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VIA U.S. MAIL & E-MAIL

May 26, 2021

Chris Ormsby, Senior Planner
City of Moreno Valley
14177 Frederick Street
Moreno Valley, CA 92553
Em: chriso@moval.org

RE: City of Moreno Valley General Plan Update, Housing Element, Climate Action Plan, and Associated Draft Environmental Impact Report

Dear Mr. Ormsby,

On behalf of the Southwest Regional Council of Carpenters ("**Commenters**" or "**Southwest Carpenters**"), my Office is submitting these comments on the City of Moreno Valley's ("**City**" or "**Lead Agency**") Comprehensive General Plan Update, Housing Element update, and Climate Action Plan (collectively "**MoVal 2040**" or "**Project**") and supporting Draft Environmental Impact ("**EIR**") (SCH No. 2020039022).

The Southwest Carpenters is a labor union representing 50,000 union carpenters in six states and has a strong interest in well ordered land use planning and addressing the environmental impacts of development projects.

Individual members of the Southwest Carpenters live, work and recreate in the City and surrounding communities and would be directly affected by the Project's environmental impacts.

Commenters expressly reserves the right to supplement these comments at or prior to hearings on the Project, and at any later hearings and proceedings related to this Project. Cal. Gov. Code § 65009(b); Cal. Pub. Res. Code § 21177(a); *Bakersfield Citizens for Local Control v. Bakersfield* (2004) 124 Cal. App. 4th 1184, 1199-1203; see *Galante Vineyards v. Monterey Water Dist.* (1997) 60 Cal. App. 4th 1109, 1121.

Commenters expressly reserves the right to supplement these comments at or prior to hearings on the Project, and at any later hearings and proceedings related to this Project. Cal. Gov. Code § 65009(b); Cal. Pub. Res. Code § 21177(a); *Bakersfield Citizens*

for Local Control v. Bakersfield (2004) 124 Cal. App. 4th 1184, 1199-1203; see *Galante Vineyards v. Monterey Water Dist.* (1997) 60 Cal. App. 4th 1109, 1121.

Commenters incorporates by reference all comments raising issues regarding the EIR submitted prior to certification of the EIR for the Project. *Citizens for Clean Energy v City of Woodland* (2014) 225 Cal. App. 4th 173, 191 (finding that any party who has objected to the Project's environmental documentation may assert any issue timely raised by other parties).

Moreover, Commenters requests that the Lead Agency provide notice for any and all notices referring or related to the Project issued under the California Environmental Quality Act ("**CEQA**"), Cal Public Resources Code ("**PRC**") § 21000 *et seq*, and the California Planning and Zoning Law ("**Planning and Zoning Law**"), Cal. Gov't Code §§ 65000–65010. California Public Resources Code Sections 21092.2, and 21167(f) and Government Code Section 65092 require agencies to mail such notices to any person who has filed a written request for them with the clerk of the agency's governing body.

The City should ensure community benefits such as requiring local hire and use of a skilled and trained workforce are necessary components of all development resulting from buildout of the Project. The City should require the use of workers who have graduated from a Joint Labor Management apprenticeship training program approved by the State of California, or have at least as many hours of on-the-job experience in the applicable craft which would be required to graduate from such a state approved apprenticeship training program or who are registered apprentices in an apprenticeship training program approved by the State of California.

Community benefits such as local hire and skilled and trained workforce requirements can also be helpful to reduce environmental impacts and improve the positive economic impact of the Project. Local hire provisions requiring that a certain percentage of workers reside within 10 miles or less of a development site can reduce the length of vendor trips, reduce greenhouse gas emissions and providing localized economic benefits. As environmental consultants Matt Hagemann and Paul E. Rosenfeld note:

> [A]ny local hire requirement that results in a decreased worker trip length from the default value has the potential to result in a reduction of construction-related GHG emissions, though the significance of the

> reduction would vary based on the location and urbanization level of the project site.

March 8, 2021 SWAPE Letter to Mitchell M. Tsai re Local Hire Requirements and Considerations for Greenhouse Gas Modeling.

Skilled and trained workforce requirements promote the development of skilled trades that yield sustainable economic development. As the California Workforce Development Board and the UC Berkeley Center for Labor Research and Education concluded:

> . . . labor should be considered an investment rather than a cost – and investments in growing, diversifying, and upskilling California's workforce can positively affect returns on climate mitigation efforts. In other words, well trained workers are key to delivering emissions reductions and moving California closer to its climate targets.[1]

In addition, public agencies have recently found that there are significant environmental benefits to local skilled and trained workforce requirements. Recently, on May 7, 2021, the South Coast Air Quality Management District found that that the "[u]se of a local state-certified apprenticeship program or a skilled and trained workforce with a local hire component" can result in air pollutant reductions.[2]

The City should also require all future developments be built to standards exceeding the current 2019 California Green Building Code to mitigate the Project's environmental impacts and to advance progress towards the State of California's environmental goals.

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[1] California Workforce Development Board (2020) Putting California on the High Road: A Jobs and Climate Action Plan for 2030 at p. ii, *available at* *https://laborcenter.berkeley.edu/wp-content/uploads/2020/09/Putting-California-on-the-High-Road.pdf*

[2] South Coast Air Quality Management District (May 7, 2021) Certify Final Environmental Assessment and Adopt Proposed Rule 2305 – Warehouse Indirect Source Rule – Warehouse Actions and Investments to Reduce Emissions Program, and Proposed Rule 316 – Fees for Rule 2305, Submit Rule 2305 for Inclusion Into the SIP, and Approve Supporting Budget Actions, *available at* http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2021/2021-May7-027.pdf?sfvrsn=10

I. THE PROJECT WOULD BE APPROVED IN VIOLATION OF THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

A. Background Concerning the California Environmental Quality Act

CEQA has two basic purposes. First, CEQA is designed to inform decision makers and the public about the potential, significant environmental effects of a project. 14 California Code of Regulations ("**CCR**" or "**CEQA Guidelines**") § 15002(a)(1).[3] "Its purpose is to inform the public and its responsible officials of the environmental consequences of their decisions *before* they are made. Thus, the EIR 'protects not only the environment but also informed self-government.' [Citation.]" *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal. 3d 553, 564. The EIR has been described as "an environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return." *Berkeley Keep Jets Over the Bay v. Bd. of Port Comm'rs.* (2001) 91 Cal. App. 4th 1344, 1354 ("*Berkeley Jets")*; *County of Inyo v. Yorty* (1973) 32 Cal. App. 3d 795, 810.

Second, CEQA directs public agencies to avoid or reduce environmental damage when possible by requiring alternatives or mitigation measures. CEQA Guidelines § 15002(a)(2) and (3). *See also, Berkeley Jets,* 91 Cal. App. 4th 1344, 1354; *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553; *Laurel Heights Improvement Ass'n v. Regents of the University of California* (1988) 47 Cal. 3d 376, 400. The EIR serves to provide public agencies and the public in general with information about the effect that a proposed project is likely to have on the environment and to "identify ways that environmental damage can be avoided or significantly reduced." CEQA Guidelines § 15002(a)(2). If the project has a significant effect on the environment, the agency may approve the project only upon finding that it has "eliminated or substantially lessened all significant effects on the environment where feasible" and that any unavoidable significant effects on the environment are "acceptable due to overriding concerns" specified in CEQA section 21081. CEQA Guidelines § 15092(b)(2)(A–B).

[3] The CEQA Guidelines, codified in Title 14 of the California Code of Regulations, section 15000 *et seq*, are regulatory guidelines promulgated by the state Natural Resources Agency for the implementation of CEQA. (Cal. Pub. Res. Code § 21083.) The CEQA Guidelines are given "great weight in interpreting CEQA except when . . . clearly unauthorized or erroneous." *Center for Biological Diversity v. Department of Fish & Wildlife* (2015) 62 Cal. 4th 204, 217.

While the courts review an EIR using an "abuse of discretion" standard, "the reviewing court is not to 'uncritically rely on every study or analysis presented by a project proponent in support of its position.' A 'clearly inadequate or unsupported study is entitled to no judicial deference.'" *Berkeley Jets*, 91 Cal. App. 4th 1344, 1355 (emphasis added) (quoting *Laurel Heights,* 47 Cal. 3d at 391, 409 fn. 12). Drawing this line and determining whether the EIR complies with CEQA's information disclosure requirements presents a question of law subject to independent review by the courts. *Sierra Club v. Cnty. of Fresno* (2018) 6 Cal. 5th 502, 515; *Madera Oversight Coalition, Inc. v. County of Madera* (2011) 199 Cal. App. 4th 48, 102, 131. As the court stated in *Berkeley Jets*, 91 Cal. App. 4th at 1355:

> A prejudicial abuse of discretion occurs "if the failure to include relevant information precludes informed decision-making and informed public participation, thereby thwarting the statutory goals of the EIR process.

The preparation and circulation of an EIR is more than a set of technical hurdles for agencies and developers to overcome. The EIR's function is to ensure that government officials who decide to build or approve a project do so with a full understanding of the environmental consequences and, equally important, that the public is assured those consequences have been considered. For the EIR to serve these goals it must present information so that the foreseeable impacts of pursuing the project can be understood and weighed, and the public must be given an adequate opportunity to comment on that presentation before the decision to go forward is made. *Communities for a Better Environment v. Richmond* (2010) 184 Cal. App. 4th 70, 80 (quoting *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 449–450).

B. The Draft Environmental Impact Report Fails to Provide Sufficient Analyses of Mitigation Measures to Address the Project's Significant Impacts

A fundamental purpose of an EIR is to identify ways in which a proposed project's significant environmental impacts can be mitigated or avoided. PRC §§ 21002.1(a), 21061. To implement this statutory purpose, an EIR must describe any feasible mitigation measures that can minimize the project's significant environmental effects. PRC §§ 21002.1(a), 21100(b)(3); CEQA Guidelines §§ 15121(a), 15126.4(a).

If the project has a significant effect on the environment, the agency may approve the

project only upon finding that it has "eliminated or substantially lessened all significant effects on the environment where feasible"[4] and find that "specific overriding economic, legal, social, technology or other benefits of the project outweigh the significant effects on the environment." PRC § 21081(b). "A gloomy forecast of environmental degradation is of little or no value without pragmatic, concrete means to minimize the impacts and restore ecological equilibrium." *Environmental Council of Sacramento v. City of Sacramento* (2006) 142 Cal.App.4th 1018, 1039.

CEQA mitigation measures proposed and adopted into an environmental impact report must be enforceable and effective. CEQA Guidelines § 15126.4(a)(1)(B) and § 15126.4(a)(2). A reviewing court will not defer to the agency's determination that mitigation measures will work when their efficacy is not apparent and there is no evidence in the record showing they will be effective in remedying the identified environmental problem. *King & Gardiner Farms, LLC v County of Kern* (2020) 45 CA5th 814, 866. When the effectiveness of a mitigation measure is not apparent, the EIR should include facts and analysis supporting its characterization of the expected result. *Sierra Club v County of Fresno* (2018) 6 C5th 502, 522. Mitigation measures that are unrealistic and unlikely to be implemented create an illusory analysis and should not be included in an EIR. *Cleveland Nat'l Forest Found. v San Diego Ass'n of Gov'ts* (2017) 17 CA5th 413, 433.

i. The Draft Environmental Impact Report Fails to Describe or Evaluate Feasible Mitigation Measures to Offset Significant Agricultural Impacts

The EIR details how Project's direct, indirect, and cumulative effects would result in the loss of substantial swaths of important agricultural lands, including Prime Farmland, Farmland of Local Importance, and Farmland of Statewide Importance. DEIR § 4.2.5.1. The Project would cause up to 3,267 acres of farmland to be lost directly through development within the General Plan's new "Concept Areas" (*See* DEIR Table 4.2-2); additional losses would occur in other portions of the City as a result of the City's continued urbanization consistent with the Project. *Id.* The DEIR rightfully concludes the Project's effect on agricultural lands will be significant. However, rather than evaluate all feasible measures to reduce those impacts as CEQA requires, the DEIR provides only a conclusory discussion of opportunities to mitigate those impacts and summarily finds, "[f]easible mitigation that would meet the

[4] CEQA Guidelines § 15092(b)(2)(A).

objectives of the project does not exist […]" DEIR § 4.2.8.1. This terse treatment of agricultural mitigation is fundamentally flawed for two primary reasons.

First, the DEIR reflects a disposition that because the loss of agricultural land within and surrounding the City is allowed under the City's General Plan (i.e., no portions of the City are zoned only for agricultural purposes) and even expected (*See* DEIR § 4.2.5.5, stating the City "anticipated conversion of all agricultural land uses to urban and rural uses" in the prior General Plan), it is an acceptable outcome of the Project and unworthy of mitigation. However, the law disagrees. PRC § 21002.1(b) instructs that an "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." Although certain mitigation measures may not be feasible in light of overriding economic, social, or other conditions, those overriding considerations do "not negate the statutory obligation to implement feasible mitigation measures." *King & Gardiner Farms, LLC v. County of Kern* (2020) 45 Cal.App.5th 814, 852. "Even when a project's benefits outweigh its unmitigated effects, agencies are still required to implement all mitigation measures unless those measures are truly infeasible." *Sierra Club v. County of Fresno* (2018), 6 Cal.5th 502, 524. Despite the City's apparent acceptance of the Project's significant impacts to agricultural lands as being a foregone conclusion or even desirable, the DEIR must nevertheless evaluate all feasible measures to mitigate them. The City has failed to do so here, providing essentially zero analysis of mitigation measures or their feasibility.

Second, the DEIR entirely failed to consider potentially viable measures to offset significant agricultural impacts. The DEIR provides slim consideration of only one potential mitigation option, Williamson Act Contracts, which it quickly dismisses without sufficient discussion as ineffective because Williamson Act Contracts are voluntary and temporary. However, a mitigation measure need not be permanent and involuntary to provide an impact-offsetting effect. The City could develop a mitigation measure that utilizes the benefits Williamson Act Contracts, despite their limitations, to slow or offset the loss of agricultural lands. The DEIR has failed to demonstrate why doing so is infeasible.

What's more, there are other highly effective mitigation options available to preserve agricultural lands that the DEIR has conveniently overlooked. For example, agricultural easements, farmland banking, and farmland in-lieu fee programs are currently being implemented in other jurisdictions to mitigate losses of agricultural

lands.[5] As noted on the California Department of Conservation's website regarding Farmland Mitigation, "Local jurisdictions have recognized the importance of addressing the impacts of agricultural land conversion through the [CEQA] and General Plan process. Requirements to partially mitigate for the loss of farmland via in lieu fees or direct purchases of conservation easements on similar land have become policy in a number of cities and counties in recent years."[6] That website is one resource among many that provides a wealth of information about potential agricultural mitigation measures.

In light of Project's significant impacts to agricultural lands, the City is obligated to carefully evaluate the feasibility of agricultural easements, in-lieu fee programs, and similar mitigation measures, not just declare without substantiation the Project's significant agricultural impacts to be unavoidable.

ii. The Draft Environmental Impact Report Fails to Mitigate the Project's Transportation Impacts to the Extent Feasible

As noted above, an EIR must include all feasible mitigation measures to address significant environmental impacts. Here, the DEIR notes that the Project would result significant transportation impacts due to an increase in vehicle miles traveled (VMT), and despite incorporating traffic demand reducing measures into the Project, the Project's traffic impacts will remain significant. Rather than describe and evaluate the many mitigation strategies available to cities to help reduce VMT impacts at the program level,[7] the DEIR simply states, "[n]o additional mitigation was identified that could reduce VMT impacts," and, therefore, "[i]mpacts would remain significant and unavoidable." DEIR § 4.16.8.2.

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[5] *See e.g.,* Yolo County Agricultural Conservation Easement Program, Yolo County Code Section 8-2.2416

[6] Available at https://www.conservation.ca.gov/dlrp/grant-programs/mitigation/Pages/FarmlandMitigation.aspx; *See also* "Conserving California's Harvest: A Model Mitigation Program and Ordinance for Local Governments" (2014), California Council of Land Trusts, available at https://www.calandtrusts.org/wp-content/uploads/2014/03/conserving-californias-harvest-web-version-6.26.14.pdf

[7] For example, see CARB's "Potential State-Level Strategies to Advance Sustainable, Equitable Communities and Reduce Vehicle Miles of Travel (VMT) – for Discussion," available at https://ww2.arb.ca.gov/sites/default/files/classic//cc/scopingplan/meetings/091316/potential%20vmt%20measures%20for%20discussion_9.13.16.pdf; also see "California Air Resources Board 2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals," January 2019, available at https://ww2.arb.ca.gov/sites/default/files/2019-01/2017_sp_vmt_reductions_jan19.pdf.

The DEIR both fails CEQA's informational requirements, failing to analyze potential mitigation measures, but also CEQA's substantive requirements that all feasible mitigation measures be adopted. For example, in April of 2020, Fehr & Peers (who happens to be a technical consultant on this particular environmental document) and the Western Riverside Council of Governments ("WRCOG") published "VMT Mitigation Through Fees, Banks & Exchanges: Understanding New Mitigation Approaches."[8]

Oddly enough, the DEIR fails to consider any of the mitigation approaches proposed by Fehr & Peers in its own White Paper. WRCOG proposes a number of regional VMT mitigation strategies including VMT-based Transportation Impact Fees, VMT Mitigation Exchanges and VMT Mitigation Banks.[9] These approaches are well documented and have already adopted in a number of jurisdictions, including in WRCOG which the City is a member agency of.[10]

In addition, there are many well-documented project level VMT mitigation strategies, none of which are discussed as potential mitigation measures in the DEIR. Fehr & Peers in another study conducted for WRCOG suggested a number of project-level VMT mitigation measures that would be effective in rural or suburban settings such as in Cities in the WRCOG, including diversifying land uses, providing pedestrian network improvements, and traffic calming measures among many other proposals.[11]

Finally, as stated previously, local skilled and trained workforce requirements can also significantly reduce vehicle miles traveled and associated air pollutant emissions.

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[8] Western Riverside Council of Governments (2020) VMT Mitigation Through Fees, Banks & Exchanges, Understanding New Mitigation Approaches, *available at* https://www.fehrandpeers.com/wp-content/uploads/2020/04/VMT-Fees_Exchanges_Banks-White-Paper_Apr2020.pdf.

[9] *Id.* at pp. 16 – 17.

[10] Neil Peacock, Senior Environmental Planner, Caltrans (2017) Working Paper: The Potential for Regional Transportation Impact Mitigation Fee Programs and Mitigation Banks to Help Streamline the Implementation of SB 743 at pp. 2 – 3, *available at* https://static1.squarespace.com/static/5b96d09a3c3a53da0e1ba210/t/5e5ec5cf5876f47000915ddd/1583269327880/VMT+Mitigation+Precedents+Peacock+March+2017.pdf

[11] Technical Memorandum from Ronald T. Milam, AICP, PTP and Jason Pack, PE to Chris Gray (WRCOG), Chris Tzeng (WRCOG), Sarah Dominguez (SCAG) and Mike Gainor (SCAG) (February 26, 2019) SB 743 Implementation TDM Strategy Assessment, *available at* https://www.fehrandpeers.com/wp-content/uploads/2019/12/TDM-Strategies-Evaluation.pdf

The DEIR needs to be revised to reflect substantive consideration of the many measures available to mitigate transportation impacts, including the use of local skilled professions on all construction projects, not just the handful of measures selected for discussion in the DEIR. Furthermore, the DEIR must be revised to require the application all feasible measures to reduce the Project's significant transportation impacts.

iii. The Draft Environmental Impact Report Fails to Establish the Efficacy of the Biological Mitigation Measures.

The EIR introduces two mitigation measures intended to minimize the Project's significant impacts to biological resources. Theoretically, those mitigation measures would require applicants for certain future projects to conduct site-specific biological surveys and provide the City reports concerning the presence of sensitive biological resources and measures that could be implemented to ensure impacts to those resources would be less than significant. However, both mitigation measures would only come into play when "the Director of Community Development or his or her designee has determined a potential for impacts…" to the resources in question. DEIR §4.4.8.1. This language is troublesome because it provides City staff unfettered discretion to decide whether to subject an applicant to the requirements of the mitigation measures. By failing to include clear and detailed criteria for staff to apply when determining whether to require an applicant to comply with the mitigation measures (e.g., "if .5-acres or more of the of the project site is currently undeveloped, the project applicant must…"), the DEIR fails to ensure the mitigation measures will be applied at all, let only applied consistently or in a manner that achieves the mitigation measures' intended effect of minimizing future impacts to sensitive biological resources.

As noted previously, CEQA mitigation measures must be enforceable and effective. CEQA Guidelines § 15126.4(a)(1)(B) and § 15126.4(a)(2). The DEIR's biological mitigation measures would be unenforceable and likely ineffective because their application would be subject to City staffs' unfettered discretion. The DEIR must be revised to rectify this foundational flaw in the biological mitigation measures and demonstrate through facts and analysis that the improved measures will in fact be enforceable and effective. See *Sierra Club v County of Fresno* (2018) 6 C5th 502, 522; *Cleveland Nat'l Forest Found. v San Diego Ass'n of Gov'ts* (2017) 17 CA5th 413, 433.

iv. The Draft Environmental Impact Statement Fails to Develop or Explain the "Programmatic Mitigation Framework" Upon Which Multiple Impact Analyses Rely

The substantial evidence test applies to any conclusions or findings in the EIR's analysis of a topic. See e.g.*, Residents Against Specific Plan 380 v. County of Riverside* (2017) 9 Cal. App 5th 941, 968. Substantial evidence is defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached." CEQA Guidelines §15384(a). The DEIR fails to provide substantial evidence to support its conclusions concerning Project's potentially significant impacts under "Public Service and Recreation" and "Utilities / Service Systems" sections of the DEIR. Specifically, the DEIR lacks relevant information and critical details about the "programmatic mitigation framework" that is supposedly established through the DEIR and was relied on by the DEIR to conclude the construction of future public service facilities and the expansion of utility infrastructure necessitated by the Project will not result in significant environmental impacts.

By way of example, consider the DEIR's examination at § 4.15.5.1(a) of the environmental impacts resulting from the construction of the new fire stations that will be needed to fulfill the growing fire protection needs of the City due to buildout out the Project. The DEIR informs us that the Project-induced development of "future fire protection facilities could result in environmental impacts, including disturbances or conversion of habitat, water pollution during construction, increased noise levels, and an increase in impermeable surfaces." *Id.* But, the DEIR concludes, the impacts of those future facilities would be reduced to less than significant levels through the application of, amongst other things, "the programmatic mitigation framework established in this environmental impact report" (*Id.;* emphasis added).

Commenters note there is no portion of the DEIR labeled "programmatic mitigation framework," nor is there a collection of mitigation measures that could be characterized as a "framework" for mitigating the impacts of future public service and utility projects necessitated by the buildout of the Project. It appears the DEIR is referring to a mitigation framework that does not exist. If a mitigation framework does exist within the DEIR, it is inadequately labeled, detailed, and analyzed. The DEIR lacks the facts and analysis necessary to support its characterizations of the expected impact-minimizing results of mitigation applicable to future facilities. See *Sierra Club v*

County of Fresno (2018) 6 C5th 502, 522. Consequently, the DEIR's conclusions that rely in part on the applicability of a "programmatic mitigation framework," especially the "Public Service and Recreation" (relating to fire, police, school, and park infrastructure) and "Utilities / Service Systems" (relating to water, power, and telecommunications infrastructure) conclusions, are fundamentally flawed and unsupported by substantial evidence.

The DEIR must be revised to include sufficient information about the supposed "programmatic mitigation framework" and a careful analysis of its enforceability and effectiveness at offsetting the potentially significant impacts of the Project.

II. THE PROJECT FAILS TO PROVIDE THE INFORMATION AND ANALYSES REQUIRED OF ALL HOUSING ELEMENT

A. Background Regarding the Housing Element Law

The Housing Elements of General Plans are the planning tools through which local governments ensure they make "adequate provision for the[ir] existing and projected housing needs" as determined through the share of the Regional Housing Needs Assessment (RHNA) allocation process. Gov. Code § 65580(d). As specified in Gov. Code § 65580 *et seq.*, Housing Elements must include particular information and analyses related to existing and projected housing needs, constraints relative to meeting those needs, and the local government's specific plans to help fulfill those needs. Housing Elements that fail to provide required information and analyses may be deemed by the state or courts to be out of compliance with the law and the local government may be subject to substantial consequences. *See* Gov. Code §§ 65754, 65754.5, and 65755.

The California Department of Housing and Community Development (HCD) is mandated to determine state-wide housing needs by income category for each Council of Governments (COG) throughout the state. The housing need is determined based on four broad household income categories: very low (households making less than 50 percent of median family income), low (50 to 80 percent of median family income), moderate (80 to 120 percent of median family income), and above moderate (more than 120 percent of median family income). The intent of the future needs allocation by income groups is to relieve the undue concentration of very low and low-income households in a single jurisdiction and to help allocate resources in a fair and equitable manner. The Southern California Association of Governments (SCAG) is the COG

for Riverside County and has determined Moreno Valley's RHNA allocation for the eight-year planning period spanning October 2021 through October 2029 (the Sixth Cycle) to be 13,627 units of total new construction, with 2,051 units allocated to the low income category and 3,779 units allocated to the very low income category.

B. The Housing Element's Inventory of Land Available for Housing Development Contains Fundamental Flaws Resulting in the Overstatement of Sites Available to Meet Low-Income Housing Needs

The purpose of a housing element's site inventory is to identify and analyze specific sites that are available and suitable for the residential development necessary to accommodate the jurisdiction's housing needs as determined through the RHNA process. Gov. Code § 65583.2(a). Only sites that meet specific criteria listed at Gov. Code § 65583.2(a) may be considered "suitable for residential development" and included in the site inventory. An inventory made up only of sites meeting that criteria is critical to accurately determining whether a jurisdiction currently has sufficient sites available to fulfill its housing needs or must implement new plans to make new sites available. Gov. Code § 65583(c)(1).

Moreno Valley's Housing Element site inventory is fundamentally flawed because it improperly includes on its inventory a substantial number of sites that it deems fit for fulfilling its low-incoming housing obligations without providing its justification for doing so as required by law. Specifically, it improperly relies on large sites (of 10 or more acres) and non-vacant sites to fulfill its low and very low-income housing needs. By doing so, the Housing Element overstates the number of sites available to meet its housing needs and, consequently, fails to consider whether the City needs to implement additional plans to make new sites available for low-income residential development.

As stated in Gov. Code § 65583.2(c)(2)(C), a "site larger than 10 acres shall not be deemed adequate to accommodate lower income housing need unless the locality can demonstrate that sites of equivalent size were successfully developed during the prior planning period for an equivalent number of lower income housing units as projected for the site or unless the locality provides other evidence to the department that the site can be developed as lower income housing." Despite this clear instruction, the Housing Element includes multiple sites larger than 10 acres—categorized as accommodating more than 750 low-income units—without providing any evidence of their suitability for development, as required by Gov. Code § 65583.2(c)(2)(C). Instead,

the Housing Element explains that at least one of those large sites is associated with a future mall development and was included "to capture the potential for affordable housing development in a highly desirable location proximate to services, transit, and employment opportunities." Housing Element, p. 94. That explanation does not fulfill the requirements of Gov. Code § 65583.2(c)(2)(C), which focuses on the practicability of housing development as demonstrated through evidence of similarly large-parcel projects being successfully developed, not the lofty ideals of the City. Thus, the Housing Element does not substantiate its inclusion of the large-acre sites in its inventory of sites available to fulfill the City's low-income housing needs.

Similarly, the Housing Element fails justify its reliance on non-vacant sites to fulfill the majority of its low-income housing needs. Because non-vacant sites are often less likely to be developed into new housing than vacant sites, Housing Elements must always provide an explanation of the methodology used to determine the development potential of non-vacant sites included in their site inventories. Gov. Code § 65583.2(g)(1)("The methodology shall consider factors including the extent to which existing uses may constitute an impediment to additional residential development, the city's or county's past experience with converting existing uses to higher density residential development, the current market demand for the existing use, an analysis of any existing leases or other contracts that would perpetuate the existing use or prevent redevelopment of the site for additional residential development, development trends, market conditions, and regulatory or other incentives or standards to encourage additional residential development on these sites). Additionally, when a Housing Element inventory fulfills more than 50 % of its low-income allocation with non-vacant sites, the existing uses of those non-vacant sites are "presumed to impede additional residential development, absent findings based on substantial evidence that the use is likely to be discontinued during the planning period." Gov. Code § 65583.2(g)(2).

The Project's Housing Element inventory reflects that 3,142 (or 54%) of the City's RHNA-required 5,814 low-income units are to be fulfilled through non-vacant sites. Consequently, the Housing Element is required to provide a detailed methodology, supported by substantial evidence, that demonstrates the non-vacant sites' existing uses (which are *presumed* to impeded residential development) will cease and the sites will become available for low-income residential development. The Housing Element fails to provide any reasonable methodology supporting its reliance on non-vacant

sites, let alone substantial evidence that the non-vacant sites' current uses will discontinue. The methodology presented in the Housing Element considers only a site's current land value and its lot size relative to the size of its current structure(s). Consideration of those two factors alone is insufficient to demonstrate a site's current use is not an impediment to redevelopment, let alone that its use will discontinue during the Sixth Cycle. The Housing Element needs to be overhauled to implement a robust methodology, as required by Gov. Code § 65583.2(g)(1), and supported by substantial evidence, as required by Gov. Code § 65583.2(g)(2), in a way that demonstrates all the non-vacant sites it relies on to fulfill the City's low-income housing needs will in fact be available for redevelopment within the Sixth Cycle.

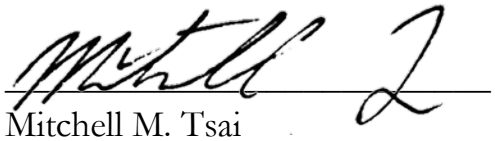
These fundamental errors in the Housing Element's site inventory must be rectified to ensure that the City will in fact be making available sufficient sites to meet its RHNA allocation.

IV. **CONCLUSION**

Commenters request that the City prepare a revise and recirculate the Draft Environmental Impact Report for the Project that addresses all the aforementioned issues.

Please contact my Office if you have any questions or concerns.

Sincerely,



Mitchell M. Tsai
Attorneys for Southwest Regional
Council of Carpenters

Attached:

March 8, 2021 SWAPE Letter to Mitchell M. Tsai re Local Hire Requirements and Considerations for Greenhouse Gas Modeling (Exhibit A);

Air Quality and GHG Expert Paul Rosenfeld CV (Exhibit B);

Air Quality and GHG Expert Matt Hagemann CV (Exhibit C);

Western Riverside Council of Governments (2020) VMT Mitigation Through Fees, Banks & Exchanges, Understanding New Mitigation Approaches (Exhibit D);

Neil Peacock, Senior Environmental Planner, Caltrans (2017) Working Paper: The Potential for Regional Transportation Impact Mitigation Fee Programs and Mitigation Banks to Help Streamline the Implementation of SB 743 (Exhibit E); and

Technical Memorandum from Ronald T. Milam, AICP, PTP and Jason Pack, PE to Chris Gray (WRCOG), Chris Tzeng (WRCOG), Sarah Dominguez (SCAG) and Mike Gainor (SCAG) (February 26, 2019) SB 743 Implementation TDM Strategy Assessment (Exhibit F).

EXHIBIT A

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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Paul E. Rosenfeld, PhD
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March 8, 2021

Mitchell M. Tsai
155 South El Molino, Suite 104
Pasadena, CA 91101

Subject: Local Hire Requirements and Considerations for Greenhouse Gas Modeling

Dear Mr. Tsai,

Soil Water Air Protection Enterprise ("SWAPE") is pleased to provide the following draft technical report explaining the significance of worker trips required for construction of land use development projects with respect to the estimation of greenhouse gas ("GHG") emissions. The report will also discuss the potential for local hire requirements to reduce the length of worker trips, and consequently, reduced or mitigate the potential GHG impacts.

Worker Trips and Greenhouse Gas Calculations

The California Emissions Estimator Model ("CalEEMod") is a "statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and greenhouse gas (GHG) emissions associated with both construction and operations from a variety of land use projects."[1] CalEEMod quantifies construction-related emissions associated with land use projects resulting from off-road construction equipment; on-road mobile equipment associated with workers, vendors, and hauling; fugitive dust associated with grading, demolition, truck loading, and on-road vehicles traveling along paved and unpaved roads; and architectural coating activities; and paving.[2]

The number, length, and vehicle class of worker trips are utilized by CalEEMod to calculate emissions associated with the on-road vehicle trips required to transport workers to and from the Project site during construction.[3]

[1] "California Emissions Estimator Model." CAPCOA, 2017, *available at:* http://www.aqmd.gov/caleemod/home.
[2] "California Emissions Estimator Model." CAPCOA, 2017, *available at:* http://www.aqmd.gov/caleemod/home.
[3] "CalEEMod User's Guide." CAPCOA, November 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/01_user-39-s-guide2016-3-2_15november2017.pdf?sfvrsn=4, p. 34.

Specifically, the number and length of vehicle trips is utilized to estimate the vehicle miles travelled ("VMT") associated with construction. Then, utilizing vehicle-class specific EMFAC 2014 emission factors, CalEEMod calculates the vehicle exhaust, evaporative, and dust emissions resulting from construction-related VMT, including personal vehicles for worker commuting.[4]

Specifically, in order to calculate VMT, CalEEMod multiplies the average daily trip rate by the average overall trip length (see excerpt below):

> "$VMT_d = \Sigma(\text{Average Daily Trip Rate}_i * \text{Average Overall Trip Length}_i)_n$
>
> Where:
>
> n = Number of land uses being modeled."[5]

Furthermore, to calculate the on-road emissions associated with worker trips, CalEEMod utilizes the following equation (see excerpt below):

> "$\text{Emissions}_{pollutant} = VMT * EF_{running,pollutant}$
>
> Where:
>
> $\text{Emissions}_{pollutant}$ = emissions from vehicle running for each pollutant
>
> VMT = vehicle miles traveled
>
> $EF_{running,pollutant}$ = emission factor for running emissions."[6]

Thus, there is a direct relationship between trip length and VMT, as well as a direct relationship between VMT and vehicle running emissions. In other words, when the trip length is increased, the VMT and vehicle running emissions increase as a result. Thus, vehicle running emissions can be reduced by decreasing the average overall trip length, by way of a local hire requirement or otherwise.

Default Worker Trip Parameters and Potential Local Hire Requirements

As previously discussed, the number, length, and vehicle class of worker trips are utilized by CalEEMod to calculate emissions associated with the on-road vehicle trips required to transport workers to and from the Project site during construction.[7] In order to understand how local hire requirements and associated worker trip length reductions impact GHG emissions calculations, it is important to consider the CalEEMod default worker trip parameters. CalEEMod provides recommended default values based on site-specific information, such as land use type, meteorological data, total lot acreage, project type and typical equipment associated with project type. If more specific project information is known, the user can change the default values and input project-specific values, but the California Environmental Quality Act ("CEQA") requires that such changes be justified by substantial evidence.[8] The default number of construction-related worker trips is calculated by multiplying the

[4] "Appendix A Calculation Details for CalEEMod." CAPCOA, October 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/02_appendix-a2016-3-2.pdf?sfvrsn=6, p. 14-15.
[5] "Appendix A Calculation Details for CalEEMod." CAPCOA, October 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/02_appendix-a2016-3-2.pdf?sfvrsn=6, p. 23.
[6] "Appendix A Calculation Details for CalEEMod." CAPCOA, October 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/02_appendix-a2016-3-2.pdf?sfvrsn=6, p. 15.
[7] "CalEEMod User's Guide." CAPCOA, November 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/01_user-39-s-guide2016-3-2_15november2017.pdf?sfvrsn=4, p. 34.
[8] CalEEMod User Guide, *available at:* http://www.caleemod.com/, p. 1, 9.

number of pieces of equipment for all phases by 1.25, with the exception of worker trips required for the building construction and architectural coating phases.[9] Furthermore, the worker trip vehicle class is a 50/25/25 percent mix of light duty autos, light duty truck class 1 and light duty truck class 2, respectively."[10] Finally, the default worker trip length is consistent with the length of the operational home-to-work vehicle trips.[11] The operational home-to-work vehicle trip lengths are:

> "[B]ased on the *location* and *urbanization* selected on the project characteristic screen. These values were *supplied by the air districts or use a default average for the state*. Each district (or county) also assigns trip lengths for urban and rural settings" (emphasis added). [12]

Thus, the default worker trip length is based on the location and urbanization level selected by the User when modeling emissions. The below table shows the CalEEMod default rural and urban worker trip lengths by air basin (see excerpt below and Attachment A).[13]

Worker Trip Length by Air Basin		
Air Basin	**Rural (miles)**	**Urban (miles)**
Great Basin Valleys	16.8	10.8
Lake County	16.8	10.8
Lake Tahoe	16.8	10.8
Mojave Desert	16.8	10.8
Mountain Counties	16.8	10.8
North Central Coast	17.1	12.3
North Coast	16.8	10.8
Northeast Plateau	16.8	10.8
Sacramento Valley	16.8	10.8
Salton Sea	14.6	11
San Diego	16.8	10.8
San Francisco Bay Area	10.8	10.8
San Joaquin Valley	16.8	10.8
South Central Coast	16.8	10.8
South Coast	19.8	14.7
Average	**16.47**	**11.17**
Minimum	**10.80**	**10.80**
Maximum	**19.80**	**14.70**
Range	**9.00**	**3.90**

[9] "CalEEMod User's Guide." CAPCOA, November 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/01_user-39-s-guide2016-3-2_15november2017.pdf?sfvrsn=4, p. 34.
[10] "Appendix A Calculation Details for CalEEMod." CAPCOA, October 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/02_appendix-a2016-3-2.pdf?sfvrsn=6, p. 15.
[11] "Appendix A Calculation Details for CalEEMod." CAPCOA, October 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/02_appendix-a2016-3-2.pdf?sfvrsn=6, p. 14.
[12] "Appendix A Calculation Details for CalEEMod." CAPCOA, October 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/02_appendix-a2016-3-2.pdf?sfvrsn=6, p. 21.
[13] "Appendix D Default Data Tables." CAPCOA, October 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/05_appendix-d2016-3-2.pdf?sfvrsn=4, p. D-84 – D-86.

As demonstrated above, default rural worker trip lengths for air basins in California vary from 10.8- to 19.8-miles, with an average of 16.47 miles. Furthermore, default urban worker trip lengths vary from 10.8- to 14.7-miles, with an average of 11.17 miles. Thus, while default worker trip lengths vary by location, default urban worker trip lengths tend to be shorter in length. Based on these trends evident in the CalEEMod default worker trip lengths, we can reasonably assume that the efficacy of a local hire requirement is especially dependent upon the urbanization of the project site, as well as the project location.

Practical Application of a Local Hire Requirement and Associated Impact

To provide an example of the potential impact of a local hire provision on construction-related GHG emissions, we estimated the significance of a local hire provision for the Village South Specific Plan ("Project") located in the City of Claremont ("City"). The Project proposed to construct 1,000 residential units, 100,000-SF of retail space, 45,000-SF of office space, as well as a 50-room hotel, on the 24-acre site. The Project location is classified as Urban and lies within the Los Angeles-South Coast County. As a result, the Project has a default worker trip length of 14.7 miles.[14] In an effort to evaluate the potential for a local hire provision to reduce the Project's construction-related GHG emissions, we prepared an updated model, reducing all worker trip lengths to 10 miles (see Attachment B). Our analysis estimates that if a local hire provision with a 10-mile radius were to be implemented, the GHG emissions associated with Project construction would decrease by approximately 17% (see table below and Attachment C).

Local Hire Provision Net Change	
Without Local Hire Provision	
Total Construction GHG Emissions (MT CO_2e)	3,623
Amortized Construction GHG Emissions (MT CO_2e/year)	120.77
With Local Hire Provision	
Total Construction GHG Emissions (MT CO2e)	3,024
Amortized Construction GHG Emissions (MT CO_2e/year)	100.80
% Decrease in Construction-related GHG Emissions	***17%***

As demonstrated above, by implementing a local hire provision requiring 10 mile worker trip lengths, the Project could reduce potential GHG emissions associated with construction worker trips. More broadly, any local hire requirement that results in a decreased worker trip length from the default value has the potential to result in a reduction of construction-related GHG emissions, though the significance of the reduction would vary based on the location and urbanization level of the project site.

This serves as an example of the potential impacts of local hire requirements on estimated project-level GHG emissions, though it does not indicate that local hire requirements would result in reduced construction-related GHG emission for all projects. As previously described, the significance of a local hire requirement depends on the worker trip length enforced and the default worker trip length for the project's urbanization level and location.

[14] "Appendix D Default Data Tables." CAPCOA, October 2017, *available at:* http://www.aqmd.gov/docs/default-source/caleemod/05_appendix-d2016-3-2.pdf?sfvrsn=4, p. D-85.

Disclaimer

SWAPE has received limited discovery. Additional information may become available in the future; thus, we retain the right to revise or amend this report when additional information becomes available. Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable environmental consultants practicing in this or similar localities at the time of service. No other warranty, expressed or implied, is made as to the scope of work, work methodologies and protocols, site conditions, analytical testing results, and findings presented. This report reflects efforts which were limited to information that was reasonably accessible at the time of the work, and may contain informational gaps, inconsistencies, or otherwise be incomplete due to the unavailability or uncertainty of information obtained or provided by third parties.

Sincerely,

Matt Hagemann, P.G., C.Hg.

Paul E. Rosenfeld, Ph.D.

EXHIBIT B

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

SOIL WATER AIR PROTECTION ENTERPRISE
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Paul Rosenfeld, Ph.D.

Chemical Fate and Transport & Air Dispersion Modeling

Principal Environmental Chemist

Risk Assessment & Remediation Specialist

Education

Ph.D. Soil Chemistry, University of Washington, 1999. Dissertation on volatile organic compound filtration.

M.S. Environmental Science, U.C. Berkeley, 1995. Thesis on organic waste economics.

B.A. Environmental Studies, U.C. Santa Barbara, 1991. Thesis on wastewater treatment.

Professional Experience

Dr. Rosenfeld has over 25 years' experience conducting environmental investigations and risk assessments for evaluating impacts to human health, property, and ecological receptors. His expertise focuses on the fate and transport of environmental contaminants, human health risk, exposure assessment, and ecological restoration. Dr. Rosenfeld has evaluated and modeled emissions from unconventional oil drilling operations, oil spills, landfills, boilers and incinerators, process stacks, storage tanks, confined animal feeding operations, and many other industrial and agricultural sources. His project experience ranges from monitoring and modeling of pollution sources to evaluating impacts of pollution on workers at industrial facilities and residents in surrounding communities.

Dr. Rosenfeld has investigated and designed remediation programs and risk assessments for contaminated sites containing lead, heavy metals, mold, bacteria, particulate matter, petroleum hydrocarbons, chlorinated solvents, pesticides, radioactive waste, dioxins and furans, semi- and volatile organic compounds, PCBs, PAHs, perchlorate, asbestos, per- and poly-fluoroalkyl substances (PFOA/PFOS), unusual polymers, fuel oxygenates (MTBE), among other pollutants. Dr. Rosenfeld also has experience evaluating greenhouse gas emissions from various projects and is an expert on the assessment of odors from industrial and agricultural sites, as well as the evaluation of odor nuisance impacts and technologies for abatement of odorous emissions. As a principal scientist at SWAPE, Dr. Rosenfeld directs air dispersion modeling and exposure assessments. He has served as an expert witness and testified about pollution sources causing nuisance and/or personal injury at dozens of sites and has testified as an expert witness on more than ten cases involving exposure to air contaminants from industrial sources.

Professional History:

Soil Water Air Protection Enterprise (SWAPE); 2003 to present; Principal and Founding Partner
UCLA School of Public Health; 2007 to 2011; Lecturer (Assistant Researcher)
UCLA School of Public Health; 2003 to 2006; Adjunct Professor
UCLA Environmental Science and Engineering Program; 2002-2004; Doctoral Intern Coordinator
UCLA Institute of the Environment, 2001-2002; Research Associate
Komex H_2O Science, 2001 to 2003; Senior Remediation Scientist
National Groundwater Association, 2002-2004; Lecturer
San Diego State University, 1999-2001; Adjunct Professor
Anteon Corp., San Diego, 2000-2001; Remediation Project Manager
Ogden (now Amec), San Diego, 2000-2000; Remediation Project Manager
Bechtel, San Diego, California, 1999 – 2000; Risk Assessor
King County, Seattle, 1996 – 1999; Scientist
James River Corp., Washington, 1995-96; Scientist
Big Creek Lumber, Davenport, California, 1995; Scientist
Plumas Corp., California and USFS, Tahoe 1993-1995; Scientist
Peace Corps and World Wildlife Fund, St. Kitts, West Indies, 1991-1993; Scientist

Publications:

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Sok, H.L.; Waller, C.C.; Feng, L.; Gonzalez, J.; Sutherland, A.J.; Wisdom-Stack, T.; Sahai, R.K.; Hesse, R.C.; **Rosenfeld, P.E.** (June 20-23, 2010). Atrazine: A Persistent Pesticide in Urban Drinking Water. *Urban Environmental Pollution*. Lecture conducted from Boston, MA.

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Paul Rosenfeld Ph.D. (September 19, 2005). Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, *Toxicology and Remediation PEMA Emerging Contaminant Conference*. Lecture conducted from Hilton Hotel, Irvine California.

Paul Rosenfeld Ph.D. (September 19, 2005). Fate, Transport, Toxicity, And Persistence of 1,2,3-TCP. *PEMA Emerging Contaminant Conference.* Lecture conducted from Hilton Hotel in Irvine, California.

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Paul Rosenfeld, Ph.D. and James Clark Ph.D. and Rob Hesse R.G. (May 5-6, 2004). Tert-butyl Alcohol Liability and Toxicology, A National Problem and Unquantified Liability. *National Groundwater Association. Environmental Law Conference*. Lecture conducted from Congress Plaza Hotel, Chicago Illinois.

Paul Rosenfeld, Ph.D. (March 2004). Perchlorate Toxicology. *Meeting of the American Groundwater Trust*. Lecture conducted from Phoenix Arizona.

Hagemann, M.F., **Paul Rosenfeld, Ph.D.** and Rob Hesse (2004). Perchlorate Contamination of the Colorado River. *Meeting of tribal representatives*. Lecture conducted from Parker, AZ.

Paul Rosenfeld, Ph.D. (April 7, 2004). A National Damage Assessment Model For PCE and Dry Cleaners. *Drycleaner Symposium. California Ground Water Association*. Lecture conducted from Radison Hotel, Sacramento, California.

Rosenfeld, P. E., Grey, M., (June 2003) Two stage biofilter for biosolids composting odor control. *Seventh International In Situ And On Site Bioremediation Symposium Battelle Conference* Orlando, FL.

Paul Rosenfeld, Ph.D. and James Clark Ph.D. (February 20-21, 2003) Understanding Historical Use, Chemical Properties, Toxicity and Regulatory Guidance of 1,4 Dioxane. *National Groundwater Association. Southwest Focus Conference. Water Supply and Emerging Contaminants*.. Lecture conducted from Hyatt Regency Phoenix Arizona.

Paul Rosenfeld, Ph.D. (February 6-7, 2003). Underground Storage Tank Litigation and Remediation. *California CUPA Forum*. Lecture conducted from Marriott Hotel, Anaheim California.

Paul Rosenfeld, Ph.D. (October 23, 2002) Underground Storage Tank Litigation and Remediation. *EPA Underground Storage Tank Roundtable*. Lecture conducted from Sacramento California.

Rosenfeld, P.E. and Suffet, M. (October 7- 10, 2002). Understanding Odor from Compost, *Wastewater and Industrial Processes. Sixth Annual Symposium On Off Flavors in the Aquatic Environment. International Water Association*. Lecture conducted from Barcelona Spain.

Rosenfeld, P.E. and Suffet, M. (October 7- 10, 2002). Using High Carbon Wood Ash to Control Compost Odor. *Sixth Annual Symposium On Off Flavors in the Aquatic Environment. International Water Association*. Lecture conducted from Barcelona Spain.

Rosenfeld, P.E. and Grey, M. A. (September 22-24, 2002). Biocycle Composting For Coastal Sage Restoration. *Northwest Biosolids Management Association*. Lecture conducted from Vancouver Washington..

Rosenfeld, P.E. and Grey, M. A. (November 11-14, 2002). Using High-Carbon Wood Ash to Control Odor at a Green Materials Composting Facility. *Soil Science Society Annual Conferenc*e. Lecture conducted from Indianapolis, Maryland.

Rosenfeld. P.E. (September 16, 2000). Two stage biofilter for biosolids composting odor control. *Water Environment Federation.* Lecture conducted from Anaheim California.

Rosenfeld. P.E. (October 16, 2000). Wood ash and biofilter control of compost odor. *Biofest.* Lecture conducted from Ocean Shores, California.

Rosenfeld, P.E. (2000). Bioremediation Using Organic Soil Amendments. *California Resource Recovery Association*. Lecture conducted from Sacramento California.

Rosenfeld, P.E., C.L. Henry, R. Harrison. (1998). Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation With High-Carbon Wood-Ash. *Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings*. Lecture conducted from Bellevue Washington.

Rosenfeld, P.E., and C.L. Henry. (1999). An evaluation of ash incorporation with biosolids for odor reduction. *Soil Science Society of America*. Lecture conducted from Salt Lake City Utah.

Rosenfeld, P.E., C.L. Henry, R. Harrison. (1998). Comparison of Microbial Activity and Odor Emissions from Three Different Biosolids Applied to Forest Soil. *Brown and Caldwell.* Lecture conducted from Seattle Washington.

Rosenfeld, P.E., C.L. Henry. (1998). Characterization, Quantification, and Control of Odor Emissions from Biosolids Application To Forest Soil. *Biofest.* Lecture conducted from Lake Chelan, Washington.

Rosenfeld, P.E, C.L. Henry, R. Harrison. (1998). Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation With High-Carbon Wood-Ash. Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings. Lecture conducted from Bellevue Washington.

Rosenfeld, P.E., C.L. Henry, R. B. Harrison, and R. Dills. (1997). Comparison of Odor Emissions From Three Different Biosolids Applied to Forest Soil. *Soil Science Society of America*. Lecture conducted from Anaheim California.

Teaching Experience:

UCLA Department of Environmental Health (Summer 2003 through 20010) Taught Environmental Health Science 100 to students, including undergrad, medical doctors, public health professionals and nurses. Course focused on the health effects of environmental contaminants.

National Ground Water Association, Successful Remediation Technologies. Custom Course in Sante Fe, New Mexico. May 21, 2002. Focused on fate and transport of fuel contaminants associated with underground storage tanks.

National Ground Water Association; Successful Remediation Technologies Course in Chicago Illinois. April 1, 2002. Focused on fate and transport of contaminants associated with Superfund and RCRA sites.

California Integrated Waste Management Board, April and May, 2001. Alternative Landfill Caps Seminar in San Diego, Ventura, and San Francisco. Focused on both prescriptive and innovative landfill cover design.

UCLA Department of Environmental Engineering, February 5, 2002. Seminar on Successful Remediation Technologies focusing on Groundwater Remediation.

University Of Washington, Soil Science Program, Teaching Assistant for several courses including: Soil Chemistry, Organic Soil Amendments, and Soil Stability.

U.C. Berkeley, Environmental Science Program Teaching Assistant for Environmental Science 10.

Academic Grants Awarded:

California Integrated Waste Management Board. $41,000 grant awarded to UCLA Institute of the Environment. Goal: To investigate effect of high carbon wood ash on volatile organic emissions from compost. 2001.

Synagro Technologies, Corona California: $10,000 grant awarded to San Diego State University.
Goal: investigate effect of biosolids for restoration and remediation of degraded coastal sage soils. 2000.

King County, Department of Research and Technology, Washington State. $100,000 grant awarded to University of Washington: Goal: To investigate odor emissions from biosolids application and the effect of polymers and ash on VOC emissions. 1998.

Northwest Biosolids Management Association, Washington State. $20,000 grant awarded to investigate effect of polymers and ash on VOC emissions from biosolids. 1997.

James River Corporation, Oregon: $10,000 grant was awarded to investigate the success of genetically engineered Poplar trees with resistance to round-up. 1996.

United State Forest Service, Tahoe National Forest: $15,000 grant was awarded to investigating fire ecology of the Tahoe National Forest. 1995.

Kellogg Foundation, Washington D.C. $500 grant was awarded to construct a large anaerobic digester on St. Kitts in West Indies. 1993

Deposition and/or Trial Testimony:

In the United States District Court For The District of New Jersey
Duarte et al, *Plaintiffs,* vs. United States Metals Refining Company et. al. *Defendant.*
Case No.: 2:17-cv-01624-ES-SCM
Rosenfeld Deposition. 6-7-2019

In the United States District Court of Southern District of Texas Galveston Division
M/T Carla Maersk, *Plaintiffs,* vs. Conti 168., Schiffahrts-GMBH & Co. Bulker KG MS "Conti Perdido" *Defendant.*
Case No.: 3:15-CV-00106 consolidated with 3:15-CV-00237
Rosenfeld Deposition. 5-9-2019

In The Superior Court of the State of California In And For The County Of Los Angeles – Santa Monica
Carole-Taddeo-Bates et al., vs. Ifran Khan et al., Defendants
Case No.: No. BC615636
Rosenfeld Deposition, 1-26-2019

In The Superior Court of the State of California In And For The County Of Los Angeles – Santa Monica
The San Gabriel Valley Council of Governments et al. vs El Adobe Apts. Inc. et al., Defendants
Case No.: No. BC646857
Rosenfeld Deposition, 10-6-2018; Trial 3-7-19

In United States District Court For The District of Colorado
Bells et al. Plaintiff vs. The 3M Company et al., Defendants
Case: No 1:16-cv-02531-RBJ
Rosenfeld Deposition, 3-15-2018 and 4-3-2018

In The District Court Of Regan County, Texas, 112th Judicial District
Phillip Bales et al., Plaintiff vs. Dow Agrosciences, LLC, et al., Defendants
Cause No 1923
Rosenfeld Deposition, 11-17-2017

In The Superior Court of the State of California In And For The County Of Contra Costa
Simons et al., Plaintiffs vs. Chevron Corporation, et al., Defendants
Cause No C12-01481
Rosenfeld Deposition, 11-20-2017

In The Circuit Court Of The Twentieth Judicial Circuit, St Clair County, Illinois
Martha Custer et al., Plaintiff vs. Cerro Flow Products, Inc., Defendants
Case No.: No. 0i9-L-2295
Rosenfeld Deposition, 8-23-2017

In The Superior Court of the State of California, For The County of Los Angeles
Warrn Gilbert and Penny Gilber, Plaintiff vs. BMW of North America LLC
Case No.: LC102019 (c/w BC582154)
Rosenfeld Deposition, 8-16-2017, Trail 8-28-2018

In the Northern District Court of Mississippi, Greenville Division
Brenda J. Cooper, et al., *Plaintiffs,* vs. Meritor Inc., et al., *Defendants*
Case Number: 4:16-cv-52-DMB-JVM
Rosenfeld Deposition: July 2017

In The Superior Court of the State of Washington, County of Snohomish
Michael Davis and Julie Davis et al., Plaintiff vs. Cedar Grove Composting Inc., Defendants
Case No.: No. 13-2-03987-5
Rosenfeld Deposition, February 2017
Trial, March 2017

In The Superior Court of the State of California, County of Alameda
Charles Spain., Plaintiff vs. Thermo Fisher Scientific, et al., Defendants
Case No.: RG14711115
Rosenfeld Deposition, September 2015

In The Iowa District Court In And For Poweshiek County
Russell D. Winburn, et al., Plaintiffs vs. Doug Hoksbergen, et al., Defendants
Case No.: LALA002187
Rosenfeld Deposition, August 2015

In The Iowa District Court For Wapello County
Jerry Dovico, et al., Plaintiffs vs. Valley View Sine LLC, et al., Defendants
Law No,: LALA105144 - Division A
Rosenfeld Deposition, August 2015

In The Iowa District Court For Wapello County
Doug Pauls, et al.,, et al., Plaintiffs vs. Richard Warren, et al., Defendants
Law No,: LALA105144 - Division A
Rosenfeld Deposition, August 2015

In The Circuit Court of Ohio County, West Virginia
Robert Andrews, et al. v. Antero, et al.
Civil Action N0. 14-C-30000
Rosenfeld Deposition, June 2015

In The Third Judicial District County of Dona Ana, New Mexico
Betty Gonzalez, et al. Plaintiffs vs. Del Oro Dairy, Del Oro Real Estate LLC, Jerry Settles and Deward DeRuyter, Defendants
Rosenfeld Deposition: July 2015

In The Iowa District Court For Muscatine County
Laurie Freeman et. al. Plaintiffs vs. Grain Processing Corporation, Defendant
Case No 4980
Rosenfeld Deposition: May 2015

In the Circuit Court of the 17th Judicial Circuit, in and For Broward County, Florida
Walter Hinton, et. al. Plaintiff, vs. City of Fort Lauderdale, Florida, a Municipality, Defendant.
Case Number CACE07030358 (26)
Rosenfeld Deposition: December 2014

In the United States District Court Western District of Oklahoma
Tommy McCarty, et al., Plaintiffs, v. Oklahoma City Landfill, LLC d/b/a Southeast Oklahoma City Landfill, et al. Defendants.
Case No. 5:12-cv-01152-C
Rosenfeld Deposition: July 2014

In the County Court of Dallas County Texas
Lisa Parr et al, *Plaintiff*, vs. Aruba et al, *Defendant.*
Case Number cc-11-01650-E
Rosenfeld Deposition: March and September 2013
Rosenfeld Trial: April 2014

In the Court of Common Pleas of Tuscarawas County Ohio
John Michael Abicht, et al., *Plaintiffs,* vs. Republic Services, Inc., et al., *Defendants*
Case Number: 2008 CT 10 0741 (Cons. w/ 2009 CV 10 0987)
Rosenfeld Deposition: October 2012

In the United States District Court of Southern District of Texas Galveston Division
Kyle Cannon, Eugene Donovan, Genaro Ramirez, Carol Sassler, and Harvey Walton, each Individually and on behalf of those similarly situated, *Plaintiffs,* vs. BP Products North America, Inc., *Defendant.*
Case 3:10-cv-00622
Rosenfeld Deposition: February 2012
Rosenfeld Trial: April 2013

In the Circuit Court of Baltimore County Maryland
Philip E. Cvach, II et al., *Plaintiffs* vs. Two Farms, Inc. d/b/a Royal Farms, Defendants
Case Number: 03-C-12-012487 OT
Rosenfeld Deposition: September 2013

EXHIBIT C

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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Santa Monica, California 90401
Tel: (949) 887-9013
Email: mhagemann@swape.com

Matthew F. Hagemann, P.G., C.Hg., QSD, QSP

Geologic and Hydrogeologic Characterization
Industrial Stormwater Compliance
Investigation and Remediation Strategies
Litigation Support and Testifying Expert
CEQA Review

Education:

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.
B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

Professional Certifications:

California Professional Geologist
California Certified Hydrogeologist
Qualified SWPPP Developer and Practitioner

Professional Experience:

Matt has 25 years of experience in environmental policy, assessment and remediation. He spent nine years with the U.S. EPA in the RCRA and Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater from perchlorate and MTBE. While with EPA, Matt also served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. He led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) while also working with permit holders to improve hydrogeologic characterization and water quality monitoring.

Matt has worked closely with U.S. EPA legal counsel and the technical staff of several states in the application and enforcement of RCRA, Safe Drinking Water Act and Clean Water Act regulations. Matt has trained the technical staff in the States of California, Hawaii, Nevada, Arizona and the Territory of Guam in the conduct of investigations, groundwater fundamentals, and sampling techniques.

Positions Matt has held include:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Geology Instructor, Golden West College, 2010 – 2014;
- Senior Environmental Analyst, Komex H2O Science, Inc. (2000 -- 2003);

- Executive Director, Orange Coast Watch (2001 – 2004);
- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);
- Geologist, U.S. Forest Service (1986 – 1998); and
- Geologist, Dames & Moore (1984 – 1986).

Senior Regulatory and Litigation Support Analyst:

With SWAPE, Matt's responsibilities have included:

- Lead analyst and testifying expert in the review of over 100 environmental impact reports since 2003 under CEQA that identify significant issues with regard to hazardous waste, water resources, water quality, air quality, Valley Fever, greenhouse gas emissions, and geologic hazards. Make recommendations for additional mitigation measures to lead agencies at the local and county level to include additional characterization of health risks and implementation of protective measures to reduce worker exposure to hazards from toxins and Valley Fever.
- Stormwater analysis, sampling and best management practice evaluation at industrial facilities.
- Manager of a project to provide technical assistance to a community adjacent to a former Naval shipyard under a grant from the U.S. EPA.
- Technical assistance and litigation support for vapor intrusion concerns.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.
- Expert witness on two cases involving MTBE litigation.
- Expert witness and litigation support on the impact of air toxins and hazards at a school.
- Expert witness in litigation at a former plywood plant.

With Komex H2O Science Inc., Matt's duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.

- Expert witness testimony in a case of oil production-related contamination in Mississippi.
- Lead author for a multi-volume remedial investigation report for an operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.

- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

Executive Director:

As Executive Director with Orange Coast Watch, Matt led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, Matt prepared issue papers in the areas of treatment and disinfection of wastewater and control of the discharge of grease to sewer systems. Matt actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Matt worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

Hydrogeology:

As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, Matt led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities were as follows:

- Led efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiated a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identified emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, Matt developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. He used analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, Matt worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for his contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. He prepared geologic reports, conducted public hearings, and responded to public comments from residents who were very concerned about the impact of designation.

- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Matt served as a hydrogeologist with the RCRA Hazardous Waste program. Duties were as follows:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
- Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, Matt directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following tasks:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.
- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

Policy:

Served senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9. Activities included the following:

- Advised the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaped EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improved the technical training of EPA's scientific and engineering staff.
- Earned an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific principles into the policy-making process.
- Established national protocol for the peer review of scientific documents.

Geology:

With the U.S. Forest Service, Matt led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities were as follows:

- Mapped geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinated his research with community members who were concerned with natural resource protection.
- Characterized the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, Matt led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large hazardous waste site in eastern Oregon. Duties included the following:

- Supervised year-long effort for soil and groundwater sampling.
- Conducted aquifer tests.
- Investigated active faults beneath sites proposed for hazardous waste disposal.

Teaching:

From 1990 to 1998, Matt taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.

Matt taught physical geology (lecture and lab and introductory geology at Golden West College in Huntington Beach, California from 2010 to 2014.

Invited Testimony, Reports, Papers and Presentations:

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

Hagemann, M.F., 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Coloradao.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

Hagemann, M.F., 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to the Ground Water and Environmental Law Conference, National Groundwater Association.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal repesentatives, Parker, AZ.

Hagemann, M.F., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

Hagemann, M.F., 2003. The Emergence of Perchlorate as a Widespread Drinking Water Contaminant. Invited presentation to the U.S. EPA Region 9.

Hagemann, M.F., 2003. A Deductive Approach to the Assessment of Perchlorate Contamination. Invited presentation to the California Assembly Natural Resources Committee.

Hagemann, M.F., 2003. Perchlorate: A Cold War Legacy in Drinking Water. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. From Tank to Tap: A Chronology of MTBE in Groundwater. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. A Chronology of MTBE in Groundwater and an Estimate of Costs to Address Impacts to Groundwater. Presentation to the annual meeting of the Society of Environmental Journalists.

Hagemann, M.F., 2002. An Estimate of the Cost to Address MTBE Contamination in Groundwater (and Who Will Pay). Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to a meeting of the U.S. EPA and State Underground Storage Tank Program managers.

Hagemann, M.F., 2001. From Tank to Tap: A Chronology of MTBE in Groundwater. Unpublished report.

Hagemann, M.F., 2001. Estimated Cleanup Cost for MTBE in Groundwater Used as Drinking Water. Unpublished report.

Hagemann, M.F., 2001. Estimated Costs to Address MTBE Releases from Leaking Underground Storage Tanks. Unpublished report.

Hagemann, M.F., and VanMouwerik, M., 1999. Potential Water Quality Concerns Related to Snowmobile Usage. Water Resources Division, National Park Service, Technical Report.

VanMouwerik, M. and **Hagemann, M.F**. 1999, Water Quality Concerns Related to Personal Watercraft Usage. Water Resources Division, National Park Service, Technical Report.

Hagemann, M.F., 1999, Is Dilution the Solution to Pollution in National Parks? The George Wright Society Biannual Meeting, Asheville, North Carolina.

Hagemann, M.F., 1997, The Potential for MTBE to Contaminate Groundwater. U.S. EPA Superfund Groundwater Technical Forum Annual Meeting, Las Vegas, Nevada.

Hagemann, M.F., and Gill, M., 1996, Impediments to Intrinsic Remediation, Moffett Field Naval Air Station, Conference on Intrinsic Remediation of Chlorinated Hydrocarbons, Salt Lake City.

Hagemann, M.F., Fukunaga, G.L., 1996, The Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui, Hawaii. Hawaii Water Works Association Annual Meeting, Maui, October 1996.

Hagemann, M. F., Fukanaga, G. L., 1996, Ranking Groundwater Vulnerability in Central Oahu, Hawaii. Proceedings, Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association Publication VIP-61.

Hagemann, M.F., 1994. Groundwater Characterization and Cleanup at Closing Military Bases in California. Proceedings, California Groundwater Resources Association Meeting.

Hagemann, M.F. and Sabol, M.A., 1993. Role of the U.S. EPA in the High Plains States Groundwater Recharge Demonstration Program. Proceedings, Sixth Biennial Symposium on the Artificial Recharge of Groundwater.

Hagemann, M.F., 1993. U.S. EPA Policy on the Technical Impracticability of the Cleanup of DNAPL-contaminated Groundwater. California Groundwater Resources Association Meeting.

Hagemann, M.F., 1992. Dense Nonaqueous Phase Liquid Contamination of Groundwater: An Ounce of Prevention... Proceedings, Association of Engineering Geologists Annual Meeting, v. 35.

Other Experience:

Selected as subject matter expert for the California Professional Geologist licensing examination, 2009-2011.

EXHIBIT D

APRIL 2020 | FINAL

VMT Mitigation Through Fees, Banks, & Exchanges

UNDERSTANDING NEW MITIGATION APPROACHES

A WHITE PAPER PREPARED BY

FEHR & PEERS

WRCOG
Western Riverside Council of Governments

VMT MITIGATION THROUGH FEES, BANKS, AND EXCHANGES

Understanding New Mitigation Approaches

BACKGROUND

On September 27, 2013, Governor Jerry Brown signed SB 743 into law and started a process intended to fundamentally change transportation impact analysis as part of CEQA compliance. These changes include elimination of *auto delay, level of service (LOS), and other similar measures of vehicular capacity or traffic congestion* as a basis for determining significant impacts. Instead, transportation impacts will be determined based on changes to vehicle miles of travel (VMT). ***This change essentially shifts the focus of analysis from impacts to drivers through higher delays to the impact of driving itself***.

Lead agencies making the transition to VMT are realizing the challenges of using the new metric especially when it comes to mitigating significant VMT impacts. Reducing VMT from land use projects and land use plans has traditionally been accomplished through transportation demand management (TDM) strategies. These strategies include modifying a project's land use characteristics (i.e., density) and incorporating vehicle trip reduction programs at the site to change travel behavior of tenants and visitors. TDM is most effective in urban areas where the site is accessible by multiple travel modes (i.e., walking, bicycling, transit, and vehicle) offering similar travel times and convenience. Conversely, TDM strategies are less effective in lower density suburban and rural areas where modes are limited to personal vehicles. In both areas though, a program-based approach to mitigation can be more effective than project-site strategies. Programs can pool development mitigation contributions to pay for larger and more effective VMT reduction strategies that are not be feasible for individual projects. This paper outlines and compares multiple program types and then explains the implementation steps and key governance issues.

PROGRAM CONCEPTS

The concept of a 'program' approach to impact mitigation is not new and has been used for a variety of technical subjects including transportation, air quality, greenhouse gases, and habitat. Transportation impact fee programs have been used to help mitigate cumulative level of service (LOS) impacts. What is new are how to use impact fee programs for VMT impacts and alternative programs called mitigation exchanges and banks. Absent new program-level mitigation options, suburban and rural lead agencies will have limited feasible mitigation options for project sites.

For CEQA purposes, feasible means "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors."

- CEQA Guidelines Section 15364

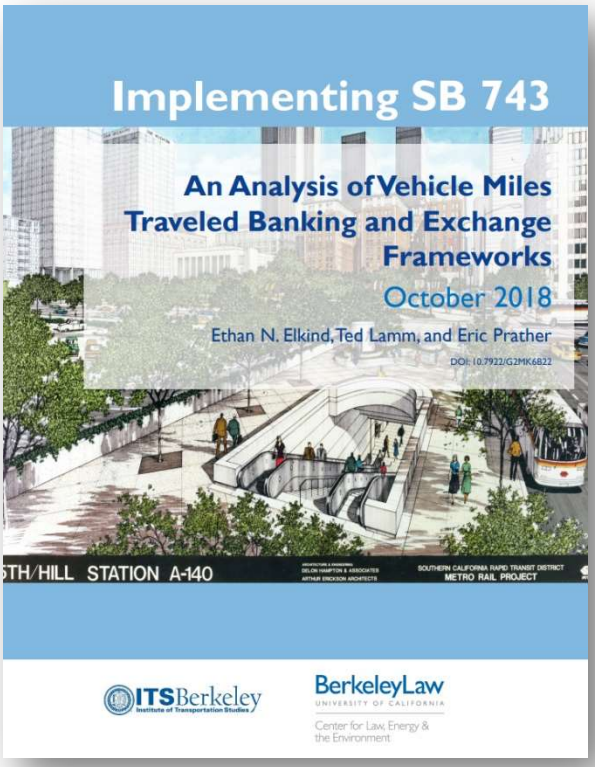
Without feasible mitigation, significant VMT impacts would be significant and unavoidable (SAU). Under these circumstances a project must prepare an environmental impact report (EIR) adding extra time and cost to environmental review compared to a negative declaration (ND). Program-based approaches may be able to overcome the limitation of project-site only mitigation. Three specific concepts as described below have been identified for the purposes of this white paper.

- **VMT-based Transportation Impact Fee program (VMT-TIF)** – The first program concept is a traditional impact fee program in compliance with the mitigation fee act. The nexus for the fee program would be a VMT reduction goal consistent with the CEQA threshold established by a lead agency for SB 743 purposes. The City of LA is the first in California to complete a nexus study for this type of program. The main difference from a fee program based on a metric such as vehicle level of service (LOS) is that the VMT reduction nexus results in a capital improvement program (CIP) consisting largely of transit, bicycle, and pedestrian projects. These types of fee programs are time consuming to develop, monitor, and maintain but are recognized as an acceptable form of CEQA mitigation if they can demonstrate that the CIP projects will be fully funded and implemented.

- **VMT Mitigation Exchange** – In simple terms, the exchange concept relies on a developer agreeing to implement a predetermined VMT reducing project or proposing a new one. The project may be located in the vicinity of the project or elsewhere in the community, and possibly outside the community. The exchange needs to have a facilitating entity that can match the VMT generator (the development project) with a VMT reducing project or action. The facilitating entity could be the lead agency or another entity that has the ability to provide the match and to ensure through substantial evidence that the VMT reduction is valid. A key unknown with this approach is the time period for VMT reduction. For example, how many years of VMT reduction are required to declare a VMT impact less than significant?

- **VMT Mitigation Bank** – A mitigation bank attempts to create a monetary value for VMT reduction such that a developer could purchase VMT reduction credits. The money exchanged for credits could be applied to local, regional, or state level VMT reduction projects or actions. Like all VMT mitigation, substantial evidence would be necessary that the projects covered by the bank would achieve expected VMT reductions and some form of monitoring may be required. This is more complicated than a simple exchange and would require more time and effort to set up and implement. The verification of how much VMT reduction is associated with each dollar or credit would be one of the more difficult parts of the program.

With both exchanges and banks, another important test is that the VMT reduction would not have occurred otherwise such that mitigation program creates 'additionality'. This means that additional VMT reduction will occur above and beyond what would have occurred without the program. A commonly accepted definition of 'additionality' has not yet been developed. One possible test of additionality is that the mitigation project is not included in the regional transportation plan (RTP). The RTP is a financially constrained plan so projects not included in the plan would not likely have been implemented within the typical cumulative timeframe.



https://www.law.berkeley.edu/research/clee/research/climate/transportation/vehicle-miles-traveled/

For any program to qualify as a CEQA mitigation program, the discretionary action to adopt the program may require CEQA review. This conclusion is based on the *California Native Plant Society v. County of El Dorado* where the court found that payment of fee does not presumptively establish full mitigation of a discretionary project. A separate CEQA review of the program is necessary to satisfy the 'duty to mitigate' imposed by CEQA. Decision makers should also realize that absent a VMT reduction program, developers would likely be limited to only project site mitigation. While this may be less effective, it also lowers their mitigation costs because the available and feasible mitigation would be more limited.

More details about exchanges and banks are explained in the framework document shown above and available at the cited web link. This white paper expands on the framework to accomplish two objectives. The first objective is to compare the pros and cons of exchanges and banks to a traditional impact fee program. Since impact fee programs have already been established as feasible CEQA mitigation, they serve as a benchmark against which to compare other program concepts. The second objective is to outline the implementation steps associated with creating an exchange or bank to help identify key implementation questions or issues that could affect their feasibility.

PROGRAM ASSESSMENT (Pros/Cons)

Table 1 below outlines the pros and cons of approach VMT mitigation through an impact fee program, exchange, or bank. This assessment is intended to highlight some of the key differences between each program concept.

Table 1 – VMT Mitigation Program Type Comparison

Program Type	Pros	Cons
Impact Fee Program	• Common and accepted practice • Accepted for CEQA mitigation • Adds certainty to development costs • Allows for regional scale mitigation projects • Increases potential VMT reduction compared to project site mitigation only	• Time consuming and expensive to develop and maintain • Requires strong nexus • Increases mitigation costs for developers because it increases feasible mitigation options • Limited to jurisdictional boundary unless a regional authority is created • Uncertainty about feasibility and strength of nexus relationship between VMT and pedestrian, bicycle, and transit projects (especially in suburban/rural jurisdictions)
Mitigation Exchange	• Limited complexity • Reduced nexus obligation • Expands mitigation to include costs for programs, operations, and maintenance • Allows for regional scale mitigation projects • Allows for mitigation projects to be in other jurisdictions • Increases potential VMT reduction compared to project site mitigation only	• Requires 'additionality' • Potential for mismatch between mitigation need and mitigation projects • Increases mitigation costs for developers because it increases feasible mitigation options • Unknown timeframe for mitigation life • Effectiveness depends on scale of the program
Mitigation Bank	• Adds certainty to development costs • Allows for regional scale projects • Allows for mitigation projects to be in other jurisdictions • Allows regional or state transfers	• Requires 'additionality' • Time consuming and expensive to develop and maintain • Requires strong nexus • Political difficulty distributing mitigation dollars/projects

Table 1 – VMT Mitigation Program Type Comparison		
Program Type	**Pros**	**Cons**
	• Expands mitigation options to include costs for programs, operations, and maintenance • Increases potential VMT reduction compared to project site mitigation only	• Increases mitigation costs for developers because it increases feasible mitigation options • Unknown timeframe for mitigation life • Effectiveness depends on scale of the program

To better understand potential program differences, Table 2 contains a comparison of the VMT mitigation projects or actions that each program type could fund or implement. The information for an impact fee program is more certain than for exchanges or banks. Fee programs have been used in practice for decades and have been vetted through court decisions. While banks and exchanges do exist for other environmental mitigation purposes such as wetlands preservation and habitat conservation, these applications have largely focused on protecting fixed land amounts versus reducing a metric that fluctuates over time and may vary in value depending on economic conditions.

Table 2 –VMT Mitigation Projects and Actions Comparison	
Program Structure	**Project Types that Reduce VMT**
Impact Fee Program	• Pedestrian network expansion • Bicycle/Scooter network expansion (includes bike/scooter share stations) • Transit vehicles or facilities associated with service expansion • Roadway gap closures that reduce trip lengths (bridges)
Mitigation Exchange	• All impact fee program project types • Private or institutional projects that reduce VMT • Transit service improvements and transit pass subsidies
Mitigation Bank	• All impact fee program project types • All mitigation exchange project types • VMT reduction strategies associated with travel behavior changes

IMPLEMENTATION STEPS

This section addresses the second objective noted above to outline the implementation steps associated with creating an exchange or bank to help identify key implementation questions or issues that could affect their feasibility. The starting point for these steps begins with identifying the potential statutory or legal requirements that could govern or influence program creation. These are highlighted in Table 3 and build on the research previously done by U.C. Berkeley in the document referenced above. Since specific statutes do not exist specific to VMT exchanges and banks, U.C. Berkeley used a proxy based on conservation programs established under the California Fish & Game code. This is a reasonable proxy given that the intent behind VMT exchanges and banks is a form of conservation. Instead of habitat, VMT exchanges and banks are trying to conserve vehicle trip making and the VMT generated through this activity. VMT mitigation banks or exchanges do not appear to require new legislative authority but as noted in the U.C. Berkeley document, having state-wide templates for their development could help establish clear standards and expectations for program designs.

Table 3 – Potential VMT Mitigation Exchange/Bank Legal Requirements

Program Type/Legal Requirements	Statutory Reference
Transportation Impact Fee Program	
1. Mitigation Fee Act – Intended to create a program that allows individual development projects to pay for all or portion of the cost to implement public facilities necessary to support the project. Public facilities are generally limited to capital projects. The nexus study for the program must demonstrate how there is a reasonable relationship between the following. • How there is a reasonable relationship between the fee's use and the type of development project on which the fee is imposed. • How there is a reasonable relationship between the need for the public facility and the type of development project on which the fee is imposed. • How there is a reasonable relationship between the amount of the fee and the cost of the public facility or portion of the public facility attributable to the development on which the fee is imposed. The fees may not be applied to existing deficiencies or the maintenance and operation of an improvement. As such, clear standards should exist about the physical and operational performance expectations for each model of travel included in the program.	• California Government Code §66000-66001

Table 3 – Potential VMT Mitigation Exchange/Bank Legal Requirements	
Program Type/Legal Requirements	**Statutory Reference**
2. Constitutional – Court decisions have placed limits on what level of mitigation can be expected of land use development projects. The limits largely require a nexus between the mitigation and a legitimate government interest plus a rough proportionality between the mitigation and the adverse impact caused by the project.	• Nollan v. California Coastal Commission, 483 U.S. 825 (1987) • Dolan v. City of Tigard, 512 U.S. 374 (1994)
3. CEQA – For mitigation to be imposed, a significant impact must occur. Impacts stem from changes to the baseline environment caused by the project. The significance of those impacts is determined by the lead agencies choice of thresholds. This limits mitigation to increment of VMT change that occurs above the threshold.	• CEQA Statute (CA Public Resources Code 21000-21189) • CEQA Guidelines (CA Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387)
VMT Mitigation Exchange or Bank	
1. An explanation of the VMT mitigation purpose of and need for the bank or exchange.	• Fish & Game Code §1852(c)(1)
2. The geographic area covered by the bank or exchange and rationale for the selection of the area, together with a description of the existing transportation and development dynamics that provide relevant context for the development of the bank or exchange.	•§1852(c)(2)
3. The public transit and VMT reduction opportunities currently located within the bank or exchange area.	•§1852(c)(3)
4. Important residential and commercial communities and transportation resources within the bank or exchange area, and an explanation of the criteria, data, and methods used to identify those important communities and resources.	•§1852(c)(4)
5. A summary of historic, current, and projected future transportation stressors and pressures in the bank or exchange area, including economic, population growth and development trends.	•§1852(c)(5-6)
6. Provisions ensuring that the bank or exchange will comply with all applicable state and local legal and other requirements and does not preempt the authority of local agencies to implement infrastructure and urban development in local general plans.	•§1852(c)(7)
7. VMT mitigation goals and measurable objectives for regional transportation resources and important mitigation elements identified in the plan that address or respond to the identified stressors and pressures on transportation within the bank or exchange area.	•§1852(c)(8)

Table 3 – Potential VMT Mitigation Exchange/Bank Legal Requirements	
Program Type/Legal Requirements	**Statutory Reference**
8. VMT mitigation projects, including a description of specific projects that, if implemented, could achieve the mitigation goals and objectives, and a description of how the mitigation projects were prioritized and selected in relation to the mitigation goals and objectives.	• §1852(c)(9)
9. Provisions ensuring that the bank or exchange plan is consistent with and complements any local, regional or federal transportation or congestion management plan that overlaps with the bank or exchange area, a summary of any such plans, and an explanation of such consistency.	• §1852(c)(10-11)
Sources: Implementing SB 743 An Analysis of Vehicles Miles Traveled Banking and Exchange Frameworks, October 2018, Institute of Transportation Studies, U.C. Berkeley. 2019 California Environmental Quality Act (CEQA) Statute & Guidelines, Association of Environmental Professionals, 2019. http://leginfo.ca.gov/ http://ccr.oal.ca.gov/	

A review of these potential legal requirements suggests that the creation of an exchange or a bank may not be less rigorous than that of a conventional transportation impact fee program. These legal requirements combined with the need to demonstrate additionality and provide verification could create implementation costs beyond those of a conventional transportation impact fee program. To explore this issue further, annotated flow charts were developed for each program concept. These flow charts are presented on the following pages and allow a reviewer to quickly surmise the differences and similarities associated with creating, operating, and maintaining these programs.

Mitigating VMT Impacts Under SB 743

FEHR PEERS

VMT Bank

Implementation

Considerations

Procedural Flowchart

Step 1
Determine Scale/Scope

There are advantages and disadvantages to creating a Bank with a larger scale/scope. However, multiple agencies must be willing to accept the Bank's mitigation options for a state or regional Bank to be feasible. Larger regions can:

*Decrease costs associated with running the Bank
*Decrease local authority over mitigation options
*Increase efficiency and effectiveness of the program

Step 2
Determine Sponsor

There are a few organizational components to consider when creating a mitigation Bank. These elements include:

*Administrative - The Bank must perform several administrative functions such as collecting fees, managing information, answering questions, and other business operations.

*Technical - There is a significant amount of technical work needed to initially and continually prove the mitigation options reduce VMT and that the reductions would not have occurred without the programs. The Bank also needs to show the fees it receives are related and proportional to new development.

*Accounting - The Bank requires a thorough accounting system to track collected fees and to ensure fees are being handled according to CEQA and other legal guidelines. This includes payments for implementing VMT reduction projects.

Agencies should consider their ability to perform these roles when deciding whether the Bank should be run internally or by a third party.

Step 3
Formally Establish Bank & Review Team

The entity creating the Bank must legally formalize its creation. If the intent is for the Bank to be used by multiple agencies, this may require a joint powers authority or equivalent.

A review team should be used to verify the effectiveness of mitigation options based on substantial evidence. This team could be internal to the entity creating the bank or an independent third party.

Potential third party entities that could function as a review team include public agencies such as those listed below.

*Caltrans - local office
*ARB
*CalEPA

Step 4
Determine & Prioritize Mitigation Options

The Bank Sponsor creates a list of mitigation options. The Review Team evaluates the list to ensure it complies with relevant requirements. The Sponsor should consider the following elements when prioritizing options:
*Equity
*Timeliness of Implementation
*Cost

Mitigation options can include:
*Infrastructure projects
*Programs/incentives (Unlike infrastructure projects, programs/incentives are ongoing activities. Because programs/incentives must be continually maintained to be effective, agencies should consider if developers must pay for them indefinitely.

Step 5
Administer Bank

The public agency or entity sponsoring a Bank may not always be the lead agency on a project. In this situation the Sponsor should develop an agreement with the lead agency that allows the Bank's mitigation options to be considered an acceptable mitigation measure for the EIR.

Banks must continue to prove that their mitigation options reduce VMT and that the reduction would not have occurred without the projects/programs.

CEQA review of the Exchange creation may be required to be considered as a formal mitigation program.

Mitigating VMT Impacts Under SB 743

FEHR PEERS

VMT Exchange

Implementation

Considerations

Procedural Flowchart

Step 1
Determine Scale/Scope

To create a regional program requires all participating agencies to adopt the program. Programs with larger scopes can:

*Decrease administrative costs
*Decrease local authority
*Increase efficiency and effectiveness of the program

Step 2
Determine Sponsor

The organizational components of a mitigation Exchange will depend on the type of sponsor (public or private) mitigation options, and matching process between mitigation options and projects.

Step 3
Determine & Propose Mitigation Options

If the sponsor is a public agency, they will develop a list of options developers can choose from to mitigate the VMT generated by their development.

If the developer wants to propose their own mitigation Exchange, they must get it approved by the sponsor and lead agency.

Step 4
Develop Review Team

The Exchange should have a Review Team to verify mitigation effectiveness and additionality based on substantial evidence. The team could consist of third-party representatives. The team reviews the mitigation list and verifies that the options reduce VMT and that the reductions would not have occurred without the project, program, or incentive.

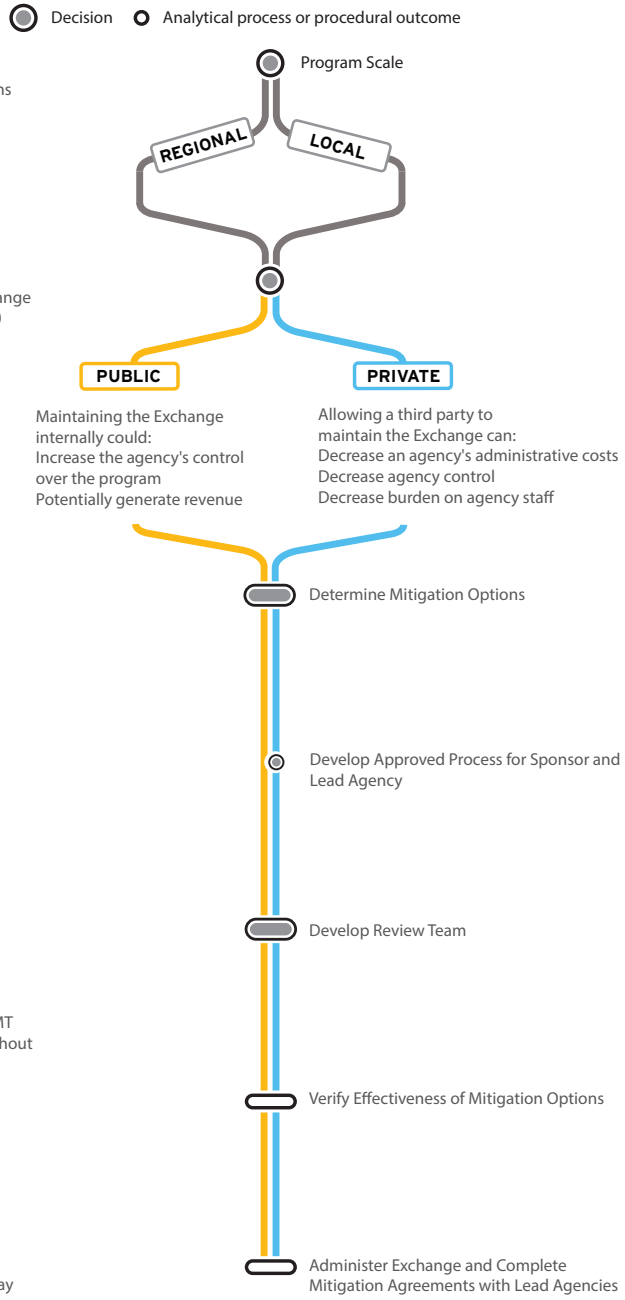
Because Exchanges can include programs/incentives as mitigation options, the Review Team must continually evaluate them to ensure the options are still effective and determine to what degree they reduce VMT.

Step 5
Administer Exchange

The public agency/entity sponsoring an Exchange may not always be the lead agency on a project. In this situation the Sponsor should develop an agreement with the lead agency that allows the Exchange's mitigation options to be considered an acceptable mitigation measure for the EIR.

Exchanges must continue to prove that their mitigation options reduce VMT and that the reduction would not have occurred without the projects/programs.

CEQA review of the Exchange creation may be required to be considered as a formal mitigation program.



Mitigating VMT Impacts Under SB 743

FEHR & PEERS

VMT Impact Fee

Implementation

Step 1
Determine Scale/Scope

Step 2
Determine Nexus (VMT)

Step 3
Determine & Propose Mitigation Options

Step 4
Prepare & Approve Nexus Study

Step 5
Prepare & Adopt Fee Ordinance

Step 6
Complete CEQA Review for the Program

Step 7
Administer the Program

Considerations

To create a regional program requires all participating agencies to adopt the program. Programs with larger scopes:

*Decrease administrative costs
*Decrease local authority
*Increase efficiency and effectiveness of the program

An agency must determine its VMT reduction goal before it can show the relationship between new development and that goal.

The CIP develops a list of capital improvement projects necessary to reduce VMT consistent with its desired goal. The agency should prioritize the projects so they are constructed in a logical order.

The prioritization process should consider:
*Equity
*Timeliness
*Cost
*Modal Preference (Walking/Biking/Transit)
*Stakeholder/Community Input

Agencies must demonstrate that the projects in the fee program contribute to VMT reduction. The agency must also show that the fees are related and proportional to new development.

Fees should take into account the delay in the time when fees are collected and when they are used.

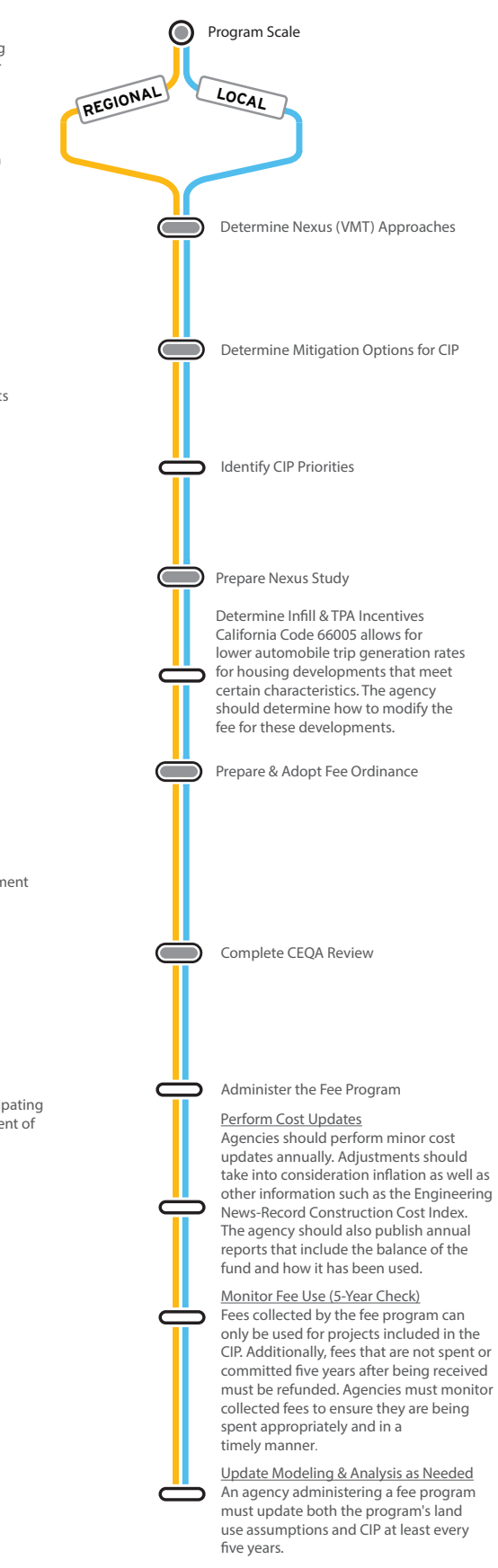
For a fee to be regularly imposed, it must be adopted as an ordinance.

The ordinance must include:
*Reason for the fee
*The relationship between the fee and new development
*Methodology used in developing the fee
*Projects to be included in the CIP

California courts have ruled that in order for a fee program to serve as acceptable CEQA mitigation, the program itself must first be reviewed in an EIR.

For Regional Impact Fee Programs ensure that participating agencies have adopted the program such that payment of fees is considered a feasible mitigation measure.

Procedural Flowchart



PROGRAM EXAMPLES

To help explain the different program types, it may be useful to consider some examples. The existing programs below range from an existing VMT-based impact fee program to programs that could be evolved into VMT mitigation banks or exchanges.

City of Los Angeles Westside Mobility Plan Transportation Impact Fee Program

(https://planning.lacity.org/eir/CoastalTrans/deir/pdfs/tiafeestudy.pdf)

The City of Los Angeles developed the first impact fee program that relies on a VMT reduction nexus. The westside previously relied on LOS-based impact fee programs but as the area matured and new laws like SB 743 emerged, the City chose to shift their nexus. This shift changed the nature of the CIP from largely roadway capacity expansion projects to more transit, bicycle, and pedestrian infrastructure projects. A key benefit of this approach as noted above is that once the fee program is in place, administration of the program is limited to construction cost updates and complying with state reviews to ensure that funding is being appropriately used to construct and implement the CIP projects. No further verification of CIP effectiveness is required.

WRCOG Transportation Uniform Mitigation Fee (TUMF) Program

(http://www.wrcog.cog.ca.us/174/TUMF)

Western Riverside County has the Transportation Uniform Mitigation Fee (TUMF) Program, implemented in 2003. While this program is tied to a vehicle LOS nexus, the foundation and structure of the program could be used to create a new VMT impact fee program similar to the Los Angeles example. The following summary describes the foundational elements of the TUMF and provides information about how to evolve the program for VMT impact mitigation purposes.

The TUMF funds critical county-wide transportation infrastructure to accommodate the traffic created by new population growth and commercial development throughout western Riverside County. It is a vital funding source that complements Federal, State, and local funding funds for improvements to roadways, interchanges, and transit facilities. The fee is uniformly assessed on new residential and non-residential development throughout the WRCOG region. Each of WRCOG's member jurisdictions and the March Joint Powers Authority (JPA) participate in the program.

WRCOG serves as the Program Administrator and has three main responsibilities. First, WRCOG leads the development of regular AB 1600 compliant Nexus Studies. These Studies identify needed the transportation facilities to be funded by the fee, identify future growth projections, and set the resulting

fee, which is then adopted by WRCOG's Executive Committee. The transportation projects included in the Nexus Study are identified through a collaborative process in which jurisdictions submit projects for consideration, which are then subject to an analysis process to verify that they meet applicable criteria. These two-step process ensures that the projects included in the Nexus Study reflect both local input and regional need. A similar process could be used to create a VMT reduction nexus and to select VMT reducing projects for either a separate VMT impact fee program or a modified TUMF that includes projects to achieve LOS and VMT reduction goals.

WRCOG's second responsibility is the collection and calculation of fees. WRCOG has developed a set of consistent fee calculation tools, which ensure that TUMF is calculated on a consistent basis for all projects, regardless of their location. Because there is a regional Nexus Study and a consistent fee calculation approach, WRCOG ensures that all projects of the same type pay the same fee, regardless of their location. In 2019, WRCOG completed work on an online fee payment system which expedites fee payments from project applicants.

The final responsibility of WRCOG is distributing funds collected from each agency and using those monies to fund transportation projects. Project identification and prioritization is led by the local agencies who meet to decide how much funding to provide to each project. Local agencies are grouped into geographic sub areas known as TUMF Zones. Each TUMF Zone is allocated a budget of anticipated revenues, which are then distributed through a consensus-based approach. WRCOG then provides reimbursements to each agency as work occurs. WRCOG's facilitates this process and also reviews invoices to ensure that funds in a manner which is consistent with program requirements.

Miles

(https://www.sacrt.com/apps/miles-get-rewarded-for-your-commute-travel/)

The City of Sacramento, Sacramento Regional Transit, and Sacramento State partnered with Miles, a new app that will rewards users with redeemable miles for their commute and travel. The redeemable miles can be exchanged for exclusive experiences, products and services with vendors including Ray-Ban, Illy, Audible, and Rockport. Miles app users automatically earn miles for daily travel and receive bonus miles for green trips (walk, bike, carpool or transit). Sacramento residents are also eligible to complete special challenges to earn additional rewards. While this program was not set up as an VMT mitigation exchange or bank, it could evolve into one.

The purpose of rewarding green trips and the special challenges is to influence user behavior to reduce vehicle trips and VMT. With some additional accounting of user travel behavior before and after using the app, enough substantial evidence could be created to provide the VMT reduction verification described above and noted in the flow charts. The program already has administrative functions developed and

established relationships between the partner agencies. Some of the unknowns at this time are listed below.

- cost of the program on a per user basis
- amount of VMT reduction that is achieved for a typical user
- how a developer could contribute to the program to sponsor additional users
- stability or permanency of VMT reductions dependent on 'challenges'

In addition to the Miles program, other similar vendors exist such as Luum (https://luumbenefits.com/) and Metropia (https://www.metropia.com/). These types of app-based vendors could evolve to offer exchange or bank type mitigation options if they can comply with the various requirements outlined in the implementation steps and identified in the U.C. Berkeley white paper cited above.

Metro Transit Pass Subsidy

Metro is the Los Angeles County mobility provider. One of the programs they currently offer is a transit pass subsidy with a couple of unique elements that may qualify it as a VMT mitigation exchange. Metro offers student and employee transit passes under their U-pass and E-pass programs. These are transit passes for students and employees in LA County that are unique because instead of a physical transit pass card, the pass comes in the form of an RFID chip with an antenna that sticks to an existing student or employee identification badge. This type of chip allows the transit agency to charge for trips when they are made, which is more cost-effective for schools and employers. The registration form for obtaining the pass includes a survey about current travel behavior and data such as the distance between home and school or work for the applicant. By tracking how individual travel behavior changes from this baseline condition over time, LA Metro can produce aggregate statistics about the effect on transit ridership and VMT.

The second unique component of the program is that Metro allows anyone to 'sponsor' these passes for a particular school or employer. As such, they are entertaining the concept of using the program as an SB 743 VMT mitigation exchange. Developers could purchase U- or E-passes and could use the Metro performance data to estimate the VMT reduction per pass. LA Metro is working with LA DOT and SCAG on a pilot concept this year to formalize the program. As part of this white paper development, we asked Metro if developers/agencies outside Los Angeles County could participate. The reason for this request is that VMT mitigation dollars spent on Metro transit passes may be more effective than the same dollars spent in other communities. Whether local communities would be willing to allow mitigation dollars across borders will likely depend on a variety of factors but knowing that it is feasible on the Metro end is an important first feasibility question. Metro replied that their work has not progressed sufficiently to answer this question yet.

Expanded Public Agency Telecommute Bank

With increased telecommuting during the COVID-19 shelter-in-place order, public agencies may decide to permanently expand their telecommuting offerings to employees. When making that decision, these agencies could 'bank' the commute VMT savings from each employee into a mitigation program. The agency would then have the option to allocate the VMT savings to individual development or transportation projects. The allocation process could be gifted, auctioned, or offered at a fixed price. WRCOG could function as an umbrella facilitator for this type of program with responsibility for collecting and organizing the VMT savings into a single 'bank' and then disposing of the savings to individual projects as mitigation subject to all the program expectations outlined above.

IMPLEMENTATION RISKS

As explained above, VMT exchanges or banks come with unique requirements such as the 'additionality' test and ongoing verification that make them more challenging to implement than a conventional transportation impact fee program. However, exchanges and banks offer the ability to include program-type strategies directed at changing travel behavior that are not available in a conventional impact fee program. Given these tradeoffs, we assessed whether other risks could influence the choice of program.

One risk that stood out was related to current legal challenges to the use of carbon offsets that are based on similar concepts. In a recent legal case, the Sierra Club, Center for Biological Diversity, and Cleveland National Forest Foundation, Climate Action Campaign, Endangered Habitats League, Environmental Center of San Diego, and Preserve Wild Santee challenged the County of San Diego over the use of carbon offsets to achieve GHG reduction goals in the County's climate action plan. The court petition is available at the link below.

- https://www.biologicaldiversity.org/programs/urban/pdfs/San-Diego-CAP-Petition-for-Writ-of-Mandate.pdf

The California Attorney General's (AG's) office has also weighed in on this court case. According to a November 11, 2019 Los Angeles Times article, "California says San Diego County could undermine state's greenhouse gas plan", the AG's office filed an amicus brief. The article reported the following about the AG's brief.

> *In a strongly worded amicus brief recently submitted to the 4th District Court of Appeal in San Diego, Becerra argued that the county's offset strategy would "perpetuate current sprawling development patterns, which will impede the ability of the region and state to reach their long-term climate objectives."*
>
> *"Without significant [vehicle miles traveled] reductions across the state, California simply will not be able to achieve its [greenhouse gas] reduction targets," the 33-page document said.*

The state does not appear to support reducing GHG emissions from land use development without those reductions coming from fundamental local land use and transportation network changes. The risk is that lower density suburban and rural parts of the state would continue their sprawling patterns leading to more VMT and emissions. If the state maintains this position, it could also be used to argue against the creation of VMT mitigation exchanges and banks that attempt to offset VMT increases. To minimize this risk, the mitigation options offered by exchanges and banks could be applied only after project site mitigation has been exhausted and should attempt to offer additional mitigation within the same area or community.

GOVERNANCE

Governance for a VMT mitigation program is another important part of assessing program feasibility for a particular agency. The definition of governance for the purposes of this assessment includes the following three components.

1. Who makes program decisions?
2. How are decisions made?
3. Who is accountable for decisions?

These questions are answered below based on WRCOG serving as the specific agency that would implement and operate the VMT mitigation program. Since the answers will vary depending on the exact type of mitigation program, WRCOG was asked about specific program types of most interest. In response, three program options were identified.

- Modified TUMF – This option involves a modification to the existing TUMF where a new VMT reduction nexus is added. This change would allow the creation of two separate capital improvement programs (CIP) with their own separate fee schedules. A roadway capacity CIP would be retained for the LOS nexus component of the program and a new VMT mitigation CIP would be created. Some of the existing projects in the TUMF CIP are VMT reducing such as transit, bicycle, and pedestrian projects. These would be moved to the new VMT mitigation CIP presuming they are consistent with the new VMT reduction nexus requirement. If changes are limited to this new accounting and nexus approach, impact fees would remain relatively stable.

  This option also allows for new VMT reducing projects to be added to the VMT mitigation CIP. The more projects that are added, the greater the potential VMT reduction, but also the greater the impact fees. Under this option, the TUMF would continue to serve a mitigation program for land use development projects. No mitigation would be available through the program for transportation infrastructure projects that generate new VMT.

- New VMT Impact Fee Program – This option involves creating a new VMT impact fee program focused solely on achieving VMT reduction through the CIP projects. The CIP would largely consist of active transportation and transit projects where sufficient evidence exists to demonstrate a VMT reduction nexus. The program would also be targeted exclusively for land use development project mitigation.

- New VMT Mitigation Exchange – This option is the most flexible in terms of offering VMT mitigation for both land use and transportation infrastructure projects. The program would identify VMT reduction projects that could be either fully funded or directly implemented by land use project applicants or transportation project sponsors. The type of project could include capital projects similar to those mentioned above for the impact fee programs plus TDM strategies or activities that reduce VMT. TDM often involves information development and dissemination and actions that change travel behavior. Since these do not qualify as capital projects, they are typically excluded from impact fee programs. As long as these strategies or activities have a clear nexus to VMT reduction, they would qualify for the VMT mitigation exchange project list. By covering VMT mitigation for transportation projects (i.e. roadway capacity projects causing induced vehicle travel impacts), more agencies could participate in the program and more VMT reduction could be delivered.

These options do not include a mitigation bank. As explained above, banks are more complex and require more effort to create, operate, and maintain without current evidence showing that the higher investment would necessarily produce greater VMT reduction than an impact fee program or exchange.

Who makes program decisions?

The simple answer to this question is that WRCOG makes the decisions, but that is not precise enough to fully understand what individuals or groups of individuals are authorized to make different types of decisions. WRCOG was formed through a joint powers agreement (JPA) is composed of all 18 incorporated Cities, Riverside County, Eastern and Western Municipal Water Districts, the Morongo Band of Mission Indians, and the Riverside County Superintendent of Education. The main decision-making body of WRCOG is the Executive Committee which is comprised of elected officials from each of WRCOG's member agencies and meets monthly to discuss policy issues and consider recommendations from WRCOG's Technical Advisory Committee (TAC), primarily comprised of the region's City Managers.

How are decisions made?

Any decision related to the implementation of any option identified above would ultimately be made by the Executive Committee after discussions, input, and voting has occurred at the various policy committees. On-going operation of the program would occur at the Executive Director, Transportation & Planning Director, and Public Works Committee (PWC) levels. Decisions and informational items are first brought to the Public Works and or Planning Directors Committee (PDC). Recommendations are then brought forth to the TAC. Following this would be the Administration & Finance Committee (AFC) who

provide budget and finance overview, which is comprised of a smaller group of elected officials who are also members of the Executive Committee. The final decision recommendations are lastly brought to the Executive Committee who make the final determination.

Once a program is established, WRCOG staff would oversee the program with input from WRCOG's member agencies, primarily through WRCOG's existing committee structure.

Who is accountable for decisions?

The WRCOG organization described above is transparent with an emphasis on a streamlined approach to decision-making. For day-to-day decision making, responsibility and accountability lies with the Executive Director and the Transportation & Planning Director. Major decisions are reserved for the Executive Committee since it has sole authority to adopt and amend by-laws for the administration and management of the JPA.

The table below summarizes the governance expectations above.

Type of Program	Who Makes Program Decisions?	How Are Decisions Made?	Who is Accountable?
Modified TUMF Program	Creation of the program - WRCOG Executive Committee Operation of the program - WRCOG Executive Committee, Executive Director, Transportation & Planning Director, AFC, TAC, and PWC	Decisions can originate from questions at any level of the agency, member agency, or the public. These are then resolved at the PWC, PDC, TAC, AFC or Transportation & Planning Director level for day-to-day operations and the Executive Committee for more significant decisions.	Executive Director and Transportation & Planning Director for day-to-day operations and the Executive Committee for more significant decisions.
New VMT Impact Fee Program			
New VMT Mitigation Exchange			

Advancing Implementation

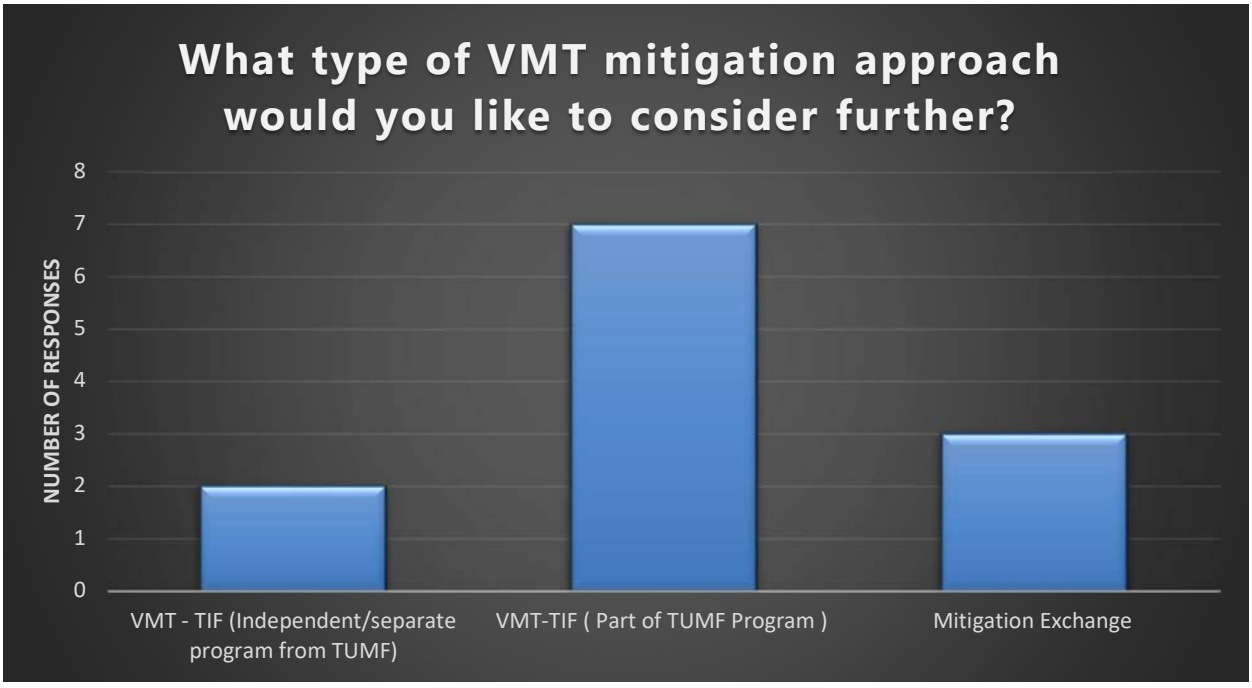
Advancing one of the three options above would begin with a formal proposal by WRCOG staff at the PWC where informative discussions, presentations, and options would be explored. With the recommendation of the PWC it would then advance to the other policy committees in the following order.

- TAC
- AFC
- Executive Committee

Prior to implementing any new Program, WRCOG would need to develop a concrete proposal for recommendation. Given WRCOG's experience, this proposal should address each item below.

- The exact structure to be implemented (bank, exchange, or fee).
- The relationship between this program and other WRCOG programs.
- Program governance, which would likely be modeled after existing WRCOG programs like TUMF.
- Supporting documentation related to this proposal such as any quantification methods related to VMT reductions and other applicable items.

WRCOG Staff conducted a survey of its member agencies late in 2019 and early in 2020 to gauge their interest in either a VMT mitigation fee or exchange. The survey results are provided below. Based on the survey responses, it appears that a majority of our local agencies prefer a fee-based approach, though there is support for an exchange as well.



Based on that positive feedback, there appears to be merit in advancing a mitigation program. The next steps would generally focus on increased socialization of this concept and conceptual program development. Specific tasks WRCOG should undertake would include but not be limited to the following items.

- Convening a meeting with the Riverside County Transportation Commission (RCTC) and Riverside Transit Agency (RTA) to discuss this concept in greater detail.
- Identify at least two options for either a fee-based approach and an exchange, which would include an evaluation of their use for mitigating development and infrastructure projects.
- A review of the latest guidance from OPR and Caltrans regarding VMT impacts and the applicability of this type of program or programs to address any issues they have raised as SB 743 is implemented.
- Coordination with the upcoming TUMF Nexus Study update to ensure that the Nexus Study scope of work provides the necessary information for this type of program.

A WHITE PAPER PREPARED BY

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Western Riverside Council of Governments

APRIL 2020 | FINAL

EXHIBIT E

Working Paper

The Potential for Regional Transportation Impact Mitigation Fee Programs and Mitigation Banks to Help Streamline the Implementation of SB 743

Prepared by Neil Peacock, Caltrans
Senior Environmental Planner with Caltrans' Division of Environmental Analysis
for the SB 743 Implementation Assistance Project: From Driving More to Driving Less

March 2017

Background:

With the passage of Senate Bill (SB) 743 (Steinberg, 2013), California will be changing the primary metric it uses to assess transportation impacts under the California Environmental Quality Act (CEQA) from Level of Service to Vehicle Miles traveled (VMT). This change will ultimately result in the deployment of new analytic approached toward determining the significance of potential impacts, as well as the use of new mitigation measures needed to address those impacts and the evolution of existing implementation programs required to carry those mitigations out.

This paper was provided as a part of the "SB 743 Implementation Assistance Project: From Driving More to Driving Less" a case-study analysis exploring the implementation of SB 743 managed by the Institute for Sustainable Solutions and Urban Sustainability Accelerator at Portland State University, which is investigating how VMT impacts from both land use developments and transportation capital projects could be adequately analyzed and successfully mitigated under SB 743 within a regional, programmatic framework. Work group members currently include the Sacramento Area Council of Governments, the Southern California Association of Governments, the Metropolitan Transportation Commission, the San Diego Association of Governments, the San Joaquin Council of Governments, the Governor's Office of Planning and Research, the California Department of Transportation, and the California State Transportation Agency.

The conceptual premise of this paper is that regional transportation impact mitigation fee programs and various "mitigation bank" models could be used to streamline VMT-related impact analysis and ensure successful implementation of associated mitigations in the future.

Below, the reader will find essential information such as important legal and technical considerations and common procedural and political challenges, as well as several relevant examples that may need to be considered by local, regional, and state agencies that are interested in helping successfully implement SB 743's changes to CEQA.

Additional papers on the various topics covered herein, and more comprehensive efforts to provide best practice methodologies on the potential for impact fees to address VMT impacts, are expected in the future. For the purpose of keeping this paper concise, discussions on many wide-ranging and complex topics are abbreviated and the following is assumed:

- The regulatory language submitted by the Governor's Office of Planning and Research to the Natural Resources Agency for rule-making will identify VMT as the new impact metric for CEQA;

- Any technical guidance provided outside this regulatory language is advisory by nature and is intended to help implement the regulatory language;

- Each CEQA lead agency is ultimately responsible for deciding the approaches that they will use to carry out impact analysis, for determining the significance of potential impacts related to the land use and/or transportation projects that they approve, and for successfully implementing required mitigation strategies or issuing statements of overriding consideration related to their potentially significant and unavoidable impacts;

- As shown by the examples provided, regional transportation impact mitigation fee (RTIMF) programs and various mitigation bank models could possibly be adapted to help streamline VMT impact analysis and the implementation of required mitigation.

This paper is organized into the following sections: **A)** Legal and technical considerations; **B)** Common procedural and political challenges; **C)** Examples of fee programs that are relevant to the discussions herein; **D)** Examples of various "mitigation bank" models that could be explored further; **E)** Resources and references; **F)** Other key briefs, white papers, and publications on VMT.

Legal and Technical Considerations

A. Regional Transportation Impact Mitigation Fee Programs

If properly developed and administered, RTIMF programs could provide an effective and efficient implementation mechanism for mitigation measures needed to address cumulative VMT impacts. If successfully carried out, these programs could help streamline ad hoc environmental reviews and provide an umbrella framework to support a wide variety of the VMT-reducing mitigation strategies that have been identified through a variety of published research (see the references below). Specifically, the impact analysis outlined in these programs' nexus plans, their capital/service improvements, and the fiduciary/delivery information presented in their annual reports and five-year updates provide the substantial evidence needed under CEQA to demonstrate that these mitigations can be successfully assured.

It is important that the relationship between VMT impacts and mitigations must be quantifiably demonstrated by technically defensible analysis in order to pass muster under both CEQA and the Mitigation Fee Act. Specifically, impact fee programs must be developed, implemented, and regularly updated as set forth in Sections 66000 et seq. of the California Government Code (Assembly Bill 1600, 1987) and subsequent case-law, commonly referred to as "Nolan and Dolan" among others. This legal framework requires that all public agencies must technically establish a reasonable and proportionate relationship, or "nexus", between fees of general applicability and the new development upon which they are imposed. The summary below describes the essential nexus criteria established by law:

1. Identify the purpose of the fee;
2. Identify the use to which the fee will be put;

3. Determine the reasonable relationship between the fees' use and the type of development on which the fees are imposed;
4. Determine the reasonable relationship between the need for the public facilities and the types of development on which the fees are imposed, and;
5. Demonstrate a reasonable relationship between the amount of the fee and the cost of public facility or portion of the public facility attributable to the development on which the fee is imposed.

For the purpose of this paper, these nexus criteria are assumed to also apply to transportation capital projects. A nexus study documents the legally-required reasonable and proportionate relationship between the fees assessed and the impacts identified on the regional transportation system. Once adopted, lead agencies would apply their adopted fee schedules as they issue building permits for new development within their jurisdiction. The revenues collected would be deposited into a restricted account dedicated to funding various transportation improvements required to mitigate the cumulative impacts that are created as new homes and businesses are constructed over time. An annual report would be issued each year that identifies program revenues and expenditures in order to demonstrate that the fees collected are being spent consistent with the adopted nexus and the reasons for which they are being imposed.

There are several generally accepted methodologies used to calculate impact fees for new development. Typically, they include the following essential steps that would need to be adjusted to incorporate VMT:

Step 1: Develop projections of future development
Step 2: Determine needed improvements
Step 3: Estimate improvement/mitigation costs
Step 4: Subtract revenues reasonably available from non-RTIMF sources (i.e. in the RTP Financial Element)
Step 5: Determine the percentage of costs attributable to new development
Step 6: Assign future VMT to each type of new development (e.g. trip-generation rates, trip-length factors, etc.)
Step 7: Divide the future VMT from each type of new development by the cost of improvements used in the fee calculation

As noted is step 4, all RTIMF projects, should be Tier 1 projects in the RTP, meaning that they are part of the RTP's fiscally-constrained financing plan. This finance plan is based on reasonably available local, regional, state, and federal revenue sources and identifies the amounts, sources, and timing of revenues needed to complete projects that are partially funded by impact fees. This linkage to the adopted RTP/MTP-SCS demonstrates the substantial evidence needed to showed that the required improvements would actually get funded and be carried out (See Napa Citizens for Honest Government v. Board of Supervisors (2001) 91 Cal.App.4th 342). Conversely, in cases where the fee program (in combination with other funding sources) does not fully fund required mitigation, then the mitigation cannot be assured. It is important to remember that CEQA does not require a time-specific schedule for completion of the mitigation; only that the only fees are linked to a specific set of improvements and that the information provided through annual reports demonstrates that projects for which the fee are collected are actually being implemented (See Save Our Peninsula Committee v. Monterey County Bd. of Supervisors, supra, 87 Cal.App.4th 99).

B. Mitigation Banks

In addition to the impact fee program model that is widely used to mitigate impacts from land use developments, it is possible that the examples and models of "mitigation banks" discussed below could provide an avenue for mitigating VMT impacts of transportation projects under SB 743. For example, Caltrans and its local/regional partners who sponsor projects on the state highway system (SHS) regularly pay in-lieu fees to mitigate impacts to biological resources at off-site locations with comparable habitat values. These in-lieu fees are often paid to separate agencies or third parties such as a non-profit conservancies that ultimately carry out the biological mitigation activity as separate stand-alone projects. It is important to note that the technical and regulatory protocols regarding the nexus between biological impacts and mitigations is complex and wide-ranging. However, there are three essential parallels to the potential mitigation of VMT impacts in the future:

1. In-lieu fees could be used to fund a wide variety of VMT-reducing strategies needed to mitigate related impacts;

2. VMT-specific methodologies and protocols would be required to demonstrate the nexus between VMT impacts and mitigations to ensure the adequacy of mitigation under CEQA as revised by SB 743, and;

3. There would need to be a comparable mechanism in place to collect these funds and pass them through to a party that would carry out those strategies in order to demonstrate that their implementation is reasonably assured.

Given the significant amount of detail that could be discussed with regard to both of these models (i.e., impact fee programs and mitigation banks), the essential point for the purpose of this paper is that they could both be possibly adapted to addressing VMT impacts and used to offer an alternative to ad-hoc, project-specific fair share analysis and fee payment by creating a "tiering" system under Section 15152 of CEQA. Under tiering, projects that are within and subsequent to a plan, program, or master environmental impact report (EIR) can be environmentally cleared if they have already been examined at a sufficient level of detail and are adequately mitigated by conditions of approval or other programmatic means such as impact fee programs.

References and examples of fee programs are included at the end of this discussion. Future exploration of topics such as the following is anticipated:

- The quantification of VMT impacts associated with potential induced demand from capacity-expansion projects;

- Various techniques available to address the limitations of model sensitivity toward quantifying VMT reductions associated with various mitigation strategies;

- The VMT-related conversion factors used to establish "Equivalent Dwelling Units", "Travel Demand Units", or "Trip Demand Factors" between land use categories;

- The allocation of VMT-based trip-end/trip-length costs and the use of VMT-based adjustments to trip generation rates used in fee calculations (e.g. the incorporation of pass-by and internal-capture effects from mixed-use/infill and the mode-split associated with transit-oriented developments);

- The best approaches to distinguish the difference between direct impacts and cumulative impacts;

- The level of accuracy and detail required to successfully tier "subsequent projects" from plan-level EIRs;

- What are the best ways to establish the strategic partnerships, multi-party agreements, and detailed implementation programs needed to adequately ensure implementation of fair share mitigations;

- The basis and methods for determining significance under CEQA.

Common Procedural and Political Challenges

The nexus methodologies between impacts and improvements and the successful use of these fee programs as mitigation under CEQA as discussed above will likely continue to vary by region. As such, a likely challenge moving forward will be in the ability of regional governments explain what is required of them and then to work with their member agencies, relevant state agencies, and non-profit stakeholders to create linkages between VMT impact nexus, project and plan-level funding streams, and administrative/implementation pathways needed to carry out required mitigation. This will likely require them to extend their existing modeling capacities, strengthen their partnership networks, and amend their funding and/or administrative programs.

Another challenge might be encountered by jurisdictions with locally-administered fee programs, as many local programs are currently limited in scope to their jurisdictional boundaries, whereas VMT is typically regional and interregional in nature. These programs may need to be updated to adequately analyze and mitigate the full scope of the VMT associated with the development or improvements that they approve. This points to the importance of enhancing the linkage between local (city) and regional (county) fee programs and the broader analytic and implementation framework provided by RTPs/MTPs-SCSs, which transcend these kinds of jurisdictional constraints.

Regional agencies that successfully overcome these challenges could help their members comprehensively address VMT impacts across jurisdictional boundaries, reduce or eliminate the need for expensive project-specific cumulative conditions analyses, and offer more certainty for developers regarding the kinds and costs of appropriate mitigations needed to address cumulative VMT impacts.

This is why most of the State's RTPs/MTP-SCSs contain some variation of the following policy language:

- *"Require that new development contribute its fair share of the costs of new transportation infrastructure and system improvements for all modes necessary for such new development, as allowed for by law."*
- *"Review local developments for consistency with General Plan circulation elements and with the Regional Transportation Plan."*

- *"Review local General Plans for consistency with the Regional Transportation Plan."*

Agencies administering regional fee programs would also be wise to consider the need for on-going monitoring of any potential discrepancies between the forecasts based on their RTP's/MTP-SCS's blue print growth scenario, the actual building permits issued over time, and the affect any such inconsistencies might have on the need for system-level VMT mitigation. The differences identified would need to be addressed, possibly by pairing plan and nexus update cycles to adjust impact analysis, mitigation strategies, and fee amounts/funding allocations accordingly to remain in environmental compliance.

Similarly, for programs that are integrally linked with an RTP's Financial Element and regional investment strategy as a part of its nexus methodology and fee calculations, the program's policies and procedures would need to consider how to maintain consistency between its adopted fee schedule and finance plan and the fees actually imposed by its member jurisdictions in order to ensure that mitigations remain fully-funded and reasonable assured.

Given the regional and interregional nature of VMT (particularly in regions with significant jobs/housing imbalances or other trip generators/attractors such as regional service centers that result in extreme travel distances), it will also be important to consider how local jurisdictions will chose to assign the cost of VMT mitigation. This is particularly important for VMT that is experienced outside of their jurisdictional boundaries, but that is partially associated with the land use projects and transportation improvements identified in local general plan land use and circulation elements.

These observations point to the important role that RTPAs, MPOs, and Caltrans plan as conveners, champions, and advocates for the successful adoption of these programs.

Any additional questions from readers, as well as any comments or concerns on the topics discussed herein are welcome and may be sent to the facilitator of this case-study effort or the author of this paper at:

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Examples of Mitigation Fee Programs

The following section provides examples from publically available websites of existing impact fee programs that are administered by cities, counties, and RTPAs/MPOs and include either VMT factors in their nexus methodologies or fee calculations or VMT-reducing mitigation strategies, as well as examples of various "mitigation bank" models that could possibly be adapted to meet the needs of implementing SB 743. Also provided is a list of resources and references on the topics discussed above.

City

City/County of San Francisco

This is an example of a comprehensive municipal effort to implement a broad array of transportation demand management (TDM)measures throughout its comprehensive planning, urban design, development review process, and impact analysis/mitigation process. This framework (which was adopted by ordinance, thereby amending the City's planning code) includes three pillars that comprise the City's Transportation Sustainability Program:

- *"Align"*; SF's local CEQA reform, which created new thresholds and processes for analyzing VMT-related impacts and determining significance under CEQA.
- *"Shift"*; the City's transportation demand management program, which is used for site-planning and development review purposes.
- *"Invest"*; its new Transportation Sustainability [impact] Fee program, which explicitly incorporates VMT impact assessment methodologies and funds VMT-reducing mobility services and investment strategies.

At the link below, readers will find portals to the City's Transportation Sustainability Fee program documents and a wide array of TDM program studies and resources, a web-based tool designed to implement that program during development review, and a model community engagement process used to advance this effort to successful adoption. This is the most comprehensive and integrative VMT-reduction initiative the author found during research to develop this white paper and the best source of best-practice resources for practitioners that desire to move in this direction.
http://sf-planning.org/shift-transportation-demand-management-tdm

City of Oakland

This example demonstrates a city-level initiative intended to better align the City's approach to transportation impact analysis with plans and polices that promote the implementation of SB 743 (i.e. the reduction of greenhouse gas emissions and the development of a diverse and multimodal transportation and land use network). At this link, readers will find a series of public presentations and staff reports describing their effort to modernize transportation impact review, as well as a summary of best practices, several examples of alternative impact analysis tools, new approaches to establishing local CEQA thresholds and determining significance as related to VMT impacts. Preceding this change, Oakland implemented a Transportation and Capital Improvement Impact Fee Ordinance.
http://www2.oaklandnet.com/government/o/PBN/OurOrganization/PlanningZoning/OAK060501

http://www2.oaklandnet.com/government/o/PBN/OurOrganization/PlanningZoning/s/ImpactFee/index.htm

City of Sacramento

This is an example of a city-wide TIMF program that is in the process of a comprehensive update to address the incremental evolution of fees that have resulted in a complex system that is cumbersome for developers and difficult for the City to manage. The program's draft Nexus Study and capital improvement program (CIP) contains both roadway capacity and operational improvements with complete street design features, dedicated bicycle and pedestrian facilities, and the extension of transit service, as well as the inclusion of VMT-related factors in the fee calculation methodology (i.e. trip-length and pass-by reductions to trip generation).

As required by AB 3005, the program's draft Nexus Study considers providing a fee reduction for development located within one-half mile of a Sacramento Regional Transit (RT) light rail station based on traffic analysis showing reduced vehicle travel rates for transit oriented developments. This draft program also includes a fee deferral program to assist residential, mixed use, and large non-residential infill development. It also includes an advance funding and reimbursement mechanism for future development. As this link, the reader will find this program's draft Nexus Plan, a proposed fee schedule, and public meeting outreach materials.
https://www.cityofsacramento.org/Community-Development/Resources/Citywide-Development-Impact-Fee-Program

City of Pasadena

This example demonstrates a multi-prong effort to move the city's local land use/transportation planning, development review process, and system investment strategies in a new direction that is reflective of both the City's vision for future growth management and SB 743's shift in metrics under CEQA. The City's local impact analysis guidelines incorporate both CEQA-related VMT impact analysis methodologies and non-CEQA LOS assessment procedures. The Nexus plan for the City's impact fee program (which is currently undergoing a public review and adoption process) incorporates a future development's fair share of future facility costs on a facility-by-facility basis, based on VMT-related impact analyses by Land Use category. The cost of future facilities, which include a wide array of transportation improvements including roads, public transit, bikeways, and pedestrian walkway facilities, are dependent on the relative benefit received by the development categories. At the following link, readers can find a variety of resources related to the City's non-profit Transportation Management Association, its Transportation Demand Management program, and local impact fee program:
http://ww5.cityofpasadena.net/transportation/complete-streets/?target=development-review
At the following link, readers can find a copy of the City's transportation impact analysis guidelines, which established new, VMT related thresholds and methodologies for determining significance under CEQA:
http://ww5.cityofpasadena.net/transportation/wp-content/uploads/sites/6/2015/12/Current-Practice-and-Guidelines.pdf

City of Los Angeles

(Coastal Transportation Corridor Specific Plan, West LA Transportation Improvement and Mitigation Specific Plan)
Recent amendments to these area-wide specific plans include an update to the list of transportation improvements to be funded, in part, by the impact fees collected from new development; an update to the

Transportation Impact Assessment fee program, including a VMT-based nexus plan, revisions to the fees, exemptions, in-lieu credits, and affordable housing credits; and a new transit-oriented development credit. The updated list of transportation improvements includes: transit, bicycle and pedestrian, roadway and intelligent transportation system, and trip reduction programs. Other proposed changes include administrative amendments and minor revisions that are consistent with SB 743, transportation policies in the City's General Plan elements, LADOT's Traffic Study Policies and Procedures, and current best planning practices. The Nexus Study for this program is included as Appendix B in its Draft EIR, which is available at the following site:
http://planning.lacity.org/eir/CoastalTrans/deir/pdfs/tiafeestudy.pdf

County

Sacramento County

This is an example of a county-wide TIMF program that reflect VMT thresholds and contains both roadway capacity and operational improvements, along with transit facilities, intelligent transportation systems, and bikeway/ pedestrian improvements, as well as the inclusion of VMT-related factors in the fee calculation methodology (i.e. trip-length and pass-by/internal-capture reductions to trip generation).
http://www.sacdot.com/Documents/A%20to%20Z%20Folder/Development%20Fees/SCTDFMarch2010.pdf

San Diego County

This is an example of a county-wide TIMF program that contains both roadway capacity and operational improvements, along with transit facilities, intelligent transportation systems, and bikeway/ pedestrian improvements, as well as the inclusion of VMT-related factors in the fee calculation methodology (i.e. trip-length and pass-by/internal-capture reductions to trip generation). As this link, the reader will find this program's adopting ordinance, Nexus Plan, annual report, and a variety of useful administrative tools, such as a fee calculator, an exemption form, and an appeals application.
http://www.sandiegocounty.gov/dpw/land/tif.html

RTPA/MPO/COG

Nevada County Transportation Commission

This is an example of a regional TIMF program that is exclusively based on LOS, includes only roadway projects, and is administered by a Regional Transportation Planning Agency, via Memorandum of Understanding (MOU), on behalf of its member agencies. At this link, readers will find a summary description of the program's most recent 5-year update, a Nexus Study, an Administrative Plan, and an Annual Report for FY 15/16
http://www.nctc.ca.gov/Reports/Regional-Transportation-Mitigation-Fee-RTMF/index.html

Amador County Transportation Commission

This is an example of a regional TIMF program that is based on LOS and safety, but includes roadway projects with multimodal components, and is administered by a Regional Transportation Planning Agency, via MOU, on behalf of its member agencies. At this link, readers will find a copy of the inter-agency MOU that governs the

program and the program's 2016 Nexus Study Update, as well as a variety of administrative supports such as administrative policies and procedures, local agency reporting forms, and an appeals process.
http://actc-amador.org/wp-content/uploads/2016/10/2016.0121_MOU_FINAL_REVISED_W.Signatures_INCL_EXHIBITS.pdf

South Placer Regional Transportation Authority

This is an example of a regional TIMF program that is administered by an independent Joint Powers Authority (JPA), which is staffed by the region's Regional Transportation Planning Agency (the Placer County Transportation Planning Agency) on behalf of its member agencies. The CIP within the Nexus plan is comprised of regional roadway projects with multimodal components and includes a dedicated line-item for transit projects.
http://pctpa.net/sprta/library/SPRTA_Traffic_Impact_Fees_Memorandum_%2012-05-14.pdf
And here is a copy of the Bylaws incorporating this JPA:
http://pctpa.net/sprta/library/SPRTA%20Bylaws.pdf

Merced County Association of Governments

This is an example of a regional impact fee program that is administered by a Regional Transportation Planning Agency, via MOU, on behalf of its member agencies. The Nexus plan for this program is LOS based and its CIP is primarily comprised of traditional capacity-expansion projects, but also includes several urban arterial projects with complete-street design elements. The projected revenue from this program is explicitly identified in the Financial Element of the region's RTP (p.24 & p.28). Although no program documents are posted to their website, contact information can be found at: http://www.mcagov.org/150/Regional-Transportation-Impact-Fee

San Joaquin Council of Governments

This is an example of a county-wide, multi-jurisdiction capital improvement funding program that is administered by a Regional Transportation Planning Agency, via MOU, on behalf of its member agencies. At this link, readers will find a copy of the program's operating agreements, Nexus Plan, project list, Regional Congestion Management Program, and most recent Annual Report. The CIP within the Nexus Plan is comprised of regional roadway projects with multimodal components and includes several dedicated line-items for bus and rail related transit projects.
http://www.sjcog.org/index.aspx?nid=118

Transportation Agency for Monterey County

This is an example of a county-wide TIMF program that is based on LOS and contains mostly traditional roadway capacity and operational improvements, along with several regional roadway projects that contain complete-street design elements. Although this program's deficiency analysis is LOS based, VMT-related factors are included in the fee calculation methodology (i.e. trip-length and pass-by/internal-capture reductions to trip generation). As this link, the reader will find this program's Nexus Plan, a fee calculation worksheet, implementation guidelines, and a map of regional fee infill areas.
http://www.tamcmonterey.org/programs/dev-impact-fees/

Western Riverside County Transportation Commission

This is an example of a regional TIMF program that is administered by an independent JPA, which is NOT the region's Regional Transportation Planning Agency. The CIP within the Nexus plan is comprised of regional roadway projects with complete-street design elements and includes dedicated line-items for transit projects. VMT factors have been incorporated in this program's fee calculations.
http://www.wrcog.cog.ca.us/tumf/resources

Examples of "Mitigation Banks"

The various "mitigation bank" models below (i.e. Regional Biological Mitigation Frameworks, Natural Communities Conservation Plans, and Regional Advance Mitigation Programs) may provide a potential model for regional VMT mitigation, primarily through their framework of linking project-specific impacts with the implementation of regional programmatic mitigation strategies. Although there are several technical, procedural, and legal differences between each of these models that warrant further discussion with subject area experts; generally, such programs allocate funds to acquire various lands with sensitive-species habitat values and fund various habitat restoration projects in exchange for streamlined project permit approvals for a variety of capital improvement projects. Typically, acquired properties are permanently preserved as open space to maintain their various biological conservation values and related restoration projects are carried out to restore various natural native habitats such as riparian rehabilitation efforts and the removal of invasive plant species.

These models typically include a process through which the impacts from various transportation projects are estimated either before or during the planning or environmental clearance phases. They reflect an effort to achieve economies of scale and create a more comprehensive and integrative approach to mitigation that might be able to satisfy the mitigation needs of multiple projects at once or sequentially over time.

It is important to note that, each of these different models and the specific programs below vary greatly in detail, include different "covered activities" (i.e. mitigations), and include either known or unknown project-specific impacts at the time they are established. However, from a CEQA perspective, the primary considerations that would likely translate between the biological resource and VMT arenas are; 1) the requirement to quantify and demonstrate parity between project-level impacts and program-level mitigation, and; 2) the assurance needed to demonstrate that the mitigations will actually be carried out.

These two factors would need to be demonstrated by any potential adaptation and application of these models to VMT in future in order to provide the "substantial evidence" needed under CEQA to claim credit for adequate mitigation and successfully tier project-specific impact analysis and associated mitigation off of an implementation program such as these.

In theory, if successfully adapted to address the VMT impacts associated the "induced demand" created by major capacity-expansion projects (to the degree that it is demonstrated by the analysis), these models could possibly allow for project sponsors to simply pay an "in-lieu" fee at the completion of the Project Approval/ Environmental Document phase toward a pooled, revolving fund (i.e. "mitigation bank") that could support an array of regional VMT-reducing mitigation strategies that would off-set the project's induced VMT impacts. In addition to possibly being funded as project-specific line-item costs as described above, these programs can also be established through independent local-measure initiatives, or as a component of a larger self-help transportation measures.

A more thorough study of the examples below, with findings and lessons-learned for the potential future adaptation and implementation of these models, entitled Setting the Stage for Statewide Advance Mitigation, was performed by the Institute of Transportation Studies at UC Davis and can be found here: https://merritt.cdlib.org/d/ark:%252F13030%252Fm5rz1ftc/1/producer%252F907322100.pdf

County Funded Multi-Project Advance Mitigation Efforts

- Coachella Valley Multiple Species Habitat Conservation Plan
  http://www.cvmshcp.org/
- Western Riverside County Multiple Species Habitat Conservation Plan
  http://wrc-rca.org/
- Orange County Transportation Authority's Environmental Mitigation Program
  http://octa.net/Projects-and-Programs/Measure-M/Measure-M2-(2011-2041)/Freeway-Mitigation/Environmental-Mitigation-Program-Overview/
- San Diego Association of Governments' Environmental Mitigation Program
  http://www.sandag.org/index.asp?projectid=263&fuseaction=projects.detail

Caltrans Led/Funded Advance Mitigation Efforts

- Beach Lake Mitigation Bank
  http://us.speciesbanking.com/pages/dynamic/banks.page.php?page_id=7180
- Elkhorn Slough Early Mitigation Partnership
  http://elkhornslough.ucdavis.edu/
- California State Route 149, Butte County
  http://www.bcag.org/projects/sr-149-freshwater-marsh/index.html
- Cottonwood Conservation Area
  http://www.buttecountyrcd.org/

Advance Mitigation Planning Efforts – Unattached to Projects or Funds

- Santa Cruz Conservation Blueprint
  http://www.landtrustsantacruz.org/blueprint/

A more comprehensive list of conservation and mitigation banks in California that have been approved by the California Department of Fish and Wildlife can be found here:
https://www.wildlife.ca.gov/Conservation/Planning/Banking/Approved-Banks

Resources and References

1. Impact Fee Handbook; 2016; Development Planning and Financing Group, Inc.; National Association of Home Builders, 1201 15th St. NW, Washington DC 20005. https://www.nahb.org/en/research/~/media/612208AE1C7D4F4C98C19471447F775C.ashx

2. Exactions and Impact Fees in California: A comprehensive Guide to Policy, Practice, and the Law; 2012, (Third) Edition; Abbott, Detwiler, et all; Solano Press Book, PO Box 773 Point Arena, CA 95468.

3. Curtin's California Land Use and Planning Law; 2012, (Thirty-Second) Edition; C. Talbert-Barclay and M. Gray; Solano Press Book, PO Box 773 Point Arena, CA 95468.

4. White Paper: A Framework for Projecting the Potential Statewide VMT Reduction from State-Level Strategies in California; 2017, M. Boarnet and S. Handy; California Strategic Growth Council. http://sgc.ca.gov/resource%20files/State-LevelVMTStrategies.pdf

5. Local Development–Intergovernmental Review Program Interim Guidance: Implementing Caltrans Strategic Management Plan 2015-2020 Consistent with SB 743 (Steinberg, 2013); November, 2016; Caltrans; 1120 N St., Sacramento, CA 95814. http://www.dot.ca.gov/hq/tpp/documents/RevisedInterimGuidance11092016.pdf

6. Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA: Implementing Senate Bill 743 (Steinberg, 2013); January, 2016; California Governor's Office of Planning & Research; 1400 10th St # 100, Sacramento, CA 95814. https://www.opr.ca.gov/docs/Revised_VMT_CEQA_Guidelines_Proposal_January_20_2016.pdf

7. The 2017 Climate Change Scoping Plan Update: The Proposed Strategy for Achieving California's 2030 Greenhouse Gas Target; JANUARY, 2017 California Air Resources Board. https://www.arb.ca.gov/cc/scopingplan/2030sp_pp_final.pdf

8. Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures; August, 2010; California Air Pollution Control Officers Association; 1107 9th Street, Suite 1005, Sacramento, CA 95814. http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

9. Summary of Best Practices; November, 2015; Nelson Nygaard; 116 New Montgomery St., Suite 500, San Francisco, CA 94105. http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak060593.pdf

10. Use of Impact Fee Programs for CEQA Mitigation; August, 2015; R. Milam, Fehr & Peers; 1013 Galleria Blvd., Suite 255; Roseville, CA 95678 http://www.fehrandpeers.com/wp-content/uploads/2017/03/USE-OF-IMPACT-FEE-PROGRAMS-FOR-CEQA-MITIGATION-1-002.pdf

Other Key Briefs, White Papers, and Publications on Vehicle Miles Traveled

1. Increasing Highway Capacity Unlikely to Relieve Traffic Congestion

2. Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions Policy Brief

3. Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions Technical Background Document

4. Increasing Walking, Cycling, and Transit: Improving Californians' Health, Saving Costs, and Reducing Greenhouse Gases

5. Growing Cooler: The Evidence on Urban Development and Climate Change

6. Moving Cooler: An Analysis of Transportation strategies for reducing greenhouse gas emissions (Executive Summary)

7. Growing Wealthier: Smart Growth, Climate Change, and Prosperity

EXHIBIT F

FEHR PEERS

TECHNICAL MEMORANDUM

Date: 2.26.19

To: Chris Gray (WRCOG), Chris Tzeng (WRCOG), Sarah Dominguez (SCAG), Mike Gainor (SCAG)

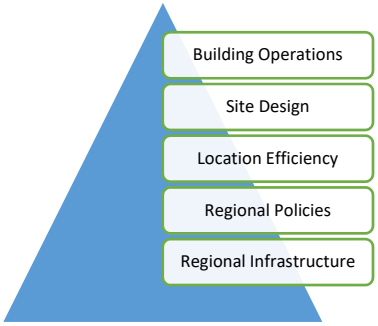
From: Ronald T. Milam, AICP, PTP and Jason Pack, PE

Subject: SB 743 Implementation TDM Strategy Assessment OC18-0567

This technical memorandum summarizes our assessment of new research related to transportation demand management (TDM) effectiveness for reducing vehicle miles of travel (VMT). The purpose of this work was to compile new TDM information that has been published in research papers since release of the *Quantifying Greenhouse Gas Mitigation Measures,* CAPCOA, August 2010 and to identify those strategies suited to WRCOG jurisdictions given the rural and suburban land use context. The matrix in Attachment A summarizes the overall evaluation of all the CAPCOA strategies while the matrix in Attachment B identifies the top seven strategies suited for the study area.

This information can be used as part of the SB 743 implementation to determine potentially feasible VMT mitigation measures for individual land use projects in the WRCOG area. An important consideration for the mitigation effectiveness is the scale for TDM strategy implementation. The biggest effects of TDM strategies on VMT (and resultant emissions) derive from regional policies related to land use location efficiency and infrastructure investments that support transit, walking, and bicycling. While there are many measures that can influence VMT and emissions that relate to site design and building operations, they have smaller effects that are often dependent on final building tenants. **Figure 1** presents a conceptual illustration of the relative importance of scale.

Figure 1: Transportation-Related GHG Reduction Measures



Of the 50 transportation measures presented in the CAPCOA 2010 report *Quantifying Greenhouse Gas Mitigation Measures*, 41 are applicable at building and site level. The remaining nine are functions of, or depend on, site location and/ or actions by local and regional agencies or funders. **Table 1** summarizes the strategies according to the scope of implementation and the agents who would implement them.

TABLE 1: SUMMARY OF TRANSPORTATION-RELATED CAPCOA MEASURES

Scope	Agents	CAPCOA Strategies (see full CAPCOA list below)
Building Operations	Employer, Manager	**26 total** from five CAPCOA strategy groups: • **3** from 3.2 Site Enhancements group • **3** from 3.3 Parking Pricing Availability group • **15** from 3.4 Commute Trip Reduction group • **2** from 3.5 Transit Access group • **3** from 3.7 Vehicle Operations group
Site Design	Owner, Architect	**15 total** from three strategy groups: • **6** from 3.1 Land Use group • **6** from 3.2 Site Enhancements group • **1** from 3.3 Parking group • **2** from 3.6 Road Access group
Location Efficiency	Developer, Local Agency	**3 shared** with Regional and Local Policies
Alignment with Regional and Local Policies	Regional and local agencies	**3 shared** with Location Efficiency
Regional Infrastructure and Services	Regional and local agencies	**6 total**

Of these strategies, only a few are likely to be effective in a rural or suburban setting such as the WRCOG area. To help winnow the list, we reviewed how land use context could influence each strategy's effectiveness and identified the seven for more detailed review. These strategies are described in Attachment B and listed below. Please note that disruptive trends, including but not limited to, transportation network companies (TNCs), autonomous vehicles (AVs), internet shopping, and micro-transit may affect the future effectiveness of these strategies.

1. Increase diversity of land uses – This strategy focuses on inclusion of mixed uses within projects or in consideration of the surrounding area to minimize vehicle travel in terms of both the number of trips and the length of those trips.

2. Provide pedestrian network improvements – This strategy focuses on creating a pedestrian network within the project and connecting to nearby destinations. Projects in the WRCOG area range in size, so the emphasis of this strategy for smaller projects would likely be the construction of network improvements that connect the project sites directly to nearby destinations. For larger projects, this strategy could focus on the development of a robust pedestrian network within the

project itself. Alternatively, implementation could occur through an impact fee program such as the TUMF or benefit/assessment district based on local or regional plans.

3. Provide traffic calming measures and low-stress bicycle network improvements – This strategy combines the CAPCOA research focused on traffic calming with new research on providing a low-stress bicycle network. Traffic calming creates networks with low vehicle speeds and volumes that are more conducive to walking and bicycling. Building a low-stress bicycle network produces a similar outcome. Implementation options are similar to strategy 2 above. One potential change in this strategy over time is that e-bikes (and e-scooters) could extend the effective range of travel on the bicycle network, which could enhance the effectiveness of this strategy.

4. Implement car-sharing program – This strategy reduces the need to own a vehicle or reduces the number of vehicles owned by a household by making it convenient to access a shared vehicle for those trips where vehicle use is essential. Note that implementation of this strategy would require regional or local agency implementation and coordination and would not likely be applicable for individual development projects.

5. Increase transit service frequency and speed – This strategy focuses on improving transit service convenience and travel time competitiveness with driving. While the WRCOG area has fixed route rail and bus service that could be enhanced, it's also possible that new forms of low-cost demand-responsive transit service could be provided. The demand-responsive service could be provided as subsidized trips by contracting to private TNCs or Taxi companies. Alternatively, a public transit operator could provide the subsidized service but would need to improve on traditional cost effectiveness by relying on TNC ride-hailing technology, using smaller vehicles sized to demand, and flexible driver employment terms where drivers are paid by trip versus by hour. This type of service would reduce wait times for travelers and improve the typical in-vehicle travel time compared to traditional transit. Note that implementation of this strategy would require regional or local agency implementation, substantial changes to current transit practices, and would not likely be applicable for individual development projects.

6. Encourage telecommuting and alternative work schedules – This strategy relies of effective internet access and speeds to individual project sites/buildings to provide the opportunity for telecommuting. The effectiveness of the strategy depends on the ultimate building tenants and this should be a factor in considering the potential VMT reduction.

7. Provide ride-sharing programs – This strategy focuses on encouraging carpooling and vanpooling by project site/building tenants and has similar limitations as strategy 6 above.

Because of the limitations noted above, strategies 1, 2, 3, 6, and 7 are initially considered the highest priorities for individual land use project mitigation subject to review and discussion with the project team and advisory committee.

The VMT reduction strategies can be quantified using CACPOA calculation methodologies and recent ARB research findings. Attachment C provides calculation methodologies for each of the mitigations provided above, along with their range of effectiveness.

Please review this information and let us know if you have any follow up questions.

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ATTACHMENT A

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Comparison of CAPCOA Strategies Versus New Research Since 2010

					New Information Since CAPCOA Was Published in 2010		
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New information	Change in VMT reduction compared to CAPCOA	Literature or Evidence Cited
Land Use/Location	3.1.1	LUT-1 Increase Density	0.8% - 30% VMT reduction due to increase in density	Adequate	Increasing residential density is associated with lower VMT per capita. Increased residential density in areas with high jobs access may have a greater VMT change than increases in regions with lower jobs access. The range of reductions is based on a range of elasticities from -0.04 to -0.22. The low end of the reductions represents a -0.04 elasticity of demand in response to a 10% increase in residential units or employment density and a -0.22 elasticity in response to 50% increase to residential/employment density.	0.4% -10.75%	Primary sources: Boarnet, M. and Handy, S. (2014). Impacts of Residential Density on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary source: Stevens, M. (2017). Does Compact Development Make People Drive Less? Journal of the American Planning Association, 83(1), 7-18.
Land Use/Location	3.1.9	LUT-9 Improve Design of Development	3.0% - 21.3% reduction in VMT due to increasing intersection density vs. typical ITE suburban development	Adequate	No update to CAPCOA literature; advise applying CAPCOA measure only to large developments with significant internal street structure.	Same	N/A
Land Use/Location	3.1.4	LUT-4 Increase Destination Accessibility	6.7%-20% VMT reduction due to decrease in distance to major job center or downtown	Adequate	Reduction in VMT due to increased regional accessibility (jobs gravity). Locating new development in areas with good access to destinations reduces VMT by reducing trip lengths and making walking, biking, and transit trips more feasible. Destination accessibility is measured in terms of the number of jobs (or other attractions) reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones.	0.5%-12%	Primary sources: Handy, S. et al. (2014). Impacts of Network Connectivity on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Handy, S. et al. (2013). Impacts of Regional Accessibility on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary source: Holtzclaw, et al. (2002.) Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and Chicago. Transportation Planning and Technology, Vol. 25, pp. 1–27.

Comparison of CAPCOA Strategies Versus New Research Since 2010

					New Information Since CAPCOA Was Published in 2010		
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New information	Change in VMT reduction compared to CAPCOA	Literature or Evidence Cited
Land Use/ Location	3.1.3	LUT-3 Increase Diversity of Urban and Suburban Developments	9%-30% VMT reduction due to mixing land uses within a single development	Adequate	1] VMT reduction due to mix of land uses within a single development. Mixing land uses within a single development can decrease VMT (and resulting GHG emissions), since building users do not need to drive to meet all of their needs. 2] Reduction in VMT due to regional change in entropy index of diversity. Providing a mix of land uses within a single neighborhood can decrease VMT (and resulting GHG emissions), since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. At the regional level, reductions in VMT are measured in response to changes in the entropy index of land use diversity.	1] 0%-12% 2] 0.3%-4%	1] Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Frank, L., Greenwald, M., Kavage, S. and Devlin, A. (2011). An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy. WSDOT Research Report WA-RD 765.1. Washington State Department of Transportation. Retrieved from: http://www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75-79. Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions- Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm 2] Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel."
Land Use/ Location	3.1.5	LUT-5 Increase Transit Accessibility	0.5%-24.6% reduce in VMT due to locating a project near high-quality transit	Adequate	1] VMT reduction when transit station is provided within 1/2 mile of development (compared to VMT for sites located outside 1/2 mile radius of transit). Locating high density development within 1/2 mile of transit will facilitate the use of transit by people traveling to or from the Project site. The use of transit results in a mode shift and therefore reduced VMT. 2] Reduction in vehicle trips due to implementing TOD. A project with a residential/commercial center designed around a rail or bus station, is called a transit-oriented development (TOD). The project description should include, at a minimum, the following design features: • A transit station/stop with high-quality, high-frequency bus service located within a 5-10 minute walk (or roughly ¼ mile from stop to edge of development), and/or • A rail station located within a 20 minute walk (or roughly ½ mile from station to edge of development) • Fast, frequent, and reliable transit service connecting to a high percentage of regional destinations • Neighborhood designed for walking and cycling	1] 0%-5.8% 2] 0%-7.3%	1] Lund, H. et al. (2004). Travel Characteristics of Transit-Oriented Development in California. Oakland, CA: Bay Area Rapid Transit District, Metropolitan Transportation Commission, and Caltrans. Tal, G. et al. (2013). Policy Brief on the Impacts of Transit Access (Distance to Transit) Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/transitaccess/transit_access_brief120313.pdf 2] Zamir, K. R. et al. (2014). Effects of Transit-Oriented Development on Trip Generation, Distribution, and Mode Share in Washington, D.C., and Baltimore, Maryland. Transportation Research Record: Journal of the Transportation Research Board. 2413, 45–53. DOI: 10.3141/2413-05

Comparison of CAPCOA Strategies Versus New Research Since 2010

CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New Information Since CAPCOA Was Published in 2010		
					New information	Change in VMT reduction compared to CAPCOA	Literature or Evidence Cited
Land Use/ Location	3.1.6	LUT-6 Integrate Affordable and Below Market Rate Housing	0.04%-1.20% reduction in VMT for making up to 30% of housing units BMR	Weak - Should only be used where supported by local data on affordable housing trip generation.	Observed trip generation indicates substantial local and regional variation in trip making behavior at affordable housing sites. Recommend use of ITE rates or local data for senior housing.	N/A	"Draft Memorandum: Infill and Complete Streets Study, Task 2.1: Local Trip Generation Study." Measuring the Miles: Developing new metrics for vehicle travel in LA. City of Los Angeles, April 19, 2017.
Neighborhood Site Enhancements	3.2.1	SDT-1 Provide Pedestrian Network Improvements	0%-2% reduction in VMT for creating a connected pedestrian network within the development and connecting to nearby destinations	Adequate	VMT reduction due to provision of complete pedestrian networks. Only applies if located in an area that may be prone to having a less robust sidewalk network.	0.5%-5.7%	Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Neighborhood Site Enhancements	3.2.2	SDT-2 Provide Traffic Calming Measures	0.25%-1% VMT reduction due to traffic calming on streets within and around the development	Adequate	Reduction in VMT due to expansion of bike networks in urban areas. Strategy only applies to bicycle facilities that provide a dedicated lane for bicyclists or a completely separated right-of-way for bicycles and pedestrians. Project-level definition: Enhance bicycle network citywide (or at similar scale), such that a building entrance or bicycle parking is within 200 yards walking or bicycling distance from a bicycle network that connects to at least one of the following: at least 10 diverse uses; a school or employment center, if the project total floor area is 50% or more residential; or a bus rapid transit stop, light or heavy rail station, commuter rail station, or ferry terminal. All destinations must be 3-mile bicycling distance from project site. Include educational campaigns to encourage bicycling.	0%-1.7%	Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103.
Neighborhood Site Enhancements	3.2.3	SDT-3 Implement an NEV Network	0.5%-12.7% VMT reduction for GHG-emitting vehicles, depending on level of local NEV penetration	Weak - not recommended without supplemental data.	Limited evidence and highly limited applicability. Use with supplemental data only.	N/A	City of Lincoln, MHM Engineers & Surveyors, Neighborhood Electric Vehicle Transportation Program Final Report, Issued 04/05/05, and City of Lincoln, A Report to the California Legislature as required by Assembly Bill 2353, Neighborhood Electric Vehicle Transportation Plan Evaluation, January 1, 2008. Cited in: California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

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Comparison of CAPCOA Strategies Versus New Research Since 2010

					New Information Since CAPCOA Was Published in 2010		
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New information	Change in VMT reduction compared to CAPCOA	Literature or Evidence Cited
Neighborhood Site Enhancements	3.4.9	TRT-9 Implement Car-Sharing Program	0.4% - 0.7% VMT reduction due to lower vehicle ownership rates and general shift to non-driving modes	Adequate	Vehicle trip reduction due to car-sharing programs; reduction assumes 1%-5% penetration rate. Implementing car-sharing programs allows people to have on-demand access to a shared fleet of vehicles on an as-needed basis, as a supplement to trips made by non-SOV modes. Transit station-based programs focus on providing the "last-mile" solution and link transit with commuters' final destinations. Residential-based programs work to substitute entire household based trips. Employer-based programs provide a means for business/day trips for alternative mode commuters and provide a guaranteed ride home option. The reduction shown here assumes a 1%-5% penetration rate.	0.3%-1.6%	Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Need to verify with more recent UCD research.
Parking Pricing	3.3.1	PDT-1 Limit Parking Supply	5%-12.5% VMT reduction in response to reduced parking supply vs. ITE parking generation rate	Weak - not recommended. Fehr & Peers has developed new estimates for residential land use only that may be used.	CAPCOA reduction range derived from estimate of reduced vehicle ownership, not supported by observed trip or VMT reductions. Evidence is available for mode shift due to presence/absence of parking in high-transit urban areas; additional investigation ongoing	Higher	Fehr & Peers estimated a linear regression formula based on observed data from multiple locations. Resulting equation produces maximum VMT reductions for residential land use only of 30% in suburban locations and 50% in urban locations based on parking supply percentage reductions.
Parking Pricing	3.3.2	PDT-2 Unbundle Parking Costs from Property Cost	2.6% -13% VMT reduction due to decreased vehicle ownership rates	Adequate - conditional on the agency not requiring parking minimums and pricing/managing on-street parking (i.e., residential parking permit districts, etc.).	Reduction in VMT, primarily for residential uses, based on range of elasticities for vehicle ownership in response to increased residential parking fees. Does not account for self-selection. Only applies if the city does not require parking minimums and if on-street parking is priced and managed (i.e., residential parking permit districts).	2%-12%	Victoria Transport Policy Institute (2009). Parking Requirement Impacts on Housing Affordability. Retrieved March 2010 from: http://www.vtpi.org/park-hou.pdf.

Comparison of CAPCOA Strategies Versus New Research Since 2010

					New Information Since CAPCOA Was Published in 2010		
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New information	Change in VMT reduction compared to CAPCOA	Literature or Evidence Cited
Parking Pricing	3.3.3	PDT-3 Implement Market Price Public Parking	2.8%-5.5% VMT reduction due to "park once" behavior and disincentive to driving	Adequate	Implement a pricing strategy for parking by pricing all central business district/employment center/retail center on-street parking. It will be priced to encourage park once" behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from project supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area-wide mode shifts to justify increased transit service to the area. VMT reduction applies to VMT from visitor/customer trips only. Reductions higher than top end of range from CAPCOA report apply only in conditions with highly constrained on-street parking supply and lack of comparably-priced off-street parking.	2.8%-14.5%	Clinch, J.P. and Kelly, J.A. (2003). Temporal Variance Of Revealed Preference On-Street Parking Price Elasticity. Dublin: Department of Environmental Studies, University College Dublin. Retrieved from: http://www.ucd.ie/gpep/research/workingpapers/2004/04-02.pdf. Cited in Victoria Transport Policy Institute (2017). Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm Hensher, D. and King, J. (2001). Parking Demand and Responsiveness to Supply, Price and Location in Sydney Central Business District. Transportation Research A. 35(3), 177-196. Millard-Ball, A. et al. (2013). Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment. Transportation Research Part A. 63(2014), 76-92. Shoup, D. (2011). The High Cost of Free Parking. APA Planners Press. p. 290. Cited in Pierce, G. and Shoup, D. (2013). Getting the Prices Right. Journal of the American Planning Association. 79(1), 67-81.
Transit System	3.5.3	TST-3 Expand Transit Network	0.1-8.2% VMT reduction in response to increase in transit network coverage	Adequate	Reduction in vehicle trips due to increased transit service hours or coverage. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements).	0.1%-10.5%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Transit System	3.5.4	TST-4 Increase Transit Service Frequency/Speed	0.02%-2.5% VMT reduction due to reduced headways and increased speed and reliability	Adequate	Reduction in vehicle trips due to increased transit frequency/decreased headway. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements).	0.3%-6.3%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Transit System	3.5.1	TST-1 Provide a Bus Rapid Transit System	0.02%-3.2% VMT reduction by converting standard bus system to BRT system	Adequate	No new information identified.	Same	N/A
Commute Trip Reduction	3.4.1	TRT-1 Implement CTR Program - Voluntary	1.0%-6.2% commute VMT reduction due to employer-based mode shift program	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-2 Implement CTR Program - Required Implementation/Monitoring" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Reduction in vehicle trips in response to employer-led TDM programs. The CTR program should include all of the following to apply the effectiveness reported by the literature: • Carpooling encouragement • Ride-matching assistance • Preferential carpool parking • Flexible work schedules for carpools • Half time transportation coordinator • Vanpool assistance • Bicycle end-trip facilities (parking, showers and lockers)	1.0%-6.0%	Boarnet, M. et al. (2014). Impacts of Employer-Based Trip Reduction Programs and Vanpools on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.2	TRT-2 Implement CTR Program - Required Implementation/Monitoring	4.2%-21.0% commute VMT reduction due to employer-based mode shift program with required monitoring and reporting	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Limited evidence available. Anecdotal evidence shows high investment produces high VMT/vehicle trip reductions at employment sites with monitoring requirements and specific targets.	Same	Nelson/Nygaard (2008). South San Francisco Mode Share and Parking Report for Genentech, Inc.(p. 8) Cited in: California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

Comparison of CAPCOA Strategies Versus New Research Since 2010

					New Information Since CAPCOA Was Published in 2010		
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New information	Change in VMT reduction compared to CAPCOA	Literature or Evidence Cited
Commute Trip Reduction	3.4.4	TRT-4 Implement Subsidized or Discounted Transit Program	0.3%-20% commute VMT reduction due to transit subsidy of up to $6/day	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	1] Reduction in vehicle trips in response to reduced cost of transit use, assuming that 10-50% of new bus trips replace vehicle trips; 2] Reduction in commute trip VMT due to employee benefits that include transit 3] Reduction in all vehicle trips due to reduced transit fares system-wide, assuming 25% of new transit trips would have been vehicle trips.	1] 0.3%-14% 2] 0-16% 3] 0.1% to 6.9%	1] Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm 2] Carolina, P. et al. (2016). Do Employee Commuter Benefits Increase Transit Ridership? Evidence rom the NY-NJ Region. Washington, DC: Transportation Research Board, 96th Annual Meeting. 3] Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.15	TRT-15 Employee Parking Cash-Out	0.6%-7.7% commute VMT reduction due to implementing employee parking cash-out	Weak - Effectiveness is building/tenant specific. Research data is over 10 years old (1997).	Shoup case studies indicate a reduction in commute vehicle trips due to implementing cash-out without implementing other trip-reduction strategies.	3%-7.7%	Shoup, D. (1997). Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies. Transport Policy. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/research/apr/past/93-308a.pdf. This citation was listed as an alternative literature in CAPCOA.
Commute Trip Reduction	3.4.14	TRT-14 Price Workplace Parking	0.1%-19.7% commute VMT reduction due to mode shift	Adequate - Effectiveness is building/tenant specific.	Reduction in commute vehicle trips due to priced workplace parking; effectiveness depends on availability of alternative modes. Workplace parking pricing may include: explicitly charging for parking, implementing above market rate pricing, validating parking only for invited guests, not providing employee parking and transportation allowances, and educating employees about available alternatives.	0.5%-14%	Primary sources: Concas, S. and Nayak, N. (2012), A Meta-Analysis of Parking Price Elasticity. Washington, DC: Transportation Research Board, 2012 Annual Meeting. Dale, S. et al. (2016). Evaluating the Impact of a Workplace Parking Levy on Local Traffic Congestion: The Case of Nottingham UK. Washington, DC: Transportation Research Board, 96th Annual Meeting. Secondary sources: Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm Spears, S. et al. (2014). Impacts of Parking Pricing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.6	TRT-6 Encourage Telecommuting and Alternative Work Schedules	0.07%-5.5% commute VMT reduction due to reduced commute trips	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	VMT reduction due to adoption of telecommuting. Alternative work schedules could take the form of staggered starting times, flexible schedules, or compressed work weeks.	0.2%-4.5%	Handy, S. et al. (2013). Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf
Commute Trip Reduction	3.4.7	1] TRT-7 Implement CTR Marketing 2] Launch Targeted Behavioral Interventions	0.8%-4.0% commute VMT reduction due to employer marketing of alternatives	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	1] Vehicle trips reduction due to CTR marketing; 2] Reduction in VMT from institutional trips due to targeted behavioral intervention programs	1] 0.9% to 26% 2] 1%-6%	1] Pratt, Dick. Personal communication regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies. Transit Cooperative Research Program. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Dill, J. and Mohr, C. (2010). Long-Term Evaluation of Individualized Marketing Programs for Travel Demand Management. Portland, OR: Transportation Research and Education Center (TREC). Retrieved from: http://pdxscholar.library.pdx.edu/usp_fac 2] Brown, A. and Ralph, K. (2017.) "The Right Time and Place to Change Travel Behavior: An Experimental Study." Washington, DC: Transportation Research Board, 2017 Annual Meeting. Retrieved from: https://trid.trb.org/view.aspx?id=1437253
Commute Trip Reduction	3.4.11	TRT-11 Provide Employer-Sponsored Vanpool/Shuttle	0.3%-13.4% commute VMT reduction due to employer-sponsored vanpool and/or shuttle service	Adequate - Effectiveness is building/tenant specific.	1] Reduction in commute vehicle trips due to implementing employer-sponsored vanpool and shuttle programs; 2] Reduction in commute vehicle trips due to vanpool incentive programs; 3] Reduction in commute vehicle trips due to employer shuttle programs	1] 0.5%-5.0% 2] 0.3%-7.4% 3] 1.4%-6.8%	1] Concas, Sisinnio, Winters, Philip, Wambalaba, Francis, (2005). Fare Pricing Elasticity, Subsidies, and Demand for Vanpool Services. Transportation Research Record: Journal of the Transportation Research Board, 1924, pp 215-223. 2] Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm 3] ICF. (2014). GHG Impacts for Commuter Shuttles Pilot Program.

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Comparison of CAPCOA Strategies Versus New Research Since 2010

					New Information Since CAPCOA Was Published in 2010		
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New information	Change in VMT reduction compared to CAPCOA	Literature or Evidence Cited
Commute Trip Reduction	3.4.3	TRT-3 Provide Ride-Sharing Programs	1%-15% commute VMT reduction due to employer ride share coordination and facilities	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Commute vehicle trips reduction due to employer ride-sharing programs. Promote ride-sharing programs through a multi-faceted approach such as: • Designating a certain percentage of parking spaces for ride sharing vehicles • Designating adequate passenger loading and unloading and waiting areas for ride-sharing vehicles • Providing an app or website for coordinating rides	2.5%-8.3%	Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm
Commute Trip Reduction	3.4.10	TRT-10 Implement a School Pool Program	7.2%-15.8% reduction in school VMT due to school pool implementation	Adequate - School VMT only.	Limited new evidence available, not conclusive	Same	Transportation Demand Management Institute of the Association for Commuter Transportation. TDM Case Studies and Commuter Testimonials. Prepared for the US EPA. 1997. (p. 10, 36-38) WayToGo 2015 Annual Report. Accessed on March 12, 2017 from http://www.waytogo.org/sites/default/files/attachments/waytogo-annual-report-2015.pdf
Commute Trip Reduction	3.4.13	TRT-13 Implement School Bus Program	38%-63% reduction in school VMT due to school bus service implementation	Adequate - School VMT only.	VMT reduction for school trips based on data beyond a single school district. School district boundaries are also a factor to consider. VMT reduction does not appear to be a factor that was considered in a select review of CA boundaries. VMT reductions apply to school trip VMT only.	5%-30%	Wilson, E., et al. (2007). The implications of school choice on travel behavior and environmental emissions. Transportation Research Part D: Transport and Environment 12(2007), 506-518.
Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Bikeshare car trip substitution rate of 7-19% based on data from Washington DC, and Minneapolis/St. Paul. Annual VMT reduction of 151,000 and 57,000, respectively. Includes VMT for rebalancing and maintenance. VMT reduction of 0.023 miles per day per bikeshare member estimated for Bay Area bikeshare, utilizing Minneapolis/St. Paul data from study above.	57,000-151,000 annual VMT reduction, based on two large US cities. VMT reduction of 0.023 miles per day per member, based on one large US city estimate.	Fishman, E., Washington, S., & Haworth, N. (2014). Bike share's impact on car use: Evidence from the United States, Great Britain, and Australia. Transportation Research Part D: Transport and Environment, 31, 13-20. TDM Methodology: Impact of Carsharing Membership, Transit Passes, Bikesharing Membership, Unbundled Parking, and Parking Supply Reductions on Driving. Center for Neighborhood Technology, Peter Haas and Cindy Copp, with TransForm staff, May 5, 2016.

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ATTACHMENT B

Relevant Strategies for Implementation in WRCOG Jurisdictions Due to Land Use Context

CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New Information Since CAPCOA Was Published in 2010		
					New information	Change in VMT reduction compared to CAPCOA(1)	Literature or Evidence Cited
Land Use/ Location	3.1.3	LUT-3 Increase Diversity of Urban and Suburban Developments	9%-30% VMT reduction due to mixing land uses within a single development	Adequate	1] VMT reduction due to mix of land uses within a single development; 2] Reduction in VMT due to regional change in entropy index of diversity.	1] 0%-12% 2] 0.3%-4%	1] Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Frank, L., Greenwald, M., Kavage, S. and Devlin, A. (2011). An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy. WSDOT Research Report WA-RD 765.1. Washington State Department of Transportation. Retrieved from: http://www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75-79. Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions- Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm 2] Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel."
Neighborhood Site Enhancements	3.2.1	SDT-1 Provide Pedestrian Network Improvements	0%-2% reduction in VMT for creating a connected pedestrian network within the development and connecting to nearby destinations	Adequate	VMT reduction due to provision of complete pedestrian networks.	0.5%-5.7%	Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Neighborhood Site Enhancements	3.2.2	SDT-2 Provide Traffic Calming Measures	0.25%-1% VMT reduction due to traffic calming on streets within and around the development	Adequate	Reduction in VMT due to building out a low-stress bike network; reduction in VMT due to expansion of bike networks in urban areas.	0%-1.7%	1] California Air Resources Board. (2016). Greenhouse Gas Quantification Methodology for the California Transportation Commission Active Transportation Program Greenhouse Gas Reduction Fund Fiscal Year 2016-17. Retrieved from: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/ctc_atp_finalqm_16-17.pdf. 2] Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103.
Neighborhood Site Enhancements	3.4.9	TRT-9 Implement Car-Sharing Program	0.4% - 0.7% VMT reduction due to lower vehicle ownership rates and general shift to non-driving modes	Adequate	Vehicle trip reduction due to car-sharing programs; reduction assumes 1%-5% penetration rate. Car sharing effect on VMT is still evolving due to TNC effects. UCD research showed less effect on car ownership due to car sharing participation and an uncertain effect on VMT.	0.3%-1.6%	Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Clewlow, Regina R. and Mishra, Gouri Shankar, (2017). Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States. UC Davis, Institute of Transportation Studies. Research Report - UCD-ITS-RR-17-07.
Transit System	3.5.4	TST-4 Increase Transit Service Frequency/Speed	0.02%-2.5% VMT reduction due to reduced headways and increased speed and reliability	Adequate	Reduction in vehicle trips due to increased transit frequency/decreased headway.	0.3%-6.3%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm

Relevant Strategies for Implementation in WRCOG Jurisdictions Due to Land Use Context

					New Information Since CAPCOA Was Published in 2010		
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New information	Change in VMT reduction compared to CAPCOA(1)	Literature or Evidence Cited
Commute Trip Reduction	3.4.6	TRT-6 Encourage Telecommuting and Alternative Work Schedules	0.07%-5.5% commute VMT reduction due to reduced commute trips	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	VMT reduction due to adoption of telecommuting	0.2%-4.5%	Handy, S. et al. (2013). Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf
Commute Trip Reduction	3.4.3	TRT-3 Provide Ride-Sharing Programs	1%-15% commute VMT reduction due to employer ride share coordination and facilities	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Commute vehicle trips reduction due to employer ride-sharing programs	2.5%-8.3%	Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm

NOTES:

(1) For specific VMT reduction ranges, refer to the cited literature.

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ATTACHMENT C

Increase Diversity of Urban and Suburban Developments (Mixed Use)

Range of Effectiveness:

0 – 12% vehicle miles traveled (VMT) reduction due to a mix of land uses within a single development (Ewing and Cervero, 2010).

0.3 – 4% VMT reduction due to change in land use entropy index (i.e., land use mix) within a project's sphere of influence (Zhang).

Measure Description:

Having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example, when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. A description of diverse uses for urban and suburban areas is provided below (CAPCOA 2010, p. 162)

Urban:

An urban project is predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential, are combined in a single building or on a single site in an integrated development project with functional interrelationships and a coherent physical design. These mixed-use developments should encourage walking and other non-auto modes of transport from residential to office/commercial/institutional locations (and vice versa). The residential units should be within a quarter mile of parks, schools, or other civic uses. These projects minimize the need for external trips by including services/facilities for day care, banking/ATM, restaurants, vehicle refueling, and shopping (CAPCOA 2010, p. 162).

Suburban:

A suburban project has at least three of the following on site and/or offsite within a quarter mile: residential development, retail development, park, open space, or office. These mixed-use developments should encourage walking and other non-auto modes of transport from residential to office/commercial locations (and vice versa). These projects minimize the need for external trips by including services/facilities for day care, banking/ATM, restaurants, vehicle refueling, and shopping (CAPCOA 2010, p. 162).

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context (unless the project is a master-planned community)
- Appropriate for mixed-use projects

Inputs:

The following information needs to be provided by the project applicant:

- Percentage of each land use type in the project

Mitigation Method:

$$\%\ VMT\ Reduction\ =\ Land\ Use \times E_{Diversity}$$

$$(not\ to\ exceed\ 15\%\ for\ non-work\ trips\ and\ 25\%\ for\ commute\ trips)$$

Where:

$$Land\ Use = (Land\ Use\ Index - 0.15)/0.15\ (not\ to\ exceed\ 500\%\ increase)$$

$$Land\ Use\ Index = -a/\ln(6)$$

$a = \sum_{i=1}^{6} a_i \times \ln(a_i)$ (Song and Knaap, 2004)

$a_i = Building\ floor\ area\ of\ land\ use\ i/total\ square\ feet\ of\ project\ land\ area$

- $a_1 = Single\ family\ residential$
- $a_2 = Multifamily\ residential$
- $a_3 = Commercial$
- $a_4 = Industrial$
- $a_5 = Institutional$
- $a_6 = Park$

$E_{Diversity}\ = Elasticity\ of\ VMT\ with\ restpect\ to\ land\ use\ index = 0.02\ to\ 0.08$ [4]

If land use a_i is not present, set a_i equal to 0.01

Discussion:

In the above calculation, a land use index of 0.15 is used as a baseline representing a development with a single land use. There are two separate maxima that should be noted: an effective cap of 500% on the allowable percentage increase of land use index and a cap of 15% and 25% on percent VMT reduction for non-work and commute trips, respectively. The 500 percent cap reflects the expected change in a land use index from 0.15 to 0.90, or from single use to a nearly equal balance of all six uses included in this method. The purpose for the 15% and 25% caps is to limit the influence of any single environmental factor (such as diversity). This emphasizes that community designs that implement multiple land use strategies (such as density, design, diversity, etc.) will show more of a reduction than relying on improvements from a single land use factor (CAPCOA 2010, p. 164).

The land use (or entropy) index measurement looks at the mix of land uses of a development. An index of 0 indicates a single land use while 1 indicates a full mix of uses. The preferred elasticity of VMT with respect to the land use mix index for Riverside County is 0.02, per work examining policy effects on VMT conducted by Salon et al for the Air Resource Board.

Example:

Sample calculations are provided below:

90% single family homes, 10% commercial

- $Land\ use\ index = -[0.9 \times \ln(0.9) + 0.1 \times \ln(0.1) + 4 \times 0.01 \times \ln(0.01)]/\ln(6) = 0.3$
- $Low\ Range\ \%\ VMT\ Reduction = (0.3 - 0.15)/0.15 \times 0.02 = 2\%$

1/6 single family, 1/6 multi-family, 1/6 commercial, 1/6 industrial, 1/6 institutional, 1/6 parks

- $Land\ use\ index = -[6 \times 0.17 \times \ln(0.17)]/\ln(6) = 1$
- $High\ Range\ \%\ VMT\ Reduction\ (land\ use\ index = 1)$
- $Land\ use = (1 - 0.15)/0.15 = 5.6\ or\ 566\%.\ Since\ this\ is\ greater\ than\ 500\%, set\ to\ 500\%$
- $\%\ VMT\ Reduction = (5 \times 0.02) = 10\%$

References:

Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

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Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75-79.

Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf

Salon, D., Boarnet, M. G., Handy, S., Spears, S., & Tal, G. (2012). How do local actions affect VMT? A critical review of the empirical evidence. *Transportation research part D: transport and environment, 17(7),* 495-508

Song, Y., and Knaap, G., "Measuring the effects of mixed land uses on housing values." Regional Science and Urban Economics 34 (2004) 663-680.(p. 669) http://urban.csuohio.edu/~sugie/papers/RSUE/RSUE2005_Measuring%20the%20effects%20of%20mixed%20land%20use.pdf

Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions-Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm

Quantifying Greenhouse Gas Mitigation Measures, California Air Pollution Control Officers Association (CAPCOA), 2010. Chapter 3.1.3 Increase Diversity of Urban and Suburban Developments (Mixed Use).

Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel."

Provide Pedestrian Network Improvements

Range of Effectiveness:

0.5 – 5.7% VMT reduction

Measure Description:

Providing pedestrian access at and near a project site encourages people to walk instead of drive, presuming that desirable destinations exist within walking distance of the project. This mode shift results in people driving less and thus a reduction in VMT. The pedestrian access network should internally link all uses and connect to all existing or planned external streets and pedestrian facilities contiguous with the project site. It should also minimize barriers to pedestrian access and interconnectivity. Physical barriers such as walls, landscaping, and slopes that impede pedestrian circulation should be eliminated (CAPCOA 2010, p. 186).

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for residential, retail, office, industrial, and mixed-use projects
- Reduction benefit only occurs if the project has both pedestrian network improvements on site and connections to the larger off-site network. All calculations should incorporate the status of the network in the project's walkshed (i.e., within a ¼ mile radius).
- Desirable destinations external to the project site must be within walking distance (i.e., preferably within a ¼ mile and no greater than ½ mile).

Inputs:

The project applicant must provide information regarding pedestrian access and connectivity within the project and to/from off-site destinations. The change in sidewalk coverage should represent the share of quality sidewalk and pedestrian facilities available in the surrounding area; for instance, if one block-face of ten is missing sidewalks, the existing coverage is 90%. This measure is not effective in reducing VMT in locations with already fully-developed, high quality sidewalk networks.

Mitigation Method:

$$\%\ VMT\ Reduction = E_{PedAccess} \times Sidewalk\ Delta$$

Where:

$$E_{PedAccess} = \%\ Change\ in\ VMT\ per\ \%\ Increase\ in\ Sidewalk\ Coverage$$

$$Sidewalk\ Delta = Assumed\ change\ in\ sidewalk\ coverage\ compared\ to\ background\ condition$$

Detail:

$E_{PedAccess} = 0.0\ to\ 0.14$ (0.07 preferred in absence of other data)

$Sidwalk\ Delta = 5\%\ to\ 100\%$

Discussion:

Pedestrian Access Elasticity varies at the local level and is dependent on many factors such as the urban form of the immediate area and population characteristics. When reliable studies are available and applicable to the project area, this elasticity should be calculated. Otherwise, 0.07 is recommended based on the range provided by Handy, S. et al.

References:

Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions – Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm

Quantifying Greenhouse Gas Mitigation Measures, California Air Pollution Control Officers Association (CAPCOA), 2010. Chapter 3.2.1 Provide Pedestrian Network Improvements.

Provide Traffic Calming Measures

Range of Effectiveness:

0 – 1.7% VMT reduction

Measure Description:

Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift results in a decrease in VMT. Project design should include pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Roadways should be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, etc. (CAPCOA 2010, p. 190).

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects

Inputs:

The following information needs to be provided by the project applicant:

- Percentage of streets within project with traffic calming improvements
- Percentage of intersections within project with traffic calming improvements

Mitigation Calculation:

The VMT reduction is a function of the percentage of streets and intersections within the project with traffic calming improvements based on the following look up table.

% VMT Reduction		% of Streets with Improvements			
		25%	50%	75%	100%
% of Intersections with Improvements	25%	0.425%	0.425%	0.85%	0.85%
	50%	0.425%	0.85%	0.85%	1.275%
	75%	0.85%	0.85%	1.275%	1.275%
	100%	0.85%	1.275%	1.275%	1.7%

Discussion:

The table above allows the project applicant to calculate a VMT reduction estimate based on the project's street and intersection design with respect to traffic calming. The applicant should look at the rows on the left and choose the percent of intersections within the project which will have traffic calming improvements. Then, the applicant should look at the columns along the top and choose the percent of streets within the project which will have traffic calming improvements. The intersection cell of the row and column selected in the matrix is the VMT reduction estimate.

Though the literature provides some difference between a suburban and urban context, the difference is small and thus the lower VMT reduction estimate was used to be applied to all contexts. Rural context is not specifically discussed in the literature but is presumed to have little to no effect on VMT reduction due to the long-distances between trip origins and destinations.

Research by Zahabi, S. et al. attributes up to a 1.7% VMT reduction to traffic calming measures. The table above illustrates the range of VMT reductions based on the percent of streets and intersections with traffic calming measures implemented. CAPCOA 2010 used a range of 0.25% to 1% for VMT reduction. The VMT reductions were updated using the same methodology to allow for reductions up to 1.7%.

Because of the high potential for double-counting, caution should be used when combining this measure with "Provide Pedestrian Network Improvements."

References:

California Air Resources Board. (2016). Greenhouse Gas Quantification Methodology for the California Transportation Commission Active Transportation Program Greenhouse Gas Reduction Fund Fiscal Year 2016-17. Retrieved from: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/ctc_atp_finalqm_16-17.pdf.

Quantifying Greenhouse Gas Mitigation Measures, California Air Pollution Control Officers Association (CAPCOA), 2010. Chapter 3.2.2 Provide Traffic Calming Measures.

Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103.

Implement Car-Sharing Program

Range of Effectiveness:

0.3 – 1.6% VMT reduction

Measure Description:

Implementation of a car-sharing program allows people to have on-demand access to a shared fleet of vehicles on an as-needed basis. VMT reduction occurs due to reductions in private vehicle ownership, lower convenience associated with indirect vehicle access, and the transparent cost of vehicle use. User costs are typically determined through mileage or hourly rates, with deposits and/or annual membership fees. The car-sharing program could be created through a local partnership or through one of many existing car-share companies. Car-sharing programs may be grouped into three general categories: residential- or citywide-based, employer-based, and transit station-based. Transit station-based programs focus on providing the "last-mile" solution and link transit with commuters' final destinations. Residential-based programs work to substitute entire household-based trips. Employer-based programs provide a means for business/day trips for alternative mode commuters and provide a guaranteed ride home option (CAPCOA 2010, p. 245).

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Inputs:

The following information needs to be provided by the project applicant:

- % reduction in car share member annual VMT
- Number of car share members per household

Mitigation Method:

$$\%\ VMT\ Reduction = P_{CarShare} \times Adoption\ Rate$$

Where:

$$P_{CarShare} = \%\ reduction\ in\ car\ share\ member\ annual\ VMT$$

$$Adoption\ Rate = number\ of\ car\ share\ members\ per\ household$$

Detail:

$$P_{CarShare} = 26.9\ to\ 37\%$$

$$Adoption\ Rate = 1\%\ to\ 2\%$$

Discussion:

The applicant must consider the demand for car-shares in a community before calculating a VMT reduction. If a community cannot support the proposed number of cars deployed, VMT reduction may be overestimated.

The percent reduction in car share member annual VMT is dependent on characteristics of the community, its residents, and for what purposes the car-sharing program is to be used for. Analysts should consult the literature to understand how these variables affect the range of reductions prior to completing the calculation of VMT reduction.

References:

Clewlow, Regina R. and Mishra, Gouri Shankar, (2017). Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States. UC Davis, Institute of Transportation Studies. Research Report - UCD-ITS-RR-17-07.

Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm

Quantifying Greenhouse Gas Mitigation Measures, California Air Pollution Control Officers Association (CAPCOA), 2010. Chapter 3.4.9 Implement Car-Sharing Program

Increase Transit Service Frequency/Speed

Range of Effectiveness:

0.03 – 6.3% VMT reduction.

Measure Description:

This measure reduces transit-passenger travel time through reduced headways and increased speed and reliability. This makes transit service more attractive and may result in a mode shift from auto to transit which reduces VMT (CAPCOA 2010, p. 280).

Inputs:

The following information needs to be provided by the project applicant:

- Percentage reduction in headways (increase in frequency) for applicable transit routes
- Level of implementation
- Project setting: urban center, urban, suburban
- Existing transit mode share

Mitigation Method:

$$\%\ VMT\ Reduction = Headway \times B \times C \times Mode$$

Where:

$$Headway = \%\ reduction\ in\ headways$$

$$B = Elasticity\ of\ transit\ ridership\ with\ respect\ to\ increased\ frequency\ of\ service$$

$$C = Ratio\ of\ vehicle\ trips\ reduced\ to\ number\ of\ new\ transit\ riders$$

$$Mode = Existing\ transit\ mode\ share$$

Detail:

$$B = 0.50$$

$$C = 25\%\ to\ 75\%$$

Discussion:

A 1% reduction in headways leads to 0.5% increase in transit ridership. This change is translated into a VMT reduction by applying a mode shift adjustment to account for new transit trips that do not represent displaced vehicle trips in addition to considering the existing transit mode share.

Variable C should be calculated based on local data. It is calculated by taking the length of an average transit trip within the sphere of influence of the project divided by the average vehicle trip length within the sphere of influence of the project.

References:

Handy, Lovejoy, Boarnet, Spears. 2013. "Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions." http://www.arb.ca.gov/cc/sb375/policies/transitservice/transit_brief.pdf

Litman, T. (2004). Transit price elasticities and cross-elasticities. Journal of Public Transportation, 7(2), 3.

Taylor, B. D., Miller, D., Iseki, H., & Fink, C. (2009). Nature and/or nurture? Analyzing the determinants of transit ridership across US urbanized areas. Transportation Research Part A: Policy and Practice, 43(1), 60-77.

Quantifying Greenhouse Gas Mitigation Measures, California Air Pollution Control Officers Association (CAPCOA), 2010. Chapter 3.5.4 Implement Transit Service Frequency/Speed

Encourage Telecommuting and Alternative Work Schedules

Range of Effectiveness:

0.2 – 4.5% commute VMT reduction.

Measure Description:

Encouraging telecommuting and alternative work schedules reduces the number of commute trips and therefore VMT traveled by employees. Alternative work schedules could take the form of staggered starting times, flexible schedules, or compressed work weeks (CAPCOA 2010, p. 236).

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for retail, office, industrial, and mixed-use projects
- VMT reduction is dependent on the performance of individual building tenants and may change over time. On-going monitoring and adjustment is necessary to achieve sustained reductions in VMT.

Inputs:

The following information needs to be provided by the project applicant:

- Percentage of employees participating (1 – 25%)
- Telecommute elasticity (see discussion below)

Mitigation Method:

$$\%\ Commute\ VMT\ Reduction = E_{Telecommute} * Telecommute\ Delta$$

Where:

$$Telecommute\ Delta = \%\ change\ in\ workers\ telecommuting\ with\ TDM\ Program$$

$$E_{Telecommute} = \%\ change\ in\ VMT\ per\ \%\ change\ in\ workers\ telecommuting$$

$$E_{Telecommute} = \ 0.18\ to\ 0.90$$

Discussion:

Telecommute Delta and $E_{Telecommute}$ should consider the potential for building tenants to change over time. Higher values require the employer at the site to be known and unlikely to change over time. $E_{Telecommute}$ will be lower in places with higher non-drive alone mode share, and higher in places with more drive alone vehicle mode share.

References:

Handy, Tal, Boarnet. 2013. "Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature."
https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf

Quantifying Greenhouse Gas Mitigation Measures, California Air Pollution Control Officers Association (CAPCOA), 2010. Chapter 3.4.6 Encourage Telecommuting and Alternative Work Schedules

Provide Ride-Sharing Programs

Range of Effectiveness:

2.5 – 8.3% commute VMT reduction.

Measure Description:

Increasing vehicle occupancy by ride-sharing results in fewer cars driving the same trip, and thus a decrease in VMT. Projects must implement a ride-sharing program as well as a permanent transportation management association membership and funding requirement to see VMT benefits. Funding may be provided by Community Facilities, District, or County Service Area, or other non-revocable funding mechanism (CAPCOA 2010, p. 227). Projects should promote ride-sharing programs through a multi-faceted approach such as:

- Designating a certain percentage of parking spaces for ride sharing vehicles
- Designating adequate passenger loading and unloading and waiting areas for ride-sharing vehicles
- Providing a web site or message board for coordinating rides
- Providing a guaranteed ride home program to carpool participants

Measure Applicability:

- Urban and suburban context
- Negligible impact in many rural contexts, but can be effective when a large employer in a rural area draws from a workforce in an urban or suburban area, such as when a major employer moves from an urban location to a rural location
- Appropriate for residential, retail, office, industrial, and mixed-use projects
- VMT reduction is dependent on the performance of individual building tenants and may change over time. On-going monitoring and adjustment is necessary to achieve sustained reductions in VMT.

Inputs:

The following information needs to be provided by the project applicant:

- Percent reduction in commute VMT
- Shared trips to VMT factor

Mitigation Method:

$$\%\ VMT\ Reduction = \%\ reduction\ in\ commute\ VMT \times Shared\ trips\ to\ VMT\ factor$$

Where:

$$\%\ reduction\ in\ commute\ VMT = 1.0\%\ to\ 20.0\%$$

$$Shared\ Trips\ to\ VMT\ Factor = 0.25\ to\ 0.50$$

Discussion:

The extent of reduction in VMT and the number of employees sharing a car is dependent on the employer, characteristics of employee's commutes and their home communities.

References:

Quantifying Greenhouse Gas Mitigation Measures, California Air Pollution Control Officers Association (CAPCOA), 2010. Chapter 3.4.3 Provide Ride-Sharing Programs

TCRP Report 95. Chapter 3: Park-and-Ride/Pool - Traveler Response to Transportation System Changes (2004).

TCRP Report 95. Chapter 5: Vanpools and Buspools - Traveler Response to Transportation System Changes (2005).

TCRP Report 95. Chapter 19: Employer and Institutional TDM Strategies - Traveler Response to Transportation System Changes (2010).