

California Air Resources Board

**Quantification Methodology for the
California State Transportation Agency
Transit and Intercity Rail Capital Program**

**Greenhouse Gas Reduction Fund
Fiscal Year 2018-19**



**FINAL
October 13, 2017**

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Section A. Introduction

The goal of California Climate Investments (CCI) is to reduce greenhouse gas (GHG) emissions and further the purposes of the Global Warming Solutions Act of 2006, known as Assembly Bill (AB) 32. The California Air Resources Board (CARB) is responsible for providing the quantification methodology to estimate the GHG emission reductions and other non-GHG outcomes—referred to as co-benefits (e.g., air pollutant emission reductions)—from projects receiving monies from the Greenhouse Gas Reduction Fund (GGRF). CARB develops these methodologies based on the project types eligible for funding by each administering agency as reflected in the program Expenditure Records available at:

<https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/expenditurerecords.htm>.

CARB staff periodically review each quantification methodology to evaluate its effectiveness and update methodologies to make them more robust, user-friendly, and appropriate to the projects being quantified.

For the California State Transportation Agency (CalSTA) Transit and Intercity Rail Capital Program (TIRCP), CARB staff developed this Quantification Methodology and accompanying TIRCP Calculator Tool to provide methods for estimating the GHG emission reductions and air pollutant emission co-benefits of each proposed project by component¹ (Section B), provide instructions for documenting and supporting the estimates (Section C), and outline the process for tracking and reporting GHG and other co-benefits once a project is funded (Section D).

This methodology uses calculations to estimate the reduction in passenger (auto) vehicle miles traveled (VMT) and associated GHG emission reductions based on specific transportation characteristics of proposed TIRCP projects. These calculations are based on the “Methods to Find the Cost Effectiveness of Funding Air Quality Projects for Evaluating Motor Vehicle Registration Fee Projects and Congestion Mitigation and Air Quality Improvement Projects” (CMAQ Methods)ⁱ and CARB-developed emission factors. Applicants will use this methodology to estimate and report the total project GHG emission reductions (in metric tons (MT) of carbon dioxide equivalents (CO₂e) as well as the total project GHG emission reductions per dollar of GGRF funds requested.

In an effort to enhance the analysis, provide greater transparency, and assist in project-level reporting, CARB included an output tab in the TIRCP Calculator Tool that summarizes key variables and air pollutant emission estimates for select criteria and toxic air pollutant emissions (in pounds (lbs.)) from TIRCP projects. Key variables estimated include: passenger VMT reductions (in miles), fossil fuel use reductions (in unites of fuel), and fossil-fuel-based energy use reductions (in kilowatt hours (kWh)). The TIRCP Calculator Tool calculates air pollutant emission estimates—using the same methodology as for GHG emissions—for the following criteria and toxic air pollutants:

¹ A component is a project type for which GHG emission reductions and air pollutant emission co-benefits may be estimated, evaluated and reported separately from other components within the TIRCP project.

reactive organic gases (ROG), nitrogen oxides (NO_x), fine particulate matter less than 2.5 micrometers (PM_{2.5}), and diesel particulate matter (diesel PM). CARB continues to develop methodologies to assess additional social, economic, and environmental co-benefits achieved by CCI.

CARB also updated the TIRCP Calculator Tool to calculate GHG emission reductions and air pollutant emission estimates by component to assist in project-level reporting and to align with TIRCP projects that have a multi-year funding agreement.

TIRCP Project Types

TIRCP funds capital improvements that will modernize California's intercity, commuter, and urban rail (train) systems, bus, ferry, shuttle bus and vanpool transit systems. These capital improvements reduce GHG emissions, improve/expand transit service, increase ridership, integrate existing bus and rail operations with each other and with high-speed rail, and improve safety.

For the purposes of this TIRCP Quantification Methodology, eligible TIRCP projects fall into four project types that meet the objectives of TIRCP and for which there are methods to quantify GHG emission reductions.ⁱⁱ Each project requesting GGRF funding must include at least one of the following project types for fiscal year (FY) 2018-19:

1. New/Expanded Service;
2. System and Efficiency Improvements that Result in Increased Ridership;
3. Cleaner Vehicles/Technology/Fuels; and/or
4. Fuel Reductions.

Some projects may include more than one project type, such as those that provide operational improvements that reduce travel time (generating ridership increase) and also deploy new, lower-emitting vehicles that replace current vehicles.

Methodology Development

CARB and CalSTA developed this TIRCP Quantification Methodology consistent with the guiding implementation principles of CCI, including ensuring transparency and accountability.ⁱⁱⁱ CARB and CalSTA developed this TIRCP Quantification Methodology to be used to estimate the outcomes of proposed projects, inform project selection, and track results of funded projects. The implementing principles ensure that the methodology would:

- Apply at the project-level;
- Provide uniform methods to be applied statewide, and be accessible by all applicants;
- Use existing and proven methods;
- Use project-level data, where available and appropriate; and

- Result in GHG emission reductions and air pollutant emission estimates that are conservative and supported by empirical literature.

CARB assessed peer-reviewed literature and tools, and consulted with experts, as needed, to determine methods appropriate for the TIRCP project types. CARB also consulted with CalSTA to determine project-level inputs available. The methods were developed to provide estimates that are as accurate as possible with data readily available at the project level.

CARB released the Draft TIRCP Quantification Methodology and Draft TIRCP Calculator Tool for public comment in September 2017. This Final TIRCP Quantification Methodology and accompanying TIRCP Calculator Tool have been updated to address public comments, where appropriate, and for consistency with updates to the TIRCP Program Guidelines.

Tools

This TIRCP Quantification Methodology and accompanying TIRCP Calculator Tool rely on project-specific outputs from the following tools:

CMAQ Methods is a set of equations for evaluating the cost-effectiveness of certain types of transportation projects. The CMAQ Methods were developed by CARB and the California Department of Transportation (Caltrans), and are used statewide by transportation agencies to evaluate criteria pollutant emission reductions from transportation projects competing for State motor vehicle fee and federal CMAQ funding.

In addition to the tools above, this TIRCP Quantification Methodology relies on CARB-developed emission factors. CARB has established a single repository for emission factors used in quantification methodologies, referred to as the CCI Quantification Methodology Emission Factor Database (Database).^{iv} The Database Documentation explains how emission factors used in CARB quantification methodologies are developed and updated.

Applicants must use this TIRCP Quantification Methodology, in conjunction with the accompanying TIRCP Calculator Tool, to estimate the GHG emission reductions and air pollutant emission co-benefits of the proposed project. The TIRCP Calculator Tool can be downloaded from: www.arb.ca.gov/cci-quantification.

Updates

CARB staff periodically review each quantification methodology to evaluate its effectiveness and update methodologies to make them more robust, user-friendly, and appropriate to the projects being quantified. CARB updated the TIRCP Quantification Methodology for FY 2016-17^v to enhance the analysis and provide additional clarity. Changes from the TIRCP GHG Quantification Methodology for FY 2016-17 include:

- Use of EMFAC 2014 instead of EMFAC 2011;
- Modification to allow for fuel-specific inputs supported by a carbon intensity score issued by the CARB Low Carbon Fuel Standard Program;^{vi}
- Expansion of the TIRCP Calculator Tool to allow for separable project components
- Updates to align with other CCI program updates (e.g., include gasoline fuel type for buses, hybrid vehicles, etc.);
- Extension of the Final Year (YrF) in the Calculator tool to allow projects to extend past 2050;
 - **Note:** EMFAC 2014 estimates emission factors through 2050. For calculations extending post 2050, auto vehicle emission factors are assumed to remain at the 2050 level.
- Addition of calculations and emission factors to estimate air pollutant emission co-benefits;
 - **Note:** This methodology assumes Tier 2 standards when estimating locomotive emissions from new or expanded services and Tier 4 standards when a new locomotive is procured. See Appendix B for more information.
- Addition of a new output tab in the TIRCP Calculator Tool that summarizes key variables and air pollutant emission estimates;
- Formatting changes to the TIRCP Calculator Tool to simplify the use of the TIRCP Quantification Methodology; and
- Additional language on reporting after funding.

Program Assistance

CARB, Caltrans, and CalSTA staff will review the quantification portions of the TIRCP project applications to ensure that the methods described in this document were properly applied to estimate GHG emission reductions and air pollutant emission co-benefits for the proposed project. Applicants should use the following resources for additional questions and comments:

- Questions on this document should be sent to GGRFProgram@arb.ca.gov.
 - **Note:** Frequently asked questions (FAQ) may be issued, as necessary. Applicants are encouraged to check the FAQ page regularly during the application process, available at: www.arb.ca.gov/cci-quantification.
- For more information on CARB efforts to support implementation of GGRF investments, see: www.arb.ca.gov/caclimateinvestments.
- Questions pertaining to TIRCP should be sent to: TIRCPcomments@dot.ca.gov.

Section B. Quantification Methodology

Overview

This TIRCP Quantification Methodology estimates auto VMT reductions, and corresponding GHG emission reductions and air pollutant emission co-benefits, of a proposed TIRCP project by component. These emission estimates are based on estimated ridership increases, the use of cleaner vehicles, and/or fuel reductions. In general, the GHG emission reductions and air pollutant emission co-benefits are estimated using the approaches outlined in Table 1.

Table 1. General Approach to Emission Estimates by Project Type

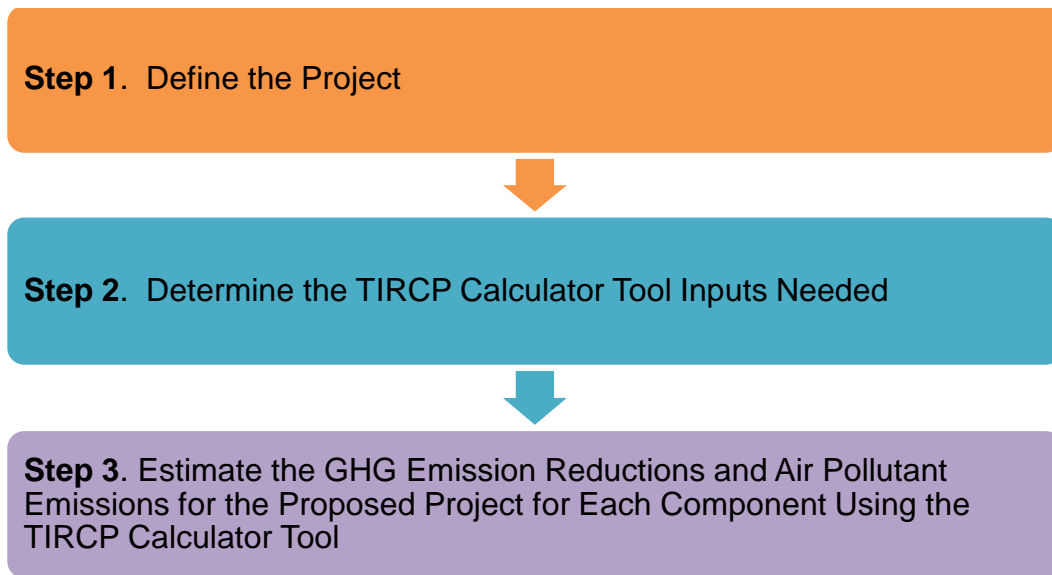
New/Expanded Service
<i>Emission Estimates = Emissions of Displaced Autos – Emissions of New/Expanded Service Vehicle</i>
System and Efficiency Improvements that Result in Increased Ridership
<i>Emission Estimates = Emissions of Displaced Autos</i>
Cleaner Vehicles/Technology/Fuels
<i>Emission Estimates = Emissions of Displaced Service Vehicle – Emissions of New Service Vehicle</i>
Fuel Reductions
<i>Emission Estimates = Emissions of Fuel Reductions</i>

Methods and equations used in the TIRCP Calculator Tool for estimating the GHG emission reductions and air pollutant emission co-benefits are provided in Appendix B. Emission factors used in calculations are contained in the Database available at: www.arb.ca.gov/cqi-quantification. Documentation on the sources and methods used to develop the emission factors is also provided.

Applicants will follow the steps outlined in Figure 1 to estimate the GHG emission reductions and air pollutant emission co-benefits from the proposed project by component. Detailed instructions for each step are provided on subsequent pages. Appendix A includes two example projects to illustrate use of this TIRCP Quantification Methodology and TIRCP Calculator Tool to estimate the GHG emission reductions and air pollutant emission co-benefits:

1. for a project proposing a new service (i.e., single component); and
2. for a project proposing operational improvements that reduce travel time, generating ridership increase, and deployment of new, lower-emitting vehicles that replace current vehicles (i.e., multiple components).

Figure 1. Steps to Estimating GHG Emission Reductions and Air Pollutant Emission Co-benefits



Step 1: Define the Project

Applicants must define the project by identifying both eligible project types (see Table 2) and the number of quantifiable components.

The project type(s) identified will determine which inputs for the accompanying TIRCP Calculator Tool must be used to estimate GHG emission reductions and air pollutant emission co-benefits.

Table 2. Description of TIRCP Project Types

Project Types	Description
New/Expanded Service	Expansion of transit (e.g., rail (train), bus, ferry, shuttle and vanpool) service through new service or additional routes.
System and Efficiency Improvements that Result in Increased Ridership	Any system or efficiency improvements that result in increased ridership for existing routes, including projects that increase service levels, reliability, or decrease travel times.
Cleaner Vehicles/Technology/Fuels	Use of cleaner vehicles, technologies, or fuels that result in GHG emission reductions.
Fuel Reductions	Any system or efficiency improvements that result in fuel reductions from existing transit services, including projects that reduce transit VMT and idling.

The number of quantifiable components identified will determine the number of Quantifiable Component tabs that must be used in the accompanying TIRCP Calculator Tool to estimate the GHG emission reductions and air pollutant emission co-benefits.

A single Quantifiable Component tab may be used for a proposed project with one project type (e.g., multi-year transformative rail infrastructure project). A single Quantifiable Component tab may also be used for a proposed project with multiple components of the same project type with similar characteristics that will receive California Transportation Commission (CTC) allocation(s) in the same calendar year (e.g., CTC allocation for the procurement of ten (10) electric buses in 2020).

Multiple Quantifiable Component tabs may be used for a proposed project with different project types (e.g., new service and the procurement of five (5) electric buses) or for project types with different project characteristics (e.g., procurement of five (5) electric buses and five (5) hybrid-diesel buses). Multiple Quantifiable Component tabs may also be used for a proposed project with multiple components of the same project type that will receive separate CTC allocations over multiple calendar years (e.g., CTC allocation to procure ten (10) electric buses in 2019 and ten (10) electric buses in 2022).

Step 2: Determine the TIRCP Calculator Tool Inputs Needed

Table 3 identifies the required data inputs to estimate the GHG emission reductions and air pollutant emission co-benefits for each quantifiable component by project type, as identified in Step 1, using the TIRCP Calculator Tool. The TIRCP Calculator Tool includes descriptions of the inputs listed in Table 3.

Table 3. Required TIRCP Calculator Tool Inputs by Project Type

ALL PROJECTS
<p>General Information (Read Me tab)</p> <ul style="list-style-type: none"> • Project Name; • Contact Name; • Contact Phone Number; • Contact Email; and • Date Completed. <p>Funding Inputs (Quantifiable Component tabs)</p> <ul style="list-style-type: none"> • Identifying Descriptor (ID) of the component; • Amount of TIRCP GGRF funds currently being requested to implement the project; • Multi-Year project;² • Identification of CCI Program(s) from which the project is currently requesting or plans to request GGRF funds;³ and • Amount of GGRF funds requested or to be requested from other CCI Programs to implement the project. <p>Project Inputs (Quantifiable Component tabs)</p> <ul style="list-style-type: none"> • Project Type; • Service Type; • Vehicle Type; • Region; • Sub Region; • Year 1 (Yr1); and • Year F (YrF).

² A component is considered multi-year if TIRCP awarded funds will be allocated by CTC over multiple calendar years (e.g., transformative rail infrastructure project). GHG emission reductions and air pollutant emission co-benefits will be reported when all awarded funds are allocated to the project by CTC.

³ For a list of GGRF-funded programs, go to: www.arb.ca.gov/cci-events.

Table 3 (continued). Required TIRCP Calculator Tool Inputs by Project Types

New/Expanded Service
<p>Displaced Autos Inputs (Quantifiable Component tabs)</p> <ul style="list-style-type: none"> • Yr1 Ridership; • YrF Ridership; • Adjustment Factor (A); and • Length of Average Trip (L). <p>New/Expanded Service Inputs (Quantifiable Component tabs)</p> <ul style="list-style-type: none"> • Hybrid Vehicle; • Fuel Type; • Model Year; • Project-Specific Emission Factor (optional⁴); and • Annual VMT or Annual Fuel.
System and Efficiency Improvements that Result in Increased Ridership
<p>Displaced Autos Inputs (Quantifiable Component tabs)</p> <ul style="list-style-type: none"> • Yr1 Ridership; • YrF Ridership; • Adjustment Factor (A); and • Length of Average Trip (L).
Cleaner Vehicles/Technology/Fuels
<p>New/Expanded Service Inputs (Quantifiable Component tabs)</p> <ul style="list-style-type: none"> • Hybrid Vehicle; • Fuel Type; • Model Year; • Project-Specific Emission Factor (optional); and • Annual VMT or Annual Fuel. <p>Displaced Vehicle Inputs (Quantifiable Component tabs)</p> <ul style="list-style-type: none"> • Fuel Type; • Model Year; • Project-Specific Emission Factor (optional⁴); and • Annual VMT or Annual Fuel.
Fuel Reductions
<p>Fuel Reductions Inputs (Quantifiable Component tabs)</p> <ul style="list-style-type: none"> • Fuel Type; and • Annual Fuel.

⁴ If used, the applicant must be able to demonstrate an approved carbon intensity value under the Low Carbon Fuel Standard and submit additional documentation.

Step 3: Estimate the GHG Emission Reductions and Air Pollutant Emission Co-benefits for the Proposed Project for Each Component Using the TIRCP Calculator Tool

The applicant will enter the required data inputs identified in Step 2 into the accompanying TIRCP Calculator Tool to estimate the GHG emission reductions and air pollutant emission co-benefits of the proposed project. Applicants must use the TIRCP Calculator Tool to complete this step. The Calculator Tool can be downloaded from www.arb.ca.gov/cci-quantification.

Users should begin with the **Read Me** tab, which contains instructions and prompts users to enter general project information.

The **Quantifiable Component** tabs identify required inputs regarding project-specific data or assumptions. Input and output fields are color coded:

- **Yellow** fields indicate a direct user input is required.
- **Red** fields indicate a direct user input is optional.
(*Note: additional supporting documentation is required if used*)
- **Green** fields indicate a selection from a drop-down box is required.
- **Gray** fields indicate output or calculation fields that are automatically populated based on user entries and the quantification methods.

Details of calculation methods are provided in Appendix B.

The **GHG Summary** tab displays the estimated:

- GHG emission reductions for each quantifiable component and for the project as a whole (i.e., Total GHG Emission Reductions) (MTCO_{2e});
- Total GHG emission reductions/Total GGRF dollar requested (MTCO_{2e}/);
- TIRCP GHG Emission Reductions/TIRCP Funds Requested (MTCO_{2e}/);⁵
- TIRCP Funds Requested/TIRCP GHG Emission Reductions (\$/MTCO_{2e}); and
- Portion of the GHG emission reductions attributable to funding from another CCI program, as applicable.

The **Co-benefits Summary** tab displays:

- Passenger VMT Reductions (miles);
- Fossil Fuel Use Reductions;
- Fossil Fuel Energy Use Reductions (kWh);
- ROG emission estimates (lbs);
- NO_x emission estimates (lbs);
- PM_{2.5} emission estimates (lbs); and
- Diesel PM emission estimates (lbs).

⁵ This is the portion of GHG emission reductions attributable to funding from TIRCP; GHG emission reductions are prorated according to the level of program funding contributed from TIRCP and other CCI programs, as applicable.

Section C. Documentation

In addition to TIRCP application requirements, applicants for GGRF funding are required to document results from the use of this TIRCP Quantification Methodology, including supporting materials to verify the accuracy of project-specific inputs.

Applicants are required to provide electronic documentation that is complete and sufficient to allow for the calculations to be reviewed and replicated. Paper copies of supporting materials must be available upon request by agency staff.

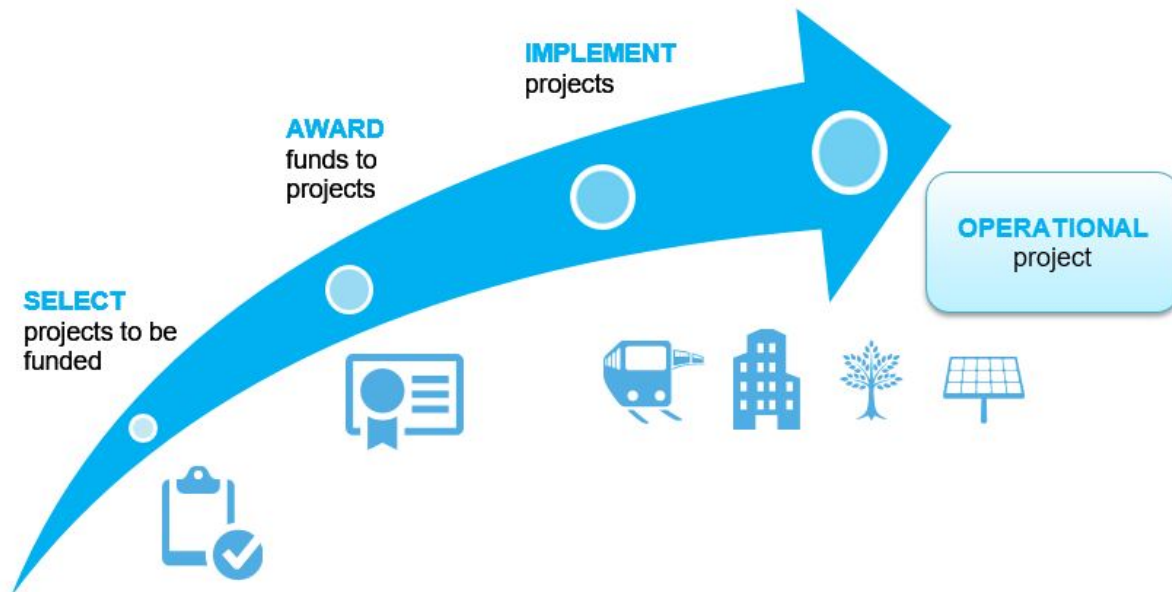
The following checklist is provided as a guide to applicants; additional data and/or information may be necessary to support project-specific inputs or assumptions.

	Documentation Description	Completed
1.	Contact information for the person who can answer project specific questions from staff reviewers on the quantification calculations	
2.	Project description, including excerpts or specific references to the location in the main TIRCP application of the project information necessary to complete the applicable portions of the quantification methodology	
3.	Populated TIRCP Calculator Tool file (in .xls/.xlsm) with the required inputs and applicable components of the project populated (ensure that all relevant fields in the GHG Summary and Co-benefits Summary tabs are populated)	
4.	Any other information, as necessary and appropriate, to substantiate TIRCP Calculator Tool inputs, such as: <ul style="list-style-type: none"> • Estimated ridership; • Project VMT; • Adjustment factor for transit dependency (A); • Length of average auto trip reduced (L); • New or displaced vehicle data (useful life, model year, etc.); and • Fuel savings 	

Section D. Reporting after Funding Award

Accountability and transparency are essential elements for all CCI. All administering agencies are required to track project implementation and report on the benefits of those investments. CARB develops tracking and reporting guidance for CCI. The reporting process and requirements are found in Volume 3 of the CARB Funding Guidelines.⁶ CARB Funding Guidelines Appendices 3.A and 3.B contain detailed reporting requirements that are specific to each project type or administering agency and cover all stages of reporting.

CalSTA will submit periodic reports to CARB. The specific data that need to be reported depend on the project type and the stage of project implementation at the time of reporting. Initially, administering agencies must report basic project information and expected benefits. As projects are implemented, administering agencies provide additional information on project status, benefits, and results. When projects are completed, administering agencies submit project closeout reports. A subset of projects, selected by CalSTA, will report on project outcomes upon reaching a specified milestone and being considered “operational.”



CalSTA is required to collect and compile project data from funding recipients, including the GHG emission reductions and air pollutant emission co-benefits estimated using this TIRCP Quantification Methodology, co-benefits, and information on benefits to AB 1550⁷ Populations. Reported information will be used to demonstrate how the

⁶ CARB released updated Funding Guidelines in August 2017. These Funding Guidelines are subject to change based on public input and Board direction. Administering agencies must incorporate all provisions reflected in the Funding Guidelines and subsequent Board approved Funding Guidelines.

⁷ AB 1550, Gomez, Chapter 369, Statutes of 2016; amending Health and Safety Code Section 39713. Detailed information on AB 1550 requirements is provided in Volume 2 of the Funding Guidelines.

Administration is achieving or exceeding the statutory objectives for CCI. Key variables and air pollutant emission estimates are highlighted in the Co-benefits Summary tab of the TIRCP Calculator Tool. Funding recipients have the obligation to provide, or provide access to, data and information on project outcomes to CalSTA. Applicants should familiarize themselves with the requirements within the TIRCP Guidelines, solicitation materials, and grant agreement, as well as the CARB Funding Guidelines.

ⁱ California Air Resources Board (2005). Methods to Find the Cost-Effectiveness of Funding Air Quality Projects for Evaluating Motor Vehicle Registration Fee Projects and Congestion Mitigation and Air Quality Improvement Projects. Available at: <https://www.arb.ca.gov/planning/tsaq/eval/eval.htm>.

ⁱⁱ California State Transportation Agency (2018). Transit and Intercity Rail Capital Program Guidelines. Available at: <http://www.dot.ca.gov/drm/sptircp.html>.

ⁱⁱⁱ California Air Resources Board. www.arb.ca.gov/cci-fundingguidelines.

^{iv} California Air Resources Board (2017). California Climate Investments Quantification Methodology Emission Factor Database. Available at: www.arb.ca.gov/cci-quantification.

^v California State Transportation Agency Transit and Intercity Rail Capital Program Quantification Methodology for FY 2016-17. February 4, 2016. Available at: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/tircp_qm_16-17.pdf.

^{vi} California Air Resources Board. Low Carbon Fuel Standard. Available at: <https://www.arb.ca.gov/fuels/lcfs/lcfs.htm>.

Appendix A. Example Projects

Example Project 1

Introduction

The following is a hypothetical project¹ to demonstrate how the TIRCP Quantification Methodology for FY 2018-19 would be applied for a project proposal with a single project component. This hypothetical project does not provide examples of the supporting documentation that is required of actual project applicants.

Overview of the proposed project

The project is proposing the following component:

- Expanding capacity of the regional transit (RT) orange and purple line by purchasing ten (10) railcars and extending the existing daily light rail service.

The proposed project is located in Sacramento County with the following project features:

- Railcars will be operational in 2020 and have an estimated useful life of 25 years;
- Increase daily ridership by 350;
- Length of the average trip will be 5.66 miles;
- Daily light rail service will be extended by 35.5 miles
- \$15,000,000 in TIRCP funds will be requested;
- CTC allocation will be requested over multiple calendar years; and
- \$5,000,000 in additional GGRF monies will be requested from the Low Carbon Transit Operations Program (LCTOP).

¹ This hypothetical project has not undergone verification of any TIRCP requirements; all assumptions about location type and features are for quantification methodology demonstration purposes only.

Methods to apply

Step 1: Define the Project

Applicants must define the project by identifying both eligible project types (see Table 2) and the number of quantifiable components.

This example project includes a new/expanded service project type and is considered to have one quantifiable component; therefore, a single Quantifiable Component tab in the accompanying TIRCP Calculator Tool will be used to estimate GHG emission reductions and air pollutant emission co-benefits.

Project Type(s)	Quantifiable Component(s)
New/Expanded Service	The estimates from this project type depend on the procurement of the rail cars and the expansion of the service, which will be operational simultaneously; therefore, only one Quantifiable Component tab needs to be completed.

Step 2: Determine the TIRCP Calculator Tool Inputs Needed

Project Information	
Identifying Descriptor	Orange/Purple Line Expansion
Funding Inputs	
TIRCP Funds Requested	\$15,000,000
Multi-Year ²	Yes
Additional CCI Program 1	
CCI Program	LCTOP
Additional GGR Funds	\$5,000,000
Project Inputs	
Project Type	New/Expanded Service
Service Type	Light Rail
Vehicle Type	Light Rail
Region	County
Sub region	Sacramento
Year 1(Yr1)	2020
Year F (YrF)	2045
Useful Life	25
Displaced Auto Inputs	
Yr1 Ridership	127,750= 365 days/year × 350 riders/day (from RT analysis)
YrF Ridership	127,750= 365 days/year × 350 riders/day (from RT analysis)
Adjustment factor (A)	0.5 (from CARB default)
Length of Average Trip (L)	5.66 (from RT survey data)
New/Expanded Service Vehicle Inputs	
Hybrid Vehicle	No
Fuel Type	Electric (Light Rail)
Model Year	
Project Specific Emission Factor	
Annual VMT	12,957.5= 365× 35.5 miles/day (from project data)
Annual Fuel	

² This example component is considered multi-year since the CTC allocation is requested over multiple calendar years for the individual component.

Step 3: Estimate the GHG Emission Reductions and Air Pollutant Emission Co-benefits for the Proposed Project for Each Component Using the TIRCP Calculator Tool

Enter the project information into the TIRCP Calculator Tool to estimate GHG emission reductions and air pollutant emission co-benefits, starting with the **Read Me** Tab.



California Air Resources Board
 Calculator Tool for the
 California State Transportation Agency
 Transit and Intercity Rail Capital Program
 Greenhouse Gas Reduction Fund
 Fiscal Year 2018-19

Project Name:	RT Light Rail Expansion
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Input	Description	Quantified Component 1
Identifying Descriptor (ID)	Brief description of the quantifiable component identifying it from other separable components.	Orange/Purple Line Expansion
Funding Inputs		
TIRCP Funds Requested	Total TIRCP funds requested for this separable component.	\$15,000,000
Multi-Year	Will this component request several California Transportation Commission allocations over multiple calendar years?	Yes
Additional CCI Program 1		
CCI Program	Other CCI Program from which project has or will be requesting GGRF funds.	LCTOP
Additional GGRF Funds	Total GGRF funds requested or to be requested from Additional CCI Program 1.	\$5,000,000
Additional CCI Program 2		
CCI Program	Other CCI Program from which project has or will be requesting GGRF funds.	
Additional GGRF Funds	Total GGRF funds requested or to be requested from Additional CCI Program 2.	
Total GGRF Funds Requested	Total GGRF funds requested from all CCI Programs	\$20,000,000

Quantification Methodology for the CalSTA FY 2018-19 TIRCP

Project Inputs			
Project Type	For the purposes of this quantification, eligible TIRCP projects fall into four project types. Select the project type that best describes this component.	New/Expanded Service	
Service Type	The transit service (e.g., Intercity/Express Bus (Long Distance), Light Rail, Vanpool, etc.) directly associated with the proposed project. For projects that serve multiple services, select Multi-modal.	Light Rail	
Vehicle Type	The vehicle type (e.g., Transit Bus, Streetcar, Ferry, etc.) that will operate the new service or will be procured.	Light Rail	
Region	The region that best encompasses the geographic location for the proposed project type.	County	
Sub region	The County or Air Basin where the majority of the service occurs.	Sacramento	
Year 1 (Yr1)	The first year of service or the first year the facility or rolling stock will be in use.	2020	
Year F (YrF)	The final year of service or the final year the facility or rolling stock's useful life.	2045	
Useful Life	The number of years the service is funded or the useful life of the facility or rolling stock.	25	
Displaced Autos Inputs		Input	Reference
Yr1 Ridership	The increase in unlinked passenger trips directly associated with the proposed project in the first year (Yr1).	127,750	365 days/year *350 riders/day (from RT analysis)
YrF Ridership	The increase in unlinked passenger trips directly associated with the proposed project in the final year. If the ridership is not expected to change, Yr1 and YrF should be the same value.	127,750	365 days/year *350 riders/day (from RT analysis)
Adjustment Factor (A)	Discount factor applied to annual ridership to account for transit-dependent riders. Use: document project-specific data or system average developed from a recent, statistically valid survey or default.	0.5	CARB default
Length of Average Trip (L)	Annual passenger miles over unlinked trips directly associated with the proposed project.	5.66	RT survey data
New/Expanded Service Vehicle Inputs		Input	Reference
Hybrid Vehicle	Is the vehicle for the new/expanded service, or vehicle(s) to be procured, a hybrid?	No	
Fuel Type	The fuel type (e.g., electric, diesel, etc.) of the vehicle for the new/expanded service, or of the new vehicle(s) to be procured.	Electric	
Model Year	The engine model year of the vehicle that will operate the new/expanded service, or of the new vehicle(s) to be procured.		
Project-Specific Emission Factor	If used, applicant must be able to demonstrate an approved carbon intensity value under the Low Carbon Fuel Standard and submit additional documentation.		
Annual VMT	The estimated annual VMT required to operate the new/expanded service or of the new vehicle(s) to be procured (e.g., 72,000). For rail and ferry vehicles, applicants may alternatively use Annual Fuel.	12,958	365* 35.5 miles/day (from project data)
Annual Fuel	The estimated annual fuel (i.e., gallon of diesel, kWh of electricity) required to operate the new/expanded service, or of the new rail or ferry vehicle(s) to be procured (e.g., 26,000).		

Quantification Methodology for the CalSTA FY 2018-19 TIRCP

The **GHG Summary** tab displays the Total GHG Emission Reductions per TIRCP and GGRF Funds Requested, which are required documentation components. GHG emission reductions are displayed per separable component and are prorated according to the level of program funding contributed from TIRCP and other CCI programs, as applicable.



California Air Resources Board
 Calculator Tool for the
 California State Transportation Agency
 Transit and Intercity Rail Capital Program
 Greenhouse Gas Reduction Fund
 Fiscal Year 2018-19

Project Name: RT Light Rail Expansion

	Quantified GHG Component 1	Quantified GHG Component 2	Quantified GHG Component 3	Quantified GHG Component 4	Quantified GHG Component 5	Quantified GHG Component 6	Total Project
Identifying Descriptor	Orange/Purple Line Expansion						
GHG Emission Reduction Start Date (Year)	2020						
Total CCI							
Total GHG Emission Reductions (MTCO ₂ e)	936						936
Total GGRF Funds Requested (\$)	20,000,000						20,000,000
Total GHG Emission Reductions/Total GGRF Funds Requested (MTCO ₂ e/\$)	0.000047						0.000047
TIRCP							
TIRCP GHG Emission Reductions (MTCO ₂ e)	702						702
TIRCP Funds Requested (\$)	15,000,000						15,000,000
TIRCP GHG Emission Reductions/TIRCP Funds Requested (MTCO ₂ e/\$)	0.000047						0.000047
TIRCP Funds Requested/TIRCP GHG Emission Reductions (\$/MTCO ₂ e)	21,365						21,365
Additional CCI Program 1							
CCI Program	LCTOP						
GHG Emission Reductions Attributable to other GGRF Programs (MTCO ₂ e)	234						
Total Additional GGRF Funds to Implement Project (\$)	5,000,000						
Additional CCI Program 2							
CCI Program							
GHG Emission Reductions Attributable to other GGRF Programs (MTCO ₂ e)							
Total Additional GGRF Funds to Implement Project (\$)							

Quantification Methodology for the CalSTA FY 2018-19 TIRCP

The **Co-Benefits Summary** tab displays the key variable and air pollutant emission estimates a total for the project. Key variables are also prorated according to the level of program funding contributed from TIRCP and other CCI programs, as applicable.



California Air Resources Board
 Calculator Tool for the
 California State Transportation Agency
 Transit and Intercity Rail Capital Program
 Greenhouse Gas Reduction Fund
 Fiscal Year 2018-19

Project Name: RT Light Rail Expansion

	Quantified Co-Benefit Component 1	Quantified Co-Benefit Component 2	Quantified Co-Benefit Component 3	Quantified Co-Benefit Component 4	Quantified Co-Benefit Component 5	Quantified Co-Benefit Component 6	Total Project
Identifying Descriptor	Orange/Purple Line Expansion						
Total CCI							
Key Variables	Passenger VMT Reductions (miles)	357,700					357,700
	Fossil Fuel Use Reductions	N/A					
	Fossil Fuel Energy Use Reductions (kWh)	N/A					
Co-Benefits	ROG Emission Reductions (lbs)	233					233
	NOx Emission Reductions (lbs)	1,177					1,177
	PM2.5 Emission Reductions (lbs)	24					24
	Diesel PM Emission Reductions (lbs)	141					141
TIRCP							
Key Variables	Passenger VMT Reductions (miles)	268,275					268,275
	Fossil Fuel Use Reductions	N/A					
	Fossil Fuel Energy Use Reductions (kWh)						
Co-Benefits	ROG Emission Reductions (lbs)	175					175
	NOx Emission Reductions (lbs)	883					883
	PM2.5 Emission Reductions (lbs)	18					18
	Diesel PM Emission Reductions (lbs)	106					106
Additional CCI Program 1							
Key Variables	Passenger VMT Reductions (miles)	89,425					89,425
	Fossil Fuel Use Reductions	N/A					
	Fossil Fuel Energy Use Reductions (kWh)						
Co-Benefits	ROG Emission Reductions (lbs)	58					58
	NOx Emission Reductions (lbs)	294					294
	PM2.5 Emission Reductions (lbs)	6					6
	Diesel PM Emission Reductions (lbs)	35					35
Additional CCI Program 2							
Key Variables	Passenger VMT Reductions (miles)						
	Fossil Fuel Use Reductions						
	Fossil Fuel Energy Use Reductions (kWh)						
Co-Benefits	ROG Emission Reductions (lbs)						
	NOx Emission Reductions (lbs)						
	PM2.5 Emission Reductions (lbs)						
	Diesel PM Emission Reductions (lbs)						

Submit Documentation

To complete the quantification process, the applicant must submit an electronic copy of the TIRCP Calculator Tool (in .xls/.xlsm) and all of the required documentation, as noted in Section C.

Save the file as instructed on the **Read Me** tab:

Read Me Tab (this page):
 Enter the Project Name and the contact information for person who can answer project-specific que

Project Name:	RT Light Rail Expansion
Contact Name:	Any R Body
Contact Phone Number:	(916) 555-1234
Contact Email:	CARB@account.com
Date Completed:	8/28/2017

Read Me | Quantifiable Component 1 | Quantifiable Component 2 | Quantifiable Component 3

File name: RT Light Rail Expansion_Calc

Save as type: Excel Macro-Enabled Workbook

Example Project 2

Introduction

The following is a hypothetical project¹ to demonstrate how the TIRCP Quantification Methodology for FY 2018-19 would be applied for a project proposal with multiple project components. This hypothetical project does not provide examples of the supporting documentation that is required of actual project applicants.

Overview of the proposed project

The project is proposing the following components:

- Operational improvements in Los Angeles Transit (LA Trans) to reduce headways and increase ridership; and
- Procurement of 20 new zero-emission buses.

The proposed project is located in Los Angeles County with the following project features:

- \$100,000 for system efficiency improvements;
 - Improvements are expected to be implemented in 2018;
 - Expected to provide five (5) years of service;
 - Resulting in increased ridership of 200 per day;
 - Length of the average trip will be 11.5 miles;
- \$10,000,000 for the first installment of ten (10) buses;
 - Expected to be operational in 2019;
 - Average annual VMT of 60,000;
- \$10,000,000 for the second installment of ten (10) buses;
 - Expected to be operation in 2022;
 - Average annual VMT of 40,000;
- All buses are electric and will have an estimated useful life of 12 years;
- Total of \$20,100,000 in TIRCP funds will be requested;
- CTC allocation will be requested over multiple calendar years (however, only one CTC allocation per component); and
- No GGRF funds from additional CCI programs will be requested.

Methods to apply

Step 1: Define the Project

Applicants must define the project by identifying both eligible project types (see Table 2) and the number of quantifiable components.

This example project includes a system and efficiency improvements and cleaner vehicle project types is considered to have three (3) quantifiable components; therefore, three (3) separate Quantifiable Component tabs in the accompanying TIRCP Calculator Tool must be used to estimate GHG emission reductions and air pollutant emission co-benefits.

Project Type(s)	Quantifiable Component(s)
System and Efficiency Improvements that Result in Increased Ridership	The estimates from this project type depend on the operational improvements which will be implemented separately from the rest of the TIRCP project; therefore, this is considered a quantifiable component. This component will be evaluated and reported apart from the rest of the TIRCP project.
Cleaner Vehicles/Technology/Fuels	The estimates from this project type depend on the procurement of the first set of ten (10) buses which will be operational separately from the rest of the TIRCP project; therefore, this is considered a quantifiable component. This component will be evaluated and reported apart from the rest of the TIRCP project.
Cleaner Vehicles/Technology/Fuels	The estimates from this project type depend on the procurement of the second set of ten (10) buses which will be operational separately from the rest of the TIRCP project; therefore, this is considered a quantifiable component. This component will be evaluated and reported apart from the rest of the TIRCP project.

Step 2: Determine the TIRCP Calculator Tool Inputs Needed**Quantifiable Component 1**

Project Information	
Identifying Descriptor	Reduce Headways
Funding Inputs	
TIRCP Funds Requested	\$100,000
Multi-Year ¹	No
Project Inputs	
Project Type	System and Efficiency Improvements
Service Type	Local/ Intercity Bus (Short Distances)
Vehicle Type	Transit Bus
Region	County
Sub region	Los Angeles
Year 1(Yr1)	2018
Year F (YrF)	2023
Useful Life	5
Displaced Auto Inputs	
Yr1 Ridership	73,000= 365 days/year x 200 riders/day (from LA Trans analysis)
YrF Ridership	73,000= 365 days/year x 200 riders/day (from LA Trans analysis)
Adjustment factor (A)	0.5 (CARB default)
Length of Average Trip (L)	11.5 (from LA Trans survey)

¹ This example component is not considered multi-year since the CTC allocation is requested for a single calendar year for this individual component.

Quantifiable Component 2

Project Information	
Identifying Descriptor	First Installment of Ten (10) Zero-Emission Buses
Funding Inputs	
TIRCP Funds Requested	\$10,000,000
Multi-Year ²	No
Project Inputs	
Project Type	Cleaner Vehicles/Technology/Fuels
Service Type	Local/ Intercity Bus (Short Distances)
Vehicle Type	Transit Bus
Region	County
Sub region	Los Angeles
Year 1(Yr1)	2019
Year F (YrF)	2031
Useful Life	12
New/Expanded Service Inputs	
Hybrid Vehicle	No
Fuel Type	Electric
Model Year	2019
Project Specific Emission Factor	
Annual VMT	600,000 = 60,000 miles/bus x 10 bus(es)/year
Annual Fuel	
Displaced Vehicle/Fuel Reductions Inputs	
Fuel Type	Diesel
Model Year	2019
Annual VMT	600,000 = 60,000 miles/bus x 10 bus(es)/year
Annual Fuel	

² This example component is not considered multi-year since the CTC allocation is requested for a single calendar year for this individual component.

Quantifiable Component 3

Project Information	
Identifying Descriptor	Second Installment of Ten (10) Zero-Emission Buses
Funding Inputs	
TIRCP Funds Requested	\$10,000,000
Multi-Year ³	No
Project Inputs	
Project Type	Cleaner Vehicles/Technology/Fuels
Service Type	Local/ Intercity Bus (Short Distances)
Vehicle Type	Transit Bus
Region	County
Sub region	Los Angeles
Year 1(Yr1)	2022
Year F (YrF)	2034
Useful Life	12
New/Expanded Service Inputs	
Hybrid Vehicle	No
Fuel Type	Electric
Model Year	2022
Project Specific Emission Factor	
Annual VMT	400,000 = 40,000 miles/bus x 10 bus(es)/year
Annual Fuel	
Displaced Vehicle/Fuel Reductions Inputs	
Fuel Type	Diesel
Model Year	2022
Annual VMT	400,000 = 40,000 miles/bus x 10 bus(es)/year
Annual Fuel	

³ This example component is not considered multi-year since the CTC allocation is requested for a single calendar year for this individual component.

Step 3: Estimate the GHG Emission Reductions and Air Pollutant Emission Co-benefits for the Proposed Project for Each Component Using the TIRCP Calculator Tool

Enter the project information into the TIRCP Calculator Tool to estimate GHG emission reductions and air pollutant emission co-benefits, starting with the **Read Me** Tab.

Quantifiable Component 1



California Air Resources Board
 Calculator Tool for the
 California State Transportation Agency
 Transit and Intercity Rail Capital Program
 Greenhouse Gas Reduction Fund
 Fiscal Year 2018-19

Project Name:	Clean Fleet LA
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Input	Description	Quantified Component 1
Identifying Descriptor (ID)	Brief description of the quantifiable component identifying it from other separable components.	Reduce Headways
Funding Inputs		
TIRCP Funds Requested	Total TIRCP funds requested for this separable component.	\$100,000
Multi-Year	Will this component request several California Transportation Commission allocations over multiple calendar years?	Yes
Additional CCI Program 1		
CCI Program	Other CCI Program from which project has or will be requesting GGRF funds.	
Additional GGRF Funds	Total GGRF funds requested or to be requested from Additional CCI Program 1.	
Additional CCI Program 2		
CCI Program	Other CCI Program from which project has or will be requesting GGRF funds.	
Additional GGRF Funds	Total GGRF funds requested or to be requested from Additional CCI Program 2.	
Total GGRF Funds Requested	Total GGRF funds requested from all CCI Programs	\$100,000

Quantification Methodology for the CalSTA FY 2018-19 TIRCP

Project Inputs			
Project Type	For the purposes of this quantification, eligible TIRCP projects fall into four project types. Select the project type that best describes this component.	System and Efficiency Improvements	
Service Type	The transit service (e.g., Intercity/Express Bus (Long Distance), Light Rail, Vanpool, etc.) directly associated with the proposed project. For projects that serve multiple services, select Multi-modal.	Local/ Intercity Bus (Short Distances)	
Vehicle Type	The vehicle type (e.g., Transit Bus, Streetcar, Ferry, etc.) that will operate the new service or will be procured.	Transit Bus	
Region	The region that best encompasses the geographic location for the proposed project type.	County	
Sub region	The County or Air Basin where the majority of the service occurs.	Los Angeles	
Year 1 (Yr1)	The first year of service or the first year the facility or rolling stock will be in use.	2018	
Year F (YrF)	The final year of service or the final year the facility or rolling stock's useful life.	2023	
Useful Life	The number of years the service is funded or the useful life of the facility or rolling stock.	5	
Displaced Autos Inputs		Input	Reference
Yr1 Ridership	The increase in unlinked passenger trips directly associated with the proposed project in the first year (Yr1).	73,000	365 days/year *200 riders/day (from LA Trans analysis)
YrF Ridership	The increase in unlinked passenger trips directly associated with the proposed project in the final year. If the ridership is not expected to change, Yr1 and YrF should be the same value.	73,000	365 days/year *200 riders/day (from LA Trans analysis)
Adjustment Factor (A)	Discount factor applied to annual ridership to account for transit-dependent riders. Use: document project-specific data or system average developed from a recent, statistically valid survey or default.	0.5	CARB default
Length of Average Trip (L)	Annual passenger miles over unlinked trips directly associated with the proposed project.	11.5	LA Trans survey data

Quantifiable Component 2



**California Air Resources Board
Calculator Tool for the
California State Transportation Agency
Transit and Intercity Rail Capital Program
Greenhouse Gas Reduction Fund
Fiscal Year 2018-19**

Project Name:	Clean Fleet LA
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Input	Description	Quantified Component 2
Identifying Descriptor (ID)	Brief description of the quantifiable component identifying it from other separable components.	First Installment of Ten (10) Zero-Emission Buses
Funding Inputs		
TIRCP Funds Requested	Total TIRCP funds requested for this separable component.	\$10,000,000
Multi-Year	Will this component request several California Transportation Commission allocations over multiple calendar years?	No
Additional CCI Program 1		
CCI Program	Other CCI Program from which project has or will be requesting GGRF funds.	
Additional GGRF Funds	Total GGRF funds requested or to be requested from Additional CCI Program 1.	
Additional CCI Program 2		
CCI Program	Other CCI Program from which project has or will be requesting GGRF funds.	
Additional GGRF Funds	Total GGRF funds requested or to be requested from Additional CCI Program 2.	
Total GGRF Funds Requested	Total GGRF funds requested from all CCI Programs	\$10,000,000
Project Inputs		
Project Type	For the purposes of this quantification, eligible TIRCP projects fall into four project types. Select the project type that best describes this component.	Cleaner Vehicles/Technology/Fuels
Service Type	The transit service (e.g., Intercity/Express Bus (Long Distance), Light Rail, Vanpool, etc.) directly associated with the proposed project. For projects that serve multiple services, select Multi-modal.	Local/ Intercity Bus (Short Distances)
Vehicle Type	The vehicle type (e.g., Transit Bus, Streetcar, Ferry, etc.) that will operate the new service or will be procured.	Transit Bus
Region	The region that best encompasses the geographic location for the proposed project type.	County
Sub region	The County or Air Basin where the majority of the service occurs.	Los Angeles
Year 1 (Yr1)	The first year of service or the first year the facility or rolling stock will be in use.	2019
Year F (YrF)	The final year of service or the final year the facility or rolling stock's useful life.	2031
Useful Life	The number of years the service is funded or the useful life of the facility or rolling stock.	12

Quantification Methodology for the CalSTA FY 2018-19 TIRCP

Displaced Autos Inputs		Input	Reference
Yr1 Ridership	The increase in unlinked passenger trips directly associated with the proposed project in the first year (Yr1).		
YrF Ridership	The increase in unlinked passenger trips directly associated with the proposed project in the final year. If the ridership is not expected to change, Yr1 and YrF should be the same value.		
Adjustment Factor (A)	Discount factor applied to annual ridership to account for transit-dependent riders. Use: document project-specific data or system average developed from a recent, statistically valid survey or default.		
Length of Average Trip (L)	Annual passenger miles over unlinked trips directly associated with the proposed project.		
New/Expanded Service Vehicle Inputs		Input	Reference
Hybrid Vehicle	Is the vehicle for the new/expanded service, or vehicle(s) to be procured, a hybrid?		No
Fuel Type	The fuel type (e.g., electric, diesel, etc.) of the vehicle for the new/expanded service, or of the new vehicle(s) to be procured.		Electric
Model Year	The engine model year of the vehicle that will operate the new/expanded service, or of the new vehicle(s) to be procured.		2019
Project-Specific Emission Factor	If used, applicant must be able to demonstrate an approved carbon intensity value under the Low Carbon Fuel Standard and submit additional documentation.		
Annual VMT	The estimated annual VMT required to operate the new/expanded service or of the new vehicle(s) to be procured (e.g., 72,000). For rail and ferry vehicles, applicants may alternatively use Annual Fuel.	600,000	60,000 miles/bus x 10 bus(es)/year
Annual Fuel	The estimated annual fuel (i.e., gallon of diesel, kWh of electricity) required to operate the new/expanded service, or of the new rail or ferry vehicle(s) to be procured (e.g., 26,000).		
Displaced Vehicle/Fuel Reductions Inputs		Input	Reference
Fuel Type	The fuel type (e.g., electric, diesel, etc.) of the displaced vehicle(s) or of fuel reductions as a result of the project.		Diesel
Model Year	The average engine model year(s) of the displaced vehicle(s) or of the vehicle(s) to realize fuel reductions as a result of the project.		2019
Annual VMT	The estimated annual VMT of the displaced vehicle(s). For rail and ferry vehicles, applicants may alternatively use Annual Fuel.	600,000	60,000 miles/bus x 10 bus(es)/year
Annual Fuel	The estimated annual fuel reductions expected to be realized as a result of the project or the estimated annual fuel the displaced vehicle(s) would have required to operate the equivalent as the new vehicle to be procured.		

Quantifiable Component 3



**California Air Resources Board
Calculator Tool for the
California State Transportation Agency
Transit and Intercity Rail Capital Program
Greenhouse Gas Reduction Fund
Fiscal Year 2018-19**

Project Name:	Clean Fleet LA
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Input	Description	Quantified Component 3
Identifying Descriptor (ID)	Brief description of the quantifiable component identifying it from other separable components.	Second Installment of Ten (10) Zero-Emission Buses
#VALUE!		
TIRCP Funds Requested	Total TIRCP funds requested for this separable component.	\$10,000,000
Multi-Year	Will this component request several California Transportation Commission allocations over multiple calendar years?	No
#VALUE!		
CCI Program	Other CCI Program from which project has or will be requesting GGRF funds.	
Additional GGRF Funds	Total GGRF funds requested or to be requested from Additional CCI Program 1.	
#VALUE!		
CCI Program	Other CCI Program from which project has or will be requesting GGRF funds.	
Additional GGRF Funds	Total GGRF funds requested or to be requested from Additional CCI Program 2.	
Total GGRF Funds Requested	Total GGRF funds requested from all CCI Programs	\$10,000,000
#VALUE!		
Project Type	For the purposes of this quantification, eligible TIRCP projects fall into four project types. Select the project type that best describes this component.	Cleaner Vehicles/Technology/Fuels
Service Type	The transit service (e.g., Intercity/Express Bus (Long Distance), Light Rail, Vanpool, etc.) directly associated with the proposed project. For projects that serve multiple services, select Multi-modal.	Local/ Intercity Bus (Short Distances)
Vehicle Type	The vehicle type (e.g., Transit Bus, Streetcar, Ferry, etc.) that will operate the new service or will be procured.	Transit Bus
Region	The region that best encompasses the geographic location for the proposed project type.	County
Sub region	The County or Air Basin where the majority of the service occurs.	Los Angeles
Year 1 (Yr1)	The first year of service or the first year the facility or rolling stock will be in use.	2022
Year F (YrF)	The final year of service or the final year the facility or rolling stock's useful life.	2034
Useful Life	The number of years the service is funded or the useful life of the facility or rolling stock.	12

Quantification Methodology for the CalSTA FY 2018-19 TIRCP

Displaced Autos Inputs		Input	Reference
Yr1 Ridership	The increase in unlinked passenger trips directly associated with the proposed project in the first year (Yr1).		
YrF Ridership	The increase in unlinked passenger trips directly associated with the proposed project in the final year. If the ridership is not expected to change, Yr1 and YrF should be the same value.		
Adjustment Factor (A)	Discount factor applied to annual ridership to account for transit-dependent riders. Use: document project-specific data or system average developed from a recent, statistically valid survey or default.		
Length of Average Trip (L)	Annual passenger miles over unlinked trips directly associated with the proposed project.		
New/Expanded Service Vehicle Inputs		Input	Reference
Hybrid Vehicle	Is the vehicle for the new/expanded service, or vehicle(s) to be procured, a hybrid?		No
Fuel Type	The fuel type (e.g., electric, diesel, etc.) of the vehicle for the new/expanded service, or of the new vehicle(s) to be procured.		Electric
Model Year	The engine model year of the vehicle that will operate the new/expanded service, or of the new vehicle(s) to be procured.		2022
Project-Specific Emission Factor	If used, applicant must be able to demonstrate an approved carbon intensity value under the Low Carbon Fuel Standard and submit additional documentation.		
Annual VMT	The estimated annual VMT required to operate the new/expanded service or of the new vehicle(s) to be procured (e.g., 72,000). For rail and ferry vehicles, applicants may alternatively use Annual Fuel.	400,000	40,000 miles/bus x 10 bus(es)/year
Annual Fuel	The estimated annual fuel (i.e., gallon of diesel, kWh of electricity) required to operate the new/expanded service, or of the new rail or ferry vehicle(s) to be procured (e.g., 26,000).		
Displaced Vehicle/Fuel Reductions Inputs		Input	Reference
Fuel Type	The fuel type (e.g., electric, diesel, etc.) of the displaced vehicle(s) or of fuel reductions as a result of the project.		Diesel
Model Year	The average engine model year(s) of the displaced vehicle(s) or of the vehicle(s) to realize fuel reductions as a result of the project.		2022
Annual VMT	The estimated annual VMT of the displaced vehicle(s). For rail and ferry vehicles, applicants may alternatively use Annual Fuel.	400,000	40,000 miles/bus x 10 bus(es)/year
Annual Fuel	The estimated annual fuel reductions expected to be realized as a result of the project or the estimated annual fuel the displaced vehicle(s) would have required to operate the equivalent as the new vehicle to be procured.		

Quantification Methodology for the CalSTA FY 2018-19 TIRCP

The **GHG Summary** tab displays the Total GHG Emission Reductions per TIRCP and GGRF Funds Requested, which are required documentation components. GHG emission reductions are displayed per separable component and are prorated according to the level of program funding contributed from TIRCP and other CCI programs, as applicable.



California Air Resources Board
 Calculator Tool for the
 California State Transportation Agency
 Transit and Intercity Rail Capital Program
 Greenhouse Gas Reduction Fund
 Fiscal Year 2018-19

Project Name: Clean Fleet LA

	Quantified GHG Component 1	Quantified GHG Component 2	Quantified GHG Component 3	Quantified GHG Component 4	Quantified GHG Component 5	Quantified GHG Component 6	Total Project
Identifying Descriptor	Reduce Headways	First Installment of Ten (10) Zero-Emission Buses	Second Installment of Ten (10) Zero-Emission Buses				
GHG Emission Reduction Start Date (Year)	2018	2019	2022				
Total CCI							
Total GHG Emission Reductions (MTCO ₂ e)	1,051	13,794	9,195				24,040
Total GGRF Funds Requested (\$)	100,000	10,000,000	10,000,000				20,100,000
Total GHG Emission Reductions/Total GGRF Funds Requested (MTCO ₂ e/\$)	0.010509	0.001379	0.000920				0.001196
TIRCP							
TIRCP GHG Emission Reductions (MTCO ₂ e)	1,051	13,794	9,195				24,040
TIRCP Funds Requested (\$)	100,000	10,000,000	10,000,000				20,100,000
TIRCP GHG Emission Reductions/TIRCP Funds Requested (MTCO ₂ e/\$)	0.010509	0.001379	0.000920				0.001196
TIRCP Funds Requested/TIRCP GHG Emission Reductions (\$/MTCO ₂ e)	95	725	1,088				836
Additional CCI Program 1							
CCI Program							
GHG Emission Reductions Attributable to other GGRF Programs (MTCO ₂ e)							
Total Additional GGRF Funds to Implement Project (\$)							
Additional CCI Program 2							
CCI Program							
GHG Emission Reductions Attributable to other GGRF Programs (MTCO ₂ e)							
Total Additional GGRF Funds to Implement Project (\$)							

Quantification Methodology for the CalSTA FY 2018-19 TIRCP

The **Co-Benefits Summary** tab displays the key variable and air pollutant emission estimates a total for the project. Key variables are also prorated according to the level of program funding contributed from TIRCP and other CCI programs, as applicable.



California Air Resources Board
 Calculator Tool for the
 California State Transportation Agency
 Transit and Intercity Rail Capital Program
 Greenhouse Gas Reduction Fund
 Fiscal Year 2018-19

Project Name: Clean Fleet LA

	Quantified Co-Benefit Component 1	Quantified Co-Benefit Component 2	Quantified Co-Benefit Component 3	Quantified Co-Benefit Component 4	Quantified Co-Benefit Component 5	Quantified Co-Benefit Component 6	Total Project
Identifying Descriptor	Reduce Headways	First Installment of Ten (10) Zero-Emission Buses	Second Installment of Ten (10) Zero-Emission Buses				
Total CCI							
Key Variables	Passenger VMT Reductions (miles)	419,750					419,750
	Fossil Fuel Use Reductions	N/A	N/A	N/A			
	Fossil Fuel Energy Use Reductions (kWh)	N/A	N/A	N/A			
Co-Benefits	ROG Emission Reductions (lbs)	116	362	241			719
	NOx Emission Reductions (lbs)	452	12,909	8,601			21,962
	PM2.5 Emission Reductions (lbs)	10	49	32			91
	Diesel PM Emission Reductions (lbs)	73	51	34			158
TIRCP							
Key Variables	Passenger VMT Reductions (miles)	419,750					419,750
	Fossil Fuel Use Reductions	N/A	N/A	N/A			
	Fossil Fuel Energy Use Reductions (kWh)	N/A	N/A	N/A			
Co-Benefits	ROG Emission Reductions (lbs)	116	362	241			719
	NOx Emission Reductions (lbs)	452	12,909	8,601			21,962
	PM2.5 Emission Reductions (lbs)	10	49	32			91
	Diesel PM Emission Reductions (lbs)	73	51	34			158
Additional CCI Program 1							
Key Variables	Passenger VMT Reductions (miles)						
	Fossil Fuel Use Reductions						
	Fossil Fuel Energy Use Reductions (kWh)						
Co-Benefits	ROG Emission Reductions (lbs)						
	NOx Emission Reductions (lbs)						
	PM2.5 Emission Reductions (lbs)						
	Diesel PM Emission Reductions (lbs)						
Additional CCI Program 2							
Key Variables	Passenger VMT Reductions (miles)						
	Fossil Fuel Use Reductions						
	Fossil Fuel Energy Use Reductions (kWh)						
Co-Benefits	ROG Emission Reductions (lbs)						
	NOx Emission Reductions (lbs)						
	PM2.5 Emission Reductions (lbs)						
	Diesel PM Emission Reductions (lbs)						

Submit Documentation

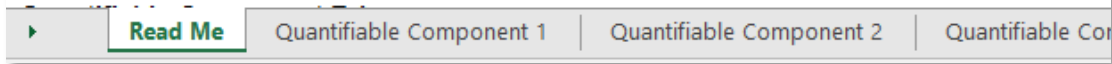
To complete the quantification process, the applicant must submit an electronic copy of the TIRCP Calculator Tool (in .xls/.xlsm) and all of the required documentation, as noted in Section C.

Save the file as instructed on the **Read Me** tab:

Read Me Tab (this page):

Enter the Project Name and the contact information for person who can answer project-specific qu

Project Name:	Clean Fleet LA
Contact Name:	Any R Body
Contact Phone Number:	(213) 555-1234
Contact Email:	LAtrans@account.com
Date Completed:	8/28/2017



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Appendix B. Equations Supporting the TIRCP Calculator Tool

Methods used in the TIRCP Calculator Tool for estimating the GHG emission reductions and air pollutant emission co-benefits by project type are provided in this appendix. The GHG emission reductions and air pollutant emission estimates from the project is estimated within the TIRCP Calculator Tool using the approaches described below. The Database documentation explains how emission factors used in CARB quantification methodologies are developed and updated.

A. Emission Estimates from New/Expanded Service

The GHG emission reductions and air pollutant emission co-benefits from New/Expanded Service projects are calculated as the difference between the emission reductions associated with displaced autos and the emission estimates associated with the operation of the new/expanded service, as calculated using Equations 1 through 3.

- Equation 1 is used to calculate the annual auto VMT reductions from the proposed project.
- Equation 2 is used to calculate the emission reductions associated with auto VMT reductions.
- Equation 3 is used to calculate the emission estimates associated with the operation of the new/expanded service.

Emission Estimates from New/Expanded Service

*Emission Estimates =
Emissions of Displaced Autos – Emissions of New/Expanded Service Vehicle*

Equation 1: Annual Auto VMT Reduced in Miles per Year

$$AutoVMT = [(R) * (A) * (L)]$$

<i>Where,</i>		<u>Units</u>
<i>R</i>	= Annual increase in unlinked passenger trips ¹ directly associated with the proposed project	Riders
<i>A</i>	= Adjustment factor to account for transit dependency Use: documented project-specific data or system average developed from recent, statistically valid survey or default. Default: 0.5 for local service or 0.83 for long-distance service, shuttle and vanpools.	Unitless
<i>L</i>	= Estimated length of average unlinked passenger trip directly associated with the proposed project, calculated as passenger-miles ² divided by unlinked trips. Applicants may use data reported to National Transit Database ⁱ for similar service or refer to Appendix C.	Mile-rider

Equation 2: Emission Estimates from Displaced Autos

$$Emission\ Estimates\ from\ Displaced\ Autos = \frac{[(AutoVMT) * \frac{(AVEF_{Yr1} + AVEF_{YrF})}{2}]}{CF} * UL$$

<i>Where,</i>		<u>Units</u>
<i>AutoVMT</i>	= Annual auto VMT reduced; calculated using Equation 1	Miles
<i>AVEF_{Yr1}</i>	= Auto Vehicle Emission Factor in Year 1	Grams/mile
<i>AVEF_{YrF}</i>	= Auto Vehicle Emission Factor in Year F	Grams/mile
<i>CF</i>	= Conversion factor	Grams/MT Grams/lb
<i>UL</i>	= The number of years the service is funded or the useful life of the facility or rolling stock	Years

Note: EMFAC 2014 estimates emission factors through 2050. For calculations extending post 2050, auto vehicle emission factors are assumed to remain at the 2050 level.

¹ Unlinked passenger trips are defined as the number of passengers who board public transportation vehicles.

² The cumulative sum of the distances ridden by each passenger.

Equation 3: Emission Estimates from New/Expanded Service

$$Emission\ Estimates\ from\ \frac{New}{Expanded}\ Service = \frac{[(NSVMT) * (NSEF)]}{CF} * UL$$

Or (only available for train/ferry service)

$$= \frac{[(NSFuel) * (FuelEF)]}{CF} * UL$$

<i>Where,</i>		<u>Units</u>
<i>NSVMT</i>	= The estimated annual VMT attributed to the operation of the new/expanded service	Miles
<i>NSEF</i>	= Emission factor based on service type	Grams/mile
<i>NSFuel</i>	= The estimated annual fuel attributed to the operation of the new/expanded service (only available for train/ferry service)	unit of fuel
<i>FuelEF</i>	= Emission factor based on fuel type	Grams/unit of fuel
<i>CF</i>	= Conversion factor	Grams/MT Grams/lb
<i>UL</i>	= The number of years the service is funded or the useful life of the facility or rolling stock	Years

Note: The second set of standards (Tier 2) applies to locomotives manufactured from 2005 to 2011. The most stringent set of standards (Tier 4) applies to locomotives originally manufactured in 2015 or later. This methodology assumes Tier 2 standards when estimating emissions from new or expanded services of locomotives and Tier 4 standards when a new locomotive is procured. According to CARB’s Draft Technology Assessment: Freight Locomotives, “the 2014 locomotive fleet in the South Coast Air Basin was dominated by Tier 2 line haul locomotives. The rest of the State has similar fleet characteristics, but typically takes an additional five years to catch up with the South Coast Air Basin.”

B. Emission Estimates from System and Efficiency Improvements that Result in Increased Ridership

The GHG emission reductions and air pollutant emission estimate co-benefits from System and Efficiency Improvements that Result in Increased Ridership are calculated as the emission estimates from displaced autos, which can be calculated using Equation 1 and Equation 2.

Emission Estimates from System and Efficiency Improvements that result in Increased Ridership

Emission Estimates = Emissions from Displaced Autos

C. Emission Estimates from Cleaner Vehicles/Technology/Fuels

The GHG emission reductions and air pollutant emission estimate co-benefits from Cleaner Vehicles/Technology/Fuels are calculated as the difference between the baseline or replaced vehicle and new vehicle. Emission estimates from the baseline, replaced, and new vehicle are calculated using Equation 4.

For the procurement of a new vehicle where there is no existing vehicle to be replaced, applicants should use a baseline diesel vehicle with a model year equal to the first year of operation to represent the newest available diesel-equivalent vehicle.

For the procurement of a new vehicle where there is an existing vehicle to be replaced, the TIRCP Calculator Tool requires project-specific inputs of the replacement vehicle to calculate the associated emission estimates.

Emission Estimates from Cleaner Vehicles

$$\begin{aligned} \text{Emission Estimates} &= \\ & \text{Emission Estimates from Baseline/Replaced Vehicle} \\ & \quad - \text{Emission Estimates from New Vehicle} \end{aligned}$$

Equation 4: Emission Estimates from Cleaner Vehicles

Emission Estimates from Baseline/Replaced/New Vehicle

$$= \frac{[(\text{AnnualVMT}) * (\text{VehicleEF})]}{CF} * UL$$

Or (only available for train/ferry service)

$$= \frac{[(\text{AnnualFuel}) * (\text{FuelEF})]}{CF} * UL$$

<i>Where,</i>		<u>Units</u>
<i>AnnualVMT</i>	= The estimated annual VMT of the vehicle to be procured	Miles
<i>VehicleEF</i>	= Emission factor based on vehicle type	Grams/mile
<i>AnnualFuel</i>	= The estimated annual fuel of the vehicle to be procured (only available for train/ferry service)	Unit of fuel
<i>FuelEF</i>	= Emission factor based on fuel type	Grams/unit of fuel
<i>CF</i>	= Conversion factor	Grams/MT Grams/lb
<i>UL</i>	= The number of years the service is funded or the useful life of the facility or rolling stock	Years

Note: The second set of standards (Tier 2) applies to locomotives manufactured from 2005 to 2011. The most stringent set of standards (Tier 4) applies to locomotives originally manufactured in 2015 or later. This methodology assumes Tier 2 standards when estimating emissions from new or expanded services of locomotives and Tier 4 standards when a new locomotive is procured. According to CARB's Draft Technology Assessment: Freight Locomotives,ⁱⁱⁱ "the 2014 locomotive fleet in the South Coast Air Basin was dominated by Tier 2 line haul locomotives. The rest of the State has similar fleet characteristics, but typically takes an additional five years to catch up with the South Coast Air Basin."

D. Emission Estimates from Fuel Reductions

The GHG emission reductions and air pollutant emission co-benefits from Fuel Reductions are calculated using Equation 5.

Emission Estimates from Fuel Reductions

Emission Estimates =
Emission Estimates from Fuel Reductions

Equation 5: Emission Estimates from Fuel Reductions

$$Emission\ Estimates\ from\ Fuel\ Reductions = \frac{[(AnnualFuel) * (FuelEF)]}{CF} * UL$$

<i>Where,</i>		<u>Units</u>
<i>AnnualFuel</i>	= The estimated annual fuel reductions to be realized as a result of the project	Unit of fuel
<i>FuelEF</i>	= Emission factor based on fuel type	Grams/unit of fuel
<i>CF</i>	= Conversion factor	Grams/MT Grams/lb
<i>UL</i>	= The number of years the service is funded or the useful life of the facility or rolling stock	Years

ⁱ Federal Transit Administration. National Transit Database. Available at <https://www.transit.dot.gov/ntd>.

ⁱⁱ California Air Resources Board (2016). Draft Technology Assessment: Freight Locomotives (2016). Available at: https://www.arb.ca.gov/msprog/tech/techreport/freight_locomotives_tech_report.pdf.

ⁱⁱⁱ California Air Resources Board (2016). Draft Technology Assessment: Freight Locomotives (2016). Available at: https://www.arb.ca.gov/msprog/tech/techreport/freight_locomotives_tech_report.pdf.

Appendix C. Length of Average Trip Lookup Tables

Caltrans developed these recommended values for applicants to use for the length of the average unlinked passenger trip, by agency or statewide, by mode using data from the National Transit Database.¹ These values were calculated by dividing passenger miles traveled by unlinked passenger trips. For additional information on the tables please contact Caltrans at: TIRCPcomments@dot.ca.gov.

Table C-1. Length of Average Trip Statewide by Mode

Mode Type		Length of Average Trip (Miles/Trip)
Commuter Bus	CB	10.23
Cable Car	CC	1.25
Commuter Rail	CR	32.15
Demand Response	DR	7.69
Demand Response Taxi	DT	7.23
Ferryboat	FB	18.07
Heavy Rail	HR	9.19
Light Rail	LR	5.18
Bus	MB	4.95
Monorail/Automated Guideway	MG	3.20
Bus Rapid Transit	RB	6.44
Streetcar Rail	SR	1.48
Trolley Bus	TB	1.50
Vanpool	VP	43.32
Hybrid Rail	YR	8.71

Table C-2. Length of Average Trip Statewide

Agency	Mode	Most Recent Report Year	Length of Average Trip
Access Services	DR	2016	11.88
Access Services	DT	2016	14.99
Alameda-Contra Costa Transit District	CB	2016	14.38
Alameda-Contra Costa Transit District	DR	2016	10.23
Alameda-Contra Costa Transit District	MB	2016	3.50
Alameda-Contra Costa Transit District	MB	2016	12.97
Altamont Corridor Express	CR	2016	43.00
Anaheim Transportation Network	MB	2016	1.98
Antelope Valley Transit Authority	CB	2016	62.54
Antelope Valley Transit Authority	DR	2016	8.79
Antelope Valley Transit Authority	MB	2016	14.91
Butte County Association of Governments	DR	2016	3.82
Butte County Association of Governments	MB	2016	5.78
California Vanpool Authority	VP	2016	44.29
Central Contra Costa Transit Authority	DR	2016	10.49
Central Contra Costa Transit Authority	MB	2016	4.44
Chula Vista Transit	MB	2015	3.72
City of Commerce Municipal Buslines	DR	2016	7.86
City of Commerce Municipal Buslines	MB	2016	3.84
City of Elk Grove	CB	2016	13.64
City of Elk Grove	DR	2016	7.60
City of Elk Grove	MB	2016	3.99
City of Fairfield - Fairfield and Suisun Transit	CB	2016	17.86
City of Fairfield - Fairfield and Suisun Transit	DR	2016	9.58
City of Fairfield - Fairfield and Suisun Transit	MB	2016	2.64
City of Gardena Transportation Department	DR	2016	3.53
City of Gardena Transportation Department	MB	2016	3.59
City of Glendale	DR	2016	5.17
City of Glendale	MB	2016	2.18
City of La Mirada Transit	DR	2016	3.00
City of Lodi - Transit Division	DR	2016	2.65
City of Lodi - Transit Division	MB	2016	2.81
City of Los Angeles Department of Transportation	CB	2016	16.89
City of Los Angeles Department of Transportation	DR	2016	4.78
City of Los Angeles Department of Transportation	DT	2016	2.39
City of Los Angeles Department of Transportation	MB	2016	1.36
City of Petaluma	DR	2016	3.26
City of Petaluma	MB	2016	2.12
City of Redondo Beach - Beach Cities Transit	DR	2016	4.36
City of Redondo Beach - Beach Cities Transit	MB	2016	3.90

Agency	Mode	Most Recent Report Year	Length of Average Trip
City of Riverside Special Transportation	DR	2016	7.49
City of San Luis Obispo	MB	2016	2.90
City of Santa Rosa	DR	2016	5.42
City of Santa Rosa	MB	2016	3.83
City of Santa Rosa	MB	2016	2.80
City of Tulare	DR	2016	6.26
City of Tulare	MB	2016	4.23
City of Turlock	DR	2016	7.29
City of Turlock	MB	2016	3.29
City of Vallejo Transportation Program	FB	2012	28.40
City of Visalia - Visalia City Coach	CB	2016	45.00
City of Visalia - Visalia City Coach	DR	2016	7.85
City of Visalia - Visalia City Coach	MB	2016	5.58
Claremont Dial-a-Ride	DR	2016	4.38
Claremont Dial-a-Ride	DT	2016	2.27
Culver City Municipal Bus Lines	DR	2016	2.26
Culver City Municipal Bus Lines	MB	2016	3.64
El Dorado County Transit Authority	CB	2016	51.96
El Dorado County Transit Authority	DR	2016	11.48
El Dorado County Transit Authority	MB	2016	0.00
Foothill Transit	MB	2016	8.21
Fresno Area Express	DR	2016	7.29
Fresno Area Express	MB	2016	2.61
Gold Coast Transit	DR	2016	7.23
Gold Coast Transit	MB	2016	4.10
Golden Empire Transit District	DR	2016	7.08
Golden Empire Transit District	MB	2016	3.62
Golden Gate Bridge, Highway and Transportation District	DR	2016	12.42
Golden Gate Bridge, Highway and Transportation District	FB	2016	10.96
Golden Gate Bridge, Highway and Transportation District	MB	2016	18.13
Imperial County Transportation Commission	DR	2016	17.26
Imperial County Transportation Commission	MB	2016	10.35
Kings County Area Public Transit Agency	DR	2016	3.53
Kings County Area Public Transit Agency	MB	2016	5.53
LACMTA - Small Operators	DR	2015	3.56
LACMTA - Small Operators	DT	2015	3.14
LACMTA - Small Operators	MB	2015	2.40
Laguna Beach Municipal Transit	MB	2016	2.18
Livermore / Amador Valley Transit Authority	DR	2016	10.18
Livermore / Amador Valley Transit Authority	MB	2016	4.95
Long Beach Transit	DR	2016	4.58

Agency	Mode	Most Recent Report Year	Length of Average Trip
Long Beach Transit	MB	2016	3.22
Los Angeles County Metropolitan Transportation Authority dba: Metro	HR	2016	4.88
Los Angeles County Metropolitan Transportation Authority dba: Metro	LR	2016	6.88
Los Angeles County Metropolitan Transportation Authority dba: Metro	MB	2016	4.09
Los Angeles County Metropolitan Transportation Authority dba: Metro	MB	2016	4.49
Los Angeles County Metropolitan Transportation Authority dba: Metro	RB	2016	6.44
Los Angeles County Metropolitan Transportation Authority dba: Metro	VP	2016	45.42
Marin County Transit District	DR	2016	8.24
Marin County Transit District	MB	2016	4.06
Modesto Area Express	DR	2016	7.14
Modesto Area Express	DT	2016	4.93
Modesto Area Express	MB	2016	3.39
Montebello Bus Lines	DT	2016	2.09
Montebello Bus Lines	MB	2016	3.25
Montebello Bus Lines	MB	2016	2.90
Monterey-Salinas Transit	CB	2016	40.39
Monterey-Salinas Transit	DR	2016	12.65
Monterey-Salinas Transit	MB	2016	6.00
Monterey-Salinas Transit	MB	2016	4.42
Napa Valley Transportation Authority	CB	2016	21.58
Napa Valley Transportation Authority	DR	2016	7.32
Napa Valley Transportation Authority	MB	2016	7.46
North County Transit District	CR	2016	28.10
North County Transit District	DR	2016	13.22
North County Transit District	MB	2016	5.03
North County Transit District	YR	2016	8.71
Norwalk Transit System	DR	2016	3.58
Norwalk Transit System	MB	2016	3.35
Omnitrans	DR	2016	14.24
Omnitrans	MB	2016	5.20
Omnitrans	MB	2016	3.89
Orange County Transportation Authority	CB	2016	23.87
Orange County Transportation Authority	CB	2016	19.01
Orange County Transportation Authority	DR	2016	11.29
Orange County Transportation Authority	DT	2016	3.02

Agency	Mode	Most Recent Report Year	Length of Average Trip
Orange County Transportation Authority	MB	2016	3.37
Orange County Transportation Authority	MB	2016	3.99
Orange County Transportation Authority	VP	2016	34.57
Paratransit, Inc.	DR	2016	9.52
Paratransit, Inc.	DR	2016	9.48
Paratransit, Inc.	DT	2016	7.91
Peninsula Corridor Joint Powers Board dba: Caltrain	CR	2016	26.60
Peninsula Corridor Joint Powers Board dba: Caltrain	MB	2016	3.47
Placer County Department of Public Works and Facilities	CB	2016	21.99
Placer County Department of Public Works and Facilities	DR	2016	3.82
Placer County Department of Public Works and Facilities	DT	2016	13.86
Placer County Department of Public Works and Facilities	MB	2016	7.89
Placer County Department of Public Works and Facilities	MB	2016	3.48
Placer County Department of Public Works and Facilities	VP	2016	39.74
Pomona Valley Transportation Authority	DR	2016	5.02
Pomona Valley Transportation Authority	DT	2016	4.89
Redding Area Bus Authority	DR	2016	9.06
Redding Area Bus Authority	MB	2016	6.51
Riverside Transit Agency	CB	2016	19.49
Riverside Transit Agency	CB	2016	23.22
Riverside Transit Agency	DR	2016	12.54
Riverside Transit Agency	DT	2016	16.56
Riverside Transit Agency	MB	2016	6.27
Riverside Transit Agency	MB	2016	6.64
Sacramento Regional Transit District	DR	2016	2.66
Sacramento Regional Transit District	LR	2016	5.66
Sacramento Regional Transit District	MB	2016	3.63
San Diego Association of Governments	VP	2016	48.79
San Diego Metropolitan Transit System	CB	2016	23.69
San Diego Metropolitan Transit System	DR	2016	9.98
San Diego Metropolitan Transit System	LR	2016	5.56
San Diego Metropolitan Transit System	MB	2016	4.48
San Diego Metropolitan Transit System	MB	2016	3.21
San Francisco Bay Area Rapid Transit District	HR	2016	13.50
San Francisco Bay Area Rapid Transit District	MG	2016	3.20
San Francisco Bay Area Water Emergency Transportation Authority	FB	2016	14.85
San Francisco Municipal Railway	CC	2016	1.25
San Francisco Municipal Railway	DR	2016	6.03
San Francisco Municipal Railway	LR	2016	2.72
San Francisco Municipal Railway	MB	2016	2.26

Agency	Mode	Most Recent Report Year	Length of Average Trip
San Francisco Municipal Railway	SR	2016	1.48
San Francisco Municipal Railway	TB	2016	1.50
San Joaquin Regional Transit District	CB	2016	44.30
San Joaquin Regional Transit District	DR	2016	11.47
San Joaquin Regional Transit District	DT	2016	6.48
San Joaquin Regional Transit District	MB	2016	3.53
San Joaquin Regional Transit District	MB	2016	4.56
San Luis Obispo Regional Transit Authority	DR	2016	7.95
San Luis Obispo Regional Transit Authority	MB	2016	12.44
San Mateo County Transit District	DR	2016	8.45
San Mateo County Transit District	DT	2016	13.11
San Mateo County Transit District	MB	2016	3.86
San Mateo County Transit District	MB	2016	7.44
Santa Barbara Metropolitan Transit District	MB	2016	4.60
Santa Clara Valley Transportation Authority	DR	2016	10.12
Santa Clara Valley Transportation Authority	LR	2016	5.10
Santa Clara Valley Transportation Authority	MB	2016	5.91
Santa Clara Valley Transportation Authority	MB	2016	3.65
Santa Clarita Transit	CB	2016	19.28
Santa Clarita Transit	DR	2016	8.07
Santa Clarita Transit	MB	2016	4.38
Santa Cruz Metropolitan Transit District	CB	2016	31.21
Santa Cruz Metropolitan Transit District	DR	2016	6.70
Santa Cruz Metropolitan Transit District	DT	2016	6.70
Santa Cruz Metropolitan Transit District	MB	2016	5.34
Santa Maria Area Transit	DR	2016	5.48
Santa Maria Area Transit	MB	2016	4.37
Santa Monica's Big Blue Bus	DR	2016	2.49
Santa Monica's Big Blue Bus	MB	2016	4.23
Solano County Transit	CB	2016	12.72
Solano County Transit	DR	2016	6.10
Solano County Transit	MB	2016	3.06
Sonoma County Transit	DR	2016	12.52
Sonoma County Transit	MB	2016	8.21
Sonoma County Transit	MB	2016	8.36
Southern California Regional Rail Authority dba: Metrolink	CR	2016	30.90
SunLine Transit Agency	DR	2016	11.94
SunLine Transit Agency	MB	2016	7.13
The Eastern Contra Costa Transit Authority	DR	2016	6.25
The Eastern Contra Costa Transit Authority	MB	2016	7.26

Agency	Mode	Most Recent Report Year	Length of Average Trip
Torrance Transit System	DT	2016	6.17
Torrance Transit System	MB	2016	4.40
Transit Joint Powers Authority for Merced County	DR	2016	6.05
Transit Joint Powers Authority for Merced County	MB	2016	6.31
Unitrans - City of Davis/ASUCD	MB	2016	2.15
Ventura Intercity Service Transit Authority	CB	2016	11.61
Ventura Intercity Service Transit Authority	DR	2016	4.27
Ventura Intercity Service Transit Authority	MB	2016	4.40
Victor Valley Transit Authority	CB	2016	51.18
Victor Valley Transit Authority	DR	2016	13.83
Victor Valley Transit Authority	MB	2016	6.23
Victor Valley Transit Authority	VP	2016	47.11
Western Contra Costa Transit Authority	CB	2016	23.20
Western Contra Costa Transit Authority	DR	2016	7.47
Western Contra Costa Transit Authority	MB	2016	7.42
Yolo County Transportation District	DR	2016	11.05
Yolo County Transportation District	MB	2016	10.39
Yuba-Sutter Transit Authority	CB	2016	38.82
Yuba-Sutter Transit Authority	DR	2016	6.90
Yuba-Sutter Transit Authority	MB	2016	2.99