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Subject: **Technical Methodology to Estimate Greenhouse Gas Emissions for the 2022
Regional Transportation Plan & Sustainable Communities Strategy for the
Shasta Region**

Introduction

The Shasta Regional Transportation Agency (SRTA) is the metropolitan planning organization (MPO) for the Shasta County region. SRTA is responsible for updating and maintaining a regional transportation plan (RTP) and sustainable communities strategy (SCS) for the long-range planning of transportation investments in the Shasta County region. Senate Bill 375 (SB 375) requires that an MPO must submit to the California Air Resources Board (CARB) a description of the technical methodology to estimate greenhouse gas emissions for the region's SCS, or if appropriate, before it starts its public outreach process [Government Code Section 65080(b)(2)(J)(I)]. This memorandum fulfills that requirement and describes the technical methodology that will be used for the 2022 RTP/SCS.

Focus of the 2022 RTP/SCS

The 2022 RTP/SCS will continue implementation of the 2018 RTP/SCS. Although it will take many years to develop and deliver projects and programs that affect regional travel behavior, early efforts have resulted in notable progress. A combination of local and regional funds; private sector and philanthropic investments; and Affordable Housing & Sustainable Communities program (AHSC), Infill Infrastructure Grant program (IIG) Active Transportation Program (ATP), Low Carbon Transit Operations Program (LCTOP), Clean Mobility Options (CMO), Transit and

Intercity Rail Capital Program (TIRCP), federal Carbon Reduction Program (CRP), Regional Early Action Planning (REAP), and Redding Electric Utility (REU) Cap and Trade grant funds have been coordinated to enhance and transform our region.

Downtown Redding has become a more vibrant urban center featuring LEED-certified affordable and market-rate housing; new complete streets; expanded employment and shopping destinations; enhanced bicycle and pedestrian facilities connected to high-quality transit; a new Class IV urban trail connecting to the Sacramento River Trail, and downtown bikeshare launching in 2023. The city of Shasta Lake and the rural community of Cottonwood, both along the Interstate 5 (I-5) corridor, in SCS designated strategic growth areas (SGA) and in the south central urban region of the county, are also seeing transformative investments. SRTA has implemented enhanced on-demand public transit services in rural areas of our region during the week and is testing on-demand services in the urban area on Sundays – resulting in increased accessibility and mobility for many, including access to housing, jobs, food, medical care, and other essential needs. Collectively, these improvements have and will increase the use of alternative travel modes, shorten trips, expand opportunities for disadvantaged communities, and reduced greenhouse gas emissions. The 2022 RTP/SCS will include a comprehensive update on all such activities aiming for the regional greenhouse gas emission reduction targets.

In addition to continued implementation of current RTP/SCS, the 2022 RTP/SCS will incorporate new and revised requirements of the federal transportation bills Fixing America's Surface Transportation (FAST) Act and Infrastructure Investment and Jobs Act (IIJA). Changes include: Performance-Based Planning and Programming; Highway Safety Improvement Program and transit performance targets; the latest California Planning Emphasis Areas; and FHWA and FTA national goals and priorities.

Greenhouse Gas Targets

The 2015 RTP/SCS was the first time that SRTA was required to quantify a baseline for greenhouse gas (GHG) emission reductions. Per SB 375, SRTA calculated a 2005 baseline of 21.31 lbs. of daily GHG emissions per capita. This same baseline will be used for each subsequent RTP/SCS to show if the region's plan will meet the California Air Resources Board (CARB) established SB 375 GHG emission reduction targets.

For the 2022 RTP/SCS, the regional GHG reduction targets have changed. CARB conducted a review of all California MPO GHG reduction targets in fiscal year (FY) 2017/18. That review resulted in updated targets for all regions based on CARB's determination of what was needed from regions to help California reach its ambitious climate and air quality goals. The regional targets for the 2022 RTP/SCS are: -4.0% for 2020 and -4.0% for 2035. Table 1 summarizes the GHG targets and projected performance for the 2015 and 2018 RTP/SCS efforts.

Table 1: SB 375 GHG Emission Reduction Targets

	2020	2035
2022 RTP/SCS Targets	-4.0%	-4.0%
2015 & 2018 RTP/SCS Targets	0%	0%

Table 2 summarizes the SB 375 GHG per capita reductions the 2015 and 2018 RTP/SCS are strived to achieve.

Table 2: 2015 and 2018 RTP/SCS Projected Daily GHG Emissions per Capita

Year	2015 RTP/SCS		2018 RTP/SCS	
	SB 375 Emissions per Capita	Change in Emissions from 2005	SB 375 Emissions per Capita	Change in Emissions from 2005
2005 Baseline	21.31 lbs.	-	21.31 lbs.	-
2020	20.3 lbs.	-4.9%	20.46 lbs.	-3.97%
2035	21.2 lbs.	-0.5%	21.06 lbs.	-1.16%

Project Timeline and Public Participation

SRTA's 2022 Public Participation Plan (PPP)¹ serves as the guiding document for SRTA's public outreach during development of the 2022 RTP/SCS. The 2022 PPP includes elements that ensure compliance with SB 375. Consistent with Government Code Section 65080(b)(2)(F), SRTA's public outreach will include the following items shown in Table 3. Additionally, because the COVID-19 pandemic increased remote participation opportunities, SRTA is providing options for agencies and the public to participate either in-person and remotely.

Table 3: Public Participation and Outreach for the 2022 RTP/SCS

Activity	Time Required/ Frequency	Locations
Broad outreach	Ongoing	E-mail, written mail, SRTA's website, social media (Facebook, Twitter, Instagram)
Public workshops	One	Centrally-located in the region
Draft document review	45-day comment period and at least 55 days before adoption of final RTP/SCS	SRTA's website, e-mail, written mail, fax
Public hearings	Two	SRTA BOD meetings based on board direction
Public information request	Ongoing	email: RTP@srt.ca.gov or srtca@srt.ca.gov

¹ <https://www.srta.ca.gov/DocumentCenter/View/6096/The-2022-Shasta-Public-Participation-and-Title-VI-Plan>

SRTA anticipates the following schedule of activities leading up to the adoption of the 2022 RTP/SCS:

- 1) RTP/SCS Scenario Development (July 2021 – October 2022)
 - a) Review and update local agency land use development forecasts and growth forecasts
 - b) Review transportation networks, transit networks, and non-motorized networks and update as needed
 - c) Review and update financial projections
 - d) Prepare RTP/SCS scenarios for review and public feedback
- 2) Draft RTP/SCS (January 2022 – March 2023)
 - a) Prepare Initial Study and Notice of Preparation
 - b) Perform analysis on RTP/SCS scenarios, including GHG reductions
 - c) Prepare environmental review documents
 - d) Develop and release the Draft 2022 RTP/SCS for agency/public review and comment
 - e) Conduct outreach in accordance with SB 375 requirements and collect input on RTP/SCS scenarios
- 3) Final RTP/SCS and Approval (April 2023 – June 2023)
 - a) Develop the final RTP/SCS
 - b) Develop final environmental document and respond to comments
 - c) SRTA Board of Directors adoption of 2022 RTP/SCS
 - d) Submittal of final 2022 RTP/SCS to CARB

Regional Growth

The California Department of Finance’s (DOF) Demographic Research Unit annually posts estimated current year and projected future population and housing data for the state and counties of California. The population baseline estimates through 2021 are based on the 2010 US Decennial Census. Per California DOF, population, and housing estimates for 2022 and beyond will be based on the 2020 US Decennial Census.² Annual population estimates are based on births, deaths and migration. Unique to data in 2020 was the separation of death data between “COVID-19 pandemic” and “non-COVID-19” deaths. Details regarding the DOF’s methodology can be found on their website at:

<http://www.dof.ca.gov/Forecasting/Demographics/Projections/>.

For the 2022 RTP/SCS, SRTA reexamined data regarding population, housing (occupied housing units), and jobs since the previous 2015 and 2018 RTP cycles relied on baseline data established in 2011, with minor updates during each RTP cycle. Below is a summary of revised population, housing, and job estimates for the 2022 RTP/SCS.

Population: SRTA reviewed population data provided by the US Census Bureau for the 2020 Decennial Census and California DOF data on estimated and projected population for local

² California Department of Finance. State Population Estimates. May 7, 2021, Release.

<https://www.dof.ca.gov/Forecasting/Demographics/Estimates/>

agencies in the Shasta Region. SRTA found 2020 US Decennial Census population numbers to be four percent lower than estimated in the 2018 RTP/SCS, while 2040 population projections in the 2018 RTP/SCS were twenty-one percent higher than those estimated by California DOF projections. The 2022 RTP/SCS population numbers start with a revised estimate for 2020, based on the 2020 Decennial Census. Future growth projections use the yearly growth rate from the California DOF P-1 Tables published in September 2020. The revised population estimates are shown in Table 4.

Table 4: Population Estimates and Forecasts for the 2022 RTP/SCS

Year	2015/2018 RTP Forecasts	CA DOF Forecast ⁴	Recommended Regionwide Forecast ⁵	City of Anderson ⁵	City of Redding ⁵	City of Shasta Lake ⁵	Shasta County (uninc.) ⁵
2010 ¹	177,223	177,367	177,223	9,932	89,861	10,164	67,266
2015 ²	183,173	178,496	179,113	10,447	91,052	10,270	67,344
2020 ³	190,192	177,692	182,155	11,323	93,611	10,371	66,850
2025	197,747	178,006	182,437	11,343	93,776	10,389	66,929
2030	205,990	180,498	184,991	11,502	95,089	10,535	67,865
2035	214,364	182,530	187,073	11,631	96,160	10,653	68,629
2040	222,738	183,482	188,049	11,692	96,661	10,709	68,987
2045		183,672	188,244	11,704	96,761	10,720	69,059
¹ Source: 2010 data based on 2010 Decennial Census							
² Source: CA Dept. of Finance, Report E-4, Population Estimates for Cities, Counties, and the State, 2011-2021, with 2010 Benchmark							
³ Source: 2020 data based on 2020 US Decennial Census							
⁴ Source: State of California, Department of Finance, P-1. Total Estimated and Projected Population for California and Counties, July 1, 2010 to 2060 in 1-year increments, September 2020. *Note - Data does not account for 2010 or 2020 Decennial Census Population Counts.							
⁵ Started with CA Dept. of Finance Report P-2A: Total Population Projections Data, 2010-2060 California and Counties (2019 Baseline). Identified annual growth change in table based on projections. Made new projections based on the 2020 US Census Data Population Total for Shasta County.							

Housing: Per the California DOF, the Shasta Region has an average of 2.48 persons per household.³ That metric is consistent with prior RTP assumptions and is applied for all years in the 2022 RTP/SCS. Household data was updated for 2020 based on the 2020 US Decennial Census and then the 2.48 persons per household average was applied for future years based on the projected population. Based on this revised population estimates described above, Table 5 shows the new estimated households by year.

Table 5: Occupied Household Estimates and Forecasts for the 2022 RTP/SCS

³ California Department of Finance, Demographic Research Unit. Table P-4: Projected Households, Household Population, Group Quarters and Persons per Household for the Counties and State of California. Published 6/12/2020.

Year	2015/2018 RTP Forecasts ¹	CA DOF Forecast ²	Recommended Regionwide Forecast	City of Anderson	City of Redding	City of Shasta Lake	Shasta County (uninc.)
2010 ¹	70,346	70,346	70,346	3,944	36,130	3,943	26,329
2015 ¹	73,956	70,993	73,956	4,495	38,669	4,339	26,453
2020 ³	78,054	70,895	72,836	4,502	37,761	4,091	26,482
2025 ⁴	82,054	71,183	73,563	4,574	37,813	4,189	26,988
2030 ⁴	85,859	71,412	74,593	4,638	38,342	4,248	27,365
2035 ⁴	89,274		75,433	4,690	38,774	4,296	27,673
2040 ⁴	92,689		75,826	4,715	38,976	4,318	27,817
2045 ⁴			75,905	4,719	39,017	4,323	27,846
¹ Source: 2015 RTP RHNA Consistency Memo: https://www.srta.ca.gov/DocumentCenter/View/1047/2015-RTP-RHNA-Consistency-Memo-PDF							
² Source: CA Dept. of Finance, Report P-4, Projected Households, Household Population, Group Quarters and Persons per Household for the Counties and State of California 2020-2030. (2019 Baseline) https://www.dof.ca.gov/Forecasting/Demographics/Projections/							
³ Calculated Based on US 2020 Census Population data and regional average of 2.48 persons per household							
⁴ Calculated based on projected population and regional average of 2.48 persons per household							

Jobs/Employment: For current employment data, SRТА reviewed employment data and projections from the California Employment Development Department (CA EDD) and the Caltrans County-Level Economic Forecast. SRТА found the CA EDD average annual employment data for 2020 (66,500 jobs) to be eight percent less than those forecasted in the 2018 RTP/SCS (72,361 jobs). The Caltrans County-Level Economic Forecast job estimates was nine percent less for 2020 (65,700 jobs), compared to the 2018 RTP/SCS.

The above findings are consistent with prior RTP/SCS efforts looking at jobs/employment data. Specifically, that the CA EDD data reports are focused on full-time equivalent employees and excludes some job types such as part-time and self-employed at home⁴. Due to this difference, prior recommendations for SRТА suggested that jobs/employment data should be adjusted up by roughly 8% in order to try to capture all available jobs types in the region. Because existing jobs/employment data has roughly this same difference to previously prepare jobs/employment forecasts, SRТА has determined that sticking with the existing jobs/employment forecast are still valid. Table 6 below shows the continued jobs “recommended forecast” assumptions by jurisdiction.

Table 6: Employment Estimates and Forecasts for the 2022 RTP/SCS

Year	Recommended Countywide Forecast	Anderson	Redding	Shasta Lake	Shasta County (uninc.)
2000					
2005	69,629	3,373	48,449	2,324	15,483
2010	63,054	2,699	43,635	2,067	14,653
2015	68,387	2,982	46,950	2,234	16,220
2020	72,361	3,263	48,250	2,427	18,420
2025	76,752	3,407	51,366	2,558	19,421
2030	80,517	3,780	53,288	2,623	20,826
2035	83,968	3,942	55,572	2,735	21,718
2040	87,418	4,104	57,856	2,847	22,611

⁴ See November 2011 Memorandum, Shasta County Forecast Assumptions, Dowling Associates, <https://www.srta.ca.gov/DocumentCenter/View/1049/November-2011-Model-Forecast-Update-PDF>

Land Use Development: SRTA developed a regional forecast for the prior 2015 RTP/SCS in 2011; which was applied to the 2018 RTP/SCS with slight changes. For the 2022 RTP/SCS the same regional forecast will be used, with the following exceptions:

- Model regional growth out to year 2042 (20-year planning horizon);
- Updated land use development information through 2020 was provided by local agencies; and
- Updated known land use development project forecasts through 2042 are based on local agency input.

For regional planning purposes, SRTA will continue the “recession adjustment” factors that were applied in the 2015 and 2018 RTP/SCS. As indicated in the 2015 and 2018 RTP/SCS technical methodologies, SRTA assumes that the region returns to ‘normal’ development activity and land use vacancy rates by year 2030. This ensures forecasts will maintain consistent with the region’s 2018-2028 Regional Housing Need Allocation (RHNA) as prepared by the California Department of Housing and Community Development (HCD). As indicated in the section above, adjustments to regional population forecasts were made based on 2020 US Census and DOF forecast information. Ongoing impacts of climate change, extreme weather, and even the COVID-19 pandemic are being monitored and further updates will be made in the next 2026 RTP/SCS.

City/County Plans

CARB has asked for an update regarding city and county plans and any known updates that have taken place since the 2018 RTP/SCS. Below is the status of various plans in the region. Updated plans will be factored into SRTA’s plans and programs when they are adopted.

Housing Elements:

On December 21, 2018, HCD issued a final letter determining the estimated number of housing units needed to be built in Shasta County between December 31, 2018, to April 15, 2028, to accommodate future housing needs. Each city and county are required to update their General Plan housing elements to accommodate their fair share of the need. Below is the status of that update for each jurisdiction in the Shasta Region.

- Shasta County adopted the 2020-2028 Housing Element on July 28, 2020.
<https://www.co.shasta.ca.us/index/drm/planning/general-plan/2020-2028-housing-element>
- The city of Anderson adopted the 2019-2028 Housing Element on July 21, 2020.
https://www.ci.anderson.ca.us/departments/development_services_and_building_departments/index.php
- The city of Redding adopted the 2020-2028 Housing Element on June 2, 2020.
<https://www.cityofredding.org/departments/development-services/planning/general-plan-and-development-guidelines>
- The city of Shasta Lake adopted the 2020-2028 Housing Element on August 3, 2020.
<https://planshastalake.com/housing-element/>

General Plan Updates:

Periodically cities and counties update their General Plans which provide general guidance regarding the future land use development of the city or county. Here is the status of each jurisdictions General Plan:

- Shasta County last adopted their General Plan in 2004, with periodic updates to various sections since then.
<https://www.co.shasta.ca.us/index/drm/planning/general-plan>
- The city of Anderson last adopted their General Plan on May 1, 2007.
https://www.ci.anderson.ca.us/city_administration/general_plan.php
- The city of Redding last adopted their General Plan on October 3, 2000.
<https://www.cityofredding.org/departments/development-services/planning/general-plan-and-development-guidelines>
- The city of Shasta Lake's General Plan was last adopted in 1999. The City has been in the process of updating their General Plan Land Use, Circulation, Conservation, Open Space, and Health & Safety elements.
<https://planshastalake.com/> A public hearing on adopting an updated General Plan is anticipated for November 1, 2022. The updated General Plan will be considered as part of the 2026 RTP/SCS.

Specific Plans:

- The city of Redding completed an update to their Downtown Redding Specific Plan in April 2018:
<https://www.cityofredding.org/home/showpublisheddocument/5529/636580040332570000>.
- The city of Redding completed a Bechelli/Bonnyview Specific Plan in March 2021. This plan established guidelines for a 222,000 square foot regional retail development on twenty-five acres of land in the southcentral region of the city.
<https://www.cityofredding.org/home/showpublisheddocument/26289/637673027601100000>

Other Projects:

- The city of Shasta Lake has plans for a 30-unit low-income apartment complex for veterans.
<https://www.cityofshastalake.org/1126/Veterans-Village-Housing-Project>
- The city of Shasta Lake has plans for development of an 11-acre parcel that would include a 120-room hotel, retail/commercial space, and other amenities.
<https://www.cityofshastalake.org/1125/RREDCO-Commercial-Center-Project>
- The city of Shasta Lake Downtown Revitalization Project was awarded over \$16.5 million in funding from the Strategic Growth Council in January 2022. This project, estimated at \$36.5 million in total funding, provide 49 units of affordable housing, 7,500 square feet of commercial space, and bike, pedestrian, and transit improvements in the city of Shasta Lake's downtown strategic growth area.
<https://www.cityofshastalake.org/1123/Downtown-Revitalization-Project>

SCS Strategies

Generally, VMT/GHG emission reduction strategies in the 2018 RTP/SCS will be carried over to the 2022 RTP/SCS with minor updates, and several new strategies will be added. The following strategies are anticipated; however, some strategies and methodologies are being finalized, while final strategies will be included in the draft 2022 RTP/SCS. For each factor below, we indicate whether these factors are included in the ShastaSIM regional activity-based travel model or are considered “off-model” with the following notation:

- ShastaSIM Activity-based Model (ABM)
- Off-model (Off-model)

Factor #1 (Carryover with updates): Population and employment growth in SGAs

Increased VMT and GHG emission reduction target values may require higher assumptions related to housing and jobs growth in SGAs compared to other areas of the region. This would allow for the potential benefits of other strategies (e.g., increased transit, more infill housing development, etc.) to be realized. Table 7 shows the adjustment assumptions for future housing and jobs growth in SGAs. Housing and job growth will rely on local and state investments (e.g., grants). State grants will be very important in bringing affordable housing options into the SGAs.

Table 7: Percent of Growth for each Jurisdiction Occur within the SGAs

SGAs	% of Housing in SGA	% of Jobs in SGA
City of Anderson	10%	10%
City of Redding	6%	6%
City of Shasta Lake	10%	10%
Shasta County (unincorporated)	10%	10%

The above actions would result in increased population growth in Strategic Growth Areas. This would lead to increased residential densities and walking, biking, and public transit use.

SRTA, in collaboration with local agencies, has chosen seven specific locations as Strategic Growth Areas (SGAs). These areas consist of one in each of the incorporated cities and four in unincorporated communities (Burney, Fall River Mills/MacArthur, Cottonwood, and Palo Cedro). The main objective of these SGAs is to increase population and employment density, encourage diverse land use, promote infill and redevelopment projects through incentives and other tools, and prioritize the development of public transportation, biking, and walking infrastructure to provide more transportation options and ultimately reduce Vehicle Miles Traveled (VMT).

SRTA's assumptions regarding these SGAs include expecting 6 to 10 percent of residential development within each jurisdiction to occur within the SGAs and anticipating a similar rate of employment growth within these areas. These assumptions consider the impact of existing and upcoming projects.

Utilizing data from the 2020 ACS census alongside parcel counts within Redding's SGA, it is estimated that the population within this area was 5,506 in 2020, constituting approximately 6%

of Redding's overall population. There are currently mixed-use housing projects completed or underway within the SGA. For example, Market Center offered 82 residential units in late 2020 and California Place Apartments offered 78 units in 2022. This expanded housing availability inside and near the SGA could lead to increased employment opportunities within the SGA and encourage more people to choose to live in Redding's SGA. Hence, given Redding's existing 6% population within its SGA, achieving a targeted 6% growth in housing units and jobs located in Redding's SGA through the proposed mixed-use housing projects is indeed feasible.

For the city of Shasta Lake, using data from the 2020 ACS census and parcel counts within SGA, it is estimated that the population in the SGA was 924, making up roughly 9% of the city's total population. The upcoming Cascade Village project, a mixed-use development, will soon begin and aims to deliver 49 housing units. Therefore, given Shasta Lake's existing 9% population within its SGA, achieving a targeted 10% growth in housing units and jobs located in Shasta Lake's SGA through the proposed mixed-use development projects is feasible. For Anderson, using data from the 2020 ACS census and parcel counts within SGA, it is estimated that the population in the SGA was 957, making up roughly 8.5% of the city's total population. Because Shasta Lake's SGA and Anderson's SGA have a small population, even small changes can make a significant impact. Given the current population ratios in these areas, aiming for a 10% increase in housing units and jobs located in these SGAs is realistic.

SRTA is currently providing incentives to encourage developers and local agencies to initiate infill and redevelopment projects within SGAs. These areas are designated to increase both employment and residential densities while implementing strategies to reduce VMT. Furthermore, the region is actively working to enhance transportation options by reducing the number of lanes and adding new bicycle lanes through the re-striping of several downtown Redding streets, demonstrating a commitment to creating more complete streets that cater to various modes of transportation.

Factor #2 (Carryover with updates): Auto Operating Costs (ABM)

Auto operating costs (AOC) are one of the greatest influences in travel behavior in the region. AOC includes fuel, maintenance, and tire wear. Other factors such as automobile price, financing costs, insurance and depreciation are currently not factors into regional AOC. Due to the lack of available data, region-specific AOC for Shasta County was not developed into ShastaSIM for the 2015 RTP. Instead SRTA utilized AOC rates similar to those used by the Sacramento Area Council of Governments (SACOG). Details regarding AOC rates can be found in their SACSIM11 Model Reference Report in Appendix C-4 of their Final Environmental Impact Report for the MTP/SCS for 2035.

CARB developed a draft AOC tool that agencies could use as part of their RTP/SCS. SRTA used this tool for the 2022 RTP/SCS. The estimated AOC when using the CARB tool is \$18.92 for the year 2035 and \$18.46 for the year 2040).

Factor #3 (Carryover with updates): Increased Public Transportation Frequency (ABM) and Transit Improvements (Off-model)

Benefits and co-benefits of various strategies to reduce VMT/GHG emissions cannot be realized without increases in public transportation use. This is especially true in our region where most

transit riders take the bus out of necessity, rather than by choice. Strategies may include: 1) increasing hours of service to later in the day; 2) adding Sunday service (currently in service under an on-demand delivery paradigm rather than traditional fixed route); or 3) adding more on-demand bus services to increase mobility options for the region. These are near-term strategies that may turn into long-term transit improvements to the region. Possible scenarios for increased transit frequency will be updated within the model.

Currently, transit bus stops in the Shasta Region do not have adequate shelters, seating, wayfinding signage, and walking and cycling related amenities. Improving bus stops by providing shelters, seating, signage, and sidewalks is associated with changes in ridership in the areas immediately surrounding improved bus stops^{5 6 7}. At present, most bus stops in the Shasta region lack even the most fundamental amenities. RABA has initiated efforts to enhance these stations, such as the inclusion of route maps. As a result, SRTA anticipates a minimum increase of one unit in the bus stop index for all bus stops by 2035 and a two-unit increase by 2040. Furthermore, enhancing the facilities at bus stops is a key mid-term strategy outlined in the [SRTA 2040 Long-Range Transit Plan](#), which was approved by the Board of Directors in April 2021. ShastaSIM Activity-based Model is not sensitive to improving bus stops, and an off-model calculation based on the existing studies and on methods identified in CARB's *Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendix E* (CARB 2019) can be used for quantification.

The RTP assumes that most mode shift/VMT reductions come from increased transit frequency towards the end of the planning period. Additional benefits to GHG emission reductions will be realized from zero-emission public transit over the life of the 20-year plan. These strategies will rely on state funding support, especially during early implementation years to help provide a service long enough to establish community use.

Factor #4 (Carryover with updates): Accelerated delivery of active transportation investments (Off-model)

The GoShasta Active Transportation Plan was adopted in February 2018 and updated in August 2019. The 2022 RTP/SCS will include key GoShasta ATP projects that are planned for implementation. This includes projects that implement GoShasta's regional focus on high-quality trunk lines that connect to/from SGAs. Continued use of regional funds, including SRTA's 2% TDA Non-Motorized Program and a portion of the region's STIP funds, will be programmed for projects that implement GoShasta and the adopted RTP/SCS. An off-model strategy quantification memo and associated spreadsheet tool will be created based on methods identified in CARB's *Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendix E* (CARB 2019). Because most studies focus on large, urban areas, it's anticipated that

⁵Brown, S. Cable, F. Chalmers, K. Clark, C. Jones, L. Kueber, G. Landfried, E. Liles, C. Lindquist, N. Pan, X. (2006). Understanding How the Built Environment around TTA Stops Affects Ridership: A Study for Triangle. Transit Authority.

⁶Kim, J Y. Bartholomew, K. Ewing, R. (2020). Another one rides the bus? The connections between bus stop amenities, bus ridership, and ADA paratransit demand. *Transportation Research Part A* 135:280–288.

⁷Shi, X. Moudon, A V. Hurvitz, P M. Mooney, S J. Zhou, C. Saelens, B E. (2021) Does improving stop amenities help increase Bus Rapid Transit ridership? Findings based on a quasi-experiment. *Transportation Research Interdisciplinary Perspectives* 10:10332.

low or mid-range elasticities may be appropriate for SRTA. Most active transportation projects will rely on a combination of local and state funding in order to be implemented.

It's important to highlight that the enhancements in active transportation, such as extra bike lanes and sidewalks, are largely absent from the travel model. Even if these improvements were integrated into the model, it lacks the sensitivity to accurately project the associated alterations. This limitation arises because ShastaSIM is a regional travel model and is not intended to account for highly localized changes.

Factor #5 (New): Plug-in electric vehicles charging infrastructure (Off-model)

Compared to other regions across California, Shasta County has a relatively small percentage of hybrid and plug-in all electric vehicles (PEV). This primarily stems from the issue of range anxiety and lack of available infrastructure for quick charging. SRTA will evaluate statewide assumptions for future PEV ownership due to state actions and determine whether regional/local efforts can more rapidly encourage PEV ownership. SRTA will look at methodologies described in the Upstate Region PEV Readiness Plan (<http://www.siskiyoucounty.org/pev/>) and CARB's *Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendix E* (CARB 2019) to develop a spreadsheet tool to forecast anticipated PEV adoption over the RTP period and the potential benefits of adding more PEV infrastructure. This would be compared to statewide adoption rates and forecasts already shown in EMFAC.

Factor #6 (New): Car Share (Off-model)

In the Shasta region, the number of required vehicles will significantly decrease if individuals share vehicles. In addition, individuals in this region use their cars only for a small portion of each day, as little as a few hours. This typical demand pattern can justify car sharing as one of the strategies that can reduce car ownership and VMT. SRTA estimates the car share membership population of TAZs identified as having sufficient residential densities to support car sharing and the CO₂ emissions from car sharing members' discarded or shed vehicles VMT, CO₂ emission rates for shed private automobiles, and VMT from car share members driving car share vehicles. An off-model strategy quantification memo and associated spreadsheet tool will be created to evaluate the potential impacts of increased car share activities. Methods will be identified and based on CARB's *Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendix E* (CARB 2019).

Factor #7 (New): Bike and Scooter Share (Off-model)

Implementing bike share programs allows people to ride a bike or a scooter to their destinations for a small fee. This strategy can reduce GHG emissions by providing access to bicycles and scooters, and this accessibility can be used to encourage active transport modes and reduce auto trips. This strategy also can encourage public transportation usage by improving first and last-mile travel options. SRTA estimates reducing VMT by providing access to bicycles and replacing auto trips with bike and scooter trips. This estimation can be used to calculate the potential reduction in GHG emissions. The area and number of stations for the planned service areas in Redding, Shasta Lake, Anderson, and other Shasta County communities are used for this estimation. An off-model strategy quantification memo and associated spreadsheet tool will be created to evaluate the potential impacts of increased bike share activities. Methods will be

identified and based on CARB's *Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendix E* (CARB 2019).

Other Recent Trends

Transit

Since adoption of the 2018 RTP new transit services have been attempted in the region to further the SCS and increase ridership:

- Redding Area Bus Authority (RABA) initiated a new Crosstown Express service in September 2016 that provides more frequent service between the Downtown Transit Center, Redding Civic Auditorium and Canby Road Transfer Center. This service has continued and is the only route in the region with a 30-minute (or less) headway.
- RABA has partnered with Shasta Community College to allow students to ride RABA for free. Students swipe their college-issue ID card to ride the buses.
- SRTA partnered with Dignity Health Connected Living (DHCL) to improve transit services:
 1. Initiated a new on-demand ridesharing public transit service that serves the cities of Anderson, Redding, and Shasta Lake on Sundays. This service started in October 2019 and has provided over 8,000 passenger trips since its launch.
 2. Expanded the eligibility of riders on the rural Monday-Friday service provided by DHCL to include anyone 18 years of age and older.
 3. SRTA and DHCL have initiated an on-demand service to provide improved public transit services in eastern Shasta County to the communities of Burney, Cassel, Fall River, and McArthur. This new service will allow residents to commute in and between those communities Monday-Friday. Trips can be booked by phone, mobile app, or email.
- SRTA, DHCL, and RABA are working on plans to implement the California Innovative Clean Transit rule. Since the services provided in the region are consider “small transit”, 25% of all new bus purchases must be zero-emission starting in 2026, and 100% of all new bus purchases must be zero-emission starting in 2029.

California has seen a decline in public transit ridership overall for several years. Despite efforts to increase transit ridership, total RABA ridership has decreased approximately 23.3 percent since adoption of the 2018 RTP/SCS, with an average decline of 9.3 percent annually. Part of that period was also severely impacted by the COVID-19 pandemic. It's possible that the impact of the COVID-19 pandemic may delay any hoped-for changes in increased ridership during the next four years. RABA is preparing an update to their Short Range Transit Plan, which may explore some new strategies for encouraging more ridership.

Household Travel Survey Data

The 2010-2012 California Household Travel Survey was completed in January 2013. While a very low number of surveys were completed for the region, SRTA utilized available data to review travel trends for the 2015 RTP/SCS. This helped to refine travel behavior assumptions in the travel demand model (ShastaSIM) for the 2015 RTP/SCS. This same information carries over into the 2022 RTP/SCS.

The 2016 National Household Travel Survey was completed in April 2017. This data will be utilized to review and update regional travel trends for the 2026 RTP/SCS.

Technical Tools, Models and Data

Land Use Tool

SRTA does not currently utilize a separate land use model such as Cube Land, UPlan, UrbanSim, or other similar products. Instead, SRTA utilizes a macro-enabled Microsoft Excel spreadsheet that allocates land uses, housing and jobs to parcels. More details on this tool are in Appendix A.

SRTA and four other small MPO's (AMBAG, BCAG, SLOCOG, TRPA) were awarded a Caltrans technical planning grant to create an Integrated Land Use Model and Development Monitoring Framework Tool. This tool will help create an easy-to-use land use model for each MPO region that is based on a common framework. That effort started in 2022 and is anticipated for completion in 2024. Once the tool is complete SRTA anticipates using the land use model as part of the 2026 RTP/SCS update.

ShastaSIM

SRTA's activity-based travel demand model, called ShastaSIM (version 1.2), is the region's primary modeling for evaluating projects and performance of the RTP/SCS. A summary of the ShastaSIM model is provided in Appendix A, while more details are available in the following model development report: <http://www.srta.ca.gov/174/Travel-Demand-Modeling>.

SRTA will update the model's land use data, transportation network data and transit network data to be consistent with any changes since the 2018 RTP. As indicated earlier, to the extent feasible, SRTA will also update auto operating costs. Additionally, a 2042 model forecast year will be added. For the 2022 RTP/SCS the following model years will be used for forecasting and evaluating results:

Table 8 – 2022 RTP/SCS Analysis Years

Year	Purpose
2005	Base year for SB 375 analysis
2020	SB 375 GHG reduction target year/ base year for 2022 RTP/SCS
2035	SB 375 GHG reduction target year
2042	2022 RTP/SCS horizon year

EMFAC

Per guidance by CARB, SRTA will utilize the 2014 version of CARB's EMFAC emissions model to quantify criteria pollutants, calculate GHG emissions and conduct SB 375 analysis of the 2022 RTP/SCS. The 2014 EMFAC model is approved by the US Environmental Protection Agency (EPA) for use in California. CARB guidance states that SRTA should use the same EMFAC model between the third and second RTP/SCS's since implementation of SB 375 to ensure proper comparison

between plans. ShastaSIM will provide model outputs files that can be converted into input files for the EMFAC model, including VMT by speed bin and time of day.

For the 2018 RTP/SCS, the EMFAC 2014 model was used to calculate GHG emissions. Because there are differences in EMFAC models, CARB developed methodologies for MPOs to follow to adjust the calculations in the percent reduction in per capita CO₂ emissions to ensure consistency in meeting targets. SRTA will follow the methods described in the CARB memo *Methodology to Calculate CO₂ Adjustment to EMFAC Output for SB 375 Target Demonstrations* to quantify and compare emissions between the 2022 and 2018 RTP/SCS. Emissions projections for the years 2035 and 2040, which are based on the 2014 version of CARB's EMFAC model, have been adjusted by CARB to account for a -2.71% difference when compared directly to the baseline data produced by the previous 2011 version of EMFAC. This adjustment ensures a fair and consistent comparison between the two versions.

Off-Model Tools

There are policy scenarios that cannot be measured within travel models. SRTA may however consider these policies within the RTP/SCS to meet the region's GHG emission reduction targets. In these situations, SRTA may develop or rely on existing off-model tools or techniques to quantify the benefits of these policies. These tools will be based on accepted best practices or academic literature, collaboration with other MPOs, and be compared to CARB's policies and practices guidelines. Any off-model tools or techniques used will be documented, with supporting data and analysis in the final 2022 RTP/SCS. Consistent with CARB guidance, EMFAC2014 will be used to assess all off-model greenhouse gas (GHG) reduction strategies, without applying any adjustment factors.

Modeling Interregional Trips

SRTA will model interregional trips in the same way they were conducted for the 2015 and 2018 RTP/SCS. Interregional trips are described as follows:

- Internal-External (I-X) trips are trips that originate within Shasta County and have a destination outside of the region.
- External-Internal (X-I) trips are trips that originate outside Shasta County and have a destination within the region.
- External-External (X-X) or "through" trips are trips that travel through the region, but never stop.

The following methodology is applied regarding interregional trips for purposes of GHG emissions estimation for the 2022 RTP/SCS:

- I-X trips – are modeled from their origin up to the Shasta County boundary.
- X-I trips – are modeled from the Shasta County boundary to their destination.
- X-X trips – are excluded from the SCS for GHG calculations.

VMT associated with interregional trips are planned to be calculated for years 2035, 2040, and 2042. While the exclusion of interregional trips as described above will be used for calculating the region's effort to meet the SB 375 GHG emission reduction target, all VMT will be calculated to estimate the overall impact VMT has on the region's transportation system.

SB 743

Senate Bill (SB) 743 changed the way that transportation impacts are evaluated under the California Environmental Quality Act (CEQA). SB 375 shifted the review and determination of a project's transportation impacts away from Level of Service (LOS) to vehicle miles traveled (VMT). To assist local and regional partners on evaluating projects, SRTA will be providing a post-processing tool that will provide VMT-per-capita and VMT-per-employee information at both a regional level and jurisdictional level (i.e., city or unincorporated county). Because the land uses within the ShastaSIM regional model are very high-level and do not go into detail that local city and county General Plans and Zoning Codes do, the tool is provided as a guide for local agency use in evaluating projects. Lead or local agencies will be responsible for determining the appropriate thresholds of significance for each project under the transportation impacts section of CEQA.

Induced travel

Induced travel refers to the additional vehicle travel generated due to the provision of new road capacity. The induced travel effect can be separated into two categories: short-term effect and long-term effect. In the context of adding capacity to the road system, both types of induced travel can occur.

Short-term induced travel effects include immediate changes in individual and household travel patterns due to the availability of additional road capacity. This is primarily due to expanded capacity reducing travel times and improving travel time reliability. Short-term induced travel can take on different forms including: driving greater distances (i.e., selecting more distant destinations); switching routes or departure times; deciding to travel more frequently and include additional stops on a single trips; or choosing to drive rather than use an alternative mode of transportation (e.g., walking, biking, or using public transit). Traditional 4-step travel models and activity-based travel models such as ShastaSIM adequately capture these changes in travel behavior resulting from roadway capacity expansion. ShastaSIM 2.0 model is designed to simulate short-term induced travel behaviors by making changes in various factors such as route assignment, travel frequency, transportation mode, and destination choice. For a better understanding of how the model represents each behavior, Table 9 has been created to match specific behaviors with their corresponding components in the model.

Long-term induced travel effects include longer-term individual discrete choice of household location, employment location, or migration as well as affecting future development patterns. ShastaSIM includes accessibility variables that quantify land-use activities accessible within various impedance values, and those variables affect the number of trips as well as other choices in the model. However, the model is not directly sensitive to land use allocation changes due to roadway capacity-increasing projects. Table 10 outlines the computation of induced travel for the roadway expansion initiatives within SRTA's 2022 RTP/SCS, employing a hybrid methodology. The process involves several steps: firstly, determining the combined short- and long-term induced travel for the roadway expansions based on assumed elasticities of 1.0 for Class 1

expansions and 0.75 for Class 2 and 3 expansions. Next, accounting for the short-term induced travel already considered in ShastaSIM 2.0 using an elasticity of 0.27 from SRTA's model sensitivity runs. Finally, by subtracting the short-term induced travel from the total, the long-term induced travel is derived, offering a comprehensive understanding of the expansion projects' implications on travel patterns and behavior over time.

Table 9: The ShastaSIM 2.0 model corresponding components for induced travel behaviors

Behaviors	Corresponding components
A different long-term destination (e.g., work or school)	Long-term location choice
A different destination (e.g., for shopping)	Activity location choice
A different mode	Mode choice
A different route	Assignment
A different frequency	Daily Activity Pattern

Table 10: Hybrid approach to calculate induced travel

Factor	Class 1	Class 2 & 3	Total	Data Source
Short-term induced travel elasticity	0.27	0.27		Travel model
Total induced travel elasticity	1.0	0.75		The literature
Adjusted elasticity	0.73	0.48		
Lane miles in model base year	289.6	397.5	687.1	NCST Calculator
Daily VMT in model base year	2,035,616	1,008,219	3,043,836	NCST Calculator
Total Daily VMT in 2035 (with short-term induced travel only)			4,020,036	Travel model
Lane mile increase in 2035 (Interstate/Highway/Major Arterial)	2.7	19.0	21.7	Travel model
Percent increase in lane miles	0.9%	4.8%		
Long-term Induced Daily VMT	13,854	23,132	36,986	
Total Daily VMT in 2035 (with both short- <u>and</u> long-term induced travel)			4,057,022	
% change in VMT in 2035			0.92%	
SRTA human population in 2035			187,559	Travel model
Daily VMT per capita in 2035 <u>without</u> long-term induced travel			21.43	
VMT per capita in 2035 <u>with</u> both short- <u>and</u> long-term induced travel			21.63	

Appendix A: ShastaSIM Model Summary

SRTA's travel model is the Shasta Activity-Based Travel Simulation model, or ShastaSIM. SRTA hired DKS Associates to develop the model, along with sub-consultants John Bowman, Mark Bradley, and Resource Systems Group Inc. (RSG). Initial development of the model started in 2011 and was completed June 2014 (v1.0). Subsequent updates to the model were adopted in June 2015 (v1.1) and October 2018 (v1.2), corresponding with the adoption of the 2015 and 2018 Regional Transportation Plan and Sustainable Communities Strategy.

ShastaSIM is an advanced forecasting tool that simulates an individual's travel patterns as a series of "trip-legs," connecting activities during a typical 24-hour day. Travel behavior is simulated at the parcel level and can be aggregated up to a Traffic Analysis Zone (TAZ) or Census Block Group level. Households and jobs are allocated at the parcel level, allowing greater sensitivity to smaller-scale land use or policy changes. ShastaSIM comprises of the following primary components:

- A parcel-based macro-enabled Microsoft Excel spreadsheet that allocates land uses, housing, and jobs to parcels, for each model year. Allocations are based on general plan land use data, local city/county anticipated projects and US Census Block Group occupancy rates. The spreadsheet includes functions to estimate land use shifts of housing and jobs to Strategic Growth Areas (SGAs) as part of the region's Sustainable Community Strategy.
- A population synthesizer, built within DaySim, which creates a synthetic population with similar characteristics of the region and allocates persons to households.
- DaySim, which is a person-day activity and travel simulator. DaySim simulates the travel behavior of every synthetic "person" with the region over the course of a typical 24-hour period. Outputs are created for every "person" and can be associated with households in the region (**Updated for 2022 RTP**).
- Citilabs Cube Base/Voyager software, which is used to run the model via the Scenario Manager interface and generate outputs. Output files can be developed into an ArcGIS map via Cube's GIS window or as tables, charts or maps that can be formatted in CUBE, ArcGIS or Microsoft Excel.

A) Cube Base/Voyager

Except for the macro-enabled Excel land use spreadsheet tool, all other components of ShastaSIM are run using Citilabs'® Cube Base/Voyager software (<http://www.citilabs.com/>). The model is opened using catalog files and run within the Scenario Manager. The model can be run completely or individual components called "applications" can be opened and independently run.

B) Macro-enable Land Use Tool

SRTA does not use a separate land use model (e.g., CubeLand, UPlan, Community Viz, etc.) to estimate future land use growth for the region. Instead, SRTA utilizes a macro-enabled Microsoft Excel spreadsheet that allocates land uses, housing and jobs to parcels. The spreadsheet includes functions to estimate land use shifts of housing and jobs to Strategic Growth Areas (SGAs). The final output is a comma delimited text file, called Parcel_Update_AllocHH.csv, that is used by ShastaSIM to estimate travel. Figure 1 summarizes the attributes of the Parcel_Update_AllocHH.csv file.

Figure 1: ShastaSIM Parcel Data Input (Parcel_Update_AllocHH.csv) File Format

FIELD	DESCRIPTION
Parcelid	parcel ID number
xcoord_p	X coordinate – state plane feet
ycoord_p	Y coordinate – state plane feet
sqft_p	Area – square feet
taz_p	TAZ number
block_p	census block
SFDU	single family dwelling units on parcel
MF2_4DU	multi-family (2-4 units) dwelling units on parcel
MF5+DU	multi-family (5+ units) dwelling units on parcel
MH DU	mobile home dwelling units on parcel
TOT_DU	total dwelling units on parcel
SFHH	single family occupied households on parcel
MF2_4HH	multi-family (2-4 units) occupied households on parcel
MF5+HH	multi-family (5+ units) occupied households on parcel
MHHH	mobile home occupied households on parcel
TOT_HH	total occupied households on parcel
stugrd_p	grade school enrollment on parcel
stuhgh_p	high school enrollment on parcel
stuuni_p	university enrollment on parcel
empedu_p	educational employment on parcel
empfoo_p	food employment on parcel
empgov_p	government employment on parcel
empind_p	industrial employment on parcel
empmed_p	medical employment on parcel
empofc_p	office employment on parcel
empret_p	retail employment on parcel
empsvc_p	service employment on parcel
empoth_p	other employment on parcel
emptot_p	total employment on parcel
parkdy_p	off-street daily parking on parcel
parkhr_p	off-street hourly parking on parcel
ppricdyp	off-street daily parking price
pprichrp	off-street hourly parking price
track	census tract
group	census block group

C) Population Synthesizer

DaySIM has a built-in population synthesizer that creates a regional population with attributes similar to the socio-demographic information available from the UC Census and American Community Survey demographic data. These attributes include: gender, age, school grade, building ownership, etc. Figure 2 below shows the population file attributes.

Figure 2: ShastaSIM Population File Format

FIELD	DESCRIPTION
serialno	Household id
pnum	Person # within household
hhtaz	Household TAZ
hhcel	Household parcelid
persons	Total persons in household
tenure	Own (1), rent(2)
bldgsz	Residence building size/type
p65	# of persons age 65+ in household
p18	# of persons age under 18 in household
npf	# of persons part of family in household
noc	# of children in household
hinc	Household income
vehicl	# of vehicles in household
relate	Relationship to householder
sex	Gender: male (1), female (2)
age	Age
grade	Current education school type
hours	Hours worked per week
worker	Worker: yes (1), no(0)
student	Enrolled student: yes (1), no(0)
nworkers	# of employed workers in household
nstudent	# of enrolled students in household
exfac	Expansion factor (assigned later)

D) DaySIM

DaySIM is the regional activity-based, tour simulator for the regional travel of the region's residents. DaySim simulates the travel behavior of every synthetic "person" with the region over the course of a typical 24-hour period. It is structured as a series of hierarchical or nested choice models, for long-term and short-term activity choices. These set of choices simulate that decision-making process people make every day for trips, such as mode of travel, destination of trip purpose and time of day for travel. Figure 3 illustrates the various DaySim components.

Detailed explanations of each DaySim component are found in Chapter 6 of the ShastaSIM Model Development Report available on SRTA's website at: <https://www.srta.ca.gov/174/Travel-Demand-Modeling>

Figure 3: DaySim Hierarchy and Flow Chart

