January 12, 2024

Ms. Callie Huff
Engstrom Properties, Inc.
837 Jefferson Blvd
West Sacramento, CA 95691

RE: VEHICLE MILES TRAVELED (VMT) ASSESSMENT FOR B STREET HOTEL SITE, MARYSVILLE, CA

Dear Ms. Huff:

Flecker Associates (FA) has completed our Vehicle Miles Travelled (VMT) assessment for the proposed B Street Hotel site in Marysville. The site is located along the east side of B Street, between 12th Street and 14th Street (Figure 1). The site is currently vacant; however, the proposed project will include a 113-room hotel, a 2,500 square foot Quick Serve Restaurant (QSR) and a 16,000 square foot grocery store (Figure 2). The QSR is likely to be a Starbucks coffee shop with drive-through lane. The site is zoned C-3, General Commercial.

With the implementation of SB 743 the focus of a transportation impact analysis under CEQA moves from consideration of operating Level of Service (LOS) to evaluation of a project's effects on regional VMT. The City of Marysville is in the process of updating their General Plan, and with it, adopting guidelines for evaluating VMT impacts under SB 743. Since the City does not have current guidelines, this assessment is using the *Technical Advisory on Evaluating Transportation Impacts in CEQA*[1] (December 2018) prepared by the Governor's Office of Planning and Research.

Trip Generation. For many types of land use development projects, estimates of the number of vehicle trips generated by a project are developed using trip generation rates from the Institute of Transportation Engineers (ITE) document *Trip Generation*, 11th Edition. The publication is an industry-standard reference document.

The proposed project includes construction of a 113-room hotel (Land Use Code 310), a 2,500 square foot QSR – coffee shop with drive-through lane (LUC 937) and a 16,000 square foot grocery store (LUC 850). The trip generation is shown in Table 1 along with descriptions of the various uses.

Trips generated by retail commercial projects fit into two categories. Some trips will be made by patrons who would not otherwise be on the local street system and who go out of their way to reach the site. These are "new" trips. Other trips will be made by patrons who are already in the roadway network and stop by the site as part of a trip made for another purpose. These "pass-by" trips do not add traffic to the overall system. ITE research has suggested typical "pass-by" percentages for various retail land uses.

[1] *Technical Advisory on Evaluating Transportation Impacts in CEQA.* Governor's Office of Planning and Research State of California, December 2018.

TABLE 1
AM / PM PEAK HOUR TRIP GENERATION

Land Use	Unit Quantity	Size	Trips Per Unit						
				AM Peak Hour			PM Peak Hour		
			Daily	Total	In	Out	Total	In	Out
Hotel (LUC 310)[1]	Rooms	113	7.99	0.46	56%	44%	0.59	51%	49%
Supermarket (LUC 850)[2]	KSF	16.00	93.84	2.86	59%	41%	8.95	50%	50%
Coffee Donut Shop w/ Drive-Thru (LUC 937)[3]	KSF	2.50	533.57	85.88	51%	49%	38.99	50%	50%
Hotel (LUC 310)			**903**	**52**	29	23	**67**	34	33
Supermarket (LUC 850)			**1501**	**46**	27	19	**143**	72	72
Coffee Donut Shop w/ Drive-Thru (LUC 937)			**1174**	**189**	96	93	**86**	43	43
Sub-Total Trips			***3578***	***287***	*152*	*134*	***296***	*148*	*147*
Internal Trips									
Hotel (LUC 310)		5%	(90)	(5)	(3)	(2)	(7)	(3)	(3)
Supermarket (LUC 850)		5%	(75)	(2)	(1)	(1)	(7)	(4)	(4)
Coffee Donut Shop w/ Drive-Thru (LUC 937)		5%	(59)	(9)	(5)	(5)	(4)	(2)	(2)
Sub-Total Trips			***(224)***	***(17)***	*(9)*	*(8)*	***(18)***	*(9)*	*(9)*
Pass-By Trips									
Supermarket *(23% Daily, 10% AM, 36% PM)[4]*			(328)	(4)	(3)	(2)	(49)	(24)	(24)
Coffee Shop with Drive-Through *(49% Daily, 48% AM, 50% PM)[4]*			(558)	(135	(69)	(66)	(41)	(20)	(20)
Total Pass-By Trips			**(886)**	**(139)**	(71)	(68)	**(90)**	(45)	(45)
Net New Trips			***2,468***	***131***	***72***	***59***	***188***	***95***	***93***

KSF – thousand square feet

[1] ITE Trip Generation, 11th Edition LU 310 - "A hotel is a place of lodging that provides sleeping accommodations and supporting facilities such as a full-service restaurant, cocktail lounge, meeting rooms, banquet room, and convention facilities".

[2] ITE Trip Generation, 11th Edition LU 850 - "A supermarket is a free-standing retail store that sells a complete assortment of food, beverage,food preparation materials, and household products. A supermarket may also provide additional products and services such as a bakery, dry cleaning, floral arrangements, greeting cards, a limited-service bank, and a pharmacy".

[3] ITE Trip Generation, 11th Edition LU 937 – "This land use includes any coffee and donut restaurant that has a drive-through window as well as a walk-in entrance area at which a patron can purchase and consume items. The restaurant sells freshly brewed coffee (along with coffee-related accessories) and a variety of food/drink products such as donuts, bagels, breads, muffins, cakes, sandwiches, wraps, salads, and other hot and cold beverages.

[4] ITE Trip Generation Handbook, 3rd Ed (note - used fast food with drive-through rate (LUC 934) for LUC 937)

Internally captured trips, those that visit the different uses within the site were assumed to be present between the gas station and car wash. Table 1 presents the "pass-by" trips and internal trips used.

The site is projected to create 3,578 daily trips, 287 a.m. peak hour trips and 296 p.m. peak hour trips. After considering internal trips, those trips being made to multiple uses by a single vehicle, and pass-by

trips, those vehicles already in the roadway network passing by the site, the net new traffic projected as a result of the project is expected to be 2,468 additional daily trips, 131 new a.m. peak hour trips and 188 additional p.m. peak hour trips.

Transit. The site is located along one Yuba-Sutter Transit bus route. The #4 route is a loop route that operates clockwise (#4A) and counterclockwise (#4B) between Peach Tree Clinic and the intersection of 22nd Street and Hansen Street. The route includes stops at the North Beale Transit Center (Walmart), downtown Marysville, the Yuba County Government Center and Marysville High School. The closest stop is at the Yuba One-Stop at 12th Street and Yuba Street, about ¼ mile from the project location.

The first bus departs in the clockwise loop from Marysville High School at 6:33 a.m. and leaves Peach Tree Clinic at 7:09 a.m. Thereafter, buses run hourly departing Peach Tree Clinic at nine minutes after the hour. The last bus departs at 6:09 p.m. The first bus departs Peach Tree Clinic in the counterclockwise loop at 6:39 a.m. with buses departing hourly; the last bus departs at 5:39 p.m. The clockwise route takes about an hour while the counterclockwise route takes about 53 minutes to complete the loop.

Vehicle Miles Traveled (VMT) Assessment

Vehicle Miles Traveled. In the City of Marysville, the impact of a project on LOS is an important factor in determining whether a project has a significant impact. However, changes made in 2018 to CEQA have changed how lead agencies use LOS in determining whether a project has a significant impact on transportation. As noted in the California Governor's Office of Planning and Research (OPR) document *Technical Advisory on Evaluating Transportation Impacts in CEQA*,

> "Senate Bill 743 (Steinberg, 2013), which was codified in Public Resources Code section 21099, required changes to the guidelines implementing CEQA (CEQA Guidelines) (Cal. Code Regs., Title 14, Div. 6, Ch. 3, § 15000 et seq.) regarding the analysis of transportation impacts. . . OPR has proposed, and the California Natural Resources Agency (Agency) has certified and adopted, changes to the CEQA Guidelines that identify vehicle miles traveled (VMT) as the most appropriate metric to evaluate a project's transportation impacts. With the California Natural Resources Agency's certification and adoption of the changes to the CEQA Guidelines, automobile delay, as measured by "level of service" and other similar metrics, generally no longer constitutes a significant environmental effect under CEQA. (Pub. Resources Code, § 21099, subd. (b)(3).)"

To help aid lead agencies with SB 743 implementation, the OPR's *Technical Advisory* provides guidance regarding the variety of implementation questions to be faced with respect to shifting to a VMT metric. Key guidance from this document includes:

- VMT is the most appropriate metric to evaluate a project's transportation impact.
- OPR recommends tour- and trip-based travel models to estimate VMT, but ultimately defers to local agencies to determine the appropriate tools.
- OPR recommends measuring VMT for residential and office projects on a "per capita" and "per employee" basis.

- OPR recommends that a per capita or per employee VMT that is fifteen percent below that of existing development may be a reasonable significance threshold. For example, an office project that generates VMT per employee that is more than 85 percent of the regional average VMT per employee could result in a significant impact. OPR notes that this threshold is supported by evidence that connects this level of reduction to the State's emissions goals.
- OPR recommends that where a project replaces existing VMT-generating land uses, if the replacement leads to a net overall decrease in VMT, the project would lead to a less-than-significant transportation impact. If the project leads to a net overall increase in VMT, then the thresholds described above should apply.
- OPR notes that lead agencies generally should presume that certain projects (including residential, retail, and office projects, as well as projects that are a mix of these uses) proposed within ½ mile of an existing major transit stop or an existing stop along a high quality transit corridor will have a less-than-significant impact on VMT.
- OPR states that by adding retail opportunities into the urban fabric and thereby improving retail destination proximity, local-serving retail development tends to shorten trips and reduce VMT. Generally, OPR suggested that retail development including stores smaller than 50,000 square feet might be considered local serving.
- Lead agencies have the discretion to set or apply their own significance thresholds; as noted, the City of Marysville is in the process of developing significance thresholds.

Certain types of projects as identified in statute, the CEQA Guidelines, or in OPR's Technical Advisory are presumed to have a less than significant impact on VMT and therefore a less than significant impact on transportation. Generally, the identified projects contribute to efficient land use patterns enabling higher levels of walking, cycling, and transit as well as lower average trip length. These projects include, for example, projects in transit priority areas, projects consisting of residential infill or those located in low VMT areas.

Caltrans references OPR's December 2018 *Technical Advisory*, which identifies projects and areas presumed to have a less than significant transportation impact. Those include:

1. An area pre-screened by an agency as having low residential or office VMT:

    a. An area where existing residential projects exhibit VMT per capita 15 percent or more below city or regional average.

    b. An area where existing office projects exhibit VMT per capita 15 percent or more below regional average.

2. Residential projects composed of 100 percent or near-100 percent affordable housing located in any infill location. Additionally, per OPR's Technical Advisory, "Lead agencies may develop their own presumption of less than significant impact for residential projects (or residential portions of mixed-use projects) containing a particular amount of affordable housing, based on local circumstances and evidence. Furthermore, a project which includes any affordable residential units may factor the effect of the affordability on VMT into the assessment of VMT generated by those units."

3. A locally-serving retail project (such a project typically reduces vehicle travel by providing a more proximate shopping destination, i.e., better accessibility).

4. Mixed-use projects composed entirely of low-VMT project types. Lead agencies can evaluate each component of a mixed-use project independently and apply the significance threshold for each project type included (e.g., residential and retail). Alternatively, a lead agency may consider only the project's dominant use. In the analysis of each use, a project should take credit for internal capture.

5. In any area of the state, absent substantial evidence indicating that a project would generate a potentially significant level of VMT, or inconsistency with a Sustainable Communities Strategy (SCS) or general plan, projects that generate or attract fewer than 110 trips per day generally may be assumed to cause a less-than significant transportation impact.

6. Residential, office, or retail projects within a Transit Priority Area, where a project is within a ½ mile of an existing or planned major transit stop or an existing stop along a high-quality transit corridor.

    a. A major transit stop is defined as a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods (Pub. Resources Code, § 21064.3).

    b. A high-quality transit corridor is defined as a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours (Pub. Resources Code, § 21155).

    However, a land use project near transit may have a significant impact on VMT if it:

        1. Has a floor area ratio less than 0.75.
        2. Includes more parking than required by the local permitting agency.
        3. Is inconsistent with the region's Sustainable Communities Strategy (i.e., development is outside region's development footprint, or in area specified as open space).
        4. Replaces affordable residential units with a smaller number of moderate- or high-income residential units.

The City of Marysville has yet to adopt local VMT guidelines; therefore, the above OPR guidelines were used in this analysis.

Screening Criteria. Screening criteria can be used to quickly identify whether sufficient evidence exists to presume a project will have a less than significant VMT impact without conducting a detailed study. However, each project should be evaluated against the evidence supporting that screening criteria to determine if it applies. Projects meeting at least one of the criteria below can be presumed to have a less than significant VMT impact, absent substantial evidence that the project will lead to a significant impact.

The following screening criteria have been reviewed. The extent to which the proposed project qualifies under each criterion is also noted.

- ***Small Projects:*** Defined as a project that generates 110 or fewer average daily vehicle trips or less than 880 VMT on a typical day.

  Assessment. The proposed project is estimated to generate 2,468 new vehicle trips per day. As this value exceeds the 110 daily trip threshold, the B Street Hotel site does not qualify under this metric.

  Conclusion. This criterion does not apply to the project.

- ***Affordable Housing:*** Defined as a project consisting of deed-restricted affordable housing.

  Conclusion. The proposed project is not of deed restricted affordable housing. This screening criteria does not apply.

- ***Proximity to High Quality Transit***: The directive notes that employment and residential development located within ½ mile of a high-quality transit corridor offering 15-minute headways can be presumed to have a less than significant impact. A high-quality transit stop is defined as a site containing an existing rail transit station or the intersection of at least two bus routes with a frequency of service of at least 15 minutes during the morning and evening commute periods. The City maintains a map showing the parcels that fit this criterion.

  Assessment. The proposed project is along the #4 route serviced by Yuba-Sutter Transit. The #4 route operates in clockwise and counterclockwise directions. The closest current stop is about 0.20 miles from the site and both routes operate at 60-minute headways; therefore, the current service does not meet the High Quality Transit requirements.

  Conclusion. The proposed project is not in an area served by high quality transit.

- ***Local Serving Retail***: Defined as retail uses of 50,000 square feet or less can be presumed to have a less than significant impact. Increasing retail opportunities closer to homes and workplaces may decrease VMT by substituting shorter trips for longer ones. Projects that fit this criterion for an individual retail site are used to distinguish local serving retail from more regional type businesses that draw customers from greater distances.

  Assessment. The project is a combination of retail uses, i.e. supermarket and QSR, and hotel use. *CalGreen 2022*, the statewide Green Buildings Standards Code, identifies hotels as part of residential construction when determining electric vehicle requirements. The retail portion of the project, the supermarket and QSR, total 18,500 square feet.

  Conclusion. Since the retail portion of the project is 50,000 square feet or less the project's VMT impacts can be presumed to be less than significant with no additional assessment necessary.

- ***Map-Based Screening for Residential and Office Projects*** **Projects in Low VMT-Generating Area.** This evaluation criteria is defined as a residential or office project that is in a VMT efficient area where regional VMT reduction goals are already satisfied. The project must be consistent in size and land use type (i.e., density, mix of uses, transit accessibility, etc.) as the surrounding built environment.

  The Sacramento Area Council of Governments (SACOG) has identified Low VMT generating locations within this region, including Marysville. The project location within the SACOG region was determined. As previously stated, *Cal Green 2022* identifies hotels as part of residential construction when determining electric vehicle requirements. Therefore, the VMT characteristics of residential per capita is identified from the SACOG Residential VMT Hex (screening) maps. The per capita VMT is shown in Table 2 and the Hex map is attached.

TABLE 2
VMT ANALYSIS RESULTS

Land Use	Per Capita VMT			B Street Hotel Reduction from Average	Jurisdiction Goal Met?
	Regional Average	15% Reduction Goal	B St Hotel		
Hotel (Residential)	20.82	17.70	13.18	-25.5%	Yes

The Regional County average residential VMT is 20.82 vehicles miles traveled per day. The hex map location containing the B Street project has a rate of 13.18. The OPR recommended goal would be a 15% reduction from the regional average, or 17.70; therefore, the VMT for the hotel use is presumed to be less than significant.

Electric Vehicle Charging Infrastructure. The project intends to provide electric vehicle charging infrastructure beyond what is required as identified *CalGreen 2022*. Table 3 presents the EV requirements for the site.

The net impact of the additional charging infrastructure was determined using CAPCOA[2] Guidelines. The project would have two additional charger spaces beyond what is required on the project site. Measure T-14 "Provide Electric Vehicle Charging Infrastructure" calculates the greenhouse gas reduction (GHG) for additional charging stations and will result in a GHG reduction of 2.9%.

[2] *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity*, California Air Pollution Control Officers Association, December 2021

TABLE 3 EV CHARGING REQUIREMENTS			
	Required EV Infrastructure	Provided EV Infrastructure	Net Over / (Under)
Hotel (160 spaces)			
EV Capable (10% total parking spaces)	16	16	0
EV Ready (25% total parking spaces)	40	40	0
EV Supply Equipment (5% total parking spaces)	8	8	0
		Net Over / (Under)	**0**
Retail (99 total spaces)			
EV Charger Spaces[1]	4	6	2
EV Capable Spaces[1]	13	13	0
		Net Over / (Under)	**2**
[1] Table 5.106.5.3.1, *CalGreen 2022*			

Evaluation / Findings

Engstrom Properties intends to develop the vacant land in Marysville located along the east side of B Street between 12th Street and 14th Street; a gas station in the northeast quadrant of B Street and 12th Street will remain with the project constructed to the north and adjacent to the gas station. The proposed project will include a 113-room hotel, a 2,500 square foot Quick Serve Restaurant (QSR) and a 16,000 square foot grocery store. The QSR is likely to be a Starbucks coffee shop with drive-through lane.

To meet CEQA guidelines a VMT analysis needs to be completed. The City of Marysville is currently updating their General Plan, and with it, development of their own VMT guidelines. Since City guidelines are currently unavailable, OPR guidelines were used following their 2018 publication *Technical Advisory on Evaluating Transportation Impacts in CEQA*.

The project is projected to create 3,578 daily trips, 287 a.m. peak hour trips and 296 p.m. peak hour trips. After accounting for internally captured trips and pass-by trips, the project is expected to generate 2,468 new daily trips, 131 new a.m. peak hour trips and 188 new p.m. peak hour trips.

A VMT screening criteria assessment was conducted for the site using the OPR screening criteria to determine if the project can be considered to have less than significant transportation impacts. OPR allows mixed-use projects to be analyzed separately by use.

The retail portion of the project, the grocery store and quick service restaurant, totaling 18,500 square feet can be considered locally serving retail. Local serving retail space of 50,000 square feet or less can be presumed to have a less than significant effect.

Map Based screening using the SACOG Hex Maps was used to analyze the hotel portion of the project;

hotels, while not defined as to a type of use in the OPR guidelines, are considered residential for analyzing EV charging criteria in the *CalGreen 2022* standards. The Map Based screening shows that the hotel land use is 25.5% lower than the 15% reduction goal of 17.70 per capita VMT. The project can be presumed to have a less than significant effect.

The project intends to exceed the minimum requirement of EV charging infrastructure by adding two additional charger spaces. The CAPCOA handbook was used to identify greenhouse gas reductions, and the additional charging spaces beyond the requirements is projected to result in a net 2.9% GHG reduction.

Should you have any questions please free to contact me at (916) 501-7513 or you may reach me via e-mail at jonathan@fa-transportation.com.

Flecker Associates.

Jonathan D. Flecker, P.E., T.E.
President

Attachments

B St Hotel VMT

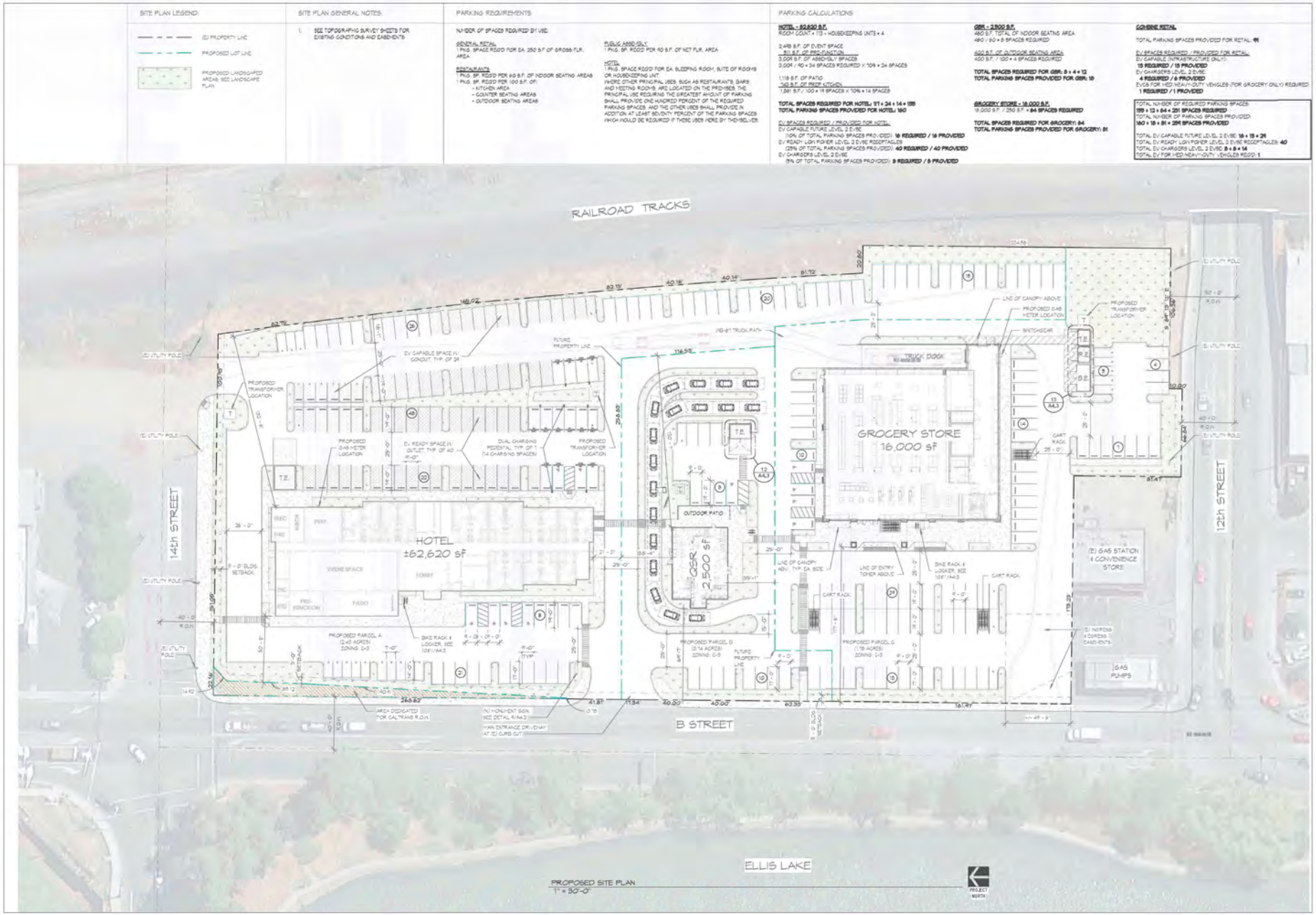
N

VICINTY MAP

FIGURE 1

FLECKER ASSOCIATES

3500-04



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FLECKER ASSOCIATES

3500-04

B STREET HOTEL SITE PLAN

FIGURE 2

Residential VMT

Sacramento Area Council of Governments

For RESIDENTIAL projects, threshold is defined as total household VMT per capita achieving 15% of reduction comparing to regional (or any appropriate sub-area) average. The map uses HEX geography. Residential VMT per capita per HEX is calculated by tallying all household VMTs, including VMT traveling outside the region, generated by the residents living at the HEX and divided by the total population in the HEX.
Note that these maps represent an example of just one of the many criteria projects are subject to when analyzing transportation impacts under CEQA, specific to SB 743. Additionally, the Draft CEQA Guidelines for implementingSB 743 and the technical guidance are still DRAFT. These draft maps are provided for information purposes only and are subject to change. SACOG will make changes as guidelines are updated and as SACOG data is updated.

For questions about the maps, please send an email to sacsim@sacog.org. To request underlying GIS layer, please fill in and sign the Data Request Form.
For more information about SACOG's supports to implement SB743, please visit https://www.sacog.org/sb-743-technical-assistance

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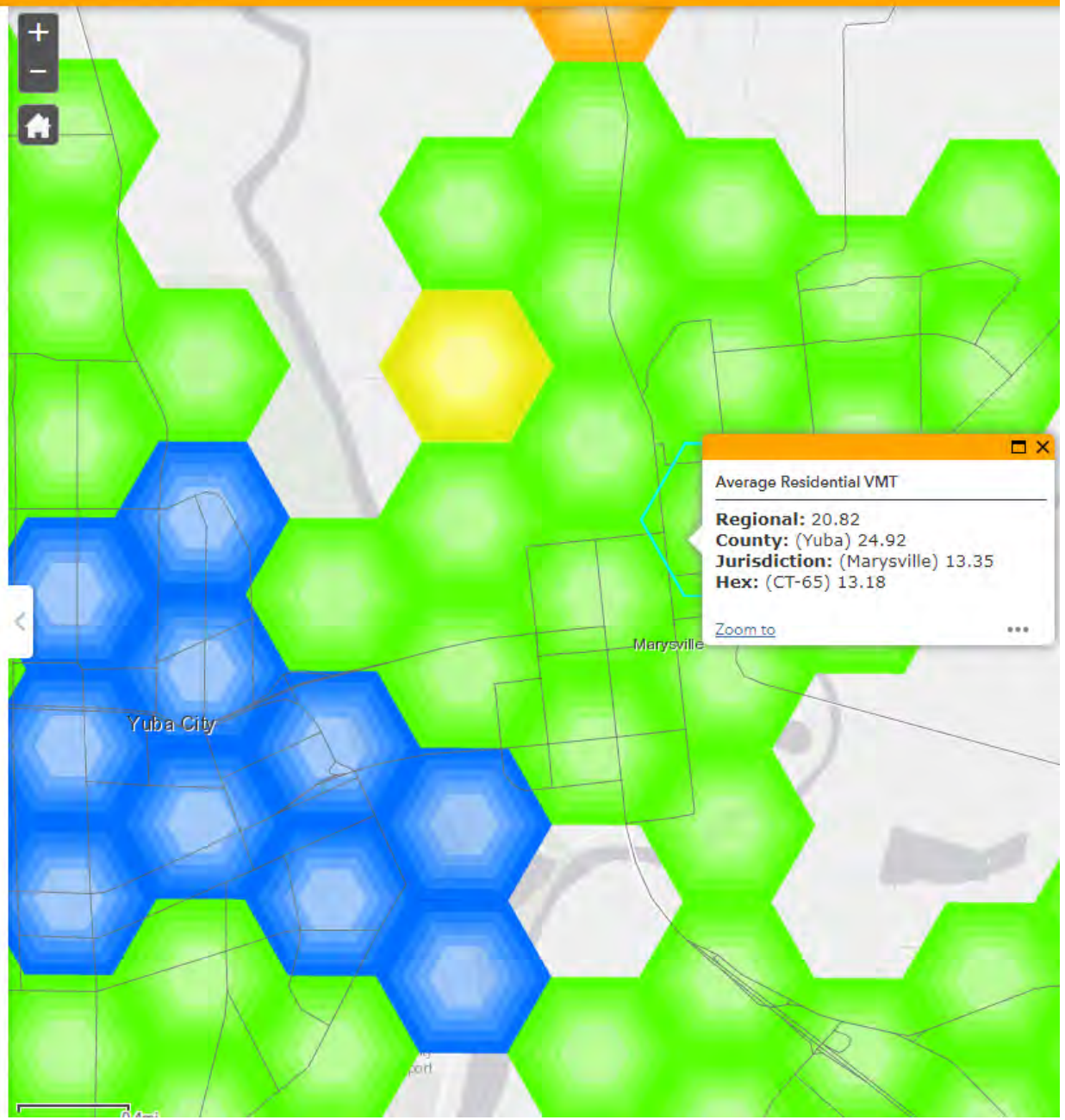
Residential VMT (including Outside-the-Region VMT by SACOG residents)(Updated 5/26/21)

Average Residential VMT per Capita

- <= 50% of Regional Average
- <= 50%-85% of Regional Average
- <= 85%-100% of Regional Average
- <= 100%-115% of Regional Average
- <= 115%-150% of Regional Average
- > 150% of Regional Average



T-14. Provide Electric Vehicle Charging Infrastructure

GHG Mitigation Potential

Up to 11.9% of GHG emissions from vehicles accessing the commercial or multifamily housing building

Co-Benefits (icon key on pg. 34)

Climate Resilience

Providing electric vehicle charging infrastructure increases fuel redundancy for electric vehicles even if an extreme weather event disrupts other fuel sources. Electric vehicles could also provide benefits to buildings and the grid, such as emergency backup, energy reserves, and demand response.

Health and Equity Considerations

Differential costs of PHEVs compared to conventional vehicles are decreasing over time, but at present are more expensive, which means this measure could disproportionately benefit those of greater economic means. As costs come into parity over time, this will be less of an issue. Employer, electricity provider, and state incentives for PHEV purchase could help address near-term disparities.

Measure Description

Install onsite electric vehicle chargers in an amount beyond what is required by the 2019 California Green Building Standards (CALGreen) at buildings with designated parking areas (e.g., commercial, educational, retail, multifamily). This will enable drivers of PHEVs to drive a larger share of miles in electric mode (eVMT), as opposed to gasoline-powered mode, thereby displacing GHG emissions from gasoline consumption with a lesser amount of indirect emissions from electricity. Most PHEVs owners charge their vehicles at home overnight. When making trips during the day, the vehicle will switch to gasoline mode if/when it reaches its maximum all-electric range.

Subsector

Parking or Road Pricing/Management

Locational Context

Urban, suburban, rural

Scale of Application

Project/Site

Implementation Requirements

Parking at the chargers must be limited to electric vehicles.

Cost Considerations

The primary costs associated with electric vehicle charging infrastructure include the capital costs of purchasing and installing charging stations, electricity costs from use of stations, and maintenance costs of keeping the charging stations in working order. Costs initially fall to the station owners, either municipalities or private owners, but can be passed along to station users with usage fees. Depending on station placement and charging times required for PHEVs, businesses near charging stations can derive benefits from patronage of station users.

Expanded Mitigation Options

In addition to increasing the percentage of electric miles for PHEVs, the increased availability of chargers from implementation of this measure could mitigate consumer "range anxiety" concerns and increase the adoption and use of battery electric vehicles (BEVs), but this potential effect is not included in the calculations as a conservative assumption. Expanded mitigation could include quantification of the effect of this measure on BEV use.

GHG Reduction Formula

$$A = \frac{B \times D \times (F - E) \times (G - (H \times I \times K \times L))}{-C \times J}$$

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from vehicles accessing the office building or housing	0–11.9	%	calculated
User Inputs				
B	Number of chargers installed at site	[ ]	integer	user input
C	Total vehicles accessing the site per day	[ ]	integer	user input
Constants, Assumptions, and Available Defaults				
D	Average number of PHEVs served per day per charger installed	2	integer	CARB 2019
E	Percent of PHEV miles in electric mode without measure	46	%	CARB 2020a
F	Percent of PHEV miles in electric mode with measure	80	%	CARB 2017
G	Average emission factor of PHEV in gasoline mode	205.1	g CO_2e per mile	CARB 2020a; U.S. DOE 2021
H	Energy efficiency of PHEV in electric mode	0.327	kilowatt hours (kWh) per mile	CARB 2020b; U.S. DOE 2021
I	Carbon intensity of local electricity provider	Tables E-4.3 and E-4.4	lb CO_2e per megawatt hour (MWh)	CA Utilities 2021
J	Average emission factor of non-electric vehicles accessing the site	307.5	g CO_2e per mile	CARB 2020a
K	conversion from lb to g	454	g per lb	conversion
L	Conversion from kWh to MWh	0.001	MWh per kWh	conversion

Further explanation of key variables:

- (D) – The average number of PHEVs served per day per charger installed is 2 vehicles (CARB 2019). If the user can provide a project-specific value, they should replace the default in the GHG reduction formula.
- (E) - Based on the EMFAC2017 model (v1.0.3), 46 percent of miles traveled by PHEVs in California are eVMT, and 54 percent are in gasoline mode (CARB 2020a).

- (F) – A review of EV user surveys and analytics included in the CARB's *Advanced Clean Cars Mid-Term Report* suggest that PHEV owners can reach 80 percent eVMT with access to adequate supportive charging infrastructure (CARB 2017).
- (G) – As described for (J), the average GHG emission factor for gasoline vehicles is 307.5 grams of CO_2e per mile.
- The fuel efficiency of a PHEV in gasoline mode is calculated as 66.7 percent of the fuel consumption rate of a gasoline vehicle, based on the assumption that a gasoline hybrid vehicle has 50 percent higher fuel economy (miles per gal [mpg]) than a comparable gasoline vehicle, based on a comparison of the gasoline and hybrid Toyota Camry and Corolla models (U.S. DOE 2021). This percentage is applied to the average GHG emission factor for gasoline vehicles to determine the average emission factor for PHEVs in gasoline mode as (66.7%×307.5 g CO_2e per mile). If the user can provide a project-specific value by running EMFAC based on the future year of a project, they should replace the default in the GHG reduction formula.
- (H) – Scaled from a light-duty automobile gasoline equivalent fuel economy 30.3 mpg (CARB 2020a), an energy efficiency ratio (EER) of 2.5 (CARB 2020b), and an assumption of 33.7 kWh electricity per gallon of gasoline (U.S. DOE 2021).
- (I) – GHG intensity factors for major California electricity providers are provided in Tables E-4.3 and E-4.4 in Appendix C. If the project study area is not serviced by a listed electricity provider, or the user is able to provide a project-specific value (i.e., for the future year not referenced in Appendix C), the user should replace the default in the GHG calculation formula. If the electricity provider is not known, the user may elect to use the statewide grid average carbon intensity.
- (J) – The average GHG emission factor for non-electric vehicles accessing the site was calculated in terms of CO_2e per mile using EMFAC2017 (v1.0.3). The model was run for a 2020 statewide average of LDA, LDT1, and LDT2 vehicles using diesel and gasoline fuel. The running emission factors for CO_2, CH_4, and N_2O (CARB 2020a) were multiplied by the corresponding 100-year GWP values from the IPCC's Fourth Assessment Report (IPCC 2007). If the user can provide a project-specific value (i.e., for a future year and project location), the user should run EMFAC to replace the default in the GHG reduction formula.

GHG Calculation Caps or Maximums

Measure Maximum

(A_{max}) The percent reduction in GHG emissions (A) is capped at 11.9 percent, which is based on the following assumptions used to generate a maximum scenario:

- (B) – number of chargers installed = 20. CALGreen provides a non-residential voluntary Tier 2 measure that requires projects with 201 or more parking spaces to allocate 10 percent of total parking spaces for "EV Capable" parking spaces (or 20 parking spaces) (CBSC 2019). Note that EV Capable parking spaces do not actually have EV chargers installed, though they do have electrical panel capacity, a dedicated branch circuit, and a raceway to the EV parking spot to support future installation of charging stations. Therefore, using the number of EV Capable parking spaces as a proxy for EV chargers as a high-end estimate is conservative.

- (C) – total vehicles accessing the site = 200. Per the CALGreen voluntary measure, the number of total parking spaces that correspond with 20 "EV Capable" parking spaces is 201.
- (D) – PHEVs served per day per charger installed = 7. This value is the max (D_{max}). This assumes that all PHEV drivers would coordinate sharing of the limited number of chargers at the site. Value is based on data from the National Renewable Energy Laboratory (CARB 2019).
- (I) – carbon intensity of local electricity provider = 0 lb CO_2e per MWh. This assumes that the local electricity provider is powered 100 percent by renewables and thus has a carbon intensity of zero.

Subsector Maximum

($\sum A_{max_{T\text{-}14 \text{ through } T\text{-}16}} \leq 35\%$) This measure is in the Parking or Road Pricing/Management subsector. This subcategory includes Measures T-14 through T-16. The VMT reduction from the combined implementation of all measures within this subsector is capped at 35 percent.

Example GHG Reduction Quantification

The user will install electric vehicle chargers at their proposed office or multifamily housing development, which will enable employees or residents with PHEVs to drive a larger share of miles in electric mode, as opposed to gasoline-powered mode, thereby displacing GHG emissions from gasoline consumption with a lesser amount of indirect emissions from indirect electricity. In this example, 20 chargers (B) will be installed at a workplace with 200 daily employee vehicles accessing the site (C). The electricity provider for the project area is the Sacramento Municipal Utility District (SMUD) and the analysis year is 2022. The carbon intensity of electricity is therefore 344 lb CO_2e per MWh (I). The GHG impact is calculated as a 3.4 percent reduction from the total emissions from vehicles accessing the site.

$$A = \frac{\mathbf{20} \times 2\frac{\text{PHEVs}}{\text{charger}\cdot\text{day}} \times (80\% - 46\%) \times (205.1\ \frac{\text{g } CO_2e}{\text{miles}} - (0.327\frac{\text{kWh}}{\text{mile}} \times 344\ \frac{\text{lb } CO_2e}{\text{MWh}} \times 454\frac{\text{g}}{\text{lb}} \times 0.001\frac{\text{MWh}}{\text{kWh}}))}{\mathbf{200\ vehicles} \times 307.5\ \frac{\text{g } CO_2e}{\text{miles}}} = 3.4\%$$

Quantified Co-Benefits

While the measure will achieve fuel savings, it will also increase electricity consumption. This section defines the methods for quantifying Improved Local Air Quality and fuel savings, as well as increased electricity consumption.

Improved Local Air Quality

Local criteria pollutants will be reduced by the reduction in fossil fuel combustion. The percent reduction in criteria pollutants can be calculated using the GHG reduction formula. Electricity supplied by statewide fossil-fueled or bioenergy power plants will generate criteria pollutants. However, because these power plants are located throughout the state, electricity consumption from vehicles charging will not generate localized criteria pollutant emissions. Consequently, for the quantification

of criteria pollutant emission reductions, either the electricity portion of the equation can be removed, or the electricity intensity (I) can be set to zero.

Fuel Savings (Increased Electricity)

The percent reduction in vehicle fuel consumption would be the same as the percent reduction in criteria pollutant emissions. The percent increase in electricity use (M) from this measure can be calculated as follows.

Electricity Use Increase Formula

$$M = \frac{B \times D \times (F - E) \times J \times N \times O}{-C \times P}$$

Electricity Use Increase Calculation Variables

ID	Variable	Value	Unit	Source
Output				
M	Increase in electricity from PHEVs	[ ]	%	calculated
User Inputs				
N	Existing electricity consumption of project/site	[ ]	kWh per year	user input
O	Days per year with vehicles accessing the site	260–365	days per year	user input
P	Average annual VMT of vehicles accessing the site	[ ]	miles per day per vehicle	user input
Constants, Assumptions, and Available Defaults				
	None			

Further explanation of key variables:

- (N) – The user should take care to properly quantify building electricity using accepted methodologies (such as CalEEMod).
- (O) – If the proposed development is a workplace in which employees access the site an average of 5 days per week, the user should input 260 workdays. If the development is multifamily dwelling, the user should input 365 days.
- Please refer to the GHG Calculation Variables table above for definitions of variables that have been previously defined.

Sources

- California Air Resources Board (CARB). 2017. *Advanced Clean Cars Mid-Term Report, Appendix G: Plug-in Electric Vehicle In-Use and Charging Data Analysis*. Available: https://ww2.arb.ca.gov/resources/documents/2017-midterm-review-report. Accessed: January 2021.
- California Air Resources Board (CARB). 2019. *Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendices*. November. Available: https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Appendices.pdf. Accessed: January 2021.

- California Air Resources Board (CARB). 2020a. *EMFAC2017 v1.0.3.* August. Available: https://arb.ca.gov/emfac/emissions-inventory. Accessed: January 2021.
- California Air Resources Board (CARB). 2020b. *Unofficial electronic version of the Low Carbon Fuel Standard Regulation.* Available: https://ww2.arb.ca.gov/sites/default/files/2020-07/2020_lcfs_fro_oal-approved_unofficial_06302020.pdf
- California Air Resources Board (CARB). 2021. OFFROAD2017–ORION. Available: https://arb.ca.gov/emfac/emissions-inventory. Database queried by Ramboll and provided electronically to ICF. March 2021.
- California Utilities. 2021. Excel database of GHG emission factors for delivered electricity, provided to the Sacramento Metropolitan Air Quality Management District and ICF. January through March 2021.
- California Building Standards Commission (CBSC). 2019. Green Building Standards Code, Title 24, Part 11. Appendix A5 – Nonresidential Voluntary Measures. Table A5.601 Nonresidential Buildings: Green Building Standards Code Proposed Performance Approach. July. Available: https://codes.iccsafe.org/content/CAGBSC2019/appendix-a5-nonresidential-voluntary-measures. Accessed: May 2021.
- Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp. Available: https://www.ipcc.ch/report/ar4/wg1/. Accessed: January 2021.
- U.S. Department of Energy (U.S. DOE). 2021. *Download Fuel Economy Data.* January. Available: https://www.fueleconomy.gov/feg/download.shtml. Accessed: January 2021.

CAPCOA CALCULATIONS			
T-14	PROVIDE ELECTRIC VEHICLE CHARGING INFRASTRUCTURE		
A=	B x D x (F - E) x (G - (H x I x K x L))/ -C x J		
A	Percent reduction in GHG emissions from vehicles accessing		
B	Number of chargers installed at site	2	beyond required by CalGreen 2022
C	Total vehicles accessing the site per day	2675	
D	Average number of PHEVs served per day per charger installed	2	
E	Percent of PHEV miles in electric mode without measure	46	
F	Percent of PHEV miles in electric mode with measure	80	
G	Average emission factor of PHEV in gasoline mode	205.1	
H	Energy efficiency of PHEV in electric mode	0.327	
I	Carbon intensity of local electricity provider	206	
J	Average emission factor of non-electric vehicles accessing the sit	307.5	
K	conversion from lb to g	454	
L	Conversion from kWh to MWh	0.001	
	A=	-2.89%	