VEHICLE MILES TRAVELED (VMT) ANALYSIS GUIDELINES

May 31, 2023

City of Carlsbad

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APPENDICES

1 BACKGROUND

This chapter provides background information on Senate Bill 743 (SB 743) and the need to conduct vehicle miles traveled (VMT) analyses for CEQA transportation studies.

1.1 SB 743 Legislation and Updated CEQA Guidelines

SB 743 was passed by the legislature and signed into law in the fall of 2013. This legislation led to a change in the way that transportation impacts are measured under the California Environmental Quality Act (CEQA). The California Natural Resources Agency updated the *Guidelines for the Implementation of the California Environmental Quality Act* (CEQA Guidelines) in December 2018. Per the CEQA Guidelines, starting on July 1, 2020, automobile delay and level of service (LOS) are no longer used as the performance measure to determine the transportation impacts of land development projects under CEQA. Instead, an alternative metric that supports the goals of the SB 743 legislation is necessary. CEQA Guidelines Section 15064.3 provides requirements for determining the significance of transportation impacts and states that, "This section describes specific considerations for evaluating a project's transportation impacts. Generally, vehicle miles traveled is the most appropriate measure of transportation impacts."

Per the CEQA Guidelines, lead agencies have discretion to develop their own methodologies or guidelines for determining significant environmental impacts. SB 743 and the updated CEQA Guidelines also apply to transportation projects.

The intent of SB 743 is to bring CEQA transportation analyses into closer alignment with other statewide policies regarding greenhouse gases, active transportation, and infill development.

1.2 Governor's Office of Planning and Research (OPR) Technical Advisory

The SB 743 legislation designated OPR to write guidelines for implementation. The process of writing guidelines started in January 2014 and concluded in 2018. OPR published the *Technical Advisory on Evaluating Transportation Impacts* in CEQA in December 2018 which represents the current statewide guidance for the implementation of SB 743.

Under CEQA, lead agencies can determine their own methodologies and significance thresholds for CEQA technical analyses but are required to provide substantial evidence as a basis of their decisions, if challenged. In its Technical Advisory, OPR generally provides substantial evidence for its recommendation. However, even OPR's recommendations are subject to challenge, and if an agency were to rely on the Technical Advisory recommendations, that agency would need to be prepared to defend the recommendations and produce the substantial evidence. OPR is not in a position to defend the Technical Advisory recommendations on behalf of agencies that choose to use it.

While OPR provides recommendations on many aspects of conducting a CEQA transportation analysis using VMT, OPR's guidance is not comprehensive, and some key decisions are left for lead agencies to determine.

1.3 Consistency with City Goals and Policies

The intent of SB 743 is directly related to three of the city's core values as stated in the General Plan: (1) Walking, Biking, Public Transportation, and Connectivity; (2) Sustainability; and (3) Neighborhood Revitalization, Community Design, and Livability. It is also consistent with many of the goals and policies included in the General Plan.

2 PURPOSE AND OBJECTIVE OF VMT ANALYSIS

2.1 Purpose of VMT Analysis Guidelines

The VMT Analysis Guidelines provide direction to city staff, consultants, and project applicants regarding the methodologies and thresholds to be used for VMT analysis for evaluating transportation impacts pursuant to CEQA in the City of Carlsbad. The guidelines generally follow the state guidance provided in OPR's Technical Advisory but add detail that is specific to the City of Carlsbad. Project applicants should refer to the VMT report templates in Appendix A to ensure compliance with the VMT Analysis Guidelines.

Although these guidelines are intended to be comprehensive, not all aspects of VMT analysis can be addressed in a single document. City staff will need to use judgment in applying these guidelines to specific projects and situations. Exceptions and additions to the guidelines will need to occur on a case-by-case basis.

2.2 Coordination with Other Agencies

Preparation of a VMT analysis may require coordination with other agencies as follows:

- Caltrans will review and provide comments on certain VMT analyses, particularly if the project requires a Caltrans encroachment permit or if it is considered to have a substantial effect on state highway facilities.
- Coordination with SANDAG may be needed if a model run of the SANDAG regional travel demand model is needed.
- Coordination with the North County Transit District (NCTD) may be needed if project mitigation measures related to transit are proposed.
- Detailed coordination with adjacent cities and the County of San Diego will not normally be required unless a proposed mitigation measure crosses jurisdictional boundaries.

2.3 Necessary Qualifications of Individuals Preparing VMT Analyses

Simple screening/scoping assessments and VMT evaluation that uses the City's screening maps may be performed by the applicant or non-engineering professionals. The applicant should contact City of Carlsbad staff to confirm that the VMT screening/scoping/evaluation is simple and can be performed by non-engineering professionals.

Completing screening/scoping assessments and VMT evaluation of complex or multi-use projects that require VMT modeling should typically be prepared under the direction of an individual who is

a licensed Traffic Engineer in the State of California or who has equivalent knowledge and experience. Individuals who have equivalent level of knowledge and experience should contact City of Carlsbad staff for approval prior to preparing a VMT analysis.

3 LAND DEVELOPMENT PROJECTS

This chapter provides guidance on conducting VMT analyses for land development projects, including single-use projects, mixed-use projects, and redevelopment projects.

3.1 Overview of Analysis

The City of Carlsbad generally follows the VMT analysis methodology recommended in OPR's Technical Advisory. OPR recommends analyzing VMT for most residential and office projects based on efficiency metrics. Projects evaluated in this way are analyzed using VMT/capita or VMT/employee rather than total VMT. City County Resolution Number 2020-114 approves the VMT thresholds of significance and screening criteria. A copy of the resolution is provided in Appendix B. Information regarding the selection of thresholds and screening criteria is provided in Appendix C.

For large projects (usually over 2,400 average daily trips[1]), a model run of the regional travel demand model operated by the San Diego Association of Governments (SANDAG) is often used to determine the project's VMT/capita or VMT/employee. For smaller projects (usually under 2,400 average daily trips – see footnote), VMT/capita and VMT/employee may also be based on the SANDAG regional travel demand model. However, rather than using an individual model run for each project, VMT/capita and VMT/employee may be determined from maps prepared by the City of Carlsbad using output from the base year SANDAG regional model. These maps, shown by the sample in **Figure 3.1**, provide an estimate of personal vehicle travel by residents and employees for each Traffic Analysis Zone (TAZ) within the city. TAZ's are geographical areas of varying size set up in the SANDAG regional travel demand model. The maps display VMT/capita and VMT/employee compared to city-wide VMT average and regional VMT average, respectively. The coloring scheme for the VMT maps is as follows:

- TAZs shown in brown represent a VMT/capita or VMT/employee of less than 85% of the city-wide or regional average, respectively, indicating a less than significant impact.
- TAZs shown in red represent a VMT/capita or VMT/employee of between 85% and 100% of the city-wide or regional average, respectively, indicating a significant impact.
- TAZs shown in grey represent a VMT/capita or VMT/employee of over 100% of the city-wide or regional average, indicating a significant impact.

[1] 2,400 daily trips is a historical "rule of thumb" number that may be updated periodically based on the travel demand model sensitivity. The 2,400 daily trips historical "rule of thumb" is based on congestion management program requirements from over a decade ago, and it may be updated based on current model considerations; however, at the time of this document publication it is the best available information. Applicants should coordinate with City staff to confirm the project size at which the SANDAG regional travel demand model maybe run.

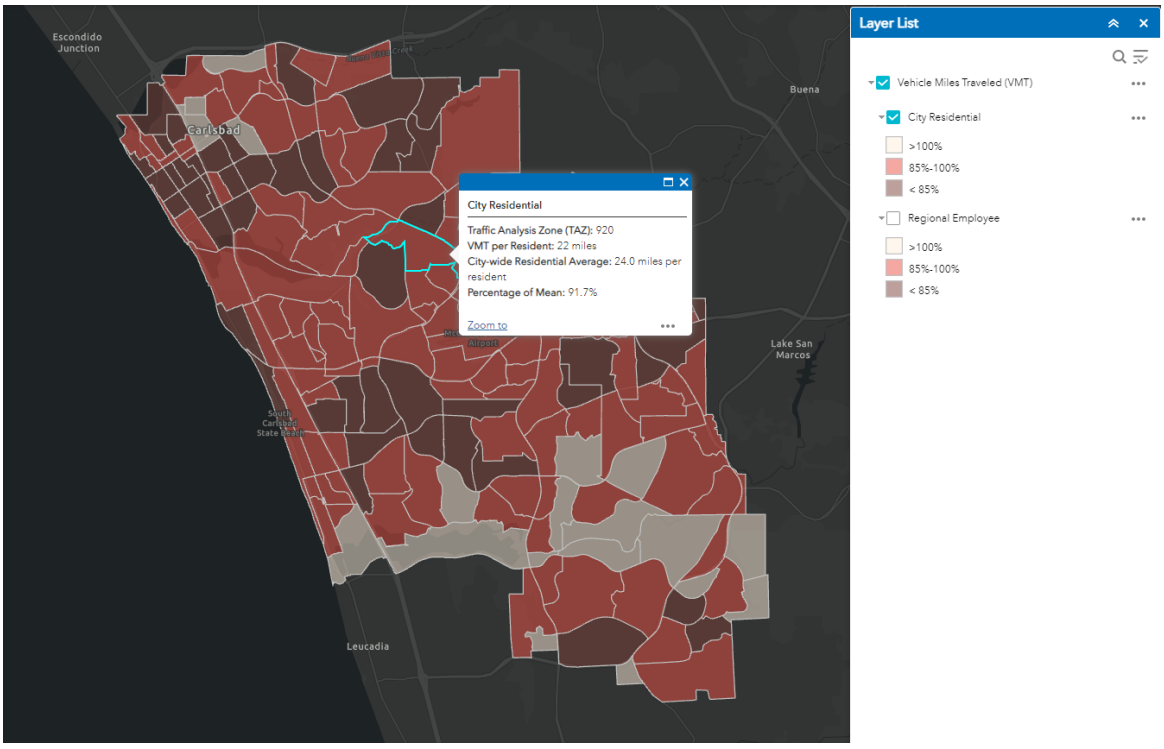


Figure 3.1: City of Carlsbad Residential VMT Map

The City of Carlsbad's VMT maps are available online here: https://experience.arcgis.com/experience/43b530c57da9469387c665d96f11c5d6. To use the maps, simply select the map corresponding to the project's land use (either residential or employment) to the right of the screen. It is important to note that only one land use should be selected at a time. Then select the TAZ in which the project is located. A pop-up will appear displaying the VMT data for that TAZ, including its percentage of the city-wide or regional average, which can then be used to assess the project's impact.

The assumption for smaller projects is that project VMT/capita or VMT/employee can be estimated based on the average VMT/capita or VMT/employee for the TAZ in which it is located. In some cases, TAZ's do not have sufficient existing development to form the basis for VMT calculations. In these cases, the VMT is determined based on the census tract in which the TAZ is located. Census tracts are larger geographic areas that typically contain several TAZ's. It may be acceptable for a project under 2,400 ADT to complete an individual VMT assessment using VMT modeling tools (such as the SANDAG regional travel demand model) if the project size and type are unique. Note that use of the SANDAG regional travel demand model should be considered carefully for smaller projects because often a project is too small for the regional model to be sensitive to; therefore, regional model results may not appropriately represent the project. Likewise, it may be possible for a project that is over 2,400 ADT to use other VMT modeling tools (other than the SANDAG regional model) that are more project specific or representative of the project conditions or the VMT maps if it is the same land use type/characteristics (such as density) as existing land use in the project TAZ. In either case, coordination with City staff is recommended.

Project trip generation should normally be determined using methodologies consistent with city transportation guidelines. Reductions for internal trips and pass-by trips (if appropriate) should be made prior to determination of project trip generation.

3.2 VMT Modeling Tools

The SANDAG regional travel demand model is one tool for estimating VMT. Since the SANDAG model is a regional tool that provides high level planning estimates it is not appropriate for use for all project types or at a microscopic scale. There are other modeling methods/tools that may be more appropriate depending on the project characteristics, redevelopment conditions, or project location. As stated in the OPR Technical Advisory:

> *Section 15064.3 explains that a "lead agency may use models to estimate a project's vehicle miles traveled . . . ." CEQA generally defers to lead agencies on the choice of methodology to analyze impacts. (Santa Monica Baykeeper v. City of Malibu (2011) 193 Cal.App.4th 1538, 1546; see Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 409 ["the issue is not whether the studies are irrefutable or whether they could have been better" … rather, the "relevant issue is only whether the studies are sufficiently credible to be considered" as part of the lead agency's overall evaluation].) (OPR Technical Advisory, Page 4)*
>
> *Travel demand models, sketch models, spreadsheet models, research, and data can all be used to calculate and estimate VMT… To the extent possible, lead agencies should choose models that have sensitivity to features of the project that affect VMT. Those tools and resources can also assist in establishing thresholds of significance and estimating VMT reduction attributable to mitigation measures and project alternatives. When using models and tools for those various purposes, agencies should use comparable data and methods, in order to set up an "apples-to-apples" comparison between thresholds, VMT estimates, and VMT mitigation estimates. (OPR Technical Advisory, Page 30)*

Coordination with City staff is necessary if a model other than the SANDAG regional model is proposed for a project analysis. The following provides an overview of the two categories of models available for estimating VMT:

- Travel Forecasting Models: A travel forecasting model is a computer model used to estimate travel behavior for a specific base year or horizon year based on land use and transportation network supply inputs. VMT is one output of a travel forecasting model run. The SANDAG regional travel demand model is an example of a travel forecasting model.
- Other models and tools: Use of a travel forecasting model is not always the most appropriate method for estimating VMT (or may not be available in some cases), VMT can also be estimated using sketch models or spreadsheet tools. Typically, these types of models/tools estimate VMT directly by multiplying the number of trips by an average trip length. Trips can be estimated using the results of local trip generation surveys or trip generation rate data published by the Institute of Transportation Engineers (ITE). Trip lengths can be extracted from models, from standardized averages, or travel pattern data from household travel surveys, big data, or other sources. These methodologies could also

be paired with a travel model and used between major model updates or to estimate project generated VMT for smaller projects that would "get lost" or be part of the "model noise" in a regional travel demand model.

3.2.1 VMT Efficiency Metric Definitions

The SANDAG regional travel demand model provides standard VMT efficiency metric outputs. The VMT/capita and VMT/employee metrics produced by the SANDAG model are defined as follows:

- **VMT/capita** is established by summing up total daily VMT generated by residents of a geographic area and dividing by the population of that geographic area. Total daily VMT includes all trip tours made by residents: home-based and non-home-based trip tours (i.e. all VMT for a resident for the entire day regardless of trip purpose or origin/destination). To analyze the VMT/capita for a proposed project, total daily VMT generated by project residents is divided by the project resident population.

  The VMT/capita produced by the SANDAG model specifically includes VMT generated *within* the SANDAG region by residents of the SANDAG region. If a resident travels outside of the region, their VMT is only accounted for up to the SANDAG boundary. Since the OPR Technical Advisory specifically provides guidance on avoiding truncating VMT[2], to account for VMT generated by residents of the SANDAG region making trips outside (and the back into) the region, the SANDAG model data must be manually appended with the external VMT from the California Statewide Travel Demand Model. The City of Carlsbad city average VMT/capita and VMT maps have refined VMT/capita data that includes the external VMT generated by SANDAG region residents.

- **VMT/employee**, as produced by the SANDAG model, is established by summing the work related total daily VMT generated by resident employees[3] of a geographic area and dividing by the number of resident employees of that geographic area. Total daily work related VMT includes all work tours made by employees (this includes an employee's commute and any other work-related travel such as going to lunch or to a meeting). To analyze the VMT/employee for a proposed project, the total work tour daily VMT produced by the project's employees is divided by the total number of employees. The SANDAG model only accounts for VMT generated within the SANDAG region by employees who are also residents of the SANDAG region. Therefore, external VMT from resident employees is not captured in the SANDAG model output. In addition, employees that live outside of the region and travel into the SANDAG region for work are not accounted for in the SANDAG output.

[2] *Lead agencies should not truncate any VMT analysis because of jurisdictional or other boundaries, for example, by failing to count the portion of a trip that falls outside the jurisdiction or by discounting the VMT from a trip that crosses a jurisdictional boundary. CEQA requires environmental analyses to reflect a "good faith effort at full disclosure." (CEQA Guidelines, § 15151.) Thus, where methodologies exist that can estimate the full extent of vehicle travel from a project, the lead agency should apply them to do so. Where those VMT effects will grow over time, analyses should consider both a project's short-term and long-term effects on VMT.* (OPR Technical Advisory, Page 6)

[3] Resident employees both live and work in the SANDAG region.

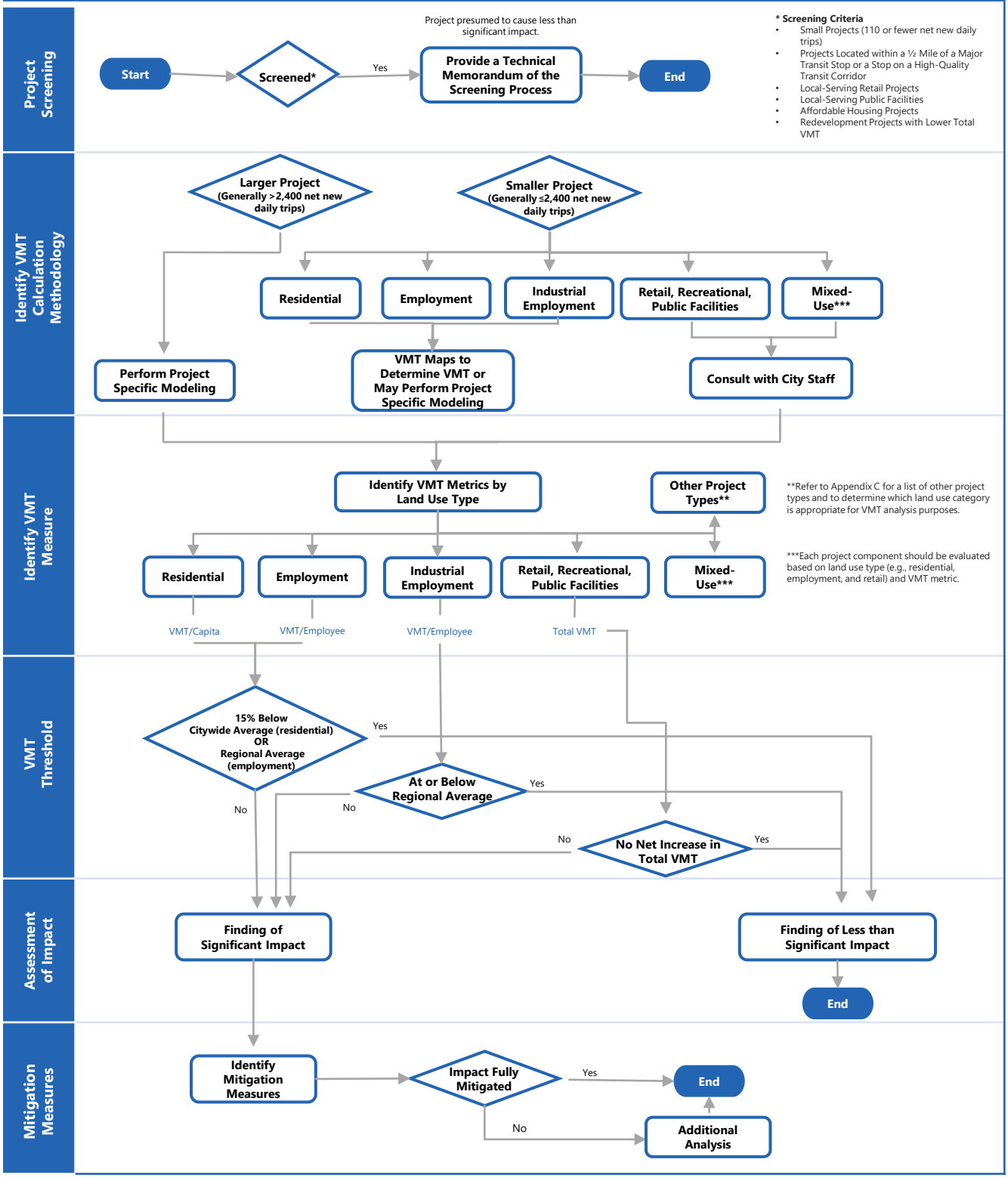
The City of Carlsbad regional VMT/employee average and VMT maps display refined data that accounts for the VMT associated with the commute trip for people who commute into the SANDAG region from another adjacent county. The data used to include the external VMT is derived from the "origin-destination" trip tables from the SANDAG model (which is a modeling step that is not part of the VMT calculations). The external VMT generated by people who live and work within the SANDAG region and travel outside the SANDAG region as part of their work tour is not included. For example, for someone who lives and works in the San Diego region and would occasionally travel to Orange County for a work conference, his or her VMT associated with that trip is not included in the refined work tour metric. Including this work related VMT is not possible because the SANDAG model does not contain trip purpose information for trips that exit and return to the region.

One limitation that applies to all VMT data produced by the SANDAG regional travel model is that VMT generated within Mexico (for example, a San Diego region resident who travels to Mexico to go shopping) or by residents of Mexico (for example someone who lives in Mexico and works in the San Diego region) are not accounted for due to lack of information. Additional documentation for the VMT/capita and VMT/employee refined metrics is provided in Appendix D.

Figure 3.2 shows a flow chart that summarizes the VMT analysis process.

Figure 3.2: VMT Analysis Process

The following process depicts the typical steps for performing VMT analysis in the City of Carlsbad. Deviations from this process may be necessary for specific projects or unique situations as coordinated with City staff.



3.3 Screening Criteria

The following is a description of projects that would be presumed to have a less than significant transportation impact due to project type or location unless substantial evidence would suggest otherwise. If a project meets at least one of the following screening criteria, it would not require a detailed VMT analysis. However, a discussion summarizing the applicability of relevant screening criteria is required.

NOTE: *Screening criteria are intended to quickly identify when a project would typically be expected to cause a less than significant impact without conducting a detailed study* (OPR Technical Advisory, Page 12, December 2018). There may be circumstances where a project meets one of the screening criteria, but evidence suggests that the project may increase areawide VMT. For example, OPR describes replacing affordable housing with fewer moderate- or high-income units, resulting in less VMT generated by the site (qualifying for the redevelopment screening); however, the displaced residents' VMT also needs to be considered because it may cause an overall increase in VMT as the residents move to farther away affordable housing. Thus, in this example, the project would not qualify for screening. Another example is redevelopment of core services (basic grocery shopping, general needs stores/services, etc.) that the existing population relies on. Removing these core services, without replacing them, may cause VMT to increase as existing residents travel farther to access these services. An analysis showing the project's effect on VMT or an analysis showing how basic service access changes may be necessary.

Further guidance on screening criteria can be found in OPR's Technical Advisory.

3.3.1 Small Projects

Per OPR's Technical Advisory, projects that generate less than 110 ADT would be presumed to have a less than significant transportation impact. Projects that can demonstrate that they would generate an ADT of less than 110 after applying trip-reduction strategies would be screened out from performing additional analysis.

3.3.2 Projects Located Near Transit

Per OPR's Technical Advisory, residential, retail, office projects, or projects that have a mix of those uses whose project site boundaries are within one half mile of an existing major transit stop, planned major transit stop, or a stop/transit center along a high-quality transit corridor would normally be presumed to have a less than significant transportation impact. In the City of Carlsbad, this would apply to projects within one half mile of the Carlsbad Village or Carlsbad Poinsettia Coaster stations, as well as projects within one-half mile of the Plaza Camino Real transit center. Certain types of projects that are located near transit would not have a presumption of a less than significant transportation impact even if located near transit. This would include, for example, projects with low density or high levels of parking. OPR Technical Advisory includes additional detail on determining the status of projects located near transit.

3.3.3 Local-Serving Retail and Similar Land Uses

Per OPR's Technical Advisory, local-serving retail uses are presumed to have a less than significant impact on VMT since they tend to attract trips from adjacent areas that would have otherwise been made to more distant retail locations.

3.3.4 Local-Serving Public Facilities

Similar to retail land uses, local-serving public facilities are presumed to have a less than significant impact on VMT. This would include government facilities intended to serve the local public, parks, public elementary schools, public middle schools, and public high schools. A study evaluating the user capture area may be required in order to demonstrate that a public facility is local-serving. Typically, private schools, charter schools, or public facilities with unique uses will be required to provide a user capture area study.

3.3.5 Affordable Housing Projects

OPR's Technical Advisory allows for a less than significant finding for transportation impacts of residential projects that are 100% affordable housing located in infill areas. Affordable housing projects in the City of Carlsbad could use this recommendation if they demonstrate that they are located in infill areas based on urban planning considerations.

3.3.6 Redevelopment Projects That Result in a Net Reduction of VMT

Per CEQA, projects are considered to have a less than significant impact if they result in a net reduction in the relevant performance measure (in this case VMT). Therefore, redevelopment projects in the City of Carlsbad that generate less VMT than the existing project they are replacing would be considered to have a less than significant impact on VMT. Since VMT/capita and VMT/employee are efficiency metrics, a redevelopment project that would produce more VMT than the existing project it is replacing would need to conduct a VMT analysis assuming the proposed land use (with no credit taken for the existing land use) to determine whether the proposed project meets the applicable significance thresholds.

3.4 Significance Thresholds

Significance thresholds for land development projects are summarized below. Additional discussion and substantial evidence can be found in Appendix C.

- Residential Projects: A significant transportation impact occurs if the project VMT/capita exceeds a level 15% below the city average VMT/capita
- Office Projects: A significant transportation impact occurs if the project VMT/employee exceeds a level 15% below the regional average VMT/employee
- Regional Retail Projects: A significant transportation impact occurs if the project results in a net increase in VMT
- Industrial Projects: A significant transportation impact occurs if the project VMT/employee exceeds the average regional VMT/employee

If the project is using data from the SANDAG regional travel demand model, the city average VMT/capita and regional average VMT/employee values are determined using the SANDAG regional travel demand model. If the project is performing a custom model run, the "no project" version of the model version being used for the analysis should be used to derive the regional average VMT/employee and VMT/capita values. Note that different model runs will produce slightly varied results because the model is a simulation model (results can't be identically replicated).

If a different VMT analysis tool is used for the analysis, the values for the VMT thresholds should be determined using the tool that is being used for the analysis. It is not appropriate to use one tool/method to determine the VMT threshold and a different tool/method to perform the analysis.

3.5 Vehicle Miles Traveled Analysis

For projects that do not meet the screening criteria listed above, a detailed VMT analysis is needed. This section provides guidance on how a VMT analysis should be conducted for various types of land development projects. See Appendix E for land use designations or consult city staff for project types that are not listed.

For projects that are inconsistent with the General Plan or are evaluated using net change in VMT, a cumulative VMT analysis may be required. Consultation with city staff should be conducted in these cases to determine the appropriate VMT analysis methodology.

3.5.1 Single Land-Use Residential or Office Projects

Typical residential or office single land-use projects generating less than 2,400 ADT[4] would use the City of Carlsbad VMT/capita and VMT/employee analysis maps and would determine VMT/capita or VMT/employee for the traffic analysis zone in which the project is located. If the project VMT/capita or VMT/employee exceeds the corresponding threshold of significance, a significant impact would be indicated. Mitigation measures would then be considered.

Typical single land-use residential or office projects generating more than 2,400 ADT would use a model run of the SANDAG regional travel demand model or other VMT estimation tool to determine the project's VMT/capita or VMT/employee. If the resulting VMT/capita or VMT/employee exceeds the corresponding threshold of significance, a significant impact would be indicated. Mitigation measures would then be considered.

3.5.2 Mixed-Use Projects

Per OPR's Technical Advisory, VMT analysis for mixed-use projects would be conducted by analyzing each individual land use independently and applying the significance threshold for each land use. It is appropriate to calculate a VMT reduction associated with "internal capture" that is applied to each land use. Internal capture accounts for the vehicle trip

[4] 2,400 daily trips is a historical "rule of thumb" number that may be updated periodically based on the travel demand model sensitivity. Applicants should coordinate with City staff to confirm the project size at which the travel demand model should be run. As described, a variety of considerations go into the selection of which VMT modeling tool should be used.

reduction due to interaction between land uses and is typically calculated as part of the trip generation analysis. Reducing vehicle trips results in reduced VMT; therefore, a reduction in VMT can be taken for mixed use projects that have internal capture. Note that if the SANDAG model is used to perform the VMT analysis for a mixed use project, it will typically account for the internal capture and further reductions are typically not necessary.

3.5.3 Redevelopment Projects

Redevelopment projects that do not meet the screening criteria above would need to conduct a VMT analysis to determine whether they meet the appropriate significance thresholds based on the project type. For analysis that uses efficiency metrics, it would be based solely on the characteristics of the new project to be developed without any consideration of the development that is being replaced.

3.5.4 Regional Retail Projects

All retail projects that do not meet the screening criteria above are considered regional retail projects and require a project specific evaluation of VMT using the SANDAG model or other model/method to assess the effect that the project has on affected area VMT. Note that the affected area should be developed in consultation with City staff and may include the City, Region, or another area as appropriate to the context of the project. Regional retail projects that result in a net increase in VMT compared to the no project condition would have a significant transportation impact.

3.5.5 Industrial Projects

For the purposes of VMT analysis, industrial projects include establishments whose primary purpose is the manufacture of goods. See Appendix E for types of industrial land uses. Typical industrial projects generating less than 2,400 ADT[5] would use the City of Carlsbad VMT/employee analysis maps and would determine VMT/employee for the traffic analysis zone in which the project is located. If the project VMT/employee exceeds the regional average VMT/employee, a potentially significant impact would be indicated. Mitigation measures would then be considered.

Typical industrial projects generating more than 2,400 ADT would use a model run of the SANDAG regional travel demand model or other model/method to determine VMT/employee. If the resulting VMT/employee exceeds the regional average VMT/employee, a potentially significant impact would be indicated. Mitigation measures would then be considered.

It should be noted that goods movement is not subject to VMT analysis. Therefore, goods movement trips associated with an industrial project would not be included when determining VMT/employee.

[5] 2,400 daily trips is a historical "rule of thumb" number that may be updated periodically based on the travel demand model sensitivity. Applicants should coordinate with City staff to confirm the project size at which the travel demand model should be run.

3.5.6 Regional Public Facility Projects

Regional public facilities that do not meet the screening criteria above are analyzed like a regional retail project and require a project specific evaluation of VMT using the SANDAG model or other model/method to assess the effect that the project has on affected area VMT. Note that the affected area should be developed in consultation with City staff and may include the City, Region, or another area as appropriate to the context of the project. Regional public facility projects that result in a net increase in VMT compared to the no project condition would have a significant transportation impact. Note that for regional public facilities that are entirely office space (for agency staff, not customer facing) it may be appropriate to use the office project methodology/metrics, coordination with City staff is required.

3.6 Mitigation

Projects can apply VMT reductions to lower their calculated resident VMT/capita or employee VMT/employee below the significance threshold. Typically, VMT is reduced by implementing strategies that achieve one of the following:

- Reducing the number of automobile trips generated by the project or by the residents or employees of the project.
- Reducing the distance that people drive.

Measures that reduce single occupant automobile trips or reduce travel distances are called Transportation Demand Management (TDM) strategies. Several TDM strategies applied in combination is referred to as a TDM plan or program.

See Appendix F for additional information on mitigation measures for land development projects.

4 TRANSPORTATION PROJECTS

SB 743 also applies to transportation projects, which are projects that improve transportation facilities for any mode of travel. Per revised CEQA Section 15064.3, lead agencies have the discretion to determine the appropriate measure of transportation impact consistent with CEQA and other applicable requirements. As recommended in OPR's Technical Advisory, the City of Carlsbad uses VMT as the performance measure for transportation projects.

4.1 Screening Criteria

Per OPR's Technical Advisory, certain types of transportation projects are presumed to have a less than significant impact on transportation. These include the following:

- Rehabilitation, maintenance, replacement, safety, and repair projects designed to improve the condition of existing transportation assets (e.g., highways; roadways; bridges; culverts; Transportation Management System field elements such as cameras, message signs, detection, or signals; tunnels; transit systems; and assets that serve bicycle and pedestrian facilities) and that do not add additional motor vehicle capacity

- Roadside safety devices or hardware installation such as median barriers and guardrails

- Roadway shoulder enhancements to provide "breakdown space," dedicated space for use only by transit vehicles, to provide bicycle access, or to otherwise improve safety, but which will not be used as automobile vehicle travel lanes

- Addition of an auxiliary lane of less than one mile in length designed to improve roadway safety

- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, two-way left turn lanes, or emergency breakdown lanes that are not utilized as through lanes

- Addition of roadway capacity on local or collector streets provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit

- Conversion of existing general purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially increase vehicle travel

- Addition of a new lane that is permanently restricted to use only by transit vehicles

- Reduction in number of through lanes

- Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g., HOV, HOT, or trucks) from general vehicles

- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority (TSP) features

- Installation of traffic metering systems, detection systems, cameras, changeable message signs and other electronics designed to optimize vehicle, bicycle, or pedestrian flow
- Timing of signals to optimize vehicle, bicycle, or pedestrian flow
- Installation of roundabouts or traffic circles
- Installation or reconfiguration of traffic calming devices
- Adoption of or increase in tolls
- Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase
- Initiation of new transit service
- Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
- Removal or relocation of off-street or on-street parking spaces
- Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)
- Addition of traffic wayfinding signage
- Rehabilitation and maintenance projects that do not add motor vehicle capacity
- Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way
- Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel
- Installation of publicly available alternative fuel/charging infrastructure
- Addition of passing lanes, truck climbing lanes, or truck brake-check lanes in rural areas that do not increase overall vehicle capacity along the corridor

4.2 Vehicle Miles Traveled Analysis

For projects that do require VMT analysis and are large transportation infrastructure projects, the typical approach would be to use the SANDAG regional travel model (or other model/method) and compare a model run without the project to a model run with the project and determine the net change in total VMT. Any net increase in VMT would result in a significant impact.

It is possible to manually calculate VMT for a small-scale transportation projects if the size of the project would be inappropriate for inclusion in a regional travel model because of model sensitivity. Generally, the change in daily trips on the project roadway (i.e. a new roadway) and roadways

within a reasonable distance of the project should be estimated. VMT can be manually calculated by multiplying the daily trips by the length of the roadway. For small-scale roadway projects that serve a small area, are a short distance, or add a short section of new travel lane, a qualitative analysis may be appropriate. If a project closes a gap (such as a bridge connection) where it can be shown to reduce the travel distance for roadway users, the project would likely reduce VMT and have a less than significant impact.

4.3 Significance Thresholds

The significance thresholds for transportation projects is the following:

- Transportation Projects: A significant transportation impact occurs if the project results in a net increase in VMT

4.4 Mitigation

Guidance on mitigation measures for transportation projects may be found in OPR's Technical Advisory.

5 ADDITIONAL RESOURCES FOR VEHICLE MILES TRAVELED ANALYSIS

This chapter provides locations of websites that can be used to locate additional resources that may be useful in conducting VMT analyses in the City of Carlsbad:

- Governor's Office of Planning and Research (OPR): https://www.opr.ca.gov/ceqa/sb-743/
- California Air Pollution Control Officers Association (CAPCOA). This organization has provided one of the most widely used resources for VMT mitigation (Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity). It can be found at the following website: https://www.airquality.org/ClimateChange/Documents/Final%20Handbook_AB434.pdf
- Caltrans SB 743 Website: https://dot.ca.gov/programs/sustainability/sb-743

VEHICLE MILES TRAVELED ANALYSIS GUIDELINES

APPENDIX A
VEHICLE MILES TRAVELED REPORT TEMPLATES

City of Carlsbad
California

VMT Report Template for Land Development Projects – Screening Only

City of Carlsbad
1200 Carlsbad Village Dr.
Carlsbad, CA 92008

How to Use this Template: Land development projects are required to conduct a California Environmental Quality Act (CEQA) transportation analysis to evaluate the transportation impacts of the project. The City of Carlsbad's VMT Analysis Guidelines provide direction to City staff, consultants, and project applicants regarding the methodologies and thresholds to be used for VMT analysis. The VMT analysis process as documented in the VMT Analysis Guidelines is:

1. Apply project screening criteria. If the project meets at least one of the screening criteria, the project is assumed to cause a less than significant impact and a detailed VMT analysis is not necessary. If the project does not meet any of the screening criteria, continue to Step 2.
2. Identify VMT calculation methodology.
3. Identify VMT metric.
4. Determine whether project falls within VMT threshold.
5. Assess transportation impact.
6. Propose mitigation measures, if necessary.

Report Types

Based on the VMT analysis process, a project will fall into one of three report types listed below:

- **Screening Only** – Projects that have met at least one of the screening criteria and do not require a detailed VMT analysis.
- **VMT Analysis Using VMT Maps** – Smaller projects (i.e., projects that generate 2,400 or less average daily trips or projects that do not require a separate modeling approach) that do not meet any of the screening criteria and require a detailed VMT analysis using the City of Carlsbad's VMT maps to determine VMT. NOTE: This method only applies to residential and employment projects.
- **VMT Analysis Using a Custom Model/Method** – Larger projects that do not meet any of the screening criteria and require a detailed VMT analysis using a project-specific model/method to determine VMT.

This template applies to projects identified as **Screening Only** projects.

For more detailed information, please refer to the Vehicle Miles Traveled (VMT) Analysis Guidelines.

Note that for projects with multiple land uses, the land use with the most complex report should be followed. If components of the project meet the screening criteria, they should be documented in the Screening Assessment section of the document.

City of Carlsbad
1200 Carlsbad Village Dr.
Carlsbad, CA 92008

VMT Analysis (Screening Only) Requirements

Submission Date:

SECTION I: Developer Profile

Developer Name: _____

Property Manager Name: _____

Developer Mailing Address: _____
Number Street Suite

_____
City State Zip Code

Primary Contact Name: _____

Primary Contact Phone/Email: Phone: _____ Email: _____

Transportation Consultant Firm/ Representative _____

Transportation Consultant Phone/Email: Phone: _____ Email: _____

SECTION II: Project Information

Project Name: _____

Permit Number: _____

Project Address: _____
Number Street Suite

_____
City State Zip Code

SECTION III: Compliance Overview Checklist

Complete the appropriate sections of the checklist below to ensure compliance with the City of Carlsbad's VMT Analysis Guidelines.

CEQA VMT Analysis (Screening Only) Compliance Checklist	Satisfactory? *(completed by City)*	
	YES	NO
Technical memorandum documenting screening analysis and conclusions, citing relevant information from VMT Analysis Guidelines Chapter 3.3	☐	☐
Which of the screening criteria does the project satisfy? Select all that apply. ☐ Small project (less than 110 net new daily trips) ☐ Local-serving public facility ☐ Project located near transit ☐ Affordable housing project ☐ Local-serving retail project ☐ Redevelopment project resulting in net reduction of VMT	☐	☐

SECTION IV: Technical Memorandum Contents

The following provides the required contents of a VMT Analysis (Screening Only) technical memorandum.

Page # or Appendix: *(completed by preparer)*	CEQA VMT Analysis (Screening Only) Required Content	Satisfactory? *(completed by City)*	
		YES	NO
	Introduction, including: • Purpose of the VMT Analysis and identification of the type of VMT report being prepared • Regional vicinity map with project location	☐	☐
	Project Description, including: • Proposed project description (land use type, intensity, etc.) • Projected opening year • Site plan	☐	☐

	VMT Screening Assessment
	• Table that displays all screening criteria and identifies which screening criteria the project meets.
	• Justification for how the project meets the screening criteria listed in the screening criteria table. This information may include:
	  ○ Daily project trip generation (total, without adjustments for existing land uses on the site).
	  ○ A map showing proximity of the project to a major transit stop, planned major transit stop, or a stop/transit center along a high-quality transit corridor and the walking route from the project to the transit stop. Justify that the project does not exceed Carlsbad parking requirements and that the floor area ratio does not exceed 0.75.
	  ○ Locally serving characteristics of the project.
	  ○ Documentation of the project's location within an infill area and designation as 100% affordable housing.
	  ○ A total VMT analysis comparison for a redevelopment project demonstrating that the proposed project generates less total VMT than the existing land uses.
		☐	☐

VMT Report Template for Land Development Projects – VMT Analysis Using VMT Maps

City of Carlsbad
1200 Carlsbad Village Dr.
Carlsbad, CA 92008

How to Use this Template: Land development projects are required to conduct a California Environmental Quality Act (CEQA) transportation analysis to evaluate the transportation impacts of the project. The City of Carlsbad's VMT Analysis Guidelines provide direction to City staff, consultants, and project applicants regarding the methodologies and thresholds to be used for VMT analysis. The VMT analysis process as documented in the VMT Analysis Guidelines is:

1. Apply project screening criteria. If the project meets at least one of the screening criteria, the project is assumed to cause a less than significant impact and a detailed VMT analysis is not necessary. If the project does not meet any of the screening criteria, continue to Step 2.
2. Identify VMT calculation methodology.
3. Identify VMT metric.
4. Determine whether project falls within VMT threshold.
5. Assess transportation impact.
6. Propose mitigation measures, if necessary.

Report Types

Based on the VMT analysis process, a project will fall into one of three report types listed below:

- **Screening Only** – Projects that have met at least one of the screening criteria and do not require a detailed VMT analysis.
- **VMT Analysis Using VMT Maps** – Smaller projects (i.e., projects that generate 2,400 or less average daily trips or projects that do not require a separate modeling approach) that do not meet any of the screening criteria and require a detailed VMT analysis using the City of Carlsbad's VMT maps to determine VMT. NOTE: This method only applies to residential and employment projects.
- **VMT Analysis Using a Custom Model/Method** – Larger projects that do not meet any of the screening criteria and require a detailed VMT analysis using a project-specific model/method to determine VMT.

This template applies to projects identified as **VMT Analysis Using VMT Maps** projects.

For more detailed information, please refer to the Vehicle Miles Traveled (VMT) Analysis Guidelines.

Note that for projects with multiple land uses, the land use with the most complex report should be followed. If components of the project meet the screening criteria, they should be documented in the Screening Assessment section of the document.

City of Carlsbad
1200 Carlsbad Village Dr.
Carlsbad, CA 92008

VMT Analysis Using VMT Maps Requirements

Submission Date:

SECTION I: Developer Profile

Developer Name: _____

Property Manager Name: _____

Developer Mailing Address: _____
Number Street Suite

_____
City State Zip Code

Primary Contact Name: _____

Primary Contact Phone/Email: Phone: _____ Email: _____

Transportation Consultant Firm/ Representative _____

Transportation Consultant Phone/Email: Phone: _____ Email: _____

SECTION II: Project Information

Project Name: _____

Permit Number: _____

Project Address: _____
Number Street Suite

_____
City State Zip Code

SECTION III: Compliance Overview Checklist

Complete the appropriate sections of the checklist below to ensure compliance with the City of Carlsbad's VMT Analysis Guidelines.

CEQA VMT Analysis Using VMT Maps Compliance Checklist	Satisfactory? *(completed by City)*	
	YES	NO
VMT Report documenting VMT screening and VMT analysis	☐	☐
VMT Analysis performed using VMT maps	☐	☐
VMT Impact Conclusion (significant or less than significant impact)	☐	☐
Mitigation Measure Identification and Analysis (for significant impacts)	☐	☐

SECTION IV: VMT Report Contents

The following provides the required contents of a VMT Analysis Using VMT Maps Report.

Page # or Appendix: *(completed by preparer)*	CEQA VMT Analysis Using VMT Maps Required Content	Satisfactory? *(completed by City)*	
		YES	NO
	Executive Summary/Introduction: • Purpose of VMT analysis and identification of type of VMT report being prepared • Regional vicinity map with project location • Project screening results • VMT analysis method (Carlsbad VMT maps) • Significance of CEQA impacts • Mitigation measures and significance after mitigation	☐	☐
	Project Description, including: • Proposed project description (land use type, intensity, etc.)	☐	☐

	• VMT reduction measures that are part of the project description • Site plan		

	VMT Screening Assessment
	• Table that displays all screening criteria and demonstrates that the project does not meet the criteria and a brief statement of why. To demonstrate why a project doesn't meet any of the screening criteria, the following information may be necessary:
	  ○ Daily project trip generation (total, without adjustments for existing land uses on the site).
	  ○ A map showing the project's lack of proximity to a major transit stop, planned major transit stop, or a stop/transit center along a high-quality transit corridor.
	  ○ Statements that locally serving, affordable housing, and redevelopment criteria are not applicable.
	• For projects with multiple land uses, perform a screening assessment and create a screening assessment table for each land use. Document the conclusion of the screening assessment by land use. If one land use meets the screening criteria and one does not, only complete a VMT analysis for the component that does not meet the screening criteria.
		☐	☐

	Identify VMT Calculation Methodology and VMT Metric • Provide screenshot(s) of Carlsbad VMT maps with project TAZ(s) highlighted and VMT data displayed (for each metric that is applicable). • For residential projects, VMT/Capita is applicable. • For employment projects, VMT/Employee is applicable. • The VMT Analysis Using VMT Maps Report type is only applicable to residential and employment projects.	☐	☐

	Identify VMT Thresholds and Perform VMT Impact Analysis • Refer to the Carlsbad VMT Analysis Guidelines to determine the appropriate impact threshold to apply to the analysis. Document the threshold and the numerical value that represents the threshold. For example, the threshold for residential projects is 15% below the city-wide average VMT/capita, or currently 20.4 miles per resident. • Determine the project's VMT using the Carlsbad VMT maps, and if applicable, apply any VMT reduction measures that are part of the project description (refer to VMT Analysis Guidelines Appendix F for guidance on performing reduction calculations). • Compare the project's VMT to the City threshold and document if the project has a significant or less than significant impact.		
	Identify and Analyze Mitigation Measures (if the Impact is Significant) • If a significant impact is identified, refer to VMT Analysis Guidelines Appendix F to identify potential mitigation measures and analysis guidance. • Analyze how much VMT reduction is associated with the mitigation measures and determine if mitigation reduces the impact to less than significant. • If the impact is still significant after mitigation is applied, document that the project has a significant and unavoidable impact.		

VMT Report Template for Land Development Projects – VMT Analysis Using Custom Model/Method

City of Carlsbad
1200 Carlsbad Village Dr.
Carlsbad, CA 92008

How to Use this Template: Land development projects are required to conduct a California Environmental Quality Act (CEQA) transportation analysis to evaluate the transportation impacts of the project. The City of Carlsbad's VMT Analysis Guidelines provide direction to City staff, consultants, and project applicants regarding the methodologies and thresholds to be used for VMT analysis. The VMT analysis process as documented in the VMT Analysis Guidelines is:

1. Apply project screening criteria. If the project meets at least one of the screening criteria, the project is assumed to cause a less than significant impact and a detailed VMT analysis is not necessary. If the project does not meet any of the screening criteria, continue to Step 2.
2. Identify VMT calculation methodology.
3. Identify VMT metric.
4. Determine whether project falls within VMT threshold.
5. Assess transportation impact.
6. Propose mitigation measures, if necessary.

Report Types

Based on the VMT analysis process, a project will fall into one of three report types listed below:

- **Screening Only** – Projects that have met at least one of the screening criteria and do not require a detailed VMT analysis.
- **VMT Analysis Using VMT Maps** – Smaller projects (i.e., projects that generate 2,400 or less average daily trips or projects that do not require a separate modeling approach) that do not meet any of the screening criteria and require a detailed VMT analysis using the City of Carlsbad's VMT maps to determine VMT. NOTE: This method only applies to residential and employment projects.
- **VMT Analysis Using a Custom Model/Method** – Larger projects that do not meet any of the screening criteria and require a detailed VMT analysis using a project-specific model/method to determine VMT.

This template applies to projects identified as **VMT Analysis Using a Custom Model/Method** projects.

For more detailed information, please refer to the Vehicle Miles Traveled (VMT) Analysis Guidelines.

Note that for projects with multiple land uses, the land use with the most complex report should be followed. If components of the project meet the screening criteria, they should be documented in the Screening Assessment section of the document.

VMT Report Template for Land Development Projects – VMT Analysis Using Custom Model/Method

City of Carlsbad
1200 Carlsbad Village Dr.
Carlsbad, CA 92008

VMT Analysis Using Custom Model/Method Requirements

Submission Date:

SECTION I: Developer Profile

Developer Name: _____

Property Manager Name: _____

Developer Mailing Address: _____
Number Street Suite

_____
City State Zip Code

Primary Contact Name: _____

Primary Contact Phone/Email: _____
Phone: Email:

Transportation Consultant Firm/ Representative _____

Transportation Consultant Phone/Email: _____
Phone: Email:

SECTION II: Project Information

Project Name: _____

Permit Number: _____

Project Address: _____
Number Street Suite

_____
City State Zip Code

SECTION III: Compliance Overview Checklist

Complete the appropriate sections of the checklist below to ensure compliance with the City of Carlsbad's VMT Analysis Guidelines.

CEQA VMT Analysis Using Custom Model/Method Compliance Checklist	Satisfactory? *(completed by City)*	
	YES	NO
VMT Report documenting VMT screening and VMT analysis	☐	☐
VMT Analysis performed using custom model/method	☐	☐
VMT Impact Conclusion (significant or less than significant impact)	☐	☐
Mitigation Measure Identification and Analysis (for significant impacts)	☐	☐

SECTION IV: VMT Report Contents

The following provides the required contents of a VMT Analysis Using Custom Model/Method Report.

Page # or Appendix: *(completed by preparer)*	CEQA VMT Analysis Using Custom Model/Method Required Content	Satisfactory? *(completed by City)*	
		YES	NO
	Executive Summary/Introduction: • Purpose of VMT analysis and identification of type of VMT report being prepared • Regional vicinity map with project location • Project screening results • VMT analysis method • Significance of CEQA impacts • Mitigation measures and significance after mitigation	☐	☐

	Project Description, including: • Proposed project description (land use type, intensity, etc.) • VMT reduction measures that are part of the project description • Site plan	☐	☐

	VMT Screening Assessment
	• Table that displays all screening criteria and demonstrates that the project does not meet the criteria and a brief statement of why. To demonstrate why a project doesn't meet any of the screening criteria, the following information may be necessary:
	  ○ Daily project trip generation (total, without adjustments for existing land uses on the site).
	  ○ A map showing the project's lack of proximity to a major transit stop, planned major transit stop, or a stop/transit center along a high-quality transit corridor.
	  ○ Statements that locally serving, affordable housing, and redevelopment criteria are not applicable.
	• For projects with multiple land uses, perform a screening assessment and create a screening assessment table for each land use. Document the conclusion of the screening assessment by land use. If one land use meets the screening criteria and one does not, only complete a VMT analysis for the component that does not meet the screening criteria.
		☐	☐

	Identify VMT Calculation Methodology and VMT Metric • Provide a detailed description of the methodology that will be used to perform the analysis, including assumptions and substantial evidence for use of the method (i.e. data sources, research studies, etc.). • Identify the appropriate metrics for the project land use(s). Document how the metrics will be developed from the custom model/method.	☐	☐

	Identify VMT Thresholds and Perform VMT Impact Analysis • Refer to the Carlsbad VMT Guidelines to determine the appropriate impact threshold to apply to the analysis. Document the threshold and the numerical value that represents the threshold. Note that the same methodology must be used to determine the project VMT and the VMT threshold. For example, if a custom spreadsheet model using origin/destination GIS analysis is used, the threshold must also be determined using the same method. • Determine the project's VMT using the custom model/method, and if applicable, apply any VMT reduction measures that are part of the project description (refer to VMT Analysis Guidelines Appendix F for guidance on performing reduction calculations). • Compare the project's VMT to the City threshold and document if the project has a significant or less than significant impact.	☐	☐
	Identify and Analyze Mitigation Measures (if the Impact is Significant) • If a significant impact is identified, refer to VMT Analysis Guidelines Appendix F to identify potential mitigation measures and analysis guidance. • Analyze how much VMT reduction is associated with the mitigation measures and determine if mitigation reduces the impact to less than significant. • If the impact is still significant after mitigation is applied, document that the project has a significant and unavoidable impact.	☐	☐

VEHICLE MILES TRAVELED ANALYSIS GUIDELINES

APPENDIX B
RESOLUTION NO. 2020-114

City of Carlsbad
California

RESOLUTION NO. 2020-114

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CARLSBAD, CALIFORNIA, APPROVING VEHICLE MILES TRAVELED THRESHOLDS OF SIGNIFCANCE AND SCREENING CRITERIA FOR PUPRPOSES OF ANALYZING TRANSPORTATION IMPACTS UNDER THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

WHEREAS, the California Environmental Quality Act Guidelines ("CEQA Guidelines") encourage public agencies to develop and publish generally applicable "thresholds of significance" to be used in determining the significance of a project's environmental effects; and

WHEREAS, CEQA Guidelines section 15064.7(a) defines a threshold of significance as "an identifiable quantitative, qualitative or performance level of a particular environmental effect, noncompliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect normally will be determined to be less than significant"; and

WHEREAS, screening criteria are applied to determine when a project should be expected to cause a less-than-significant impact without conducting a detailed study; and

WHEREAS, CEQA Guidelines section 15064.7(b) requires that thresholds of significance must be adopted by ordinance, resolution, rule, or regulations, developed through a public review process, and be supported by substantial evidence; and

WHEREAS, pursuant to CEQA Guidelines section 15064.7(c), when adopting thresholds of significance, a public agency may consider thresholds of significance adopted or recommended by other public agencies provided that the decision of the agency is supported by substantial evidence; and

WHEREAS, Senate Bill 743, enacted in 2013 and codified in Public Resources Code section 21099, required changes to the CEQA Guidelines regarding the criteria for determining the significance of transportation impacts of projects; and

WHEREAS, in 2018, the Governor's Office of Planning and Research ("OPR") proposed, and the California Natural Resources Agency certified and adopted, new CEQA Guidelines section 15064.3 that identifies vehicle miles traveled ("VMT") - meaning the amount and distance of automobile travel attributable to a project - as the most appropriate metric to evaluate a project's transportation impacts; and

WHEREAS, as a result, automobile delay, as measured by "level of service" and other similar metrics, generally no longer constitutes a significant environmental effect under CEQA; and

WHEREAS, CEQA Guidelines section 15064.3 goes into effect on July 1, 2020, though public agencies may elect to be governed by this section immediately; and

WHEREAS, the City of Carlsbad, following internal study and a public review process consisting of staff a presentation before the Transportation and Mobility Commission, wishes to adopt VMT thresholds of significance for determining the significance of transportation impacts and screening criteria; and

WHEREAS, on June 16, 2020, the City Council held a duly noticed public hearing to consider this Resolution, at which all persons interested were given an opportunity to be heard.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Carlsbad, California, as follows:

1. That the above recitations are true and correct.
2. That the City of Carlsbad hereby adopts the VMT thresholds of significance and screening criteria for transportation impact analysis under CEQA that are included as Attachment A. These thresholds of significance and screening criteria have been developed through a public review process and are supported by substantial evidence, as required by CEQA Guidelines section 15064.7.
3. This Resolution shall take effect on July 1, 2020.

PASSED, APPROVED AND ADOPTED at a Regular Meeting of the City Council of the City of Carlsbad on the 16th day of June 2020, by the following vote, to wit:

AYES: Hall, Blackburn, Bhat-Patel, Schumacher.

NAYS: None.

ABSENT: None.

Matt Hall

MATT HALL, Mayor

for

BARBARA ENGLESON, City Clerk

(SEAL)

VEHICLE MILES TRAVELED ANALYSIS GUIDELINES

APPENDIX C
SCREENING CRITERIA AND THRESHOLD EVIDENCE

City of Carlsbad
California

SCREENING CRITERIA AND THRESHOLD EVIDENCE

This appendix provides context and evidence for the screening criteria and threshold evidence included in Chapters 3 for Land Development Projects and Chapter 4 for Transportation Projects.

Screening Criteria

Certain types of development projects are presumed to have less than significant impacts to the transportation system, and therefore would not be required to conduct a detailed VMT analysis, if any of the following criteria are established, based on substantial evidence.

Small Projects

Small projects that would generate less than 110 average daily vehicle trips (ADT), would also not result in significant transportation impacts on the transportation system:

Evidence – The OPR Technical Advisory states that "projects that generate or attract fewer than 110 trips per day generally may be assumed to cause a less-than-significant impact." This is supported by the fact that CEQA provides a categorical exemption for existing facilities, including additions to existing structures of up to 10,000 square feet, so long as the project is in an area where public infrastructure is available to allow for maximum planned development, and the project is not in an environmentally sensitive area. (CEQA Guidelines, § 15301(e)(2).) Typical project types for which trip generation increases relatively linearly with building footprint (e.g., general office building, single tenant office building, office park, or business park) generate or attract an additional 110- 124 trips per 10,000 square feet. Therefore, absent substantial evidence otherwise, it is reasonable to conclude that the addition of 110 or fewer trips could be considered not to lead to a significant impact.

Projects Located Near Transit

Per OPR's Technical Advisory projects whose project site boundaries are within a half mile of an existing or planned major transit stop or a major stop along a high-quality transit corridor can be screened out of VMT analysis. Withing the City of Carlsbad, this would apply to projects within one half mile of the Carlsbad Village or Carlsbad Poinsettia Coaster stations, as well as projects within one-half mile of the Plaza Camino Real transit center. This presumption would not apply, however, if project-specific or location-specific information indicates that the project will still generate significant levels of VMT.

Evidence – The OPR Technical Advisory states that "Proposed CEQA Guideline Section 15064.3, subdivision (b)(1), states 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. This presumption would not apply, however, if project-specific or location-specific information indicates that the project will still generate significant levels of VMT." Pub. Resources Code, § 21064.3 clarifies the definition of a major transit stop (" 'Major transit stop' means 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, § 21155 clarifies the definition of a major transit stop ("For purposes of this section, a high-quality transit corridor means

a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours..").

Local-Serving Retail and Similar Uses

Local-serving retail is defined in the City of Carlsbad as retail that is less than 50,000 square feet of total gross floor area or retail development that is greater than 50,000 square feet that has a market area study showing a market capture area that is primarily within Carlsbad and the adjacent cities of Oceanside, Vista, San Marcos, and Encinitas.

Evidence – The OPR Technical Advisory provides that "because new retail development typically redistributes shopping trips rather than creating new trips, estimating the total change in VMT (i.e., the difference in total VMT in the area affected with and without the project) is the best way to analyze a retail project's transportation impacts." Local serving retail generally shortens trips as longer trips from regional retail are redistributed to new local retail. The OPR Technical Advisory states that stores larger than 50,000 square feet may be considered regional-serving. Since the type of retail influences whether it will be locally serving or retail serving (for example grocery, drug stores, convenience stores, etc.) and the size of these facilities may be above 50,000 square feet, an applicant can provide a market survey demonstrating that the project serves the local community if it is over 50,000 square feet.

Local-Serving Public Facilities

Similar to local-serving retail, local-serving public facilities serve the community and either produce very low VMT or divert existing trips from established local facilities.

Evidence – Similar to local serving retail, local serving public facilities would redistribute trips and would not create new trips. Thus, similar to local serving retail, trips are generally shortened as longer trips from a regional facility are redistributed to the local serving public facility. The evidence from the OPR Technical Advisory described above also applies to local-serving public facilities.

Affordable Housing Projects

Residents of affordable residential projects typically generate less VMT than residents in market rate residential projects. This pattern is particularly evident in affordable residential projects near transit. In recognition of this effect, and in accordance with the OPR Technical Advisory, deed- restricted affordable housing projects meet the City's screening criteria and would not require a VMT analysis.

Projects that provide affordable housing affordable to persons with a household income equal to or less than 50 percent of the area median income as defined by California Health and Safety Code Section 50093, housing for senior citizens (as defined in Section 143.0720(e)), housing for transitional foster youth, disabled veterans, or homeless persons (as defined in 143.0720(f)) are not required to complete a VMT analysis.

Evidence –Affordable residential projects generate fewer trips than market rate residential projects. This supports the assumption that the rate of vehicle ownership is expected to be less for persons that qualify for affordable housing. Additionally, senior citizens, transitional foster youth, disabled veterans, and homeless individuals also have low vehicle ownership rates.

Redevelopment Projects That Cause a Net Reduction in VMT

A redevelopment project that demonstrates that the total project VMT is less than the existing land use's total VMT is not required to complete a VMT analysis.

Evidence – Consistent with the OPR Technical Advisory, "[w]here 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." Per CEQA, projects are considered to have a less than significant impact if they result in a net reduction in the relevant performance measure.

Thresholds

If a project is required to complete a VMT analysis, the project's impacts to the transportation system would be significant if the VMT would exceed any of the thresholds below.

Residential Projects

Threshold – 15% below city average household VMT/Capita.

Evidence – The OPR Technical Advisory provides that "residential development that would generate vehicle travel that is 15 or more percent below the existing residential VMT/capita, measured against the region or city, may indicate a less-than-significant transportation impact."

Office/Employment Projects

Threshold – 15% below regional average VMT/Employee.

Evidence – The OPR Technical Advisory provides that "office projects that would generate vehicle travel exceeding 15 percent below existing VMT/employee for the region may indicate a significant transportation impact."

Industrial Projects

Threshold – Above the regional average VMT/employee

Evidence – The OPR Technical Advisory provides that "[o]f land use projects, residential, office, and retail projects tend to have the greatest influence on VMT. For that reason, OPR recommends the quantified thresholds described above for purposes of analysis and mitigation. Lead agencies, using more location-specific information, may develop their own more specific thresholds, which may include other land use types." Purely industrial uses are desired to be located in locations that are less dense and not within urban areas which typically have higher VMT/employee. Industrial land uses are land intensive; therefore, placing industrial land uses in less urban areas characterized by having higher VMT/employee allows land in efficient VMT areas to be more effectively utilized as high density residential and commercial uses. This threshold is consistent with achieving an overall reduction in VMT. It recognizes that industrial uses, which generate relatively lower total VMT are most appropriate in areas that have a lower potential to reduce VMT. This allows more available land within areas with a high potential to achieve VMT reductions available for more dense development.

Regional Retail

Regional retail uses are retail uses that are larger than 50,000 square feet of total gross floor area and/or do not have a market study indicating that they are local-serving.

Threshold – A net increase in total regional VMT

Evidence – The OPR Technical Advisory provides that "because new retail development typically redistributes shopping trips rather than creating new trips, estimating the total change in VMT (i.e., the difference in total VMT in the area affected with and without the project) is the best way to analyze a retail project's transportation impacts…Regional-serving retail development,… which can lead to substitution of longer trips for shorter ones, may tend to have a significant impact. Where such development decreases VMT, lead agencies should consider the impact to be less-than- significant."

Transportation Project Screening Criteria

This section provides a list of transportation projects that are presumed to have a less than significant impact, and therefore, would not be required to conduct VMT analysis.

Project types that would not result in increased vehicle travel have a less than significant impact and can be screened out from performing VMT analysis. These types of projects include:

- Rehabilitation/maintenance projects that do not add motor vehicle capacity
- Addition of bicycle facilities
- Intersection traffic signal improvements/turn-lane configuration changes
- Additional capacity on local/collector streets if conditions are substantially improved for active transportation modes
- Installation of roundabouts and traffic calming devices

The following specific project types are presumed to have a less than significant impact to VMT:

- Rehabilitation, maintenance, replacement, safety, and repair projects designed to improve the condition of existing transportation assets (e.g., highways; roadways; bridges; culverts; Transportation Management System field elements such as cameras, message signs, detection, or signals; tunnels; transit systems; and assets that serve bicycle and pedestrian facilities) and that do not add additional motor vehicle capacity
- Roadside safety devices or hardware installation such as median barriers and guardrails
- Roadway shoulder enhancements to provide "breakdown space," dedicated space for use only by transit vehicles, to provide bicycle access, or to otherwise improve safety, but which will not be used as automobile vehicle travel lanes
- Addition of an auxiliary lane of less than one mile in length designed to improve roadway safety

- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, two-way left turn lanes, or emergency breakdown lanes that are not utilized as through lanes
- Addition of roadway capacity on local or collector streets provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit
- Conversion of existing general purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially increase vehicle travel
- Addition of a new lane that is permanently restricted to use only by transit vehicles
- Reduction in number of through lanes
- Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g., HOV, HOT, or trucks) from general vehicles
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority (TSP) features
- Installation of traffic metering systems, detection systems, cameras, changeable message signs and other electronics designed to optimize vehicle, bicycle, or pedestrian flow
- Timing of signals to optimize vehicle, bicycle, or pedestrian flow
- Installation of roundabouts or traffic circles
- Installation or reconfiguration of traffic calming devices
- Adoption of or increase in tolls
- Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase
- Initiation of new transit service
- Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
- Removal or relocation of off-street or on-street parking spaces
- Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)
- Addition of traffic wayfinding signage
- Rehabilitation and maintenance projects that do not add motor vehicle capacity

- Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way
- Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel
- Installation of publicly available alternative fuel/charging infrastructure
- Addition of passing lanes, truck climbing lanes, or truck brake-check lanes in rural areas that do not increase overall vehicle capacity along the corridor

Evidence – The list above is consistent with recommendations in the OPR Technical Advisory that indicates projects that can be presumed to have a less than significant impact on VMT due to overall project characteristics.

Threshold

For transportation projects, significant impact occurs if the project results in a net increase in VMT.

Evidence – Use of any net increase in the performance measure (in this case VMT) is considered to be the most conservative possible threshold possible under CEQA, assuming that any degradation in the performance measure cause a significant impact. In the OPR Technical Advisory, the determination of a performance measure for transportation projects is left to the discretion of the lead agency.

VEHICLE MILES TRAVELED ANALYSIS GUIDELINES

APPENDIX D
VEHICLE MILES TRAVELED METRIC CALCULATION DOCUMENTATION

City of Carlsbad California

VMT METRIC CALCULATION DOCUMENTATION

ACCOUNTING FOR EXTERNAL VMT

The City of Carlsbad uses refined VMT/capita and VMT/employee metrics instead of the metrics as produced directly from SANDAG and displayed on the SANDAG website/web-map application. The purpose of producing refined metrics is to provide more detailed estimates that are consistent with the recommendations from the OPR Technical Advisory on Evaluating Transportation Impacts in CEQA (December 2018). Specifically, refined metrics are responsive to the following quote from the OPR Technical Advisory:

- *Considerations for All Projects. Lead agencies should not truncate any VMT analysis because of jurisdictional or other boundaries, for example, by failing to count the portion of a trip that falls outside the jurisdiction or by discounting the VMT from a trip that crosses a jurisdictional boundary. CEQA requires environmental analyses to reflect a "good faith effort at full disclosure." (CEQA Guidelines, §15151.) Thus, where methodologies exist that can estimate the full extent of vehicle travel from a project, the lead agency should apply them to do so. Where those VMT effects will grow over time, analyses should consider both a project's short-term and long-term effects on VMT (Page 6).*

If a SANDAG model run is used to evaluate a project's VMT/capita or VMT/employee, an additional step is necessary to refine the results for impact analysis purposes. This step is to run a script that is available to the City and the step will be performed by City staff or affiliates. The script is available in two programming language formats; Python and R.

The script utilizes SANDAG model files (some of the files are model outputs that will be generated after running the model and some are the model inputs) to calculate the employee and resident VMT based on new refined metrics. The following files should be requested from SANDAG/City in the CSV format to run the script:

1. Households (from SANDAG) – it provides information for every household in the SANDAG region.
2. Persons (from SANDAG) – it provides information for every person within a household in the SANDAG region.
3. wsLocResults_3 (from SANDAG) – it provides information about the work and school location. Only work location information is used for this script.
4. maz_xref (from SANDAG) – it provides information about Micro Analysis Zones (MAZ or MGRA); in what TAZ, Census Tract, City, or County they are located.
5. Ietrip (from SANDAG) – it provides information about internal-external trips. These trips are made by SANDAG residents who travel outside the region.

6. Eitrip (from SANDAG) – it provides information about external-internal trips. These trips are made by people living outside the SANDAG region who travel to San Diego County.

7. Jointtrips (from SANDAG) – it provides information about trips made by SANDAG residents traveling in groups of more than one person per vehicle.

8. Indivtrips (from SANDAG) – it provides information about individual trips made by SANDAG residents.

9. jointTourData_3 (from SANDAG) – it provides information about tours made by SANDAG residents traveling in groups of more than one person per vehicle.

10. ieei (from the City) – it provides information about the average trip length outside the region for residents and non-residents where either end of their trips started in the SANDAG region. This file is based on the CSTDM and provides the calculated weighted average trip length outside of the region.

Once the files are obtained, they can be loaded in the script. All necessary functions and libraries are included in the script to load and process the data. Outputs of the script will be generated in two CSV files for VMT/Capita and VMT/Employee. The CSV files will include all TAZs within the region. The user should look for the TAZ that they are interested in to find the associated VMT/Capita or VMT/Employee.

The following sections explain how the refined metrics differ from the "off-the-shelf" metrics from SANDAG.

VMT per Capita

A limitation of the SANDAG-generated VMT/Capita is that it only includes VMT generated within the SANDAG region by residents of the SANDAG region. For example, if a resident of San Diego County shops in Riverside County, a part of his or her trip from the SANDAG border to the shopping mall would not be included in that resident's VMT record.

In addition, the Technical Advisory statement, mentioned above *(CEQA Guidelines, § 15151),* indicates that external trips – trips that originate or terminate outside of the transportation model area or outside of the agency – should be considered when calculating VMT. For the County of San Diego, this would entail incorporating VMT information from Riverside County, Imperial County, and Orange County. In addition, VMT associated with trips originating or terminating in Mexico should also be included; however, including these Mexico – US trips is extremely difficult because VMT data sources are extremely limited.

To account for VMT generated by residents of the SANDAG region traveling outside of the region, the California Statewide Travel Demand Model (CSTDM) was used to calculate average trip lengths outside of San Diego County for each entry/exit point of San Diego County. These trip lengths were appended to trips made by residents of San Diego County to Riverside, Orange, or Imperial Counties and back to calculate VMT per Resident considering the entirety of a resident's daily vehicle miles traveled both within and outside the County.

Table D-1 displays the current base year (2012) weighted average distance beyond the SANDAG model boundary for trips passing through each model gateway using the CSTDM.

TABLE D-1 - TRIP DISTANCES OUTSIDE SAN DIEGO COUNTY FOR ENTERING AND EXITING TRIPS

Gateway		Distance Outside San Diego County (miles)	
Route	**County**	**IX Trips**	**XI Trips**
I-8	Imperial	70.16	69.20
SR-78	Imperial	54.07	58.90
SR-79	Riverside	71.71	62.54
Pechanga Pkwy	Riverside	35.89	30.91
I-15	Riverside	24.86	24.81
I-5	Orange County	60.54	62.81

VMT per Employee

A limitation of the SANDAG VMT/Employee is that it does not include employee trips from people living outside of San Diego County. For example, someone who commutes to San Diego from Riverside County would not be included in the calculation. In addition, the VMT/Employee metric only includes VMT generated within the SANDAG region by employees who live and work in the SANDAG region; therefore if an employee lives and works in Carlsbad, but travels regularly to meetings in Orange County, the VMT associated with the meeting travel is not included.

The Carlsbad refined work-tour VMT/Employee metric includes all work-related trips (work-tour) for employees and is assigned to their work location TAZ. To account for work-related VMT generated by people living outside of the San Diego region, one of SANDAG's model output files ("eitrip" file) was used to calculate the work-related VMT for trips originating outside the SANDAG region and terminating in the SANDAG region. For example, if a resident of Orange County works in the City of Carlsbad, his or her commute VMT is included in the employee VMT record. There is a limitation with inclusion of non-resident commute VMT, which is that if that employee makes other work-related trips during the day (for example going to lunch or to a meeting), the VMT associated with those trips is not included.

One other limitation of the refined metric is that external to/from internal work-related VMT generated by people who live and work within the SANDAG region and travel outside the SANDAG region as part of their work tour is not included. For example, for someone who lives and works in the San Diego region and occasionally travels to Orange County for a work conference, his or her VMT associated with the Orange County trips is not included in the refined work tour metrics. Including this work related VMT is not possible because the SANDAG model does not provide trip type/purpose for resident's trips that are leaving and re-entering the SANDAG model boundary; therefore, it is not possible to conclude which internal to/from external trips are work related.

APPLYING COMMUTE RELATED TDM MEASURES TO THE VMT/CAPITA METRIC

Residential projects, as part of their travel demand management program, will sometimes provide on-site travel demand management measures and amenities that reduce commute/work related trips. Example work based measures that may be incorporated into residential projects are rideshare programs, vanpool programs, and business centers. Since these measures apply specifically to work

related travel, VMT reductions associated with them should only be applied to the portion of VMT generated by the project that is commute/work related. Therefore, it is necessary to determine the portion of the VMT/capita metric that is work related.

The SANDAG ABM 2+ model output was used to determine the portion of the VMT/Capita metric that is work related. The calculation was specifically performed for Carlsbad VMT/Capita, the percentage would be slightly different in other areas of the region. The portion of City of Carlsbad VMT/Capita that is work related is approximately 44% of the total VMT/Capita. Table D-2 shows the calculation for determining the percent of VMT/capita that is work related for the City of Carlsbad.

TABLE D-2 – PERCENT OF VMT/CAPITA THAT IS WORK RELATED

TRACT Within the City	Total Resident VMT	Commute Tour VMT
17109	169,512.32	71,571.76
17801	171,803.75	75,181.49
17808	155,168.22	64,574.99
17809	54,413.80	23,800.48
17810	123,174.56	52,491.84
17811	153,235.52	67,175.34
17813	110,467.06	44,286.25
17900	162,556.71	79,133.40
18000	89,582.07	42,555.98
19803	103,112.99	46,054.21
19804	110,746.43	45,678.20
19806	269,038.40	106,520.49
20013	317,174.47	145,442.50
20014	196,150.14	86,916.59
20015	135,581.04	64,107.30
20016	220,858.50	98,741.53
22100	225,085.81	88,839.17
Total	**2,767,661.80**	**1,203,071.52**
Portion of City of Carlsbad Resident VMT that is work related	***44%***	

Source: SANDAG Model ABM 2+ Output

To determine the effectiveness of TDM measure(s) or commute trip reduction program(s) that are part of a residential project's travel demand management program, the following steps are taken:

1. Determine the project's VMT/Capita
2. Identify the work based TDM measure and calculate the percent reduction in work-related VMT due to implementing the measures/program.

3. The effectiveness of the work based TDM measure is multiplied by 44% to get the resulting effectiveness. If multiple work based TDM measures are identified, the procedure outlined in Appendix F would be followed to combine them together. If TDM measures that would reduce all VMT are also included, the same dampening process for combining measures would apply (Appendix F). The resulting work effectiveness would be combined with the other measures' effectiveness using the dampening equations.
4. The percent reduction calculated in Step 3 is applied to the VMT/Capita from Step 1 to arrive at "reduced" VMT/Capita.
5. The "reduced" VMT/Capita is compared to the significance threshold to assess whether there is a significant impact.

VEHICLE MILES TRAVELED ANALYSIS GUIDELINES

APPENDIX E
LAND USE DESIGNATIONS

City of Carlsbad
California

LAND USE DESIGNATIONS

Table E-1 provides guidance on how specific land use designations fit within the overall land use VMT analysis categories: residential, office, industrial, retail (typically size determines if it is locally serving or regional), and public facilities. Land use designation will be determined in consultation with City staff.

TABLE E-1: LAND USE DESIGNATIONS

LAND USE
Residential
Mobile Home
Multiple Dwelling Unit (all sizes)
Senior Housing (not Assisted Living)
Single Family Detached
Office/Employment
Assisted Living/Nursing Facility
Hospital
Industrial/Business Park
Scientific Research and Development
Hotel (including with and without convention facilities/restaurant)
Motel
Resort Hotel (could be considered retail, coordination with City Staff required)
Office
Medical Office
Government Offices (Use is Primarily Office with Employees; not Providing In-Person Customer Service)
Industrial Employment
Manufacturing/Assembly
Warehousing (including high-cube warehouses, parcel hubs, fulfillment centers, and cold storage warehouses)
Data Center
Agriculture

Regional Public Facilities/Services: Presumed to be Not Locally Serving
Airport
University
Community College
Regional Education Facilities
Regional House of Worship
Regional Park
Public Facilities/Services: Presumed to be Locally Serving
Cemetery
Cellular Communications Towers/Facilities and other Utility Facilities
Local-Serving Educational Facilities
Day Care Center/Child Care Center
Fire Stations
Library
Department of Motor Vehicles
Government Offices (Providing Primarily In-Person Customer Service)
Post Office
Park & Ride Lot
Neighborhood House of Worship
Transit Station
Park
Waste-water Treatment Facilities
Regional Retail: Presumed to be Not Locally Serving
Shopping Center Greater than 50,000 square feet (unless a market study demonstrates otherwise)
Stand Alone Convention Centers/Event Venues
Theme Parks

Retail: Presumed to be Locally Serving (Less than 50,000 square feet or a market study). If multiple retail land uses are provided as one development, the sizes for all retail uses must be summed and considered together as a shopping center to determine whether the project qualifies for screening.
Automobile Services
Convenience Market Chain
Discount Store/Discount Club
Drugstore
Fitness Center/Sports Facility (indoor or outdoor)
Furniture Store
Lumber/Home Improvement Store
Nursery
Restaurant/Winery
Neighborhood Shopping Center
Specialty Retail Center/Strip Commercial
Supermarket
Financial Institution (Bank or Credit Union)
Bowling Center
Movie Theater

APPENDIX F
VEHICLE MILES TRAVELED REDUCTION STRATEGIES AND EFFECTIVENESS CALCULATIONS

City of Carlsbad
California

VMT REDUCTION STRATEGIES AND EFFECTIVENESS CALCULATIONS

VMT REDUCTION STRATEGIES UNDER CEQA

Projects can apply VMT reduction strategies to lower their calculated VMT below the significance threshold. Typically, VMT is reduced by implementing strategies that achieve one of the following:

- Reducing the number of automobile trips generated by the project or by the residents or employees of the project; or
- Reducing the distance that people drive.

Measures that reduce single occupant automobile trips or travel distances are called Transportation Demand Management (TDM) strategies.

QUANTIFYING TDM EFFECTIVENESS

To be effective mitigation measures, TDM strategies must be supported by sufficient evidence to quantify the level of VMT reduction that they could achieve for a given project site. In general, the TDM strategies can be quantified using the methodologies described in the Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity (California Air Pollution Control Officers Association (CAPCOA), 2021, referred to herein as "GHG Handbook").

The 2021 GHG Handbook supersedes the 2010 CAPCOA *Quantifying Greenhouse Gas Mitigation Measures* handbook (referred to herein as the "CAPCOA report"). Projects must use the current available information, and as such, should rely on data and procedures contained in the 2021 GHG Handbook and not the 2010 CAPCOA report. The GHG Handbook contains updated data, calculations, and procedures used in calculating TDM measure effectiveness at reducing VMT.

Table F-1 identifies TDM measures that are included in the GHG Handbook. This table provides a description of each measure with information about the land use types that they are applicable to, maximum effectiveness (if available), and guidance for the application of each measure for VMT reduction.

Calculating TDM Program Effectiveness

As explained below, there are some important considerations for calculating the effectiveness of TDM strategy mitigation measures. Alternative methodologies may be used to quantify VMT reductions, provided there is substantial evidence to justify the calculated reduction. All assumptions regarding participation, eligibility, and other variables should be clearly documented for each proposed TDM strategy.

Some TDM strategies can be combined with others to increase the effectiveness of VMT mitigation; however, the interaction between the various strategies is complex and sometimes counterintuitive. Strategies apply to *either* the Project scale *or* the Community/City scale; therefore, VMT reductions at these scales must be calculated separately. This limits project scale strategies to employer commute

programs, land use strategies (increased density, mixed-use development, and transit-oriented development), and parking (unbundled parking, parking cash-out, and pricing).

While individual projects may contribute to the cost of community-serving infrastructure improvements (for example, pedestrian network and bicycle facility improvements), percentage VMT reductions from community-scale strategies should be calculated separately from percentage VMT reductions due to project-focused strategies. These percentage reductions can then be applied to total VMT generated at the project or community levels. At the City's discretion, community-scale VMT reductions can be applied to offset project-generated VMT impacts.

As described in the GHG Handbook, strategy effectiveness levels are not directly additive, and when determining the overall VMT reduction, the VMT reduction separately calculated for each individual strategy (within their overall TDM strategy category) should be dampened, or diminished, according to a multiplicative formula to account for the fact that some of the strategies may be redundant or applicable to the same populations. Ultimately, the intent of this dampening is to provide a mechanism for minimizing the possibility of overstating VMT reduction effectiveness.

To quantify the VMT reduction that results from combining strategies, the formula below can be applied absent additional knowledge or information:

$$Total\ VMT\ Reduction = 1\text{-}[(1 - P_a) * (1 - P_b) * (1 - P_c) * \ldots]$$

Where:

P_x = percent reduction of each VMT reduction strategy

For example, if two strategies were proposed with corresponding VMT reductions of 20 percent and 10 percent, the equation would be [1-(1-20%)*(1-10%)] or [1-(80%*90%)], which equates to a 28 percent reduction rather than the 30 percent reduction that would otherwise result from a direct sum. This adjustment methodology is simply a mathematical approach to dampening the potential effectiveness and is not supported by research related to the actual effectiveness of combined strategies. As noted above, this approach minimizes possibility of overstating VMT reduction effectiveness. When calculating the effects of different groups of strategies, this formula should be applied when combining individual strategies in a group and again when combining groups of strategies in a single program.

When calculating the VMT reduction of a combination of strategies, the effectiveness of each strategy should be calculated using the same method consistently.

Per the GHG Handbook, subcategory-specific maximum reasonable VMT reductions are identified to prevent double-counting of reductions from measures that affect travel behavior in similar ways. For example, the GHG Handbook indicates that the combination of any group of trip reduction strategies would have a maximum effect. Maximums are provided for each subcategory of measures. Within Carlsbad, the combination of all measures is expected to have a **maximum feasible overall reduction of 15 percent**.

TABLE F-1: VMT REDUCTION STRATEGIES AND EFFECTIVENESS CALCULATIONS

GHG Handbook #	**Measure**[1] Measures shown in green may be applied to individual development projects in Carlsbad– Must Follow procedures in GHG Handbook, this Appendix, and Calculation Notes shown in this Table. Measures shown in orange are not quantified in the GHG Handbook but may be quantifiable with appropriate evidence/information. Coordination with City staff required. Measures shown in yellow are not quantifiable but should be considered if a project has a significant and unavoidable impact to provide mitigation to the extent feasible. Measures shown in gray are not quantifiable, are not appropriate at the project scale, are not applicable in Carlsbad, or are already accounted for in the VMT modeling and may not be considered as mitigation measures.	**Scale of Application** **P/S – Project/Site** **P/C – Plan/Community**	**Locational Context** **U – Urban (Village)** **S – Suburban (Outside of Village)**	**Applicable Land Use Types**	**Maximum Percent Reduction in VMT**[2]	**Measure Description/GHG Handbook Calculation Notes** **The calculation notes provide guidance on selecting values for the variables in the GHG Handbook VMT reduction equations. If a variable does not have stated guidance below, the user should apply the value provided in the GHG Handbook. Additionally, data sources are periodically updated; therefore, the user should confirm and use the most current data source for any given variable.**
Land Use Measures						
T-1	Increase Residential Density (from existing neighborhood conditions)	P/S	U, S	Residential	30%	Typically, this measure is accounted for in the SANDAG Model if a model run is performed for a project. If a model run is not required for the project, this measure may be applicable. To be applicable, the project density must exceed 9.1 dwelling units per acre (the typical US residential unit density). If the existing residential density of the transportation analysis zone/census tract is greater than 9.1 dwelling units per acre, the existing residential unit density (variable "C" in the GHG Handbook equation) should be derived from the relevant transportation analysis zone or census tract instead of the value for a typical development in the calculation.
T-2	Increase Job Density (from existing neighborhood conditions)	P/S	U, S	Retail Office Industrial	30%	Typically, this measure is accounted for in the SANDAG Model if a model run is performed for a project. If a model run is not required for the project, this measure may be applicable. To be applicable, the employment density must exceed 145 employees per acre (the typical US employment density). If the existing employment density is greater than 145 employees per acre, the existing employment density (variable "C" in the GHG Handbook equation) should be derived from the relevant transportation analysis zone (or census tract) instead of the value for a typical development in the calculation.
T-3	Provide Transit-Oriented Development	P/S	U, S	Residential Retail Office Industrial	31%	This measure is accounted for in the SANDAG model.
T-4	Integrate Affordable and Below Market Rate Housing	P/S	U, S	Residential	26.8%	This measure is applicable to a project (or a portion of a project) that is defined as below market rate affordable housing, defined as 80-percent of area median income or below.
T-17	Improve Street Connectivity	P/S	U, S	N/A	30%	This measure accounts for the VMT reduction achieved by a project that is designed with a higher density of vehicle intersections compared to the average intersection density in the U.S. This is not applicable at a project scale.
T-31-A	Locate Project in Area with High Destination Activity	P/S	U, S	Residential Retail Office Industrial	Not Quantified	This measure is accounted for in the SANDAG model. The measure requires development in an area with high accessibility to destinations. Destination accessibility is measured in terms of the number of jobs or other attractions (e.g., schools, supermarkets, and health care services) that are reachable within a given travel time or travel distance, and tends to be highest at central locations and lowest at peripheral ones.

TABLE F-1: VMT REDUCTION STRATEGIES AND EFFECTIVENESS CALCULATIONS

GHG Handbook #	**Measure**[1] Measures shown in green may be applied to individual development projects in Carlsbad– Must Follow procedures in GHG Handbook, this Appendix, and Calculation Notes shown in this Table. Measures shown in orange are not quantified in the GHG Handbook but may be quantifiable with appropriate evidence/information. Coordination with City staff required. Measures shown in yellow are not quantifiable but should be considered if a project has a significant and unavoidable impact to provide mitigation to the extent feasible. Measures shown in gray are not quantifiable, are not appropriate at the project scale, are not applicable in Carlsbad, or are already accounted for in the VMT modeling and may not be considered as mitigation measures.	**Scale of Application** **P/S – Project/Site** **P/C – Plan/Community**	**Locational Context** **U – Urban (Village)** **S – Suburban (Outside of Village)**	**Applicable Land Use Types**	**Maximum Percent Reduction in VMT**[2]	**Measure Description/GHG Handbook Calculation Notes** **The calculation notes provide guidance on selecting values for the variables in the GHG Handbook VMT reduction equations. If a variable does not have stated guidance below, the user should apply the value provided in the GHG Handbook. Additionally, data sources are periodically updated; therefore, the user should confirm and use the most current data source for any given variable.**
T-31-B	Increase Destination Accessibility in Underserved Areas	P/C	U, S	Retail Office Industrial	Not Quantified	This measure accounts for the VMT reduction that would be achieved by constructing job centers or other attractions (e.g., schools, supermarkets, and health care services) for residents in underserved areas (e.g., food deserts).
T-32	Orient Project Toward Non-Auto Corridor	P/S	U, S	Residential Retail Office Industrial	Not Quantified	Not applicable/captured by other measures.
T-33	Locate Project near Bike Path/Bike Lane	P/C	U, S	Residential Retail Office Industrial	Not Quantified	Not applicable/captured by other measures.
Trip Reduction Programs						
T-5	Implement Commute Trip Reduction Program (Voluntary)	P/S	U, S	Retail Office Industrial	4%	A multi-strategy program implemented by employers on a voluntary basis. The program must include: • Employer-provided services, infrastructure, and incentives for alternative modes such as ridesharing (Measure T-8), discounted transit (Measure T-9), bicycling end of trip facilities (Measure T-10), vanpool (Measure T-11), and guaranteed ride home. • Information, coordination, and marketing for said services, infrastructure, and incentives (Measure T-7).
T-6	Implement Commute Trip Reduction Program (Mandatory Implementation and Monitoring)	P/S	U, S	Retail Office Industrial	26%	Participation in the program by employees is required and the GHG Handbook requires specific strategies are implemented as part of the program. A reduction goal is specified, and ongoing monitoring and reporting to assess the program's effectiveness is required. Given the mandatory trip reduction requirements and associated penalties, this measure would not typically be applicable. **Coordination with Carlsbad staff is required if this measure is selected.**

TABLE F-1: VMT REDUCTION STRATEGIES AND EFFECTIVENESS CALCULATIONS

GHG Handbook #	**Measure**[1] Measures shown in green may be applied to individual development projects in Carlsbad– Must Follow procedures in GHG Handbook, this Appendix, and Calculation Notes shown in this Table. Measures shown in orange are not quantified in the GHG Handbook but may be quantifiable with appropriate evidence/information. Coordination with City staff required. Measures shown in yellow are not quantifiable but should be considered if a project has a significant and unavoidable impact to provide mitigation to the extent feasible. Measures shown in gray are not quantifiable, are not appropriate at the project scale, are not applicable in Carlsbad, or are already accounted for in the VMT modeling and may not be considered as mitigation measures.	Scale of Application P/S – Project/Site P/C – Plan/Community	Locational Context U – Urban (Village) S – Suburban (Outside of Village)	Applicable Land Use Types	Maximum Percent Reduction in VMT[2]	**Measure Description/GHG Handbook Calculation Notes** **The calculation notes provide guidance on selecting values for the variables in the GHG Handbook VMT reduction equations. If a variable does not have stated guidance below, the user should apply the value provided in the GHG Handbook. Additionally, data sources are periodically updated; therefore, the user should confirm and use the most current data source for any given variable.**
T-7	Implement Commute Trip Reduction Marketing	P/S	U, S	Residential Retail Office Industrial	4%	Promote and advertise various transportation options, including promoting information and resources regarding Carlsbad's Citywide TDM Plan as well as SANDAG's iCommute program, which provides support to commuters through a variety of TDM measures such as carpool matching services, vanpool, and other services. As resources are available through Carlsbad's Citywide TDM Program, those should be advertised and applied as well. Marketing should be for services that are appropriate and available to employees/residents. Viable transportation alternatives should be marketed, for example, it is not appropriate to market transit options if there are no transit options near the project site. For residential projects, the VMT reduction is only applicable to the portion of the VMT associated with the commute trips. The "eligible employees" should be a maximum of 50% to indicate that not all residents will have work locations or schedules that are compatible with available options. For ABM2+, the portion of the Carlsbad citywide average VMT/capita that is commute/work related is 44% (**see Appendix D for additional information**).
T-8	Provide Ridesharing Program	P/S	U, S	Residential Retail Office Industrial	8%	This strategy focuses on encouraging carpooling by project site/building tenants. Existing ride-share companies could also be leveraged by providing subsidies for shared ride purchases (e.g., Waze Carpool or equivalent). The program must be specify the platform(s) that will be promoted and identify the subsidy that will be provided to incentive use. Must use GHG Handbook, Table T-8.1 to determine variable "C." For Suburban context the value is -4%, for Urban context the value is -8%. For residential projects, the VMT reduction is only applicable to the portion of the VMT associated with the commute trips and the "eligible employees" should be a maximum of 25% to indicate that it is more difficult to match employees for ridesharing in a residential project where people work in various geographic areas and have various work schedules. For ABM2+, the portion of the Carlsbad citywide average VMT/capita that is commute/work related is 44% (**see Appendix D for additional information**).

T-9	Implement Subsidized or Discounted Transit Program	P/S	U, S	Residential Retail Office Industrial	5.5%	Subsidized or discounted public transit passes are provided to employees and/or residents. Example applications include subsidized, discounted, or free out-of-pocket costs for daily or monthly public transit passes. Reducing the out-of-pocket cost for choosing transit improves the competitiveness of transit against driving, increasing the total number of transit trips and decreasing vehicle trips. The project should be accessible either within 1 mile of high-quality transit service (rail or bus with headways of less than 15minutes), 0.5 mile of local or less frequent transit service, or along a designated shuttle route providing last-mile connections to rail service. If a well-established bikeshare service (Measure T-22-A) is available, the site may be located up to 2 miles from a high-quality transit service. If this measure is selected, the user may not also take credit for either Measure T-5 or T-6. Calculating the effectiveness of this measure requires inputting several variables. Guidance for selecting variables is described below: Variable B/C – Average transit fare without subsidy and subsidy amount. These variables can be presented as either the fare per ride or cost of a monthly pass. The variables should be input based on how the program will be administered. If the program will subsidize individual rides, the fare per ride should be used. If the program will provide monthly passes, the cost of a monthly pass should be used. Variable D – The percentage of employees/residents associated with the site who have access to the subsidy. If it is an employment project – all employees (accounting for contract, part-time, etc. who may not be eligible) should be included in the percentage. If the subsidy doesn't fully cover the cost of transit, or if a limited number of subsidized passes would be available, Variable D must be adjusted. Variable E – The percentage of project-generated VMT from employees/residents is used to adjust the percent reduction in GHG emissions from the scale of employee and/or resident-generated VMT to project-generated VMT. Since the VMT metrics are VMT/employee or VMT/resident and the VMT associated with these metrics is already scaled to the individual, the value is 100%. Variable F – The existing transit mode share for work trips (employment projects) or all trips (residential projects) should be based on the project location. The GHG Handbook indicates that if a local survey is not available, the California Household Travel Survey is the preferred data source for determining the transit mode shares. Based on the most recent California Household Travel Survey (2012) the values are 0.6% for all trip transit mode share based on the City of Carlsbad data (to be applied to residential projects) and 1.6% for work trips transit mode share (based on the combined transit mode share for North County coastal cities: Del Mar, Solana Beach, Encinitas, Carlsbad, and Oceanside). The North County coastal cities were combined to provide a bigger sample size of work trips in the California Household Travel survey data. Variable H – Use given value of 50% unless a project specific value is available.
T-10	Provide End-of-Trip Bicycle Facilities	P/S	U, S	Retail Office Industrial	4.4%	This measure will install and maintain end-of-trip facilities for employee use. End-of-trip facilities include bike parking, bike lockers, showers, and personal lockers. If this measure is selected, the user may not also take credit for either Measure T-5 or T-6. See the City of Carlsbad TDM Handbook for amenity design requirements. Guidance for selecting variables is described below: Variable B: If only bicycle racks/lockers are provided the value is 1.78. If bicycle racks/lockers, personal storage lockers, and showers are provided the value is 4.86. Variable C/D – The bicycle and vehicle average trip length should be based on the project location. The GHG Handbook indicates that if a local survey is not available, the California Household Travel Survey is the preferred data source for determining the average trip lengths. Based on the most recent California Household Travel Survey

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						(2012) the average bicycle trip length for Carlsbad is 5.0 miles and the average vehicle trip length is 7.9 miles. The applicant may also provide SANDAG model data specific to the City of Carlsbad for these values as an alternative. Variable E/F - The existing bicycle and vehicle mode shares for work trips (employment projects) should be based on the project location. The GHG Handbook indicates that if a local survey is not available, the California Household Travel Survey is the preferred data source for determining the bicycle and vehicle mode shares. Based on the most recent California Household Travel Survey (2012) the values are 1.2% for work trips bicycle mode share (based on the combined bicycle mode share for North County coastal cities: Del Mar, Solana Beach, Encinitas, Carlsbad, and Oceanside). The work trip vehicle mode share for the North County coastal cities is 95.0%. The North County coastal cities were combined to provide a bigger sample size of work trips in the California Household Travel survey data. The applicant may also provide SANDAG model data specific to the City of Carlsbad for these values as an alternative.
T-11	Provide Employer Sponsored Vanpool	P/S	U, S	Retail Office Industrial	20.4%	This measure will implement an employer-sponsored vanpool service or subsidy for iCommute vanpool program. Vanpooling is a flexible form of public transportation that provides groups of 5 to 15 people with a cost-effective and convenient rideshare option for commuting. If this measure is selected, the user may not also take credit for either Measure T-5 or T-6. Guidance for selecting variables is described below: Variable B, D, and E – Since the GHG Handbook values are derived from San Diego data, use GHG Handbook suggestions. Variable C - The work trip vehicle average trip length should be based on the project location. The GHG Handbook indicates that if a local survey is not available, the California Household Travel Survey is the preferred data source for determining the average trip lengths. Based on the most recent California Household Travel Survey (2012) the average work vehicle trip length is 11.9 miles. The applicant may also provide SANDAG model data specific to the City of Carlsbad for as an alternative.

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T-12	Price Workplace Parking	P/S	U, S	Retail Office Industrial	20%	This measure will price onsite parking at workplaces. Because free employee parking is a common benefit, charging employees to park onsite increases the cost of choosing to drive to work. On-street public parking must be restricted near (within ¾ miles) the project to reduce the opportunity for employees to avoid charges for parking at the workplace while still driving to work. Given the context of the City of Carlsbad, this measure would not typically be applicable and use of it requires coordination with City staff. Guidance for selecting variables is described below: Variable C: If baseline parking price is $0 (that is, if parking is typically free), set C = ¼ B, allowing for the maximum 50 percent increase in price. Alternatively, for locations that are located within 0.5 mile of transit service, set C = average transit fare to/from the location.
T-13	Implement Employee Parking Cash-Out	P/S	U, S	Retail Office Industrial	12%	This measure will require project employers to offer employee parking cash-out. Cash-out is when employers provide employees with a choice of forgoing their current subsidized/free parking for a cash payment equivalent to or greater than the cost of the parking space. This measure also requires that employee parking is managed and enforced via a permit system (or other monitoring system) and free parking is not available within ¾ miles of the project site (reducing the incidence of employees receiving parking cash out, but still driving and parking within walking distance).
T-23	Provide Community-Based Travel Planning	P/C	U, S	Residential	2.3%	This measure will target residences in the plan/community with community-based travel planning (CBTP). CBTP is a residential based approach to outreach that provides households with customized information, incentives, and support to encourage the use of transportation alternatives in place of single occupancy vehicles, thereby reducing household VMT and associated GHG emissions. This measure requires a staffed position that is responsible for providing outreach.
T-38	Provide First and Last Mile TNC Incentives	P/C	U, S	N/A	Not Quantified	This measure requires a first-last mile partnership between a municipality/transit agency and a transportation network company (TNC) for subsidized, shared TNC rides to or from the local transit station within a specific geographic area. This measure encourages a shift to transit mode for longer trips. Consider providing inclusive mechanisms so people without bank accounts, credit cards, or smart phones can access the incentives.

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T-39	Implement Preferential Parking Permit Program (Carpoolers)	P/S	U, S	Residential Retail Office Industrial	Not Quantified	This measure requires projects provide preferential parking in terms of free or reduced parking fees, priority parking, or reserved parking in convenient locations (such as near public transportation or building entrances) for commuters who carpool, vanpool, ride-share or use sustainably fueled vehicles.
T-40	Implement School Bus Program	P/S	U, S	Residential	Not Quantified	This measure will provide school bus service transporting students to a school project. A school bus service can reduce the number of private vehicle trips to drop-off or pick-up students, thereby reducing VMT and associated GHG emissions, as well as onsite air pollution emissions, especially if the bus is zero emissions. If a residential project includes a school and the type, enrollment, and school bus commitment is known, it may be possible to quantify the VMT reduction associated with school busing. The reduction would only apply to school related VMT. Coordination with Carlsbad staff is required if this measure is selected.
T-41	Implement School Pool Program	P/S	U, S	Residential	Not Quantified	This measure requires projects create a ridesharing program for school children. If a residential project includes a school and the type, enrollment, and school pool commitment is known, it may be possible to quantify the VMT reduction associated with a school pool program. The reduction would only apply to school related VMT. Coordination with Carlsbad staff is required if this measure is selected.
T-42	Implement Telecommute and/or Alternative Work Schedule Program	P/S	U, S	Retail Office Industrial	Not Quantified	This measure requires projects to permit employee telecommuting and/or alternative work schedules and monitor employee involvement to ensure forecasted participation matches observed participation. This measure is not quantified because recent research has suggested that while commute VMT is reduced, overall VMT of teleworkers may not be reduced. Since commute VMT is reduced and can be directly applicable to VMT/Employee, teleworking may be appropriate to include VMT reduction for. The program must ensure that more than 15% of the employees will telecommute (15% is assumed in the SANDAG model; therefore, is already accounted for in the VMT calculations). Information on employee participation and methods for monitoring the program are necessary. Coordination with Carlsbad staff is required if this measure is selected.

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Parking or Road Pricing/Management						
T-14	Provide Electric Vehicle Charging Infrastructure	P/S	U, S	Residential Retail Office Industrial	0%	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 measure does not result in VMT reduction but does reduce GHG.
T-15	Limit Residential Parking Supply	P/S	U, S	Residential	13.7%	This measure will reduce the total parking supply available at a residential project or site as compared to the residential parking demand in an effort to reduce access to automobiles and reduce driving. Since the majority of Carlsbad is car dependent, this measure is not applicable at this time.
T-16	Unbundle Residential Parking Costs from Property Cost	P/S	U, S	Residential	15.7%	This measure will unbundle, or separate, a residential project's parking costs from property costs, requiring those who wish to purchase parking spaces to do so at an additional cost. To be effective, this parking cost must be passed through to the vehicle owners/drivers utilizing the parking spaces. In addition. on-street public parking must be restricted within ¾ miles of the project to reduce the opportunity for residents to avoid parking costs. If this measure is selected, a discussion of the implications of reductions in car ownership is necessary. For example, for much of the City it would be unreasonable to conclude that residential units would have no vehicles; however, it may be feasible that the number of units that have two vehicles is reduced through this measure. The values provided in the GHG Handbook should be used in the VMT reduction equation.
T-24	Implement Market Rate Public Parking (On-Street)	P/C	U, S	N/A	30%	This measure will price all on-street parking in a given community, with a focus on parking near central business districts, employment centers, and retail centers.
T-48	Implement Area or Cordon Pricing	P/C	U	N/A	Not Quantified	This measure requires projects implement a cordon pricing scheme. The pricing scheme will set a cordon (boundary) around a specified area to charge a toll to enter the area by vehicle. The cordon location is usually the boundary of a central business district or urban center but could also apply to substantial development projects with limited points of access. This is not applicable at a project scale.

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T-49	Replace Traffic Controls with Roundabout	P/C	U, S	N/A	Not Quantified	This measure requires projects install a roundabout as a traffic control device to smooth traffic flow, reduce idling, eliminate bottlenecks, and manage speed. In some cases, roundabouts can improve traffic flow and reduce emissions. The emission reduction depends heavily on what the roundabout is compared to (e.g., uncontrolled intersection, stop sign, traffic signal). This is not applicable at a project scale.
T-50	Required Project Contributions to Transportation Infrastructure Improvement	P/C	U, S	N/A	Not Quantified	This measure requires projects contribute to traffic-flow improvements or other multi-modal infrastructure projects that reduce emissions and are not considered as substantially growth inducing. This may be applicable when/if Carlsbad develops a program to facilitate contributions to VMT reducing infrastructure. If that program determines the citywide VMT reduction associated with implementation, credit to the project VMT may be warranted.
T-51	Install Park-and-Ride Lots	P/C	U,S	N/A	Not Quantified	This measure requires projects install park-and-ride lots near transit stops and high occupancy vehicle lanes. This is not applicable at a project scale.
T-52	Designate Zero Emissions Delivery Zones	P/C	U	N/A	Not Quantified	This measure requires the municipality to designate certain curbside locations as commercial loading zones exclusively available for zero-emission commercial delivery vehicles. This is not applicable at a project scale.
Neighborhood Design						
T-18	Provide Pedestrian Network Improvement	P/C	U, S	Residential Retail Office Industrial	6.4%	This measure will increase the sidewalk coverage to improve pedestrian access. Reduction is calculated for all household trips in the surrounding neighborhood, offsetting VMT impacts arising from the project. VMT reduction is associated with expansion of sidewalk coverage, which includes building of new sidewalks and improving degraded or substandard sidewalk. Sidewalk measurements should be collected on both sides of the street. A reasonableness check should be performed using an average walk trip length of 0.5 miles to determine how many new walk trips result from this measure. If the VMT reduced divided by 0.5 miles results in a 200% increase or higher on a particular sidewalk segment, the VMT reduction may need to be adjusted. Note that percentage VMT reductions from Project-Level and Community-Level measures must be calculated separately. To apply the VMT reduction as a credit to the project VMT, the total residential tour based VMT should be calculated by multiplying the VMT/resident by the total number of residents. The VMT reduction is subtracted from the total residential tour based VMT value.

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T-19-A	Construct or Improve a Bike Facility	P/C	U, S	Residential Retail Office Industrial	0.8% of adjacent roadway VMT	This measure will construct or improve a single bicycle lane facility (only Class I, II, or IV) that connects to a larger existing bikeway network. This measure reduces *VMT on the roadway segment parallel to the bicycle facility* (i.e., the corridor). Therefore, to calculate the VMT reduced it is necessary to know the VMT on the corridor. This is calculated by multiplying the daily vehicle volume by the length of the corridor. The corridor length should be the full length of the roadway that includes the bicycle facility or the full length of the roadway within Carlsbad if the bicycle facility is present on the entire corridor. A reasonableness check should be performed using an average bike trip length of 5 miles to determine how many new bike trips result from this measure. If the VMT reduced divided by 5 miles results in 200% or larger increase in daily bike trips, the VMT reduction may need to be adjusted. Note that percentage VMT reductions from Project-Level and Community-Level measures must be calculated separately. To apply the VMT reduction as a credit to the project VMT, the total residential tour based VMT should be calculated by multiplying the VMT/resident by the total number of residents. The VMT reduction is subtracted from the total residential tour based VMT value. Guidance for selecting variables is described below: Variables B, C, D, E, F, and I should be applied from the GHG Handbook. Variable G/H: The bicycle and vehicle average trip length should be based on the project location. The GHG Handbook indicates that if a local survey is not available, the California Household Travel Survey is the preferred data source for determining the average trip lengths. Based on the most recent California Household Travel Survey (2012) the average bicycle trip length for Carlsbad is 5.0 miles and the average vehicle trip length is 7.9 miles. The applicant may also provide SANDAG model data specific to the City of Carlsbad for these values as an alternative.

We T-19-B	Construct or Improve Bike Boulevard	P/C	U, S	Residential Retail Office Industrial	0.2% of corridor VMT	Construct or improve a single bicycle boulevard that connects to a larger existing bikeway network. Bicycle boulevards are a designation within Class III Bikeway that create safe, low-stress connections for people biking and walking on streets. See GHG Handbook for specific design requirements. This measure reduces *VMT on the roadway segment parallel to the bicycle facility* (i.e., the corridor). Therefore, to calculate the VMT reduced it is necessary to know the VMT on the corridor. This is calculated by multiplying the daily vehicle volume by the length of the corridor. The corridor length should be the full length of the roadway that includes the bicycle facility or the full length of the roadway within Carlsbad if the bicycle facility is present on the entire corridor. A reasonableness check should be performed using an average bike trip length of 5 miles to determine how many new bike trips result from this measure. If the VMT reduced divided by 5 miles results in 200% or larger increase in daily bike trips, the VMT reduction may need to be adjusted. Guidance for selecting variables is described below: Variables B and C should be applied from the GHG Handbook. Variable D/E: The bicycle and vehicle average trip length should be based on the project location. The GHG Handbook indicates that if a local survey is not available, the California Household Travel Survey is the preferred data source for determining the average trip lengths. Based on the most recent California Household Travel Survey (2012) the average bicycle trip length for Carlsbad is 5.0 miles and the average vehicle trip length is 7.9 miles. The applicant may also provide SANDAG model data specific to the City of Carlsbad for these values as an alternative. Variable F/G: The existing bicycle and vehicle mode shares for work trips (employment projects) should be based on the project location. The GHG Handbook indicates that if a local survey is not available, the California Household Travel Survey is the preferred data source for determining the bicycle and vehicle mode shares. Based on the most recent California Household Travel Survey (2012) the values are 1.2% for work trips bicycle mode share (based on the combined bicycle mode share for North County coastal cities: Del Mar, Solana Beach, Encinitas, Carlsbad, and Oceanside). The work trip vehicle mode share for the North County coastal cities is 95.0%. The North County coastal cities were combined to provide a bigger sample size of work trips in the California Household Travel survey data. OR The “San Diego-Carlsbad” values from GHG Handbook Appendix C Table T-10.2 (which are based on the National Household Travel Survey) should be used (unless more current local survey data is available) for bicycle and vehicle work trip mode share. Based on the December 2021 GHG Handbook the values are 1.3% for work trips bicycle mode share and 91.8% for work trips vehicle mode share.
T-20	Expand Bikeway Network	P/C	U, S	N/A	0.5%	This measure will increase the length of a city or community bikeway network. A bicycle network is an interconnected system of bike lanes, bike paths, bike routes, and cycle tracks. This is not applicable at a project scale, see T-19A/B for options that could be available to individual projects.
T-21-A	Implement Conventional Carshare Program	P/C	U, S	Residential Retail Office Industrial	0.15%	This measure will increase carshare access in the user’s community by deploying conventional carshare vehicles. Carsharing offers people convenient access to a vehicle for personal or commuting purposes. This research associated with this measure was conducted for large scale carshare programs (with fleets of 400 vehicles or more); therefore, applying this measure at a small scale will result in minimal reductions. An applicant may coordinate with the City of Carlsbad to determine if VMT reduction associated with this measure is appropriate. Guidance for selecting variables is described below: Variable B, D, and E should be applied from the GHG Handbook.

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						Variable C: Total VMT in plan/community without carshare should be calculated using the total tour VMT calculated by multiplying the VMT/resident or VMT/employee by the total residents or employees.
T-21-B	Implement Electric Carshare Program	P/C	U, S	Residential Retail Office Industrial	0.15%	This measure will increase electric vehicle carshare access in the user's community by deploying electric carshare vehicles. Carsharing offers people convenient access to a vehicle for personal or commuting purposes. This research associated with this measure was conducted for large scale carshare programs (with fleets of 400 vehicles or more); therefore, applying this measure at a small scale will result in minimal reductions. An applicant may coordinate with the City of Carlsbad to determine if VMT reduction associated with this measure is appropriate. Guidance for selecting variables is described below: Variable B, D, and E should be applied from the GHG Handbook. Variable C: Total VMT in plan/community without carshare should be calculated using the total tour VMT calculated by multiplying the VMT/resident or VMT/employee by the total residents or employees. The VMT reduction is calculated using the simplified equation for Variable O in the GHG Handbook.
T-22-A	Implement Pedal (non-Electric) Bikeshare Program	P/C	U, S	N/A	0.02%	This measure will establish a bikeshare program. Bikeshare programs provide users with on-demand access to bikes for short-term rentals. Minimal reductions are calculated for this measure. The research associated with this measure is for citywide bikeshare programs and is not applicable to individual development projects.
T-22-B	Implement Electric Bikeshare Program	P/C	U, S	N/A	0.06%	This measure will establish an electric bikeshare program. Electric bikeshare programs provide users with on-demand access to electric pedal assist bikes for short-term rentals. Minimal reductions are calculated for this measure. The research associated with this measure is for citywide bikeshare programs and is not applicable to individual development projects.

TABLE F-1: VMT REDUCTION STRATEGIES AND EFFECTIVENESS CALCULATIONS

GHG Handbook #	**Measure**[1] Measures shown in green may be applied to individual development projects in Carlsbad– Must Follow procedures in GHG Handbook, this Appendix, and Calculation Notes shown in this Table. Measures shown in orange are not quantified in the GHG Handbook but may be quantifiable with appropriate evidence/information. Coordination with City staff required. Measures shown in yellow are not quantifiable but should be considered if a project has a significant and unavoidable impact to provide mitigation to the extent feasible. Measures shown in gray are not quantifiable, are not appropriate at the project scale, are not applicable in Carlsbad, or are already accounted for in the VMT modeling and may not be considered as mitigation measures.	Scale of Application P/S – Project/Site P/C – Plan/Community	Locational Context U – Urban (Village) S – Suburban (Outside of Village)	Applicable Land Use Types	Maximum Percent Reduction in VMT[2]	**Measure Description/GHG Handbook Calculation Notes** **The calculation notes provide guidance on selecting values for the variables in the GHG Handbook VMT reduction equations. If a variable does not have stated guidance below, the user should apply the value provided in the GHG Handbook. Additionally, data sources are periodically updated; therefore, the user should confirm and use the most current data source for any given variable.**
T-22-C	Implement Scootershare Program	P/C	U, S	N/A	0.07%	This measure will establish a scootershare program. Scootershare programs provide users with on-demand access to electric scooters for short-term rentals. Minimal reductions are calculated for this measure. The research associated with this measure is for citywide scootershare programs and is not applicable to individual development projects.
T-34	Provide Bike Parking	All	U, S	Residential	Not Quantified	This measure requires projects provide short-term and long-term bicycle parking facilities to meet peak season maximum demand. Parking can be provided in designated areas or added within rights-of-way, including by replacing parking spaces with bike parking corrals. Ensure that bike parking can be accessed by all, not just project employees or residents. This measure is a component of measure T-10.
T-35	Provide Traffic Calming Measures	All	U, S	Residential Retail Office Industrial	Not Quantified	This measure requires projects to include pedestrian/bicycle safety and traffic calming measures above jurisdictional requirements. Roadways should also be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features.
T-36	Create Urban Non-Motorized Zones	P/C	U	Residential Retail Office Industrial	Not Quantified	The measure requires projects to convert a percentage of its roadway miles to transit malls, linear parks, or other non-motorized zones.
T-37	Dedicate Land for Bike Trails	All?	U, S	Residential Retail Office Industrial	Not Quantified	This measure requires projects to provide for, contribute to, or dedicate land for the provision of off-site bicycle trails linking the project to designated bicycle commuting routes in accordance with an adopted citywide bikeway plan.
Transit						
T-25	Extend Transit Network Coverage or Hours	P/C	U, S	N/A	4.6%	This measure will expand the local transit network by either adding or modifying existing transit service or extending the operation hours to enhance the service near the plan/community area. This is not applicable at a project scale since transit service is managed and operated by North County Transit District (NCTD) and is not within the control of an individual project to change.

TABLE F-1: VMT REDUCTION STRATEGIES AND EFFECTIVENESS CALCULATIONS

GHG Handbook #	**Measure**[1] Measures shown in green may be applied to individual development projects in Carlsbad– Must Follow procedures in GHG Handbook, this Appendix, and Calculation Notes shown in this Table. Measures shown in orange are not quantified in the GHG Handbook but may be quantifiable with appropriate evidence/information. Coordination with City staff required. Measures shown in yellow are not quantifiable but should be considered if a project has a significant and unavoidable impact to provide mitigation to the extent feasible. Measures shown in gray are not quantifiable, are not appropriate at the project scale, are not applicable in Carlsbad, or are already accounted for in the VMT modeling and may not be considered as mitigation measures.	Scale of Application P/S – Project/Site P/C – Plan/Community	Locational Context U – Urban (Village) S – Suburban (Outside of Village)	Applicable Land Use Types	Maximum Percent Reduction in VMT[2]	**Measure Description/GHG Handbook Calculation Notes** **The calculation notes provide guidance on selecting values for the variables in the GHG Handbook VMT reduction equations. If a variable does not have stated guidance below, the user should apply the value provided in the GHG Handbook. Additionally, data sources are periodically updated; therefore, the user should confirm and use the most current data source for any given variable.**
T-26	Increase Transit Service Frequency/Speed	P/C	U, S	N/A	11.3%	This measure will increase transit frequency on one or more transit lines serving the plan/community. This is not applicable at a project scale since transit service is managed and operated by NCTD and is not within the control of an individual project to change.
T-27	Implement Transit-Supportive Roadway Treatments	P/C	U, S	N/A	0.6%	This measure will implement transit-supportive treatments on the transit routes serving the plan/community. Treatments can include transit signal priority, bus-only signal phases, queue jumps, curb extensions to speed passenger loading, and dedicated bus lanes. This is not applicable at a project scale since transit service is managed and operated by NCTD and is not within the control of an individual project to change.
T-28	Provide Bus Rapid Transit	P/C	U, S	N/A	13.8%	This measure will convert an existing bus route to a bus rapid transit (BRT) system. BRT includes the following additional components, compared to traditional bus service: exclusive right-of-way (e.g., busways, queue jumping lanes) at congested intersections, increased limited-stop service (e.g., express service), intelligent transportation technology (e.g., transit signal priority, automatic vehicle location systems), advanced technology vehicles (e.g., articulated buses, low-floor buses), enhanced station design, efficient fare-payment smart cards or smartphone apps, branding of the system, and use of vehicle guidance systems. This is not applicable at a project scale since transit service is managed and operated by NCTD and is not within the control of an individual project to change.
T-29	Reduce Transit Fares	P/C	U, S	N/A	1.2%	This measure will reduce transit fares on the transit lines serving the plan/community. This is not applicable at a project scale since transit service is managed and operated by NCTD and is not within the control of an individual project to change.
T-43	Provide Real-Time Transit Information	P/C	U, S	N/A	Not Quantified	This measure requires projects provide real-time bus/train/ferry arrival time, travel time, alternative routings, or other transit information via electronic message signs, dedicated monitor or interactive electronic displays, websites, or mobile apps. This is not applicable at a project scale since transit service is managed and operated by NCTD and is not within the control of an individual project to change.

TABLE F-1: VMT REDUCTION STRATEGIES AND EFFECTIVENESS CALCULATIONS

GHG Handbook #	**Measure**[1] Measures shown in green may be applied to individual development projects in Carlsbad– Must Follow procedures in GHG Handbook, this Appendix, and Calculation Notes shown in this Table. Measures shown in orange are not quantified in the GHG Handbook but may be quantifiable with appropriate evidence/information. Coordination with City staff required. Measures shown in yellow are not quantifiable but should be considered if a project has a significant and unavoidable impact to provide mitigation to the extent feasible. Measures shown in gray are not quantifiable, are not appropriate at the project scale, are not applicable in Carlsbad, or are already accounted for in the VMT modeling and may not be considered as mitigation measures.	Scale of Application P/S – Project/Site P/C – Plan/Community	Locational Context U – Urban (Village) S – Suburban (Outside of Village)	Applicable Land Use Types	Maximum Percent Reduction in VMT[2]	**Measure Description/GHG Handbook Calculation Notes** **The calculation notes provide guidance on selecting values for the variables in the GHG Handbook VMT reduction equations. If a variable does not have stated guidance below, the user should apply the value provided in the GHG Handbook. Additionally, data sources are periodically updated; therefore, the user should confirm and use the most current data source for any given variable.**
T-44	Provide Shuttles (Gas or Electric)	All	U, S	Residential Office Industrial	Not Quantified	This measure will provide local shuttle service through coordination with the local transit operator or private contractor. The shuttles will provide service to and from commercial centers to nearby transit centers to help with first and last mile connectivity, thereby incentivizing a shift from private vehicles to transit, reducing associated GHG emissions. Note that this measure can also be implemented at the Project/Site scale by a large employer as part of a Trip Reduction Program. Quantification of VMT reduction associated with this measure may be possible if the applicant can provide details about the shuttle service such as vehicle type, routes, schedule, and ridership estimates. An applicant may coordinate with the City of Carlsbad to determine if VMT reduction associated with this measure is appropriate.
T-45	Provide On-Demand Microtransit	All	U, S	Office Industrial	Not Quantified	This measure will provide small-scale, on-demand public transit services that can offer fixed routes and schedules or flexible routes and on-demand scheduling through coordination with the local transit operator or private contractor. Note that this measure may also be applicable at the Project/Site scale for a large employer (e.g., Google's Via2G pilot) as part of a Trip Reduction Program. Typically, this is not applicable at a project scale since transit service is managed and operated by NCTD and is not within the control of an individual project to change. An applicant may coordinate with the City of Carlsbad to determine if VMT reduction associated with this measure is appropriate.
T-46	Improve Transit Access, Safety, and Comfort	All	U, S	Residential Retail Office Industrial	Not Quantified	This measure requires projects improve transit access and safety through sidewalk/crosswalk safety enhancements, bus shelter improvements, improved lighting, and other features. Projects should evaluate access to transit stops within one-half mile of the project site to determine if additional features are needed to meet NCTD's Bus Stop Development Handbook, March 2018 or the city's multimodal level of service standards.
T-47	Provide Bike Parking Near Transit	-All	U, S	Residential Retail Office Industrial	Not Quantified	This measure requires the project to provide short-term and long-term bicycle parking near rail stations, transit stops, and freeway access points where there are commuter or rapid bus lines.

Source: GHG Handbook (2021), Fehr & Peers, 2022.

1 Refer to updated information contained in the 2021 GHG Handbook. CAPCOA (2021) Each measure is numbered alphanumerically with the first letter of the emissions sector serving as the letter code (e.g., T=Transportation).

2 Effectiveness is based on the 2021 GHG Handbook unless otherwise specified. Measures that are "not quantified" are those that did not have sufficient research to support determination of individual effectiveness.