft EIS states that by shifting trips to freeways, the Freeway Tunnel Alternative would divert VMT from local arterials; however, the Draft EIS does not quantify the amount of VMT that would be shifted from local arterials to the Freeway Tunnel Alternatives in the Executive Summary and other summary statements. Tables 3.5.6 and 3.5.11 include daily volumes of vehicles that would travel on arterials and freeways and other quantitative information about travel on arterials. This information should be summarized in the text conclusions for increased clarity for the public.

The transportation section also does not include information about annual average daily traffic on individual segments of freeway and arterials in the study area. This information is important to determine whether certain areas of the study area, for instance the areas where the new freeway alignment would connect to the existing freeway under the Freeway Tunnel Alternative, would experience significant increases in traffic and resulting air quality and noise impacts.

Recommendations:

- The Final EIS Executive Summary and other summary text should include a discussion, including percentages and other quantitative data, on how much traffic would be diverted from local arterials to the Freeway Tunnel Alternative.
- The Final EIS should include information about annual average daily traffic on individual segments of freeway and arterials in the study area, including which segments would experience increases in traffic and potential impacts resulting from that traffic.

Community Impacts Along Haul Routes

The Draft EIS states that the Freeway Tunnel Alternative would result in between 380 (single-bore variation) and 620 (dual-bore variation) haul trips per day during excavation, to transport excavated soil to the proposed disposal sites, two former rock quarries in Irwindale. The Draft EIS does not, however, appear to quantify the number of haul trips that would be required under the LRT Alternative. Tunnel boring operations, and subsequent haul trips, could occur 24 hours a day, 7 days a week. EPA is concerned that this amount of haul trips would have adverse impacts on communities near the disposal sites. Although the routes to the disposal sites would primarily run along freeways, EPA is concerned about the segments that run along local streets, and about traffic and community impacts in general along the haul routes.

Recommendation:

- If the LRT or Freeway Tunnel Alternatives are chosen as the preferred alternative, Caltrans should include a discussion in the Final EIS of the land uses on the local streets near the proposed disposal sites. The discussion should analyze potential impacts to residents and businesses in those areas and commit to mitigation measures for noise, air, traffic, and other potential impacts.

Environmental Justice Impacts

The Draft EIS states that no environmental justice (EJ) impacts were identified with any of the alternatives. Chapter 7 of the Community Impact Assessment contains maps which show each of the alternatives overlaid on (1) Racial Minority Population; (2) Hispanic/Latino Population; (3) Low Income Population; and (4) Census Tracts with One or More Environmental Justice Population Characteristics. These maps are very helpful in understanding potential impacts to the EJ communities. The local communities may be concerned about the location of the tunnel vents and the haul routes (rail and truck) for the tunnel bore material. Therefore, EPA recommends that these features also be indicated on the EJ maps for the LRT or Freeway Tunnel Alternative. As discussed above, the Freeway Tunnel Alternative with the dual-bore design variation would result in approximately 620 haul trips per day. Any EJ communities and/or sensitive populations located along the haul route could be impacted by the increased truck traffic.

Recommendations:

- Include maps in the EJ section of the Final EIS that show the preferred alternative overlaid on the various data included in the Community Impact Assessment. If the Freeway Tunnel Alternative is chosen, include the location of tunnel vents and haul routes on the maps.
- If the LRT Alternative is chosen as the preferred alternative, the Final EIS should also include a map in the EJ section of Chapter 3.3 that overlays EJ communities with proposed property acquisitions and haul routes.

- Any potential impacts to these communities should be discussed and mitigated, especially if there are any sensitive receptors impacted, such as schools, child care centers, or senior centers.

Dewatering During Tunnel Construction

The Draft EIS states that temporary dewatering will be required during construction of the LRT and Freeway Tunnel Alternatives. It states that the Los Angeles Regional Water Quality Control Board requires a permit for discharging wastes to surface waters from activities involving groundwater extraction. Order No. R4-2013-0095 (NPDES No. CAG994004) covers treated or untreated groundwater generated from permanent or temporary dewatering operations or other appropriate wastewater discharge not specifically covered in other general National Pollutant Discharge Elimination System (NPDES) permits in the Los Angeles region.

To be eligible for coverage under this order, a discharger must:

- Demonstrate that pollutant concentrations in the discharge shall not cause violation of any applicable water quality objective for the receiving waters, including discharge prohibitions;
- Demonstrate that the discharge shall not exceed, or have the reasonable potential to exceed, the applicable water quality objectives/criteria for the receiving waters; and
- Conduct water quality screening of a representative sample of the discharge to prove that a reasonable potential for discharge of toxics does not exist.

The Draft EIS states that the soil conditioners that may be injected into the ground at the face of the excavation would be nontoxic and biodegradable, and therefore would not adversely impact groundwater quality. Groundwater monitoring will be performed routinely during tunnel excavation to ensure that the activities are not affecting groundwater levels and quality.

The Draft EIS states that the concrete lining of the LRT and Freeway Tunnel Alternatives would be designed and constructed to be watertight and that after excavation the space between the outside of the tunnel lining and the soil is typically grouted to prevent groundwater flow along the tunnel bores. The Draft EIS states that no permanent dewatering would be required. Because groundwater basins in the area are already impaired by VOCs, nitrates, and other contaminants, it is critical that Caltrans insure no pollutants will enter groundwater during construction and operation of the project.

Recommendations:

- The Final EIS should discuss whether Caltrans/Metro have submitted a notice of intent (NOI) to be covered under the permit and how Caltrans will fulfill the requirements of the above Order (R4-2013-0095 (NPDES No. CAG994004), given the existing impairment of the local groundwater basins.
- The Final EIS should discuss how much dewatering is expected (duration or amount), whether the groundwater will be reused or re-injected, and whether there are any additional requirements on dewatering due to the existing statewide drought.
- Clearly identify what actions will be taken if groundwater monitoring indicates groundwater levels and/or quality are impacted during tunnel excavation.

Soil Disposal During Tunnel Construction

The Draft EIS states that the "excavated soil would be disposed of at the Manning and Olive Pits in the City of Irwindale. These pits are former rock quarries that have been previously environmentally cleared and licensed to accept clean soil from construction projects." However, no detail is provided about the environmental clearance. Page 2-53 states that "The Manning Pit is accessible by both rail and truck."

However, no additional information is provided about whether rail or trucks will be used for hauling bore material to the Manning Pit, or the potential environmental impacts of rail versus trucks.

Recommendations:

- The Final EIS should provide detailed information on the environmental clearance that has been completed for the Manning and Olive Pits in the City of Irwindale, including whether any additional permits will be required for soil disposal resulting from this project.
- As these sites have been licensed to accept clean soil, the Final EIS should discuss alternative disposal sites for soil that is found to be contaminated, and the timing and haul routes for that disposal, if necessary.
- The Final EIS should also discuss potential environmental impacts associated with hauling excavated soil by rail versus truck, and discuss how the decision will be made about whether rail or trucks are used.

Noise and Vibration Impacts

The Draft EIS discusses the locations of receptors that would experience noise impacts due to the various alternatives. It also discusses which locations were considered for noise abatement, and where noise barriers are considered reasonable and feasible, according to characteristics of the sites and cost considerations. We note that many of the noise barrier locations considered feasible were not found to be reasonable based on cost considerations. EPA encourages the consideration of noise barriers and other mitigation of noise impacts in areas of sensitive receptors, and in particular in areas of sensitive receptors located in environmental justice communities. The Cumulative Impact section discusses projects that have the potential to contribute to cumulative noise impacts. Again, we encourage mitigation of noise impacts in particular in areas that would experience cumulative noise impacts from this project and other projects.

With regard to temporary impacts, EPA is concerned about potential noise impacts along the haul routes during construction and vibration impacts from tunneling. The Draft EIS considers a 24-hour operation, and the resulting number of trucks per hour (30 trucks). The Final EIS should discuss whether adverse noise impacts would occur if a 24 hour operation does not occur and there were more trucks per hour.

Recommendations:

- EPA recommends that Caltrans include noise barriers and other mitigation of noise and vibration impacts in areas of sensitive receptors, and in particular in areas of sensitive receptors located in environmental justice communities or in areas that would experience cumulative noise impacts. We encourage mitigation of both permanent impacts from operation of the project alternative, and temporary impacts from construction.
- Include an analysis in the Final EIS of potential noise impacts resulting from different construction operations, including a less than 24-hour operation, which would result in more trucks per hour on roads and increased noise levels. If adverse impacts were to occur under those conditions, we encourage Caltrans to provide mitigation for those impacts.

Wetlands and Water Quality

Wetlands and Waters of the US

The Draft EIS states that while the total area of wetland and nonwetland areas meeting the criteria for US Army Corps of Engineers (USACE) jurisdiction in the Biological Study Area is approximately 4.8 acres (0.4 acre of wetlands and 4.4 acres of nonwetland waters of the US), potential impacts are much less, with the highest impacts being 0.5 acre of permanent and 0.2 acre temporary nonwetland water impacts anticipated from the dual-bore design variation of the Freeway Tunnel Alternative. The Draft

EIS also states that the alternatives would not permanently alter the values and functions of the waters in the area, which primarily function as conveyance of urban runoff and stormwater flows. EPA appreciates that, as stated in the Draft EIS, the Freeway Tunnel Alternative variations were refined during design development to avoid and minimize impacts to wetlands and other waters in the Laguna Channel.

Recommendation:

- Once a preferred alternative is selected, Caltrans should coordinate with the USACE to verify the jurisdictional delineation of wetlands and impacts in the study area, prior to publication of the Final EIS. Caltrans should also coordinate with USACE and EPA to determine appropriate mitigation for wetland impacts.

Water Quality

The Draft EIS states that best management practices would treat widely varying percentages of newly created or replaced impervious surfaces under the various alternatives.

Recommendation:

- Include a discussion in the Final EIS of the percentage of imperious surface that will be treated for the preferred alternative and how that fulfills local permit requirements.

Climate Change

The Draft EIS states that neither EPA nor the Federal Highway Administration (FHWA) have issued guidance or methods to conduct project-level greenhouse gas (GHG) analysis; however, the Council on Environmental Quality released revised draft guidance in December 2014 that describes how Federal departments and agencies should consider the effects of GHG emissions and climate change in their NEPA reviews. EPA recommends that Caltrans review that guidance to see whether it can be used to help outline the framework for its analysis of these issues. EPA appreciates the quantitative analysis included in the CEQA Evaluation chapter of the Draft EIS and encourages Caltrans to include this information as a part of the NEPA review. We support Caltrans' and Metro's efforts to reduce energy consumption and GHG emissions. As Caltrans continues to assess the risks to transportation facilities from climate change effects, we encourage Caltrans to adapt the design standards of this project to mitigate any effects.

Recommendations:

- We believe the Council on Environmental Quality's December 2014 guidance discussed above outlines a reasonable approach, and we recommend that Caltrans use that draft guidance to help outline the framework for its analysis of these issues.
- EPA encourages Caltrans to include the information in the CEQA Evaluation chapter as a part of the NEPA review.
- EPA encourages Caltrans to adapt the design standards of this project to mitigate climate change effects as feasible.

Other Items: **Please address the following in the Final EIS.**

Monitored Air Quality. The Draft EIS contains information regarding monitoring stations and air quality trends in the study area, however it is not clear in the document where the stations are located with respect to the new transportation facilities.

Recommendation:

- The Final EIS should include a map showing the local air quality monitoring stations discussed (i.e., the South Wilson Avenue Pasadena Station, the North Main Street Los Angeles Station, and any other stations located within the project study area) and their relationship to the project location.

Air Quality – Identification of Sensitive Receptors. The Draft EIS includes one paragraph describing where sensitive receptors are expected to occur in the study area but does not include any specifics on where those receptors are located.

Recommendation:

- The Final EIS should include a map showing sensitive receptors.

Air Quality Management Plan. The Draft EIS discusses the 2012 AQMP but not the most recent update or state or federal actions on that plan.

Recommendation:

- The Final EIS should update the information to include ARB adoption and EPA actions on the 2012 AQMP.

CO Screening Analysis. The flow chart was used incorrectly in the Level 4 portion of the analysis.

Recommendation:

- Since the study area is a CO Maintenance area, the lower part of the flow chart (levels 3 and 4) should be used. Please reapply the flow chart correctly and update the CO air quality analysis in the Final EIS.

Transportation Conformity. The Draft EIS indicates that SO_2 is a transportation-related criteria pollutant, which is not correct. The document also references national rulemakings regarding the transportation conformity rule, and ozone and particulate standard that occurred in 2003-2004. Multiple major federal rulemakings that have occurred since this time. Overall the discussion of EPA and ARB standards on pages 2-9 and 2-10 appears to conflate conformity and NAAQS updates.

Recommendation:

- The Final EIS should correct the text to indicate that SO_2 and lead are not required to be included in transportation conformity analyses. In addition, please update the document to include the most recent updates to federal and state NAAQS and the most recent amendments to the transportation conformity rule. Information on the conformity regulations can be found here: http://www.epa.gov/otaq/stateresources/transconf/conf-regs.htm. The latest NAAQS updates can be found here: http://www.epa.gov/air/criteria.html.

ATTACHMENT 6

Beyond the 710 Initiative

NELSON NYGAARD

NEW INITIATIVE FOR MOBILITY AND COMMUNITY

www.nelsonnygaard.com

SUMMARY

The San Gabriel Valley is an area of diverse cities and neighborhoods that trace the history of Southern California. New homes mingle with historic downtowns and educational institutions to create a lively sub-region. All of that activity, however, creates demand for ever-increasing mobility and access. The economic might of our region means we will continue to have opportunities to invest in transportation. Doing so in ways that serve our economy and environment, while supporting our health and quality of life, will require sound decisions. This initiative is a starting point that changes the conversation to focus on the transportation needs of the area and the opportunities that may be explored by the local community as they develop their vision for community mobility.

Transit – Building out the area's rapid transit network (particularly some missing north-south options) will make car ownership an option rather than a necessity – potentially improving life quality and household finance.

Active Transportation – Every trip starts by walking, and the people of this community deserve to be able to walk safely and comfortably. What better use of dollars is there than those spent to reduce injuries and deaths while taking cars off our congested roads?

Managing Demand – Sometimes it costs less to convince people not to drive than it does to accommodate driving with more road construction. Five-Hundred Million well spent dollars can take more cars off the roads than could be carried on a comparably priced new facility.

Congestion – While spending to create more choice, we can't lose sight of the fact that sometimes you just need to drive. Dollars spent smartly can help make those drives less miserable without encouraging the development sprawl that can result from less focused projects.

DIVERSE COMMUNITY, DIVERSE SOLUTIONS

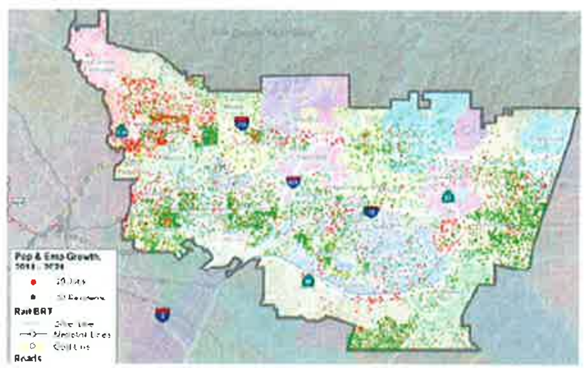
For many years, the idea of a 710 freeway connection has been misleadingly touted as a solution to the transportation woes of the San Gabriel Valley. The publication of the 710 Environmental Impact Report has made clear, however, that this 50-year old project is no solution. It does not help a community craving transit access. It does not address east-west mobility problems. It prohibits trucks, bikes, pedestrians and charges tolls for cars. Perhaps most importantly, it will consume all of the available financial resources for this area. Problems with the tunnel proposal include:

- The tunnel does not "pay for itself" through tolls as some have asserted.
- According to the EIR, the tunnel does not address congestion issues in Alhambra.
- The tunnel bypasses the very destinations people want to go to.

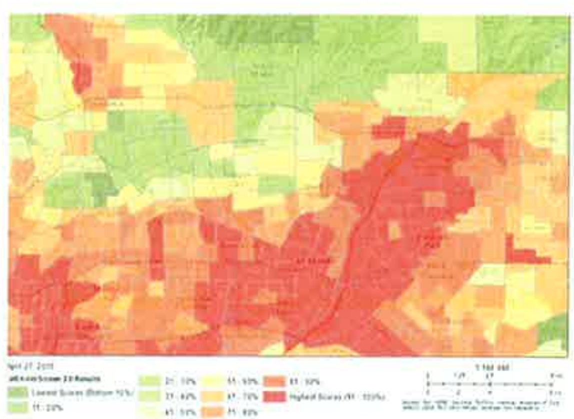
The San Gabriel Valley is a community of diverse people, with widely varying commute patterns. Employees need to make short commutes to Pasadena and long commutes to Burbank (Metro has found that 70 percent of study area vehicle trips start and end within the San Gabriel Valley). Students attending Cal State LA and East LA College need ways to make short commutes to school. Communities need to be able to walk safely to transit and want to be able to invest in ways that can improve air quality.

The set of ideas outlined in the pages that follow are intended as a starting point for the development of a real, community-based transportation vision. This is a compilation of many good ideas that have emerged from community and agency processes over the years. This diverse set of solutions should be refined based on community input and community needs in order to accommodate community aspirations. A community-based solution represents the best investment of our transportation dollars to connect and create community in the San Gabriel Valley.

It strains credibility that, despite holding scores of public open houses filled with community comment, no changes of substance have been made to any of the alternatives under evaluation. The 710 tunnel is not a community solution.



The addition of a 710 freeway linkage could bring the same level of environmental risk to local residents as that faced by residents in corridors such as I-605.



Analysis by Metro indicates the greatest population growth in the San Gabriel Valley will be in Pasadena - a community that has passed a resolution against 710 tunnel.

THE NORTH STUB

For fifty years this community has been held hostage to the wrong-headed idea of a freeway extension – an idea which has precluded all sensible solutions. Allowing these "complete street" connections to happen would improve access and reconnect neighborhoods as the land relinquished by Caltrans is put back into productive use. The plan could even facilitate a trail connection from Pasadena, along the Arroyo to the LA river.

As an example of the kind of solution that can be developed from the grass roots community, this vision of Pasadena's future stands in stark contrast to the 710 tunnel envisioned by planners (not influenced by community input).

This vision of reconnected streets supporting redevelopment would bridge the gap between downtown and West Pasadena.

QUICK COMPARISON

OPTION A:

FILL THE DITCH

Option A		Option B
+	East-West Connections	
+	Reducing Traffic Impacts	
+	Developable Land	
+	Grade Issues for Buildings	
+	Grade Issues for Access	
	Maintaining Bridges	X
+	Front/Back/Servicing	
+	Civic Open Space Plan	
?	Costs	?
←	MORE VALUE	

OPTION B:

RETAIN CURRENT GRADES

THE SOUTH STUB

The 710 freeway stub north of the 10 is over-scaled, and dumps all its traffic onto Valley Blvd, creating a congestion bottleneck. Converting the freeway into a boulevard allows us to solve its traffic problems by providing direct access to Cal State LA, and a 2-lane complete street connection to Alhambra Ave/Mission Rd, allowing traffic to be distributed into the arterial grid while protecting residential neighborhoods. A complete street connection through the emerging "Biotech Triangle" can reduce traffic at Fremont/Mission and cut-though along Concord Ave.

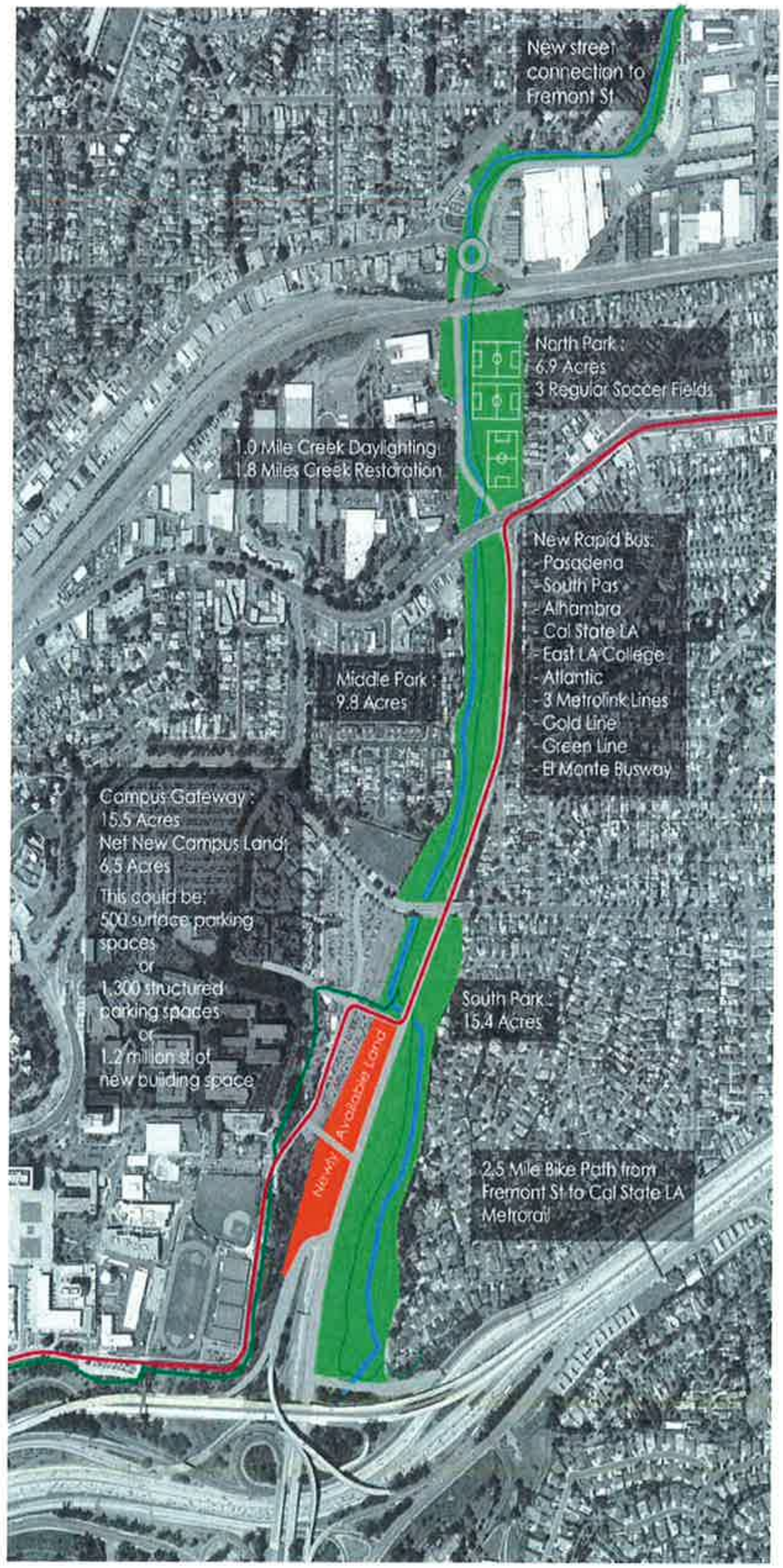
These changes also allow the restoration of Arroyo Rosa de Castilla, the year-round creek that runs alongside and under the 710, and the creation of over 30 acres of new parklands, three regular soccer fields, and a 2.5 mile bike path connecting Alhambra, El Sereno, and South Pasadena.

The boulevard also allows the creation of a new front door for Cal State LA, including 6.7 acres of flat, developable campus land.

Changing the disconnected south 710 Freeway stub into a connected boulevard would free up space for Cal State LA campus expansion, more efficiently disperse area traffic, provide space for premium transit including the opportunity to expand Dash service to El Sereno and Cal State LA. Perhaps more importantly it would connect communities, provide needed greenspace.

LEGEND

- New Rapid Bus
- Restored Aroyo Rosa de Castilla
- Golden Eagle Boulevard Complete Street
- Bike Path



THE NORTH STUB

Offers the potential to create 35 "new acres" of developable land to link the vibrant West Pasadena neighborhoods with Old Pasadena. This could create as much as 2.5 million square feet of new housing, retail, and office space.

Nearly 1,300 Residential units

Retail equivalent of expanding Old Pasadena by one-third

New Parks and Open Space

JOB CREATION

Building this development program will create more than 8,000 construction job years and more than $275 million in wages. Property and sales taxes are estimated to be more than $12 million per year.

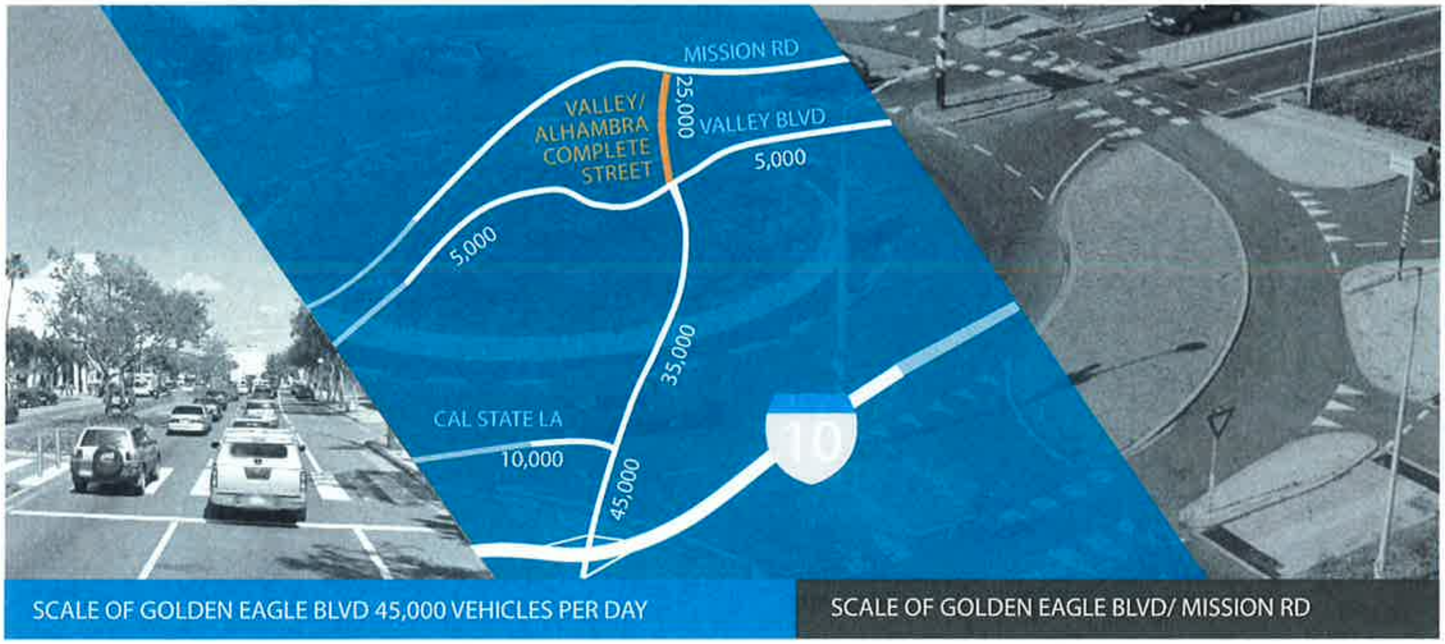
Commercial space in the north stub could potentially house more than 4,000 on-going office and retail jobs.

THE SOUTH STUB

Enhanced quality of life and home values from proximity to parks, open space, and transit.

Construction jobs from the development of a gateway for Cal State LA and buildout of the bus rapid transit system.

Support for the emerging Valley Boulevard Biosciences Corridor, connecting LAC/USC Medical Center, Keck School of Medicine, Bravo Medical Magnet High School, Grifols, Inc. and other private sector biotech firms.

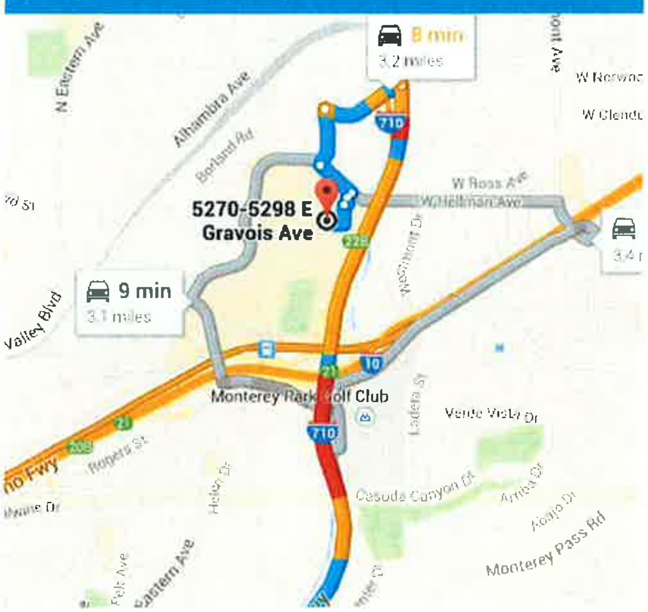


CONGESTION RELIEF

DISAPPEARING TRAFFIC

By replacing the freeway stub with a connected local street, "Golden Eagle Boulevard" would allow drivers to reach their destinations sooner – reducing traffic on the northern connector so much that a two-lane complete street (potentially ending in a traffic calming roundabout) could handle the reduced traffic. Measure R tax money was set aside for improvements to this corridor, but has gone unused so that the idea of a tunnel wouldn't be harmed. The citizens have already paid the taxes – it's time to get the benefit.

CAL STATE LA TRAFFIC



Currently, a query to Google would send a driver on a round about trip to Cal State LA, adding miles to the roads and congestion to local streets.

Changing the Freeway stub to a connected street and adding a complete street link to Mission Road is the real solution to area congestion.

RESTORATION

Restoration of the Arroyo Rosa de Castilla will provide local residents with increased open space, beautiful vistas, opportunities for active mobility, areas for community gatherings and overall improved quality of life.

BIOTECH TRIANGLE

Rebuilding the stub as a complete street would allow the restoration of the Arroyo Rosa de Castilla – a natural waterway that was piped and channelized to make room for the freeway stub.

The new street connection will provide a link between the University and the emerging "Biotech Triangle." Connecting these minds to the investment outcomes of their thinking allows this cycle of creativity to happen in the San Gabriel Valley. The new network along "Golden Eagle Boulevard" can reduce traffic at Fremont/ Mission and cut-through traffic along Concord Ave. The resulting complete street intersection on Mission will have such an manageable level of traffic entering that it could likely be handled by a single lane roundabout.

ON-GOING COMMUNITY DEVELOPMENT BENEFITS

Creation of a diverse mobility plan provides long-term economic benefits that cannot be duplicated with the tunnel solution.

- Thousands of permanent transit jobs for operators, maintenance workers, and administrators

Opportunities for transit oriented development at each transit station

- Phase 1 of the Gold Line to Pasadena has already generated $1.4B in private investment, with a potential of many times this amount as the light rail system develops regionally.

- Phase 2A and B is estimated to generate over twice the investment of Phase 1.

- The Gold Line Eastside Extension, proposed BRT, and increased Metrolink service create significant additional opportunities for sustainable community development.

ADDITIONAL BENEFITS

PUBLIC HEALTH

- Reduces air pollution and greenhouse gases
- Increases physical activity through walking and biking
- Reduces traffic-related injuries and fatalities
- Provides access to medical facilities
- Reduces the stress of commuting

QUALITY OF LIFE

- Open space and recreation promote healthy lifestyles
- Access to transit makes regional destinations more accessible
- Parks and complete streets reduce the noise, stress, and vibration associated with living near a freeway.

ECONOMIC OPPORTUNITIES

- The average transit pass holder in Los Angeles saves about $11,000 per year on commuting costs
- Transit access and nearby parks create a premium for housing values
- Transit supports sustainable community development and more opportunities for housing

WALKING

SUPPORTED BY ENHANCED PRIORITY CROSSINGS

This budget could improve safety for pedestrians throughout the San Gabriel Valley. Crossings of major arterials, accessibility improvements to intersections and dignified transit stops could all be achieved.

PEDESTRIAN FATALITIES IN CALIFORNIA

700 estimated pedestrians are killed in California every year, the most of any state.

200 of those fatalities are in Los Angeles County alone.

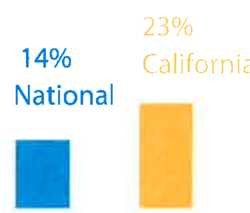
COLLISIONS IN LA

$25 M

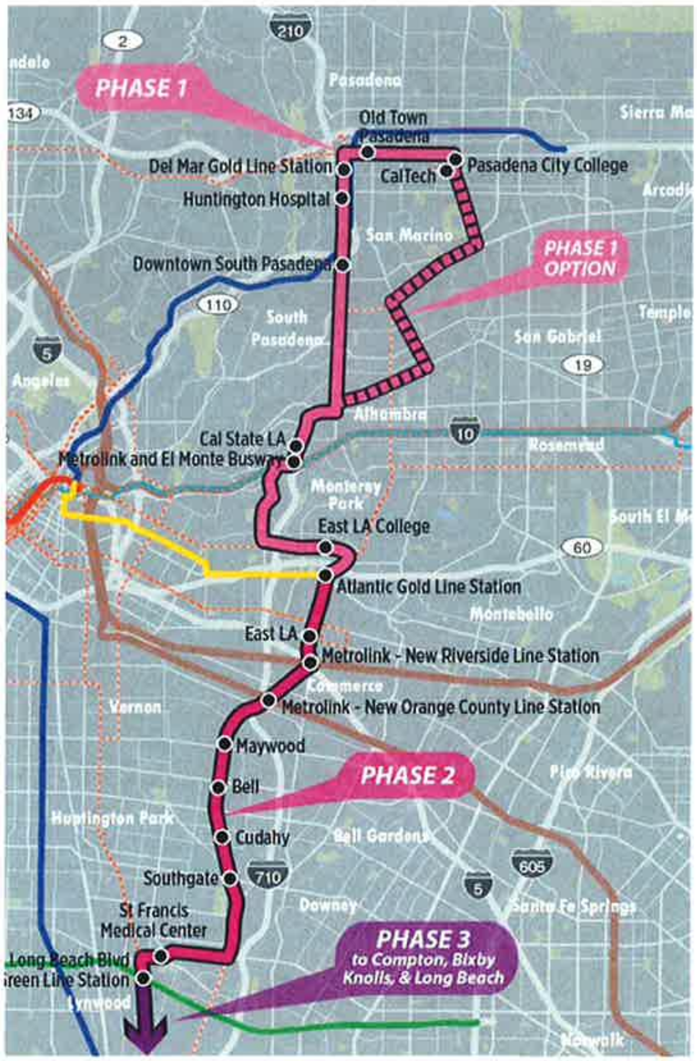
5,000 collisions involving pedestrians, in an average year in LA. County

CAR CRASHES AND PEDESTRIANS IN CALIFORNIA

In 2014, 23% of those killed in car crashes in California were pedestrians – well above the national average of 14%.



NORTH-SOUTH CONNECTIONS

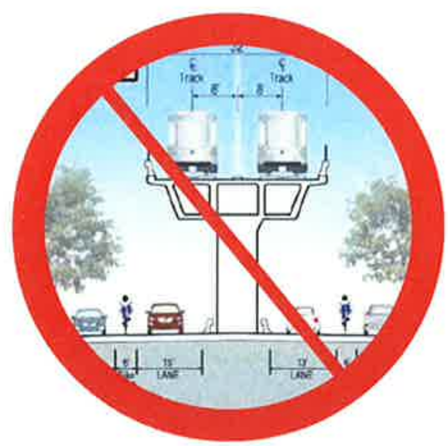


LEGEND

● Activity Centers

This option would be different from the transit alternative shown in the EIR. Rather than a disruptive aerial structure, this would be a fast, surface, community-serving alternative.

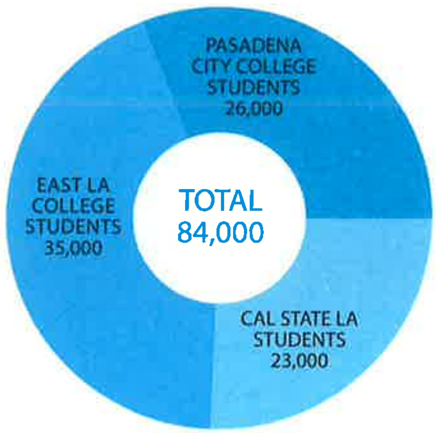
This area's great east-west transit connectivity could be supplemented by a north-south corridor that would connect both legs of the Gold Line, MetroLink's San Bernardino, Riverside and Orange County Lines, the El Monte Busway, the Green Line and the Blue Line. In addition to all those transit linkages, activity centers along the line such as Huntington Hospital, Cal State LA, East LA College, St. Francis Medical Center and the communities of Bell, Maywood and Southgate and Long Beach would all become better connected. As ridership continues to grow, the community may explore the possibility of a light rail option that could further enhance the existing transit network.



The community supports an enhanced, surface transit solution that connects to employment centers, recreational opportunities and educational institutions, not a disruptive aerial structure as proposed in the EIR.

DEMAND MANAGEMENT

CAN TDM SOLVE THE PROBLEM?



20%

VEHICLE TRIP REDUCTION ESTIMATE

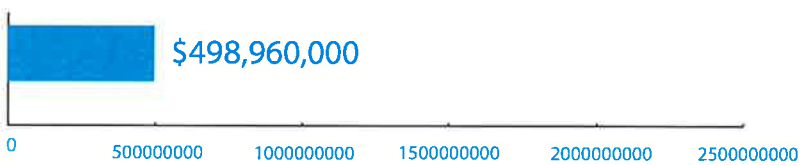
33,600 TRIPS SAVED PER DAY

302,400 TRIPS SAVED PER YEAR

YES

COST $500 M

30 YEAR COST AT MARGINAL COST RATE

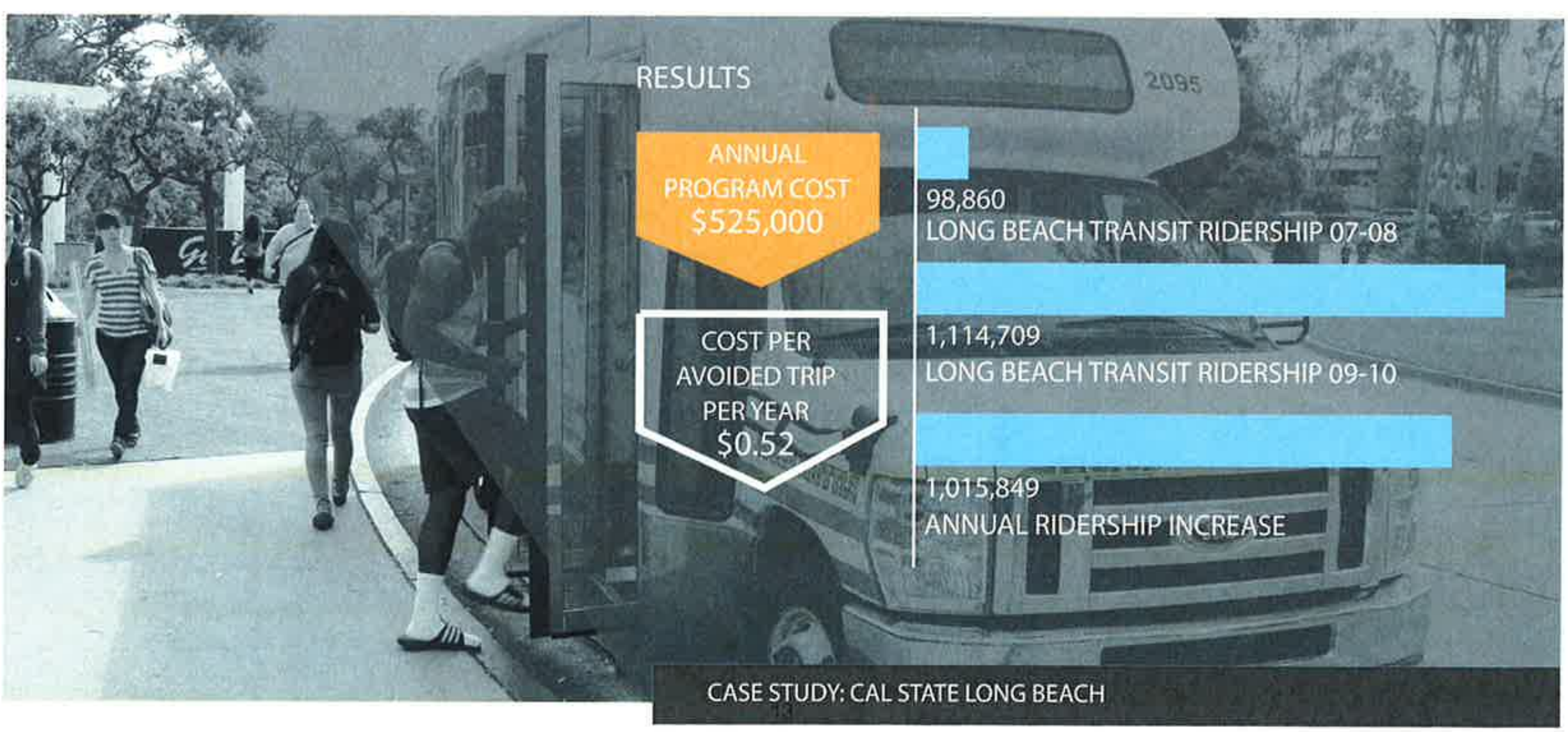


$73.00

COST PER YEAR PER RIDER - MARGINAL

CASE STUDY:

Cal State Long Beach has offered unlimited free rides on Long Beach Transit to all faculty, staff and students since 2008, achieving great results.



WHAT CAN HAPPEN NOW?

Remove the South Stub and build "Golden Eagle Boulevard," including a connection to Mission Road, as a "complete street." (bus lanes and separated bike path included)	$200 M
Expanded DASH service to CalState LA	$15 M
Rebuild street connections to stitch together the North Stub	$95 M
Add 30 safe, pedestrian arterial crossings, 10 miles of new sidewalks and build the planned network of bike lanes and paths within one mile of either side of the 710 alignment	$25 M
Deliver real Rapid Surface Transit (Improved Route 762) north-south service to include greater frequency, longer hours, weekend service and some dedicated bus lanes	$170 M
Rosemead Boulevard is the main north-south street in the San Gabriel Valley, connecting the City of Rosemead to Temple City, East San Gabriel and East Pasadena. It is also served by Metro Lines 266 and 489, and a segment in Temple City features the region's first protected bike lanes.	$200 M

FUTURE PHASES: Moving forward the sale of surplus Caltrans properties could generate up to an additional $250 million to fund effective approaches such as student transit passes in the corridor:

Transit passes for 10 years for students of Pasadena City Collage, Cal State LA and East LA Collage	$170 M

WHAT COULD HAPPEN WITH MORE FUNDING

With an initiative such as Measure R2, the following projects can address the regional transportation issues throughout the area.

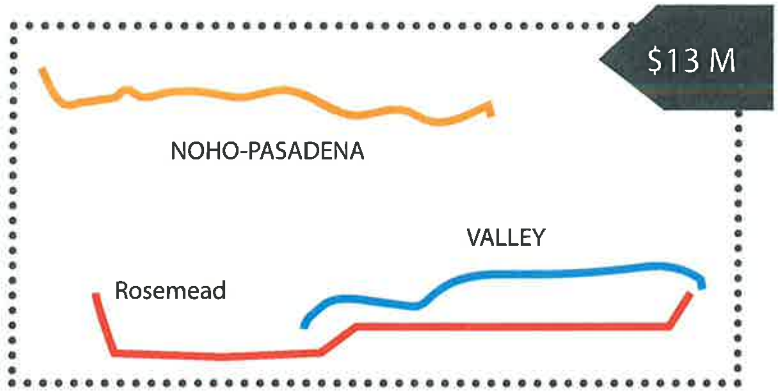
Premium Transit to connect the network. Pasadena-Hollywood BRT and Valley Boulevard BRT. Glendale-Burbank link.	$13 M
Extension of the Foothill and Eastside Gold Line.	$2.3 B
Metrolink upgrades to Burbank Airport and San Bernardino. Providing 30 minute all day service.	$400 M
Gold Level Active Transportation. Safe and comfortable bike and pedestrian networks throughout the Valley.	$275 M

PREMIUM TRANSIT CONNECTIVITY

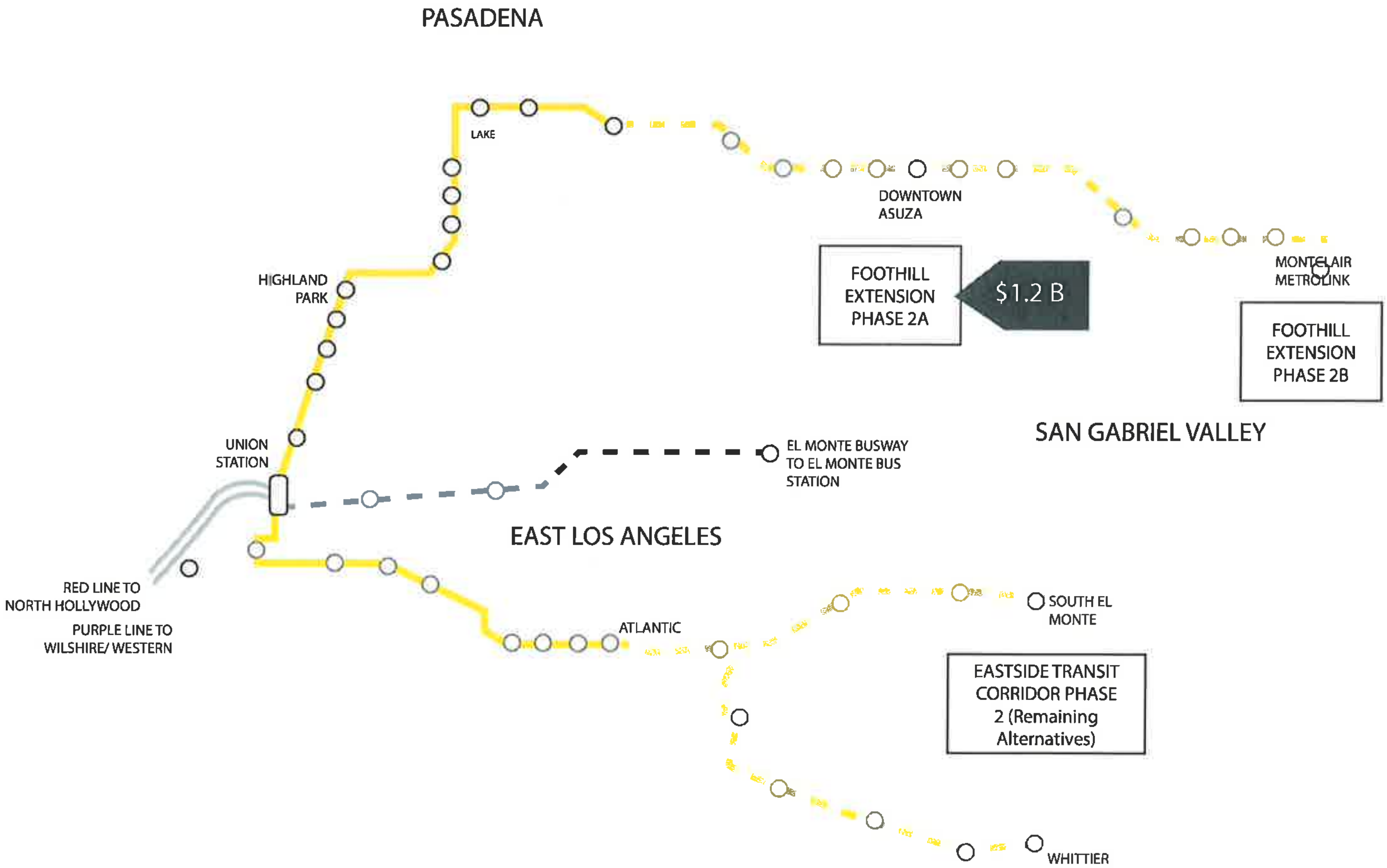
- North Hollywood to Pasadena BRT (including Burbank and Glendale)
- Valley Boulevard BRT (Downtown LA to El Monte Transit Center)
- Rosemead BRT (Boyle Heights to El Monte Station)

Rapid Bus Transit along the sub-region's key corridors can connect communities that are a bit farther from the rail network. These corridors involve more than just buses. Improvements to transit stops/stations can assure that all riders have a safe and dignified experience. Improvement of sidewalk connectivity and quality can assure people can get to the system and safely cross streets at stations. Once the sidewalks are improved, consolidating stations can make the ride much faster and more reliable.

As illustrated in this 1990 Metro Rail Plan, there has always been a "V" shaped missing link in rail planning that bypasses Glendale and Burbank. The time has come to bridge the missing link and connect communities.



LOS ANGELES *METRO RAIL PLAN*



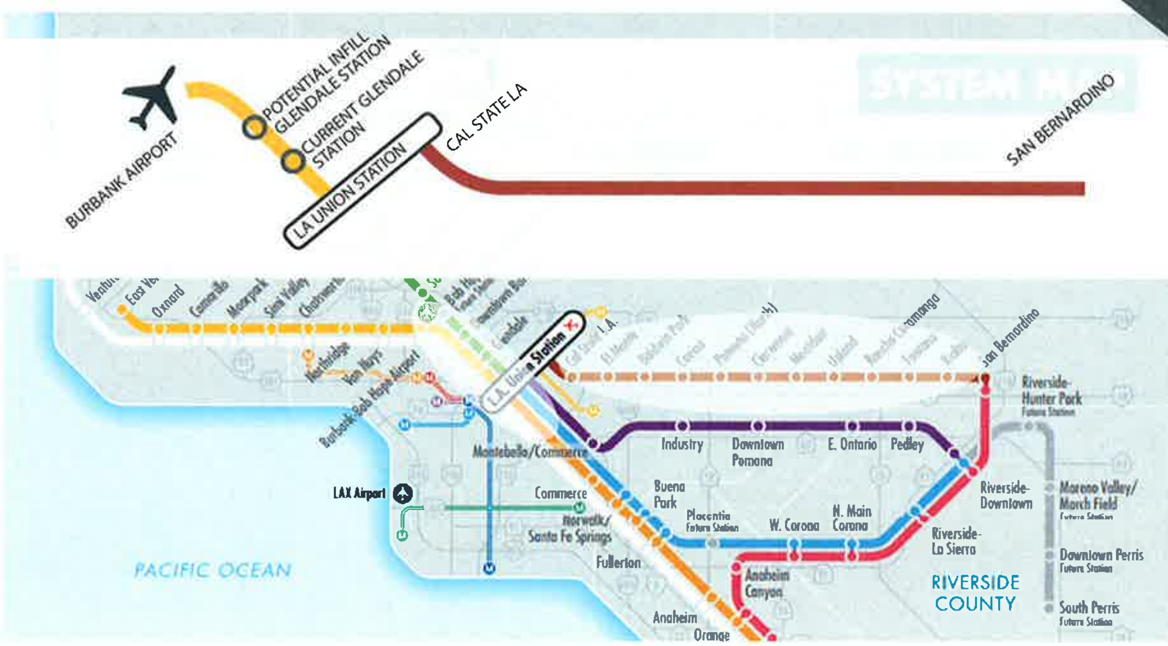
GOLD LINE COMPLETION

Premium Transit Access for the east end of the San Gabriel Valley will connect many more residents to jobs throughout Los Angeles County.

The long-planned completion of the Gold Line will connect the eastern San Gabriel Valley into the rest of the region's rapidly expanding transit network.

All day, frequent service to Burbank Airport, San Bernardino and points between will represent a significant improvement to quality of life.

$400 M

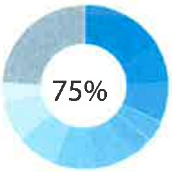


METROLINK UPGRADES

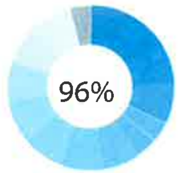
Upgrades to service on the Ventura County Line could provide 30 minute all day (and evening) service to the Burbank Airport. It might also make sense to supplement the current Glendale station (which is closer to Atwater Village) with an infill station closer to downtown Glendale. Improvements to the San Bernardino Line could provide hourly reverse commute and mid-day service. Both would represent a tremendous improvement to the usability of these valuable existing systems.

GOLD LEVEL ACTIVE TRANSPORTATION

This budget would be enough to create a premier, nationally-competitive bike network connecting the entire San Gabriel Valley. This system would focus on "low-stress" facilities that are comfortable to a wide range of potential users.

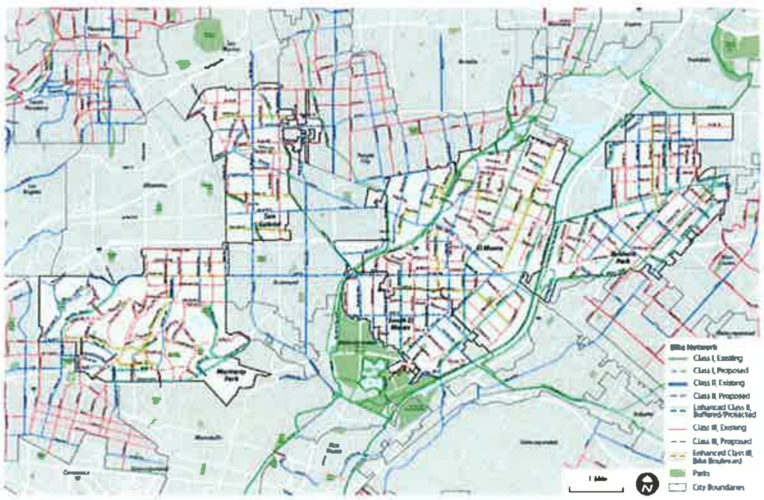


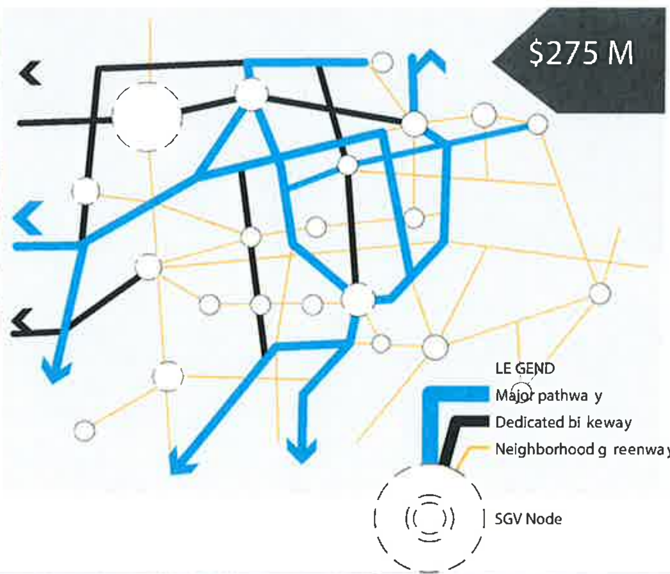
In its first year, a protected bike lane increases bicycle traffic on a street by an average of 75%



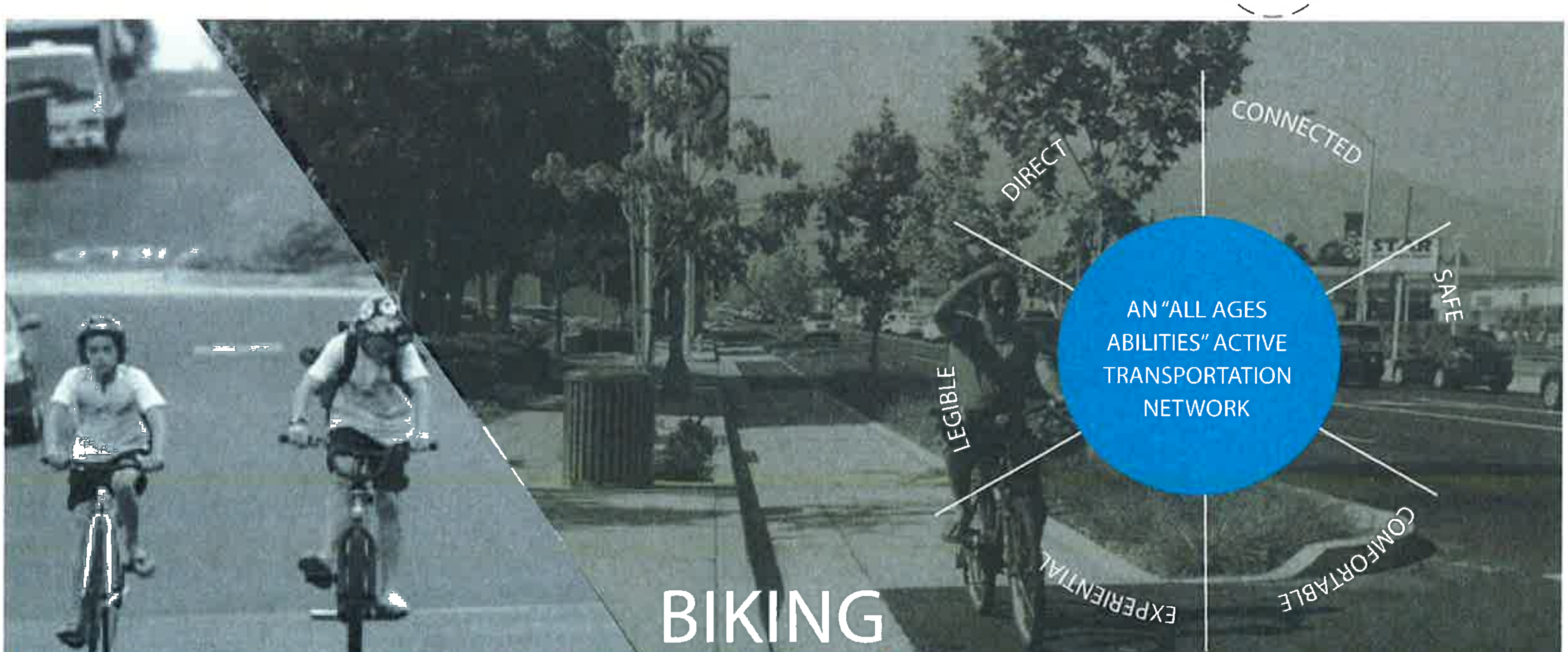
Most people riding in protected bike lanes feel safer on the street because of the lanes

SGV ACTIVE TRANSPORTATION FRAMEWORK





NETWORK PRINCIPLES



NEIGHBORHOOD GREENWAYS EVERY 1/2 MILE

SEPARATED BACKBONE - EVERY 1 MILE

Since the initial release of the Beyond the 710: New Initiative for Mobility and Community during the May 28, 2015, press conferences at Gateway Plaza, the Connected Cities and Communities has met with numerous stakeholders to refine the projects and strategies identified in the Initiative to build consensus, provide opportunities for stakeholder engagement and collaboration.

Future revisions and refinements will be provided to reflect ongoing public input of impacted communities and interested stakeholders.

The Beyond the 710: New Initiative for Mobility and Community and associated economic analysis was produced in conjunction with the internationally recognized transportation firm Nelson\Nygaard Consulting Associates, and The Maxima Group LLC, Real Estate and Business Solutions.

For more information:
http://www.beyondthe710.org/
info@beyondthe710.org
(626) 788-5231

Community Development Department

TUSTIN

BUILDING OUR FUTURE
HONORING OUR PAST

February 1, 2016

Ms. Courtney Aguirre
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017

SUBJECT: REVIEW OF DRAFT 2016 SCAG RTP/SCS AND DRAFT PEIR

Dear Ms. Aguirre:

Thank you for the opportunity to provide comments on the Draft 2016 Southern California Association of Governments (SCAG) Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and the Draft Program Environmental Impact Report (DPEIR) for the Draft 2016 SCAG RTP/SCS.

The City of Tustin has prepared the following comments for your consideration at this time:

1. The City of Tustin supports the 2016-2040 RTP/SCS growth forecast for Orange County and the adoption of the growth forecast at a geographic level no lower than the jurisdictional level. This level of the growth forecast accurately reflects Orange County's Projections dataset. Because the Intensified Land Use Alternative (Alternative 3) in the DPEIR does not include the technically corrected growth forecast for Orange County, the City of Tustin would not support the consideration of Alternative 3 as the preferred alternative or for any other purpose.

2. Although state law provides that it is appropriate to indicate in mitigation measures that they "can and should" be implemented where the authority to implement the measures rests with agencies other than the lead agency, it seems inappropriate and overreaching to use the term "can and should" in the DPEIR given the express limitation of Senate Bill 375 upon local agencies' land use authority. The City of Tustin requests that "can and should" be changed to read "can and should consider where applicable and feasible" in all project level mitigation measures in the DPEIR.

3. The Draft RTP/SCS incorrectly assumes that most new housing in the SCAG region will be constructed more than 500 feet from a freeway or other major transportation corridor. This assumption is based on the California Air Resources Board's (CARB) 2005 advisory guidance that new housing be discouraged within 500 feet of high volume roadways, including freeways, due to roadway emissions. This guidance from CARB does not prohibit housing development near major roadways. However, SCAG's "buffer" strategy

assumes little growth in these areas, which are often highly accessible to employment, retail, and housing centers that are connected through various transportation modes. Further, the use of the "buffer" strategy does not take into account the many mitigation measures that are available to address roadway emissions, nor the significant reduction in diesel emissions over the last decade. The implementation of a "buffer" strategy will discourage proximity and accessibility between different land uses that often reduce vehicle trips and vehicle miles traveled. As technology advances and vehicle engines and fuels become less polluting, the "buffer" strategy will become more obsolete. The "buffer" strategy is also contrary to the overarching principles of SB 375 to locate housing near job centers, existing urban areas, and transportation opportunities. Therefore, the City of Tustin urges that the "buffer" strategy be removed from the Draft RTP/SCS and that the Draft RTP/SCS emphasize the use of mitigation for housing developments that may be exposed to higher levels of roadway emissions, rather than discourage such development.

4. Several mitigation measures in the DPEIR indicate that local jurisdictions and other entities should implement new fees or propose taxes to pay for a variety of programs or for the acquisition of land for mitigation purposes. However, many fee increases or taxes require voter approval, and therefore it should not be assumed that they will be approved by the voters. The City of Tustin requests that the mitigation measures indicate that any new or increased fee or new tax be left as an option for jurisdictions, if desired. It is also suggested that the DPEIR clarify whether these additional fees were considered feasible and whether the suggested new fees were considered in the financial plan or economic analysis for the Draft RTP/SCS.

5. Proposed mitigation measures that are duplicative of existing regulations already required by State and Federal law or are regulated by other agencies such as the South Coast Air Quality Management District, California Department of Housing and Community Development, California Department of Fish and Game, and the Regional Water Quality Control Boards should be removed from the PEIR, because existing regulations are not valid mitigation measures under the California Environmental Quality Act.

6. The City of Tustin participates on the Orange County Council of Governments (OCCOG) Board and OCCOG Technical Advisory Committee. Although the comments from the OCCOG Board on the Draft RTP/SCS and PEIR are not fully restated in this comment letter, the City of Tustin concurs with the comments identified by the OCCOG Board in its letter to SCAG, dated January 28, 2016. A copy of the OCCOG letter is attached for reference.

Again, thank you for the opportunity to review and comment on the Draft 2016 Southern California Association of Governments Regional Transportation Plan/Sustainable Communities Strategy and the Draft Program Environmental Impact Report for the 2016 SCAG RTP/SCS. We look forward to receiving a copy of the Final PEIR, with responses to our comments and the requested modifications to the RTP/SCS and PEIR. If you have any questions regarding the City's comments, please call me at (714) 573-3031, or Scott Reekstin, Principal Planner, at (714) 573-3016.

Sincerely,

Elizabeth A. Binsack

Elizabeth A. Binsack
Community Development Director

Attachment: OCCOG Board Letter to SCAG dated January 28, 2016

cc: Hasan Ikhrata, SCAG
Marnie Primmer, OCCOG
Tustin City Council
Jeffrey C. Parker
Doug S. Stack
Justina Willkom
Scott Reekstin

SR:environmental etc\SCAG 2016 RTP SCS and PEIR Letter.doc

OCCOG

January 28, 2016

Mr. Hasan Ikhrata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017-3435

Subject: Orange County Council of Governments Comments for RTP/SCS and PEIR

Dear Mr. Ikhrata:

On behalf of the Orange County Council of Governments (OCCOG), I would like to thank you for the opportunity to comment on the Southern California Association of Governments (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS or "The Plan") and the associated Program Environmental Impact Report (PEIR). The draft 2016 RTP/SCS and PEIR is a monumental effort and the OCCOG recognizes that the documents are critical to the region's ability to receive federal funding for transportation projects, improve mobility, support sustainable development, operate and maintain the transportation system, and meet the region's greenhouse gas emission reduction targets and other air conformity standards.

The OCCOG is comprised of 34 cities, the County of Orange, and six special districts. The OCCOG Technical Advisory Committee (OCCOG TAC), made up of member agency planning staff, created an ad hoc committee dedicated to the review of the draft 2016 RTP/SCS and PEIR. The ad hoc committee membership was extended to partner agencies within Orange County that serve as ex-officio members on the OCCOG Board. The ad hoc committee includes representation from the OCCOG, the County of Orange, the cities of Anaheim, Irvine, and Mission Viejo, the Orange County Health Care Agency, the Orange County Transportation Authority, the Transportation Corridor Agencies, the Association of California Cities Orange County, the League of California Cities Orange County Division, the Building Industry Association, and the Center for Demographic Research at California State University Fullerton. This committee met six times since December 3, 2015, and has collectively spent hundreds of hours reviewing the draft Plan and documents, and preparing comments which incorporated additional feedback provided by Orange County jurisdictions and agencies, such as the Orange County Business Council. The OCCOG TAC review and analysis was considered in late January by the OCCOG Board and serves as the basis for OCCOG's comments.

The following general comments and recommendations are offered by OCCOG on the draft 2016 RTP/SCS, PEIR, and all associated appendices. OCCOG requests that the letter and attachments be included in the public record as our collective comments on the draft 2016 RTP/SCS, PEIR, and associated documents.

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RTP/SCS

1. Growth Forecasts

Overall, the OCCOG supports the 2016-2040 RTP/SCS growth forecast and the adoption of the growth forecast at a geographic level no lower than the jurisdictional level. The OCCOG supports The Plan since the growth forecast accurately reflects Orange County's Projections dataset. The Plan growth forecast reflects entitlements, development agreements, and projects recently completed or under construction in Orange County. OCCOG appreciates the ongoing coordination between SCAG and the Center for Demographic Research (CDR) at California State University Fullerton on behalf of all Orange County jurisdictions. The Orange County Projections have been used by the Orange County Transportation Authority (OCTA) in the development of its Orange County Long-Range Transportation Plan demonstrating that Orange County has integrated transportation and land use planning for decades.

OCCOG representatives on the Regional Council and SCAG Policy Committees repeatedly requested that the growth forecasts in the 2016 RTP/SCS and all PEIR alternatives be based on the technically corrected growth forecast submitted to SCAG in August 2015 by the CDR on behalf of all Orange County jurisdictions. Because the draft PEIR's Intensified Land Use Alternative (Alternative 3) does not include the technically corrected growth forecast for Orange County, the OCCOG would not support consideration of this Alternative as the preferred alternative.

Growth Forecast Recommendations: OCCOG supports the adoption of the 2016 RTP/SCS growth forecast at the jurisdictional level. OCCOG does not support the use of Alternative 3 for any purposes.

2. Maintain Unbiased, Objective Tone

Language throughout the draft 2016 RTP/SCS and the associated appendices has a tendency to be leading and dramatic in its emphasis of certain key issues such as active transportation and public health. While these issues are important, it is recommended that the document utilize a more unbiased, objective tone. For example, OCCOG recommends the removal of "Our Vision" and "Our Overarching Strategy" from the Executive Summary of the document. These two sections are highly speculative and are not necessary to the document. "Our Vision" and "Our Overarching Strategy" go above and beyond the requirements of the RTP. Additional examples of overly emphatic language are outlined in Attachment 1.

General Comments

3. Concurrence with the Comments from the Orange County Transportation Authority

The OCCOG concurs with the comments identified by OCTA in its letter of January 11, 2016. OCTA has identified policy and technical issues related to the draft 2016 RTP/SCS and PEIR that are of concern to Orange County. These are focused on the regional strategies that go above and beyond the projects submitted by the county transportation commissions (CTC). The OCTA comment letter is included for reference as Attachment 2.

4. "Can and Should"

As indicated in the PEIR, state law provides that it is appropriate to indicate in mitigation measures that they "can and should" be implemented where the authority to implement the measures rest with agencies other than SCAG. The language conveys to local agencies an affirmative obligation to address each mitigation measure, irrespective of whether such agencies deem the measures applicable to a particular project or duplicative of their own or other governmental agencies' regulatory measures. OCCOG recognizes SCAG's use of the words "can and should" are derived from California Environmental Quality Act (CEQA), at Public Resources Code sections 21081 and 2155.2(b)(5)(B)(ii) and CEQA Guidelines, including section 15091(a)(2). Nevertheless, given the express limitation of SB 375 upon respective local agencies' land use authority, OCCOG deems inappropriate any language seemingly imposing affirmative obligations contrary to SB 375 inappropriate. As such, the use of the language "can and should" for mitigation measures addressed to local agencies is overreaching.

"Can and Should" Recommendations: Change language in all project level mitigation measures to read "~~can and~~ should consider where applicable and feasible." This change will clarify that the project level mitigation measures are a menu of options.

5. 500 foot "buffer"

The Draft RTP assumes that almost no new growth will occur within 500 feet of a freeway or busy transportation corridor. The Draft RTP states that a "buffer" is consistent with the California Air Resources Board's 2005 advisory guidance that housing be discouraged within 500 feet of high volume roadways such as freeways. It is important to note that CARB's guidance is not a prohibition of development near high-volume roadways; nevertheless, SCAG's "buffer" strategy eradicates growth in these areas that are otherwise rich in connections to jobs, retail and housing accessible by many transportation modes. Furthermore, the proposed "buffer" does not reflect the availability of mitigation measures to address near-roadway emissions that remain despite a dramatic reduction of diesel emissions in the last decade. At best, this strategy is a short-term response and problematic because it prevents the kind of density and proximity between land uses that actually reduce trips and associated VMT. As vehicle engines and fuels become cleaner, the "buffer" strategy will become obsolete yet will leave behind a legacy of inefficient land use patterns. Moreover, throughout the SCAG Region, the prevailing existing land use patterns include residential and sensitive receptor uses within 500 feet of a major transportation corridor. In many cases, these areas demonstrate compact development form and serve as affordable housing. Removing this substantial portion of developable land from availability for use is premature and counter to the overarching principles of SB375 to locate housing near job centers and previously urbanized areas.

There needs to be consistency throughout all the documents regarding the 500 foot "buffer." To that end, OCCOG offers the following **recommendations and requests for additional clarification**:

- The word "buffer" should not be used.
- Use consistent radius/demarcation throughout the documents
- Clarify where distance is measured from (e.g. centerline, edge of roadway, edge of right of way)
- Clearly articulate the types of transportation corridors being identified (e.g. freeways, high quality transit corridors, high volume corridors, rail etc.)
- Emphasis should be on mitigation not prohibition of development.
    - Resolve the conflict with discouraging development within 500 feet of transportation corridors now and future reductions in emissions and fleet changes over time which will negate the need to utilize this mitigation measure, so that the mitigation approach allows for flexibility with the changing fleet mix in the future.

6. <u>Cities vs. Jurisdiction</u>

Throughout the 2016 RTP/SCS, PEIR, and associated appendices, there are references to "cities". Since the SCAG region also includes counties, it is recommended that references to "city" or "cities" are changed to "jurisdiction" or "jurisdictions" where appropriate.

Recommendation: Change references to "city" or "cities" to "jurisdiction" or "jurisdictions" where appropriate.

7. <u>Remain Neutral on Technology</u>

Throughout the documents, there are specific examples of technology identified. It is not SCAG's purview to pick winner and losers in technology; the marketplace will determine dominant technologies. Therefore, it should be noted that these are only examples and that future technologies should not be ignored or excluded from meeting the goals of the RTP/SCS. This will allow the document, including mitigation measures, to be more flexible.

<u>PEIR</u>

8. <u>PEIR Mitigation Measures</u>

a. Please state that in the event a state law referenced in the mitigation measure is updated or changed, the most current state law requirements prevails.
b. For all "Project-level Mitigation Measures", replace the word "require" with "encourage" or "it is recommended". Examples include:
MM-AES-3(b), MM-Air-2(b), MM-Air-4(b), MM-BIO-1(b), MM-BIO-2(b), MM-BIO-3(b), MM-BIO-4(b), MM-BIO-5(b), MM-GHG-3(a)(11), MM-TRA-1(b), MM-TRA-2(b), MM-USS-6(b)

A redline version identifying the location of the exact language is provided in the matrix of comments in Attachment 1.

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c. Priority and Funding Preference for Transportation Projects:
To address the significant impacts of increasing Vehicle Miles Traveled (VMT) and traffic congestion, the draft Program EIR for SCAG's 2016 - 2040 RTP/SCS proposes project-level mitigation measures that include language allowing for:

(1) Giving priority to transportation projects that would contribute to a reduction in vehicle miles traveled per capita [Mitigation Measure MM-TRA-1(b)]; and,
(2) Giving funding preference to improvements in public transit over other new infrastructure for private automobile traffic [Mitigation Measure MM-TRA-2(b)].

Please delete these provisions in Mitigation Measure MM-TRA-1(b) and Mitigation Measure MM-TRA-2(b), unless the language in these provisions is modified to recognize that they would only be considered if they are found by the Lead Agency to be appropriate and consistent with local transportation priorities.

The language in these provisions implies a specific emphasis towards policy consideration to the prioritization, selection and funding of transportation projects that, to our knowledge, has not been discussed nor endorsed by SCAG's Transportation Committee, or Regional Council, as a regional strategy for the implementation of the 2016 RTP/SCS.

Moreover, the language in these provisions fails to recognize that several counties in the SCAG region implement transportation projects and programs that are mandated through voter-approved sales tax measures (i.e., Renewed Measure M2 in Orange County), and that are identified through long-range transportation plans.

Finally, the language in these provisions could compromise the delivery of committed transportation projects, by creating opportunities for potential delay and legal challenge. To avoid these kinds of potential unintended consequences, **we request that SCAG either delete these provisions, or modify these provisions to make it abundantly clear that they are only for consideration when determined to be appropriate by the Lead Agency.**

9. Fees and Taxes

Several mitigation measures indicate that local jurisdictions or other entities should implement new fees or propose taxes to pay for a variety of programs or for acquisition of land for preservation. Increases to fees or taxes are issues that could require voter approval, and therefore it should not be assumed that they will be approved.

Fees and Taxes Recommendations: a) Reword measures to indicate that a new or increased fee, new tax, or other increase is only an option as a way to implement the mitigation. b) Clarify whether it was assumed that these additional fees were considered feasible and if the new fees that are suggested were considered in the financial plan or economic analysis of the RTP.

10. Duplicative/Existing Regulations

It is noted that many of the mitigation measures are duplicative of existing regulation or processes

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(e.g. CEQA review requirements). Under CEQA, it is intended that measures be identified that will mitigate impacts of the project. Existing regulations are already assumed to be abided by in the evaluation of the impact, and the significance of the impact is after all existing regulation is applied. Therefore, mitigation measures should address those actions that need to be undertaken in addition to existing regulation in order to mitigate the impact. Therefore, mitigation measures that simply restate existing regulation are not valid mitigation for purposes of CEQA. Further, it is possible for regulations to change over time. Because of this, restatement of the regulation in the mitigation measures could result in future conflict between the stated mitigation and regulation. It has become common practice to state that existing regulation will be implemented. When this is done, it is common practice when compliance is used as a mitigation measure to simply state that the responsible entity will simply comply with the regulation. If mitigation measures that restate existing regulation are not removed, then it is requested that the wording of the measures be restated to simply read that compliance with all applicable laws and regulations will be undertaken. Language that could be used is: "Local jurisdictions, agencies, and project sponsors shall comply, as applicable, with existing federal, state, and local laws and regulations." Similar language is included in some mitigation measures.

Examples of existing regulations included as mitigation measures are found within the Hydrology section of the draft PEIR. For example, Section 3.10.6, Mitigation Measures (page 3.10-56): Parts of this section list mitigation measures that are already being required by municipal storm water programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that cities and County employ for requiring a WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-1(b).

Additionally, there are specific mitigation measures included in the Hydrology section that may be in conflict with Storm Water Permits issued by Regional Water Quality Control Boards. In the SCAG region, there are five water quality control boards each with its own Municipal NPDES Storm Water Permit. The regulations and requirements contained in these permits vary from each other. By listing specific measures in the PEIR that are not included in a project's applicable Municipal NPDES Storm Water Permit, the PEIR creates conflicting compliance requirements. To eliminate potential conflict with existing regulations, the mitigation measures regarding specific BMPs should be removed and replaced with a single requirement that each project must comply with its applicable Municipal NPDES Storm Water Permit.

Conclusion

The OCCOG recognizes the immense efforts SCAG undertook to prepare the 2016-2040 RTP/SCS documents. They represent incredibly complex technical work and have important and far-reaching policy impacts for our region. However, because of this importance and complexity, we would like to express concern about the timing of the release of the documents, and our desire that the preparation of future RTP/SCS documents in future RTP/SCS cycles will take into account the need to accommodate adequate review, discussion and revision time for all of the documents. The current timeline of document releases, public comment period, and time allowed for the response to comments results makes it challenging to have credible discussion regarding possible changes, because the timeline does not allow for recirculation or full discussion of requested changes. While OCCOG is appreciative of the extended public comment period through February 1, 2016, there remains concern that only a few weeks remain for SCAG to prepare responses to comments and amend the documents to ensure that the Regional Council may consider the certification of the PEIR and the approval of the draft RTP/SCS on April 7, 2016. With that, we look forward to working with SCAG collaboratively to achieve the schedule.

We appreciate your consideration of all the comments provided in this letter and its attachments and look forward to your responses. It is a shared goal to have a RTP/SCS adopted that is credible and defensible on all levels. If you have any questions, please do not hesitate to contact me or Marnie Primmer, OCCOG's Interim Executive Director.

Sincerely,

Arthur C. Brown

Art Brown
Chairman

Cc: OCCOG Member Agencies
OCCOG Board of Directors
OCTA Board of Directors
Orange County City Managers Association

OCCOG

Attachment 1: Detailed comments on RTP/SCS, PEIR, & related appendices

2016 RTP/SCS

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	p.2	Delete Our Vision & Our Overarching Strategy strategies. These sections are highly speculative and not necessary for the rest of the document.
2	Clarification	p.3, column 2, bullet 5	"Millions of people are in poor health… Millions of more people live with chronic diseases, such as asthma, every day." Define 'poor health' Cite numbers or share of population for region instead of saying "millions". Provide reference to what chronic diseases include.
3	Clarification	P. 4, column 2, paragraph 2	"Among the milestones: a one-year demonstration of the tolled Express Lanes in Los Angeles County along Interstate 10 and Interstate 110 was made permanent in 2014…"
4	Clarification	p. 7, column 2, paragraph 1	"In many instances, the additional ~~these~~ chargers will create the opportunity to increase ~~may double~~ the electric range of PHEVs, reducing vehicle miles traveled that produce tail-pipe emissions."
5	Clarification	p. 13, column 2, paragraph 2	"Since 2009, every MPO in California has been required to develop a Sustainable Communities Strategy…Once implemented along with the rest of the Plan, it will improve the overall quality of life for all residents of the region."
6	Clarification	p. 13, column 2, paragraph 3	"But these advances in mobility also have the potential to help Baby Boomers, and the generations that follow them, maintain their independence as they age."
7	Clarification	p. 14, column 1, paragraph 2	"In Southern California, striving for sustainability includes ~~will require~~ achieving state-mandated targets for reducing greenhouse gas emissions from vehicles and federal air quality conformity requirements, and also adapting wisely to a changing environment and climate."
8	Clarification	p. 14, column 2, paragraph 5	"It is particularly important that the Plan consider and minimize the negative impacts ~~consequences~~ of transportation projects, especially on low-income and minority communities ~~and minimize negative impacts~~."

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#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
9	Clarification	p. 16, column 2	"2. Collaborating with Member Agencies, Jurisdictions and Stakeholders. Implementing the Plan will require SCAG to continue working closely with its all jurisdictions ~~member agencies~~…" "The agency will also have to work with key stakeholders to ensure the Plan benefits the economy and promotes ~~ensures~~ social equity. To ensure that the region makes progress on its goals, SCAG will monitor its own progress toward achieving its targets and will share this information with its ~~relevant~~ partners and the public."
10	Clarification	p. 20, column 1, paragraph 3	"However, of the remaining developable land, only a small portion of it can be developed as transit-ready infill ~~sustainably~~ – meaning it can be reached via planned transit service and that it can readily access existing infrastructure (water resources, sewer facilities, etc.). According to ~~SCAG~~ land use data collected by SCAG, only two percent of the total developable land in the region is located in High Quality Transit Areas (HQTAs). ~~A more compact land development strategy is needed, which will be discussed in Chapter 5.~~"
11	Clarification	p. 20, column 1, paragraph 4	"~~SCAG supports the fact that local jurisdictions conduct much of the planning for land use in our region. However, a~~As the agency prepared the 2016 RTP/SCS, it needed to organize the many different land use types and classifications ~~of land uses~~ in…"
12	Clarification	p. 20, column 1, paragraph 5	"To accurately represent land uses throughout the region, SCAG aggregated ~~reviewed~~ information from jurisdictions and simplified the types and classifications of land use into a consolidated set of land use types. The agency then converted these consolidated land uses into ~~identified~~ 35 "Place Types"… the Urban Footprint Scenario ~~Sustainability~~ Planning Model (SPM), to demonstrate ~~which guided and evaluated~~ urban development in the Plan in terms of form, scale and function in the built environment."
13	Clarification	p. 20, column 2, paragraph 2	"SCAG then classified ~~sorted~~ the 35 Place Types into three Land Development Categories. The agency used these categories to: describe the general conditions that exist and/or are likely to exist within a specific area; ~~. SCAG did not intend to have them represent detailed policies for land use, development or growth. Rather, they~~ and, reflect the varied conditions of buildings and roadways, transportation options, and the mix of housing and employment throughout the region."

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#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	p. 21, column 1, paragraph 3	"~~Conversely, s~~Some areas, especially near the edge of existing urbanized areas, do not have plans for conservation and may be slated for development ~~are susceptible to development pressure~~. … – meaning these ~~are~~ areas ~~that~~ are home to a high number of species and serve as highly functional habitats." "Some key habitat types are underrepresented within the 35 percent of the region already under protection." Clarify why does there need to be an equal share of types of protected land? If not, delete sentence.
15	Clarification	p. 22, column 1, paragraph 1	"However, although these housing units are planned and zoned for, historical data shows that less than ten percent of the needed affordable housing has been built. In contrast, housing construction measured by building permits issued meets nearly 90 percent of projected market rate housing needs." What is the data source that reports on building finals by income category? What is the time frame for the "less than ten percent"? What is the time period for the data on the market rate housing?
16	Clarification	p. 22, column 2, paragraph 1	"… of our region's jurisdictions have certified ~~adopted~~ housing elements."
17	Define	p. 22, column 2, paragraph 3	Define "high quality" housing
18	Define	p. 23, Figure	Define "demand response" in "Passenger Miles by Mode" figure
19	Clarification	p. 25, column 2, paragraph 2	"This network includes fixed-route local bus lines, community circulators, express and rapid buses, Bus Rapid Transit (BRT), ~~demand response~~paratransit,[3] light rail transit, heavy rail transit (subway) and commuter rail.[4]"
20	Clarification	p. 26, column 1, paragraph 2	"Transit users directly ~~typically~~ pay about 25 percent of the operating and maintenance cost of their travel, with the remaining 75 percent paid for by state and local public subsidies. Most capital expenditures are also funded through various taxes and ~~with~~ public subsidies, including a larger share of federal grants."

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#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	p. 28, column 1, paragraph 2	"The regional bike network is expanding ~~evolving~~ but remains fragmented. Nearly 500 additional miles of bikeways were built since SCAG's 2012 RTP/SCS, but only 3,919 miles of bikeways exist regionwide, of which 2,888 miles are bike paths/ lanes (see EXHIBIT 2.3). This is compared with more than 70,000 roadway lane miles. ~~One way to quantify bikeway quality and density is to calculate a ratio of bike path to lane miles. SCAG's ratio of bike path/lane miles ratio is 0.039. To put this in perspective, Portland, Oregon and San Francisco have bike path/lane ratios to lane miles at 0.054 and 0.078, which are 38 percent and 100 percent higher than the SCAG region, respectively. Our region's lack of consistent infrastructure discourages all but the most fearless people to bike.~~" Comment: There is typically only one bike lane in each direction whereas there could be multiple traffic lanes in each direction. It is not appropriate to compare lane miles to bike lane miles. Comparison, if any, should be to centerline miles. Comparison of bike path/lane miles ratio for SCAG region to individual cities is not appropriate.
22	Clarification	p. 28, column 1, paragraph 2	"Most walk trips (83 percent) are less than one half mile; walkers are less likely to travel ~~often discouraged from traveling~~ farther. Routes to bus stops and stations are often…"
23	Delete	p. 33, column 1, paragraph 2	"A significant amount of travel in the region is still by people who choose to drive alone (42 percent of all trips and nearly 77 percent of work trips). ~~So, the challenge of getting individuals to seek more environmentally friendly alternatives of travel remains.~~"
24	Clarification	p. 54, column 2, paragraph 4	"~~Certainly, t~~The overall quality of life is expected to ~~will~~ increase for many people."
25	Clarification	p. 55, column 1, paragraph 3	"Chronic diseases including heart disease, stroke, cancer, chronic lower respiratory disease and diabetes are responsible for 72 percent of all deaths in our region. ~~Millions of more people live with chronic diseases every day.~~" Cite number and source or delete sentence.
26	Clarification	p. 56, column 1, paragraph 1	"California is experiencing o~~O~~ngoing drought conditions, water shortages due to less rainfall as well as declining snowpack in our mountains, and an agriculture industry in crisis ~~have become hard realities in recent years~~."
27	Clarification	p. 61, column 1, paragraph 2	Add statement that says "These preliminary scenarios are not the ones modeled in the PEIR."

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
28	Clarification	p. 64, column 1, paragraph 1	Clarification should be made that attendance was self-selected as was the survey participation. Attendees were strongly encouraged by SCAG staff to fill out a survey. A more detailed description should be included that explains that these results are not scientific.
29	Clarification	p. 64, column 2, paragraph 2	"…was also a principal concern, as was access to healthy food." What percentage of respondents elevates an item to a 'principle concern'?
30	Clarification	p. 64, column 2, paragraph 4	"Collectively, the survey responses offered an invaluable guide to help finalize the Plan's investments, strategies and priorities. They reflect how regional stakeholders want us to address priority areas such as transit and roadway investments, system management, active transportation, land use and public health." Did the survey responses change the Plan? Clarify if a higher priority in making changes was afforded to survey respondents' feedback over jurisdictional and CTC input?
31	Clarification	p. 65, column 1, paragraph 4	"~~Jurisdictions were asked to provide input on the growth scenario, including information on specific planned development projects with entitlements, other planned projects, or recently completed developments.~~" Comment: During the local input process, SCAG requested feedback on the distribution of new households and employment. SCAG did not request information from jurisdictions on specific planned development projects with entitlements, other planned projects, and recently completed developments. During review of the draft policy growth forecast (PGF) in summer 2015, technical errors throughout the draft PGF were identified. These "technical errors" in the dataset were that entitlements, development agreements, and projects currently under construction or recently completed were not properly reflected. It was then that SCAG stated that jurisdictions could provide the information if jurisdictions wanted corrections made to the PGF.

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#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
32	Clarification	p. 65, column 2, bottom note	"*With the exception of the 6 percent of TAZs that have average density below the density range of local general plans." Please clarify the footnote. Did SCAG lower the growth or is General Plan buildout expected after 2040?
33	Clarification	p. 70, column 1, paragraph 1	"In addition, local jurisdictions are encouraged to ~~should~~ pursue the production of permanent affordable housing through deed restrictions or development by non-profit developers, which will ensure that some units will remain affordable to lower-income households."
34	Clarification	p. 70, Table 5.1	Add note to table "Adopted in 2013"
35	Define	p. 73, column 2, paragraph 4	Define "riparian"
36	Clarification	p. 76, paragraph 1	How many of these trips are alone vs. with others? Are these linked trips/trip segments?
37	Clarification	p. 76, paragraph 3	The narrative implies that Neighborhood Mobility Areas (NMAs) are needed for Neighborhood Electric Vehicles (NEVs). If this is not true, reword section to allow for flexibility that one is not tied to another exclusively.
38	Clarification	p. 77	Figure needs title
39	Clarification	p. 79, Figure 5.2	Clarify if the preservation and operations expenditures apply to the SCAG region or California State.
40	Clarification	p. 83, column 2, paragraph 5	"Bus lanes are even more effective at increasing speeds, however in our region there is a dearth of such lanes. ~~Transit agencies should heavily lobby~~ SCAG encourages transit agencies and local jurisdictions ~~in which they operate~~ to implement them, where appropriate~~at least for peak-period operation~~."
41	Clarification	p. 88, column 1, paragraph 4	"The ~~2016~~ Active Transportation portion of the 2016 Plan updates the 2012 ~~Active Transportation~~ Plan…"
42	Clarification	p. 89, column 2, paragraph 2	"SCAG has identified ~~developed~~ 12 regionally significant bikeways that connect the region."
43	Clarification	p. 92, column 1, paragraph 2	"The launch date coincided with the end of daylight savings time ~~decline in daylight hours~~, a period when bicycle and pedestrian collisions peak during the year."
44	Define	p. 93, column 1, paragraph 4	Define "no-maintenance exercise spots"
45	Clarification	p. 103, column 1, paragraph 3	"…figure "2040 Airport Demand Forecasts" on the previous page…" Properly label figure and page reference.

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#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
46	Clarification	p. 105, column 1, paragraph 1	"In recent years, airport operators, CTCs and SCAG have all undertaken their own initiatives to improve ground access at the region's aviation facilities." Clarify what initiatives SCAG has undertaken.
47	Clarification	p. 111, column 1, paragraph 2	"Building on its strong commitment to the environment as demonstrated in the 2012 RTP/SCS, SCAG's mitigation program is intended to function as a resource for lead agencies to consider in identifying mitigation measures to reduce impacts anticipated to result from future <u>transportation</u> projects as deemed applicable and feasible by such agencies."
48	Clarification	p.111-119 & PEIR	Update language on the mitigation measures to be consistent with any language changes to the PEIR document.

ACTIVE TRANSPORTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	all	Needs to include statement saying that pedestrians and bikes are also responsible (e.g. distracted walking by cell phones; bikers with headphones) and isn't always vehicles as cause Everyone needs to be educated and follow the rules and enforcement needs to happen for all modes
2	General Comment	all	Acknowledge the improvement over time of AT usage and the lowering of accident and death rates
3	Clarification	p. 5	"Class I Bikeways …A Class I Bikeway provides a completely separated <u>right-of-way</u> designated for the exclusive use of bicycles and/or pedestrians with cross flows by motorists minimized. Some of the region's rivers include Class 1 Bikeways. Increasing the number of bikeways ~~in~~ <u>along</u> rivers<u>, utility corridors, and flood control channels</u> may provide additional opportunities for "interested but concerned" cyclists."
4	Clarification	p.6, column 1	"INTERSECTION TREATMENTS …In the SCAG region, nearly 44 percent of all pedestrian injuries are at intersections." Define how far away from the intersection an accident may occur to be included in the count of pedestrian injuries at intersections

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#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
5	Clarification	p.6, column 1	"COMPLETE STREETS In recognition of the need to accommodate various types and needs of roadway users, the State of California adopted the Complete Streets Act of 2008 (AB 1358) requiring cities and counties to incorporate the concept of Complete Streets to any ~~general plan's substantive~~ update to their General Plan's circulation element."
6	Clarification	p.8, column 1	"COLLISIONS AND FATALITIES While the numbers of bicyclists and pedestrians are increasing, so are injuries and fatalities, although not as fast as the growth in active transportation. In California, 64,127 pedestrians were injured and 3,219 were killed between 2008 and 2012. In 2012 alone, ~~702 pedestrians were killed and~~ 13,280 pedestrians were injured and 702 pedestrians were killed."
7	Clarification	p. 17, Table 5	Create separate tables for columns 1 to 3 and columns 3 to 10.
8	Define	p. 24, column 1, paragraph 1	"2012 RTP/SCS PROGRESS The ~~2016~~ Active Transportation portion of the Plan …The Plan examined access to transit, noting that 95 percent of SCAG residents would be within walking (0.5 mile) or biking (2 mile) distance from a transit station." Define what constitutes a 'transit station'
9	Clarification	P. 25, second column, top bullet (last under #4)	"Success of this program depends on cities and counties conducting these counts and providing the data to SCAG." Identify funding source and acknowledge that this is voluntary effort and may not be a priority, especially without funding
10	Add bullet	P. 25, second column, Bullet 6	Add 4th bullet under #6: "OCCOG is working on a comprehensive Complete Streets design manual for the entire county which will be completed in 2016."
11	Correction	P.26, Table 9	Change language for Orange County: ~~Not yet Planned.~~ In Process
12	Clarification	p. 27, column 1, and any other references	Clarify that the '2016 Action Transportation Plan' is not a standalone plan, but is a portion within the RTP.
13	Clarification	P.66-67, Tables 16 & 17	Add note to Table: "These draft scenarios are not the alternatives that were evaluated in the PEIR."
14	Clarification	P. 71	Delete "Strategic Plan Beyond 2040" section. The inclusion of this section is not consistent with other appendices. It creates confusion as to what the RTP's Strategic Plan is.

DEMOGRAPHICS/GROWTH FORECAST APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Label Y axis on all figures
2	Clarification	P. 2, column 1, paragraph 3	Add text: "The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data shall not be required for purposes of qualifying for future grant funding or other incentives or for determining a proposed project's consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA)."

GOODS MOVEMENT

#	TOPIC	PAGE REFERENCE	RTP NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	p. 4, Exhibit 2	Exhibit is labeled warehouse & distribution centers but shows manufacturing firms total employment. Correct.

PERFORMANCE MEASURES APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.8-10, Table 4	Label all Performance Measures that were new in 2016 Plan
2	Clarification	P.11	Add definition of HQTA to map.
3	Clarification	p.20	LSPT was used for 2012 RTP. Add information on the SPM.
4	Clarification	p. 31, Table 12	Add model sources to bottom of table.

PUBLIC HEALTH APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Final document should contain hyperlinks to other documents.
2	General Comment	All	Spell out Acronyms in Tables/Figures Titles e.g. CHIS

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#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
3	Clarification	p.1, column 1	"~~Public health is increasingly an area of emphasis for~~ Metropolitan Planning Organizations (MPOs) and Departments of Transportation (DOTs) across the country, have an opportunity to impact ~~due to~~ the prevalence of chronic diseases such as obesity, hypertension, asthma and heart disease through transportation planning which promotes increased physical activity."
4	Clarification	p.2, column 1	Introduction- first paragraph sentence beginning with "Public health outcomes are the product of Social Determinants of Health….." consider adding "and other factors.
5	Clarification	p.1, column 2	"Climate Adaptation: Support efforts to ~~prevent~~ mitigate climate change and make the region more resilient to future changes with reductions in VMT and greenhouse gas emissions."
6	Correction	p.2, Figure 1	Arrows should go both ways.
7	Clarification	p.3, column 1, paragraph 2	"Evidence shows that healthier lifestyles and improved air quality can improve outcomes, and built environment factors and related conditions can play a role in supporting healthy behaviors."
8	Clarification	p.3, column 2, paragraph 3	"Access to healthy food environments such as grocery stores, farmers' markets and community gardens ~~decreases~~ can play an important role in food insecurity and obesity."
9	Define	p.7, column 1, first line	Define "weather insurance"
10	Clarification	p.7, column 2, paragraph 2	"… Providing access to education and job training aligned with job opportunities in the region ~~jobs with a living wage~~ is critical to ensuring communities become and stay healthy."
11	Clarification	p.7, column 2, paragraph 3	"…Creating infrastructure policies and community conditions and facilities that encourage active transportation such as biking and walking provides opportunities for residents to increase their daily physical activity."
12	Clarification	p.8, paragraph 3	Consider adding the recommendations for children which has a higher standard of one hour per day. This is valuable as jurisdictions look at health co-benefits of safe routes to school infrastructure changes and related programming.
13	Clarification	p.9, all figures	Recommend using the more current 2014 data. Also, it might be helpful to look at these metrics on a smaller level of geography and/or by poverty and/or by race/ethnicity. Especially since there are often funding set asides to reach disadvantaged communities, it might be interesting to see what each of these indicators looks like at a more refined level. The need is not equally distributed throughout any jurisdiction.

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#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
14	Clarification	p.9	Add table with data for walking.
15	Clarification	p.10, column 2	Consider including funding as both a challenge and an opportunity.
16	Clarification	p.10, column 1, last sentence	"Much of our local arterial system is also in need of pavement improvements, as local roadways in the SCAG region average a score of 69 out of 100 in the Pavement Condition Index (PCI), where a score of 70 or less typically translates to conditions that are ~~inadequate~~ more costly to repair."
17	Clarification	p.10, column 2, paragraph 4	"With more than 18 million people, 191 cities, six counties and hundreds of local and regional agencies, Southern California is ~~one of the most complex regions on earth~~ a diverse region. Within the region, health outcomes vary widely based on many things, such as geography, income and race."
18	Clarification	p. 15, column 2, paragraph 3; & throughout all	"500 foot buffer"- be consistent with usage and description throughout all documents in whether this is adjacent to just freeways or freeways, rail, and high frequency transit corridors.
19	Clarification	p. 16, column 1, paragraph 1	"Region-wide, about ten percent of the land area within HQTAs is also within ~~the~~ 500 feet ~~foot buffer~~ of the freeway. To balance regional policy goals, the Plan accommodates the vast majority of growth within HQTAs but beyond ~~outside of the~~ 500 feet ~~buffer~~ of freeways…"
20	Clarification	p. 17, column 1	"Water Consumption" and "Land Consumption" Specify the time period for the change or difference in numbers. Compare this to 2040 Baseline.
21	Clarification	p. 19, column 2	"Public Health Work Program" Clarify if this work program was approved by the RC or SCAG staff is pursuing these tasks under direction of RC to incorporate more public health into RTP.
22	Clarification	p. 22-29	Are these all "best practices" or are they local examples of promising practices? Since some of these are in process, are the results are there to show that this particular practice has proven efficacy over another? These may have the potential to be best practices. If the project is based upon a best practice, it is recommended to link to the best practice so other jurisdictional leaders could consider for replication. If it is not already a proven practice, suggest calling it something different such as "local promising practices". Add the Complete Streets Guidelines that are being developed in Orange County (which integrates in best practices.)

SCS BACKGROUND DOCUMENTATION APPENDIX

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	Clarification	P.42-43	How do the SPM Place Types nest into the Land Development Categories?
2	General Comment	All maps	"Note: The forecasted land use development patterns shown are based on Transportation Analysis Zone (TAZ) level data utilized to conduct required modeling analyses. Data at the TAZ level or at a geography smaller than the jurisdictional level are advisory only and non-binding, because SCAG sub-jurisdictional forecasts are not to be adopted as part of the 2016 RTP/SCS. The advisory sub-jurisdictional data shall not be required ~~should not be used~~ for purposes of qualifying for future grant funding or other incentives~~. The data is controlled to be within the density ranges of local general plans and/or input received from local jurisdictions. the purpose of~~ or for determining a proposed project's consistency with the 2016 RTP/SCS for any impact analysis required pursuant to the California Environmental Quality Act (CEQA) ~~streamlining, lead agencies have the sole discretion in determining a local project's consistency with the 2016 RTP/SCS~~."
3	Clarification	p.6/43	Move the definitions of Urban, Compact Walkable, and Standard Suburban from page 43 to page 6 before the maps
4	Clarification	p. 41, column 1, paragraph 4	"Scenario modeling with UrbanFootprint brings meaningful, comprehensible, and timely results to those local jurisdictions wanting to understand how growth and development choices will impact their community, city, or region in the coming years and decades."
5	Correction	p. 41, column 2, paragraph 2	"Since 2012… Developers of UrbanFootprint have also met with regional agencies, such as SCAG, Sacramento Area Council of Governments (SACOG), and San Diego Association of Governments (SANDAG)~~, Orange County Council of Governments (OCCOG)~~."
6	Clarification	p. 50, 51, 54, 56 maps	Clarify in map legends if growth refers to population, housing and/or employment.
7	Correction	p. 56 column 1, last paragraph	"~~The scope of t~~These four scenarios were developed in early 2015 by SCAG and their consultant and shared~~, which were developed in consultation~~ with the CEHD Committee and ~~the~~ SCAG's Technical Working Group (TWG)~~, evolved throughout the first five months of 2015~~."
8	Clarification	p. 56 column 2, paragraph 2	"Conversely, growth focused in urban areas often takes advantage of existing infrastructure and more efficient service to higher concentrations of jobs and housing, but sometimes modernization of utilities needs to be considered and completed to accommodate the additional usage."

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#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
9	Clarification	P. 58, column 2, paragraph 4	"Saving water also saves on costs, and the RTP/SCS saves about $1.2 billion over the span of the plan, and saves households in the SCAG region $93 million on annual water bills." Add "Notwithstanding, infrastructure operations and maintenance costs require continued funding; further, these costs could offset ratepayer savings resulting from the implementation of RTP/SCS policies, conservation efforts, or installation and use of efficient appliances."
10	Clarification	P. 83, column 2, paragraph 2	"The SPM includes a suite of tools and analytical engines that help to quickly illustrate alternative plans and policies and to estimate their transportation, environmental, fiscal, and public health ~~and community~~ regional impacts."
11	Clarification	P. 83, column 2, last sentence	"~~SPM will serve as a common platform for communications between SCAG and local jurisdictions in the process of local input and public outreach, providing local planners advanced analytical capabilities.~~"

PEIR

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
1	General Comment	All	Any changes to mitigation measure language should be updated in both the Executive Summary and the chapters throughout the PEIR, as well as the RTP/SCS document.
2	General Comment	All	Cite original source data, not other documents, e.g. SCAG's Local Profiles
3	Clarification	ES-14	"MM-AES-1(b): Consistent … the Lead Agency ~~can and~~ should consider mitigation measures…"
4	Clarification	ES-14 & 15	"MM-AES-3(b): Consistent …the Lead Agency ~~can and~~ should consider mitigation measures… •~~Require~~ Encourage development of design guidelines… •~~Require~~ Encourage that sites are kept in a… ""
5	Define	ES-16	Define 'Natural Resource Inventory Database and Conservation Framework & Assessment'
6	Define	ES-16	Define 'Conservation Plan'
7	Define	ES-16	Define 'mitigation banks'
8	Clarification	ES-19	MM-Air-2(b): "•~~Require~~ Encourage contractors to assemble… •As appropriate ~~require~~ encourage that…"
9	Clarification	ES-19	MM-Air-4(b): "•~~Require~~ Encourage clean fuels, and reduce petroleum dependency."

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#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
10	Clarification	ES-19	"MM-Air-4(b): Consistent with the provisions of Section 15091 of the State CEQA Guidelines, SCAG has identified mitigation measures that are within the jurisdiction and authority of the air quality management district(s) where proposed 2016 RTP/SCS transportation projects ~~or development projects resulting from the land use patterns in the 2016 RTP/SCS~~ would be located."
11	Clarification	ES-20	MM-BIO 1(b): ~~• Require~~ Encourage project design to avoid occupied habitat, potentially suitable habitat, and designated critical habitat, wherever practicable and feasible."
12	Clarification	ES-22	MM-BIO-2(b): "~~• Require~~ Encourage project design to avoid sensitive natural communities and riparian habitats, wherever practicable and feasible."
13	Clarification	ES-22	MM-BIO-3(b): "~~• Require~~ Encourage project design to avoid federally protected wetlands consistent with the provisions of Section 404…" "~~• Require~~ Encourage review of construction drawings by a certified wetland delineator…"
14	Clarification	ES-23	MM-BIO-4(b): "~~• Require~~ Encourage review of construction drawings and habitat connectivity mapping provided by the CDFW or CNDDB…"

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#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
15	Clarification	ES-24	MM-BIO-5(b): "• ~~Require~~ Ensure that no change in existing ground level occur from the base of any protected tree at any time. ~~Require~~ It is recommended that no burning or use of equipment with an open flame occur near or within the protected perimeter of any protected tree." "• ~~Require~~ Encourage that no storage or dumping of oil, gas, chemicals, or other substances that may be harmful to trees occur from the base of any protected trees, or any other location on the site from which such substances might enter the protected perimeter. ~~Require~~ It is recommended that no heavy construction equipment or construction materials be operated or stored within a distance from the base of any protected trees. ~~Require~~ It is recommended that wires, ropes, or other devices not be attached to any protected tree, except as needed for support of the tree. ~~Require~~ It is recommended that no sign, other than a tag showing the botanical classification, be attached to any protected tree." "•… ~~require~~ ensure replacement of any tree removed with another tree or trees on the same site deemed adequate by the local agency to compensate for the loss of the tree that is removed."
16	Clarification	ES-31	MM-GHG-3(a)(11): "• ~~Require~~ Encourage amenities for non-motorized transportation, such as secure and convenient bicycle parking."
17	Clarification	ES-40	MM-LU-1(a)(3): "SCAG shall work with its member cities and counties to encourage but not require that transportation projects and growth are consistent with the RTP/SCS."
18	Clarification	ES-40	MM-LU-1(a)(4): "SCAG shall coordinate with member cities and counties to encourage but not require that general plans consider and reflect as appropriate RTP/SCS policies and strategies. SCAG will work to encourage but not require consistency between general plans and RTP/SCS policies."
19	Clarification	ES-40	MM-LU-1(a)(8): "SCAG shall continue to use its Intergovernmental Review Process to provide comments to lead agencies on regionally significant projects, ~~that may be considered for determining consistency with the RTP/SCS~~."
20	Clarification	ES-52	MM-TRA-1(b): "•… bicyclist accommodations, and ~~require~~ encourage new development and redevelopment projects to include bicycle facilities…"

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
21	Clarification	ES-53	MM-TRA-1(b): "• ~~Require~~ Encourage new office developments with more than 50 employees to offer a Parking "Cash-out" Program to discourage private vehicle use."
22	Clarification	ES-53	MM-TRA--2(b) "•Where traffic signals or streetlights are installed, ~~require~~ encourage the use of Light Emitting…"
23	Clarification	ES-54	MM-TRA--2(b) "•Diode (LED) technology, or similar technology.
24	Clarification	ES-55	MM-TRA--2(b) "• ~~Require~~ Encourage the development of Transportation Management Associations for large employers and commercial/ industrial complexes;"
25	Clarification	ES-59	MM-USS-6(b): "• ~~Require~~ Encourage the reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard)."
26	Clarification	ES-59	MM-USS-6(b): "Discourage exporting of locally generated waste outside of the SCAG region during the construction and implementation of a project. Encourage disposal within the county where the waste originates as much as possible." Comment: Trash disposal should be addressed regionally while considering distance instead of being limited to within the SCAG region. It is possible that disposal could be done nearby while crossing regional boundaries.
27	Delete	P. 3.3-26 Regional Air Quality	It is not appropriate to use the American Lung Association grading system to rate the region's the transportation plan. This section (paragraph and Table 3.3.2-1) should be deleted.
28	Clarification	P. 3.3-29 Sensitive Receptors & Table 3.3.2-3	"Sensitive Receptors by County" Clarify what the source data was and how the tally of sensitive receptors was made.
29	Clarification	Figure 3.3.2-3	Figure needs legend, labels, source of data and definition of sensitive receptors
30	Clarification	P. 3.10-5 Section 3.10.1, Regulatory Framework	The definition of a Municipal Separate Storm Sewer System (MS4) is incomplete and incorrectly cited.

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#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
31	Clarification	p. 3.10-15 Section 3.10.1, Orange County General Plan	Specific mention of the Orange County Stormwater Program's Drainage Area Management Plan (DAMP) should be made under PEIR heading Orange County General Plan. The DAMP is Orange County's principle policy and program guidance document for urban nonpoint source pollution mitigation. The PEIR should reference the DAMP's agreements, structure, and programs, and, at the project level, make note to consider the specific water pollution control elements of the DAMP that apply to land development and redevelopment projects. Transportation infrastructure projects deemed to be Priority Projects, in accordance with DAMP designation (Exhibit 7.1Table 7-1.1), would require the development of a Project Water Quality Management Plan (WQMP) in conformance with Orange County's Model WQMP.
32	Clarification	p. 3.10-17 Section 3.10.2, Existing Conditions	Table 3.10.2-1 lists San Juan Creek as a surface water resource within Santa Ana (Region 8) jurisdiction. San Juan Creek is located within the San Diego Regional Water Quality Control Board (Region 9) jurisdictional boundary.
33	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	Mitigation Measures: Parts of this section list mitigation measures that are already being required by municipal stormwater programs across the region. Instead of listing specific mitigation measures, the PEIR should make reference to these programs. In Orange County, for example, this program is detailed in the DAMP/Model WQMP. The Model WQMP describes the process that the cities and County employ for requiring a Project WQMP, which is a plan for minimizing the adverse impacts of urbanization on site hydrology, runoff flow rates, and pollutant loads at the project level. A reference to the Model WQMP and equivalent documents in the region's other counties, should replace the last ten bullet points of section MM-HYD-l(b).
34	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures	If a proposed project has the potential to create a major new stormwater discharge to a water body with an established Total Maximum Daily Load (TMDL), a quantitative analysis of the anticipated pollutant loads in the stormwater discharges to the receiving waters should be carried out.

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#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
35	Clarification	p. 3.10-56 Section 3.10.6, Mitigation Measures & Table ES 4-1 (page ES-37)	The PEIR states that "where feasible, restore or expand riparian areas such that there is no net loss of impervious surface as a result of the project." While the intent with many mitigative measures is to preserve (emphasis added) perviousness, the PEIR should not be establishing performance measures for land development/redevelopment outside of established local stormwater programs.
36	Clarification	3.11-8&9, 3.11-13 3.11-16 & 17	Need to specify the vacant areas that are permanently preserved or undevelopable, even park space that is vacant i. Identify the source of the data used to identify vacant land. ii. What are the following items classified as (e.g. vacant, open space): HOA open space, HOA streets, private parking lots, lakes. Table 3.11.2-2- Break out vacant land category into permanently preserved/undevelopable or developable Figure 3.11.2-7 Need to correctly label national forests as permanently preserved open space. Areas labeled vacant need to be reviewed to correctly allocate lands that are permanently preserved/undevelopable and which are developable.
37	Clarification	3.11-10	Table 3.11.2-1- Define 'Established Communities'; Correct label or number of square miles by county
38	Define	3.11-11	Define 'carbon sinks'
39	Define	3.11-14	Define medium, high, and low density housing within text
40	Clarification	3.11-34	3.11.7 LEVEL OF SIGNIFICANCE AFTER MITIGATION IMPACT LU-1… It is likely that in some instances currently adopted general plans and other adopted plans will not General Plans are not required to be consistent with the 2016 RTP/SCS policies and land use strategies, and they are not required to be consistent for purposes of the SCS pursuant to SB 375. Implementation of mitigation measures MM-LU- 1(a)(1), MM-LU-1(a)(2), MM-LU-1(a)(3), MM-LU-1(a)(4), MM-LU-1(a)(5), MM-LU-1(a)(6), MM-LU- 1(a)(7), MM-LU-1(a)(8), and MM-LU-1(b) would may reduce some of these impacts. However, direct, indirect, and cumulative impacts would remain significant and unavoidable.
41	Correction	3.14-9	Update Table 3.14.2-1 with May 2015 DOF data and label columns as 'Households' not 'Housing Units'

#	TOPIC	PAGE REFERENCE	NARRATIVE, COMMENT & RECOMMENDATION
42	Correction	3.14-12	Update Table 3.14.2-3 with May 2015 DOF data
43	Correction	3.14-13	Update Table 3.14.2-5 with May 2015 DOF data
44	Define	Figures 3.14.2-1 3.14.2-2 3.14.2-3	Define subjects of maps
45	Clarification	3.14.22, paragraph 4	Clarify if discussion is on new lane miles or existing; Define "additional transportation facilities"
46	Clarification	4-1, 4.1 add after last bullet	"If an alternative is rejected and the project approved, it is the EIR for the proposed project that is to be used for future tiering purposes."
47	Clarification	P. 4-6, and all related documents' references to Alternative 3.	Alternative 3: Intensified Land Use Alternative "The hypothetical land use pattern in this Alternative builds on the land use strategies as described in the 2016 RTP/SCS and beyond. Specifically, it increases densities and intensifies land use patterns of the Plan, especially around high quality transit areas (HQTAs) in an effort to maximize transit opportunities. The hypothetical growth pattern associated with this Alternative…" Comment: Update all references to Alternative 3 in all RTP/SCS documents where it mentions that the land use pattern was developed based on the Plan to say that Alternative 3's land use plan is hypothetical.

Attachment 2: OCTA Comment Letter

OCTA

AFFILIATED AGENCIES

Orange County Transit District

Local Transportation Authority

Service Authority for Freeway Emergencies

Consolidated Transportation Service Agency

Congestion Management Agency

Service Authority for Abandoned Vehicles

January 11, 2016

Mr. Hasan Ikhrata
Executive Director
Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, CA 90017-3435

Re: **Comments on the Draft 2016-2040 Regional Transportation Plan/ Sustainable Communities Strategy and Program Environmental Impact Report**

Dear Mr. Ikhrata:

Thank you for the opportunity to comment on the Southern California Association of Governments' (SCAG) draft 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), and associated Program Environmental Impact Report (PEIR). The draft RTP/SCS and PEIR reflect the transportation and funding challenges that the region will face in the coming years. These documents are critical to the region's ability to improve mobility, and to operate and maintain the transportation system.

The Orange County Transportation Authority (OCTA) appreciates that SCAG has included the commitments identified in OCTA's 2014 Long-Range Transportation Plan (LRTP), as well as the demographic forecasts approved and submitted by the Orange County Council of Governments. Additionally, OCTA recognizes the hard work and cooperation of SCAG staff throughout the RTP/SCS and PEIR development process.

OCTA has identified policy and technical issues related to the draft RTP/SCS and PEIR that are of concern to Orange County. These are focused on the regional strategies that go above and beyond the projects submitted by the county transportation commissions (CTC). The strategies include the assumed mileage-based user fee, regional express lane network, California High-Speed Rail, and the additional investments in transit, active transportation, and congestion management. OCTA's concerns and comments regarding each of the regional strategies are discussed below.

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January 11, 2016
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Innovative Financing and New Revenue Sources

The draft RTP/SCS suggests that $130.8 billion of the approximately $200.4 billion regional shortfall can be addressed through actions at either the state or federal level. The innovative financing strategy, included in the RTP/SCS, assumes that a $0.10 gas tax increase will be implemented by 2020. Additionally, by 2025, it assumes that the state or federal government would either replace the gas tax with an indexed mileage-based user fee of $0.04 per mile, or further increase fuel taxes to generate revenues equivalent to the mileage-based user fee.

OCTA cannot support an increase in fees, including the introduction of a mileage-based user fee, until a comprehensive economic impact study is completed and presented to the OCTA Board of Directors for discussion. When considering support for any kind of a new user-based fee program, the region should place an emphasis on the need for return-to-source criteria that guarantee funds generated within a county are reinvested in that county's transportation system. Moreover, any user-based fees should be indexed appropriately to provide a justifiable and sustainable source of funding. Finally, throughout the development of any new funding mechanisms, opportunities should be sought to accelerate project delivery and reduce costs, consistent with OCTA's Breaking Down Barriers initiative. While these comments are generally consistent with SCAG's guiding principles for identifying reasonably available funding in the RTP/SCS, OCTA would like to reinforce these principles, particularly in consideration of the mileage-based user fee.

California High-Speed Rail

The draft RTP/SCS identifies Phase I of the California High-Speed Rail Authority (CHSRA) Project as a potential solution for improving interregional and intercity ground transportation. As described in the draft RTP/SCS, the project includes completing the first section through the San Joaquin Valley by 2018, extending to Palmdale and the Burbank Bob Hope Airport by 2022, connecting to San Jose/San Francisco by 2026, and finally reaching Los Angeles Union Station (Union Station) by 2028.

This also assumes upgraded commuter rail connections between Union Station and the Anaheim Regional Transportation Intermodal Center along the Los Angeles-San Diego-San Luis Obispo (LOSSAN) corridor. This upgraded service will be achieved through a $1 billion program of projects identified in a memorandum of understanding (MOU) between the CHSRA and nine Southern California agencies. This investment is part of a phased delivery, known as the "blended approach", which OCTA supports through the adopted Resolution 2012-020.

OCTA recommends that SCAG continue to provide regular updates to the Transportation Committee and Regional Council regarding the CHSRA business plan, financial status, implementation progress, and any changes in assumptions by the CHSRA. These updates should focus particularly on the status of the MOU.

Regional Express Lane Network

The draft RTP/SCS includes implementation of a regional express lane network. This network proposes to increase occupancy requirements from 2+ to 3+ persons per vehicle on select existing and planned high-occupancy vehicle (HOV) lanes throughout the region. Pricing for single-occupancy and dual-occupancy vehicles will then be used to increase the throughput of the corridor and reduce emissions from congestion. As a result, this concept would generate additional revenues. When combined with tolls from a new east-west freight corridor in Los Angeles County, the projected revenues would total $23.5 billion. These funds are assumed to contribute toward the $200.4 billion regional shortfall.

The proposed Regional Express Lane Network focuses on converting specific existing and planned HOV facilities to express lanes. However, the segment of State Route 55 (SR-55), between Interstate 405 (I-405) and State Route 91 (SR-91), is noted as a potential single or dual express lane facility. The potential for a dual lane facility is inconsistent with the projects submitted by OCTA in December 2014. The submittal identifies general purpose lane additions on SR-55, between I-405 and Interstate 5 (I-5), as well as between I-5 and State Route 22 (SR-22). OCTA did not submit any new capacity enhancements on SR-55 north of SR-22. If new capacity is proposed, over and above the OCTA LRTP, new funding would be required that is likely dependent on state and federal legislative action.

The 2016-2040 RTP/SCS should consistently recognize the capacity enhancements along SR-55, between I-405 and I-5, and between I-5 and SR-22, as general purpose lanes. This is consistent with how these projects are characterized in OCTA's LRTP, OCTA's 2006 program-level environmental document, and the current 2012-2035 RTP/SCS. Furthermore, the 2016-2040 RTP/SCS should clearly recognize that the proposed express lane network is subject to further study to evaluate right-of-way impacts, community issues, and overall feasibility before any final decisions on implementation can be made.

Mr. Hasan Ikhrata
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Other Regional Strategies

SCAG proposes a number of other investments within the draft RTP/SCS that affect Orange County, and go beyond the LRTP. These include additional investments in congestion management projects, transit service, and active transportation.

The congestion management projects were identified by the California Department of Transportation through studies required for corridors receiving Proposition 1B Corridor Mobility Improvement Account funding. In Orange County, these corridors included State Route 57, SR-22, I-5, Interstate 605, SR-91, and I-405.

The improvements consist of relatively low-cost operational improvements, such as ramp metering, auxilary lanes, and other ramp and interchange enhancements. The draft 2016-2040 RTP/SCS estimates that an investment of $5 billion is necessary to implement the improvements throughout the SCAG region. These are in addition to capacity and operational improvements submitted by the CTCs, and would be funded through the draft 2016-2040 RTP/SCS innovative financing strategy.

The draft 2016-2040 RTP/SCS also proposes additional transit enhancements throughout the region. The improvements consist of expanded local bus service, additional Bravo! and bus rapid transit services, and new express bus service. SCAG states that the additional cost to the region for these services, including capital and operations and maintenance costs, is estimated at about $8.5 billion, which is again assumed to be funded with innovative sources. It should be noted that the proposed improvements in Orange County are generally consistent with the financially unconstrained element of the OCTA 2014 LRTP.

An additional emphasis is also placed on active transportation improvements, with the draft 2016-2040 RTP/SCS proposing to invest $12.9 billion. Compared to the previous RTP/SCS, the active transportation investment has more than doubled. About $1.7 billion of the total investment reflects active transportation projects submitted by CTCs. SCAG proposes investing another $6.4 billion from the draft 2016-2040 RTP/SCS innovative financing strategy. SCAG then estimates that the remaining $4.8 billion would be invested through active transportation elements from roadway operations and maintenance efforts. The $12.9 billion investment results in more trips made by walking or bicycling, increasing from 11.9 percent of all trips in 2012, to 15.7 percent of all trips by 2040.

Mr. Hasan Ikhrata
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OCTA recognizes that it is within SCAG's purview to plan for regional strategies that enhance transportation; however, it should be noted that OCTA is committed to delivering the projects within the LRTP. The 2016-2040 RTP/SCS should clearly state that the regional strategies suggest improvements beyond the projects submitted by OCTA, and that the implementation of the strategies is subject to availability of new revenue sources and the necessary project development and review processes by the implementing agencies. OCTA will only consider additional investments after new revenues are realized and identified to account for these additional improvements.

OCTA appreciates SCAG's work on the RTP/SCS and PEIR, and looks forward to the adoption of the final 2016-2040 RTP/SCS and PEIR in April. If you have further questions, please contact Gregory Nord, Senior Transportation Analyst, at (714) 560-5885.

Sincerely,

Darrell Johnson
Chief Executive Officer

DJ:gn

c: OCTA Board of Directors
Executive Staff

February 1, 2016

Comments on the Draft 2016 RTP/SCS

Attn: Courtney Aguirre
Southern California Association of Governments
818 W. 7th Street, 12th Floor
Los Angeles, CA 90017

Dear SCAG Regional Council members, Policy Committee members, and staff:

Thank you for providing the opportunity to comment on the 2016 Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS).

We recognize and appreciate the hard work required to develop this long-range plan, including all the effort and thought that has gone into researching and developing the plan, doing public outreach, and soliciting feedback from the public.

Measuring progress on the last plan
We enclose the Executive Summary of our forthcoming report, "Toward a Sustainable Future: Is Southern California On Track? From Vision to Action: Measuring Progress on Southern California's Sustainable Community Strategy."

Our report measures progress in the implementation of the 2012 RTP/SCS and presents lessons learned. We believe this will be useful and informative in finishing the 2016 plan to make sure that it is actually implemented—to live up to the plan's potential to meet required climate goals while creating a more healthy, prosperous, and sustainable region for all.

We want to particularly thank SCAG's research staff for the assistance they provided and encourage support for their work to collect more and better data—which is much needed—on implementation.

Revising the new plan
Our partners have also submitted additional comment letters, with more detailed input on the current draft plan but we wanted to submit this together, as we have put considerable work into it together, to inform the new plan.

We are hoping for a transparent, inclusive fair process as comments are collected and incorporated to revise the draft plan.

A brighter future for Southern California
We applaud SCAG's efforts to create an RTP/SCS to help Southern California grow in a way that creates a thriving region of sustainable, healthy communities with opportunity for all residents.

Thank you for the opportunity to provide comments, and we look forward to continuing to work with SCAG as you implement this plan.

Sincerely,

Carey Knecht
Director
ClimatePlan

Bill Sadler and Demi Espinoza
Senior California Policy Manager and Southern California Policy Manager
Safe Routes to School National Partnership

Bonnie Holmes-Gen
Senior Director, Air Quality and Climate Change
American Lung Association in California

Caro Jauregui
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Green Vision Coordinator
Friends of Harbors, Beaches and Parks

Gloria Ohland
Policy & Communications Director
Move LA

Manal J. Aboelata, MPH
Managing Director
Prevention Institute

Toward a Sustainable Future: Is Southern California On Track?

From Vision to Action:
Measuring Progress on Southern California's
Sustainable Community Strategy

Presented by

ClimatePlan

and the

Safe Routes to School National Partnership

in partnership with:

American Lung Association in California
California Walks
Friends of Harbors, Beaches and Parks
Investing in Place
Move LA
Prevention Institute

Note: This executive summary of the "On Track" report on the 2012 RTP/SCS is being submitted as comments on the 2016 RTS/SCS. The full "On Track" report has not yet been released.

February 1, 2016

Executive Summary

The Southern California region is home to over eighteen million people, half the state's population. It encompasses diverse communities and stark contrasts: from coast to high desert, from the boulevards of Hollywood to the dirt roads of farming communities. It is the nation's largest metropolitan planning region, and leaders from all its communities are coming together now to plan for its growth and investments in the years to come.

With a clear sense of the vision ahead, the progress thus far, and the steps still needed, Southern California's leaders can get the region ready for what the future brings. Together, they can build a more sustainable future and a better quality of life for all.

A plan for a more sustainable region

In 2012, this diverse region adopted its first Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). This regional plan, required by state law SB 375, shows how the region's towns, cities, and counties will act together to reduce greenhouse gas emissions through more sustainable transportation and land use. The 2012 plan set out to do this in a way that would also create a more healthy and prosperous region.

Now, the second regional plan is being prepared by the Southern California Association of Governments. It will be adopted in 2016.

It's a good time to ask: Since the first plan's adoption, what progress has the region made?

Measuring progress

In the last SCS, the region set ambitious goals to shift from "business as usual" and commit to fight climate change, create cleaner air and safer streets, and bring opportunity to all. Is the region on track to meet its goals?

To answer this question, ClimatePlan, the Safe Routes to School National Partnership, and our partners have prepared this report. We asked: Is the 2012 RTP/SCS being implemented, and what are the results so far? We measured the region's progress on nine metrics: greenhouse gas emissions, public transit, transit-oriented development, active transportation, affordable housing, land conservation, public health, equity, and regional funding for local planning.

The results can inform local and state decisions as well as the new plan. They show where the region is succeeding, what challenges persist, where new local strategies are needed, and what areas require more federal and state support.

There is one caveat: to measure progress, you need good data. One of our most consistent findings, unfortunately, was that the available data is often outdated, incomplete, or both. If the region can't accurately measure progress, it's unlikely it will reach its goals. Better data is needed, and consistent tracking and reporting. The Southern California Association of Governments uses its excellent research and analysis capacity to help with this, and we encourage it to do even more.

A stronger plan

The results on each metric are below. We have four key actions to recommend for the 2016 regional plan—and beyond:

1) **Connect transportation decisions to impacts on the climate and communities:**
SCAG and County Transportation Commissions can work together to make sure that county

transportation plans clearly show the climate impacts of proposed transportation projects, both in terms of greenhouse gas emissions (GHG) and vehicle miles traveled (VMT). SCAG has done considerable work to plan for health, equity, and conservation; transportation plans can also show outcomes for these priorities.

County transportation plans represent investments of hundreds of billions of dollars. The plans should show how those investments will meet the region's goals.

2) **Invest more and sooner in public transit, biking, and walking:**
The new RTP/SCS and county transportation plans should continue to grow their investment in public transit and active transportation, and invest sooner where possible. They can be made even more effective by implementing first mile/last mile plans to help people walk and bike easily and safely to transit. These investments are especially important in disadvantaged communities that depend most on public transit, walking, and biking; they will help people reach new opportunities and build better lives.

3) **Convene leaders and get better data to support action:**
SCAG should continue its excellent work to bring people together to address crucial regional issues, such as environmental justice, equity, gentrification, displacement, land conservation, and rural issues.

SCAG's impressive research capacity can support communities to take action on these issues. SCAG has made good progress in analyzing the impacts of new development and transportation investments on disadvantaged communities; this should guide new planning and investment. Better data is still needed on some critical regional questions, such as tracking where job and housing growth is occurring and how many affordable homes are being built.

4) **Step up:**
Every county, every city, and every town must do its part if the region is to succeed. The state and federal government must step up too, providing more funding for planning and implementation, and aligning existing funding with goals.

Here are our findings on the region's progress since its first plan:

1) Greenhouse Gas Emissions

Transportation Plans

Some county transportation plans show their projects' impacts on the climate. All plans should show these, along with how they add up to meet regional and state greenhouse gas goals. This is not required, but it makes sense: County Transportation Commissions choose and fund the region's transportation projects; their plans should clearly align with the region's goals. Los Angeles, Orange, and San Bernardino counties have taken some steps to estimate climate impacts in their long-range transportation plans; Ventura and Imperial have not, and Riverside does not have one.

Some counties have not updated their long-range transportation plans; Riverside County does not yet have one.

Vehicle Miles Traveled

People are driving less, which is good news, but this change will need to speed up to meet the 2020 greenhouse gas reduction goal. Greenhouse gas emissions (GHG) from driving, approximated using per-capita vehicle miles traveled (VMT), are down by 1% since 2011 and by 3.3% since the base year of 2005. They need to go down faster to meet the goal of 9% by 2020, based on 2005 levels.

Data for direct greenhouse gas emissions was not available. Vehicle miles traveled (VMT) data is available through 2013. This should be tracked and reported against the goals in the state law and regional plan.

Recommendations

- With SCAG's help, County Transportation Commissions can estimate climate impacts of both individual transportation projects and whole plans, to clearly show how these will reduce GHG and VMT to meet regional goals. This will also show where more support may be needed.
- SCAG's extensive research capacity can quantify GHG reductions from a broader range of projects, such as active transportation, affordable housing, and land conservation.
- SCAG's well-known education, technical, and financial assistance programs can continue to help communities reduce GHG; special focus should go toward disadvantaged, small, and rural communities.

2) Public Transit

Investment

Public transit investment is close to meeting the region's goal now but will have to increase to keep pace with the plan. Los Angeles County's transit spending makes up three quarters of the region's total. Imperial County is spending almost half its transportation budget on public transit. Riverside and San Bernardino counties are spending very low proportions of their transportation budgets—just 0.4% and 3%, respectively—on transit. Counties should increase transit spending and prioritize investment in disadvantaged communities. State and federal investment in public transit must increase as well.

This data is available.

Ridership

Public transit ridership in Southern California is low and in several counties, including Los Angeles, has dropped recently. This may be due to fare increases, as well as longer-term impacts of service cuts during the recession. It is a worrisome trend.

The most recent data is from 2013, from the National Transit Database; more recent data is incomplete.

Commuting

Commuting by public transit is at a low level, though it is higher in Orange County and highest by far in Los Angeles County. Building new jobs and homes close to transit can help. Innovative solutions are needed to help residents of rural and disadvantaged communities use transit to reach more job opportunities.

The most recent data is from 2013 from the American Community Survey.

Recommendations

- County Transportation Commissions (CTCs) can increase investments in public transportation to give residents more options and reach regional goals. Prioritizing disadvantaged communities will help the people who depend most on reliable public transit.
- Road and highway improvements will be more effective if they focus on complete streets and multimodal goals. Adding new lanes, as Caltrans recently noted, only "induces demand," failing to relieve gridlock.
- More county sales taxes can support public transit, and SCAG can help counties study these and alternative revenue sources as well.
- Updating county transportation plans more frequently, with a transparent and

inclusive approach, will help build community support.

- To increase mobility in rural areas, SCAG can help CTCs to identify and fund more solutions such as vanpools and ride-sharing.
- Jurisdictions must continue to plan for and build more homes and jobs near public transit.
- Federal and state sources must provide more revenue to support public transit.

3) Active Transportation: Walking and Biking

Investment

Investment in active transportation is meeting the region's 1% goal—but that is too low. It will need to increase quickly to keep up with the plan and meet the need. Much of this planned spending was deferred to the end of the plan. The 1% goal is too low; 21% of all trips are made on foot or by bike. More funding is needed. Los Angeles and Riverside counties' investment is relatively high, and Imperial County's is an impressive 10% of its transportation budget. The new plan and county transportation programming should increase spending and bring it forward.

The data is available, though some active transportation improvements are included in other projects, and not all active transportation projects are included in the Federal Transportation Improvement Program.

Commuting

Commuting by walking and biking still occurs at very low rates in the Southern California region. Continuing to build new jobs and homes close to each other and to services will enable more people to walk and bike easily. Complete Streets plans also need to be funded and implemented to make safe walking and biking possible.

The most recent data is from 2013 from the American Community Survey. Commuting is not the best measure; people tend to walk and bike more for other trips, but that data is lacking.

Injuries and Deaths

Injuries and deaths suffered by people who walk and bike occur in the Southern California region at slightly higher rates than statewide (35% of all traffic injuries and fatalities, vs. 32% statewide); it's not clear yet whether this is changing. Though walking and biking are the most healthy and sustainable forms of transportation, too many people are still being hurt or killed by cars.

The most recent data is from 2013 from SWITRS. This data is also both delayed and incomplete. Walk and bike trip data is needed to help evaluate levels of risk.

Recommendations

- The region can do far better than a goal of 1%; by investing more, and sooner, CTCs can help thousands of people to walk and bike on safer streets every day. This investment is especially important in disadvantaged communities, where more people walk and bike to public transit and are more vulnerable to collisions.
- County sales taxes can include more support for walking and biking, and show voters their investment will make communities safer.
- Federal and state sources must do more to support active transportation infrastructure.
- Jurisdictions can continue adopting—and funding—first mile/last mile and Vision Zero plans to help people reach transit easily and make all road users safer.

- SCAG can help communities gather and share better data on active transportation, especially on walk/bike trips and on safety, since state and national data is often outdated or incomplete.

4) Affordable Housing

Housing elements

Of all the region's jurisdictions, 83% have updated housing elements, their plans for building new homes—including affordable homes—to meet projected population growth. One out of five jurisdictions are out of compliance with the law on this, including both the city and the county of Riverside.

This data is available and up to date.

Affordable housing built

According to city and county reporting, over recent years, only 13% of needed affordable homes were actually built. This is a conservative estimate—the shortfall may be even greater. The region is falling far short on meeting the need.

This data is from housing element progress reports 2006 to 2013, which are incomplete; only about half the region's jurisdictions reported.

Recommendations

- If cities and towns plan for 125% of the affordable homes needed, they are more likely to build more of these homes, as not all plans come to pass.
- The problem is harder to address when cities and towns don't report the number of affordable homes actually built—the state can help make this reporting easier.
- Cities and towns can adopt more policies to help get affordable homes built, such as increasing density along transit corridors, lowering parking requirements, and using effective inclusionary ordinances.
- To encourage good planning, SCAG can require jurisdictions to have certified, up-to-date housing elements in order to receive Sustainability Program funds.
- A dedicated long-term source of funding for affordable housing is needed from the state; more federal funding is needed as well.
- SCAG can convene regional leaders and stakeholders to share solutions and support for addressing gentrification and displacement.

5) Transit-Oriented Development

Jobs and households near transit

Current data is not available, but from 2008 to 2012, although the region lost jobs overall during the recession, it actually gained jobs in high-quality transit areas, suggesting that jobs near transit may be more resilient. This data also indicates that housing development near transit must accelerate to meet the goals.

No data since 2012. Jobs and housing data from the Census Bureau, HQTA (2035) data from SCAG, transit data from the Center for Neighborhood Technology's AllTransit database.

Recommendations

- Many cities are planning for more housing and jobs around transit lines; others can follow their lead, using tools like reforming zoning and parking requirements to support compact development.
- As SCAG works with cities and counties to track where new growth is occurring, it can share this information frequently, to help show progress. This is critical to the success of the entire plan.
- SCAG should continue and if possible expand its work to help cities and

counties apply for new funding sources, such as the Affordable Housing and Sustainable Communities (AHSC) grant program, and to identify and share best practices in transit-oriented development (TOD) throughout the region.

- Efforts should take care to include disadvantaged rural areas, which need investment in existing communities, and to expand transit access there.
- To help compact development around transit reach its full potential, first mile/last mile plans need to be implemented to help people get to and from transit.

6) Land Conservation

Planning

Though the region has allocated funds for conservation planning, and mapped priority areas, no plan has yet been developed.

This information is available.

Land development

No current data is available. From 2002 to 2012, though land was developed much faster than the RTP/SCS forecast, the rate of urbanization slowed significantly, indicating that the region could meet its goal.

This data is from 2012, from the State Farmland Mapping and Monitoring project. More recent data is needed.

Recommendations

- Counties should prioritize funding opportunities to conserve important landscapes.
- When new transportation projects travel through important landscapes that should be preserved, mitigation should be funded by the sales taxes used to build these new corridors; this funding should be made available in advance, and as part of a regional approach.
- SCAG should work with local jurisdictions to develop and implement a regional open space plan.
- SCAG should monitor and report rates of development and land loss.

7) Public Health

Collaboration

S**CAG has made consistent efforts to collaborate with public health experts.** The new plan should reflect the results of this collaboration, with clear goals for improving health.

This information is available.

Physical activity

The rates of physical activity in Southern California are very low, though they are the same as statewide rates: only one in three people walks 20–30 minutes per day. Residents in Los Angeles and Orange counties are doing a little better, likely because walking and biking facilities are more readily available. Cities can help more people walk and bike by putting new jobs and houses near transit and providing first mile/last mile connections, to make physical activity a part of daily transportation.

This data is from 2012, from the California Health Information Survey. More recent, consistent data is needed.

Smog/Ozone

The region's ozone (smog) levels are very high, though they have improved over the long term. San Bernardino County, Riverside County, and the City of Los Angeles have the highest ozone levels in the country. This has not changed in recent years, and climate change tends to make it worse. The region's long-term improvement is impressive, though, and shows more is possible. Reducing driving will help.

This data is from 2013, from the American Lung Association's 2015 "State of the Air" report.

Particle pollution

The region's air quality is poor, as measured by particle pollution, though again, it has improved over the long term. Riverside and Los Angeles counties have the worst air in the region and both are among the worst in the country. This has not changed recently, though positive long-term trends show that change is possible. Reducing driving will result in cleaner air.

This data is from 2013, from the American Lung Association's 2015 "State of the Air" report.

Recommendations

- SCAG has been working to connect planning and public health, and to reflect this, decision-making around the new RTP/SCS can use strong public health metrics, such as transportation-related physical activity, that are then closely tracked and reported. The chosen scenario should also clearly improve health.
- SCAG and local jurisdictions can work together to study and address pollution problems in underserved communities.

8) Equity

Collaboration

SCAG has not yet collaborated with local leaders and stakeholders to address neighborhood gentrification and housing displacement. SCAG could help this pressing issue by convening local representatives and by providing data.

This information is available.

Environmental justice analysis

The region's size and diversity requires finer-grained analysis of the impacts of development; mitigation is needed so that new development helps, rather than harms, low-income communities of color. Too many communities still lack even basic infrastructure.

This information is available.

Recommendations

- SCAG's analytic capacity can help identify areas at risk of gentrification and displacement, planning accordingly, and supporting cities and towns to prevent and mitigate these impacts.
- SCAG's use of the "Communities of Concern" approach will be very helpful in identifying where and how to address inequities, and prioritizing investment based on social equity and data. Counties can adopt this approach as well.
- The state, SCAG, and local jurisdictions can all do more to get basic infrastructure built in low-income and rural communities, such as sidewalks, bike lanes, and vanpools. This will greatly improve residents' safety and quality of life.

9) Regional Support for Local Planning

Regional Funding for Local Planning	**SCAG's Sustainability Program funding for planning has increased; it is a good small-scale model to support public transit, transit-oriented development, and active transportation—but far more funding is needed.** County Transportation Commissions, and other regions, can use this funding program as a model for their own. Though the Sustainability Program funds have increased somewhat, they are still very small amounts. *This data is from 2013-14 from SCAG.*
Recommendations	• SCAG can provide data and analysis on critical regional issues around transportation, housing, and equity, such as displacement. • SCAG's Sustainability Program is a good model for funding local planning, and should be expanded with more funding. • County Transportation Commission (CTC) can use this as a model to inform their spending decisions and provide much-needed funds for local planning.

Getting on track

The Southern California region can achieve a more sustainable future, with safer, healthier communities, and opportunity for all.

Is it there yet? No. Can it get on track to get there? Yes.

The region's cities and counties are starting to head in the right direction. Important changes have already begun. Planning and investment need to speed up to keep up, in a world that is changing faster every day.

This challenge can inspire leaders from across the region, as they come together to forge a new plan. Their determination should inspire state and federal leaders as well: this work needs support.

With vision, and with commitment, Southern California can build a brighter future for all.