Appendix C

Greenhouse Gas Reduction Measures Analysis

Memo

455 Capitol Mall, Suite 300
Sacramento, CA 95814
916.444.7301

Date: August 2023

To: Lani Lee Ho, Santa Clara Valley Transportation Authority

From: Erik de Kok, John Steponick, and Honey Walters

Subject: VTA CAAP – Revised Final Greenhouse Gas Reduction Memorandum

---

1 INTRODUCTION

This technical memorandum (Memo) was prepared for the forthcoming Santa Clara Valley Transportation Authority (VTA) Climate Action and Adaptation Plan (CAAP). The goals of the CAAP are as follows: (1) to minimize VTA's contributions to climate change by reducing greenhouse gas (GHG) emissions; and (2) to build adaptive capacity and resilience to climate impacts. The purpose of this Memo is related to the first goal. A separate memo will be prepared to address the second goal.

This Memo outlines a series of draft GHG reduction strategies, along with more detailed measures and specific implementing actions under each measure, that were developed for VTA's consideration. These strategies are intended to reduce countywide GHG emissions from both the countywide surface transportation system and from VTA's own operations.

The main sections of this Memo, following this introductory section, include:

- Section 2, Methodology, describes the methods used and overall framework for developing and analyzing potential GHG reduction strategies, measures, and implementing actions, including the creation of prioritization criteria.
- Section 3, Analysis of Draft GHG Reduction Strategies, Measures, and Implementing Actions, includes a detailed description of all strategies, measures, and implementing actions, along with discussion of results from analyzing and scoring the proposed measures.
- Section 4, Quantitative GHG Analysis, includes a description of GHG quantification results from the subset of GHG reduction measures that were determined to be quantifiable, and an analysis of how the estimated GHG reductions compare to VTA's GHG emissions inventory, forecasts, and adopted targets for reducing GHG emissions in VTA's Sustainability Plan 2020.
- Section 5, Recommendations, includes recommendations for which measures should be prioritized for inclusion in the CAAP, and which should be removed from further consideration.

2 METHODOLOGY

Ascent developed a framework for identifying, analyzing, and prioritizing potential GHG reduction strategies. The framework is described in more detail below under Section 2.1.

Section 2.2 outlines the multi-step process used to refine preliminary GHG reduction strategies, including criteria that were used to evaluate and inform prioritization of the draft strategies. The steps described in Section 2.2 represent an iterative process whereby strategies were vetted and refined in collaboration with VTA staff.

2.1 GHG REDUCTION FRAMEWORK

The structure and approach for identifying actionable strategies that can be included in the CAAP is based on a framework that consists of a series of nested categories including **focus areas, strategies, measures, and implementing actions**. Each of these are defined and explained below.

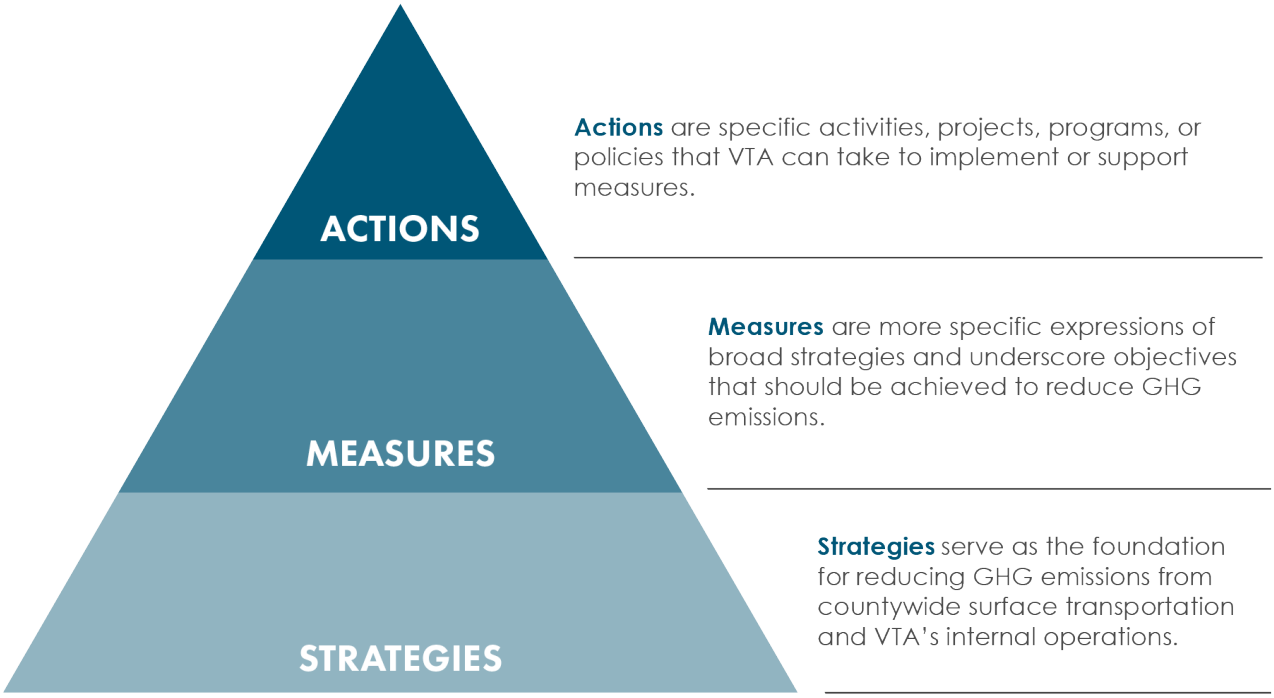
Focus Areas

Mitigating climate change means reducing the amount of GHGs in the atmosphere. The major sources of GHG emissions, according to VTA's updated GHG emissions inventory, are passenger trips, buildings, fleet operations, and decomposition of waste. Taking this into consideration, Ascent first identified four broad **focus areas** that represent the major sectors where GHG reduction potential would be the greatest. The focus areas are the broadest category in the framework and are defined as follows:

- **Transportation and Land Use:** This focus area addresses the Countywide Transportation section of the updated GHG emissions inventory and forecast. While Countywide Transportation refers to GHG emissions generated by the transportation system countywide, these corresponding strategies, measures, and implementing actions primarily address the reduction of vehicle trips and vehicle miles traveled (VMT) on the roadway network and associated GHG reductions, with some emphasis also on supporting the transition to zero-emission vehicles by countywide transportation system users.
- **Building and Facilities:** This focus area addresses the Buildings and Facilities sector of the VTA Transit Operations section of the updated GHG emissions inventory and forecast. This focus area addresses emissions from energy used in all buildings and other energy-consuming facilities in VTA's internal operations, and its strategies and measures are focused on energy efficiency, energy conservation, renewable energy, and decarbonization.
- **Fleet and Employee Commute:** This focus area addresses both the Revenue and Non-Revenue Fleet sector and the Employee Commute sector of the VTA Transit Operations section of the GHG emissions inventory and forecast. This focus area addresses emissions from revenue-generated vehicles (e.g., VTA buses), non-revenue vehicles (e.g., VTA-owned cars or trucks operated by VTA employees on the job), and private vehicles operated by VTA employees in their commute to/from their workplace, through a combination of zero-emission vehicle and transportation demand management strategies.
- **Materials and Waste:** This focus area addresses the Waste sector of the section of the updated GHG emissions inventory and forecast. This focus area addresses emissions from all waste generated by VTA operations through a combination of waste management, reduction, and recycling measures.

GHG Reduction Strategies, Measures, and Implementing Actions

Strategies under each focus area serve as the foundation for reducing GHG emissions—they are purposefully broad and overarching and tend to be expressions of goals or desired outcomes. Each strategy contains a series of **measures**, which are more specific and tactical areas of action that include commitments and more specific and measurable objectives that can be achieved to reduce GHG emissions. Lastly, **implementing actions** are the specific activities, projects, programs, or other steps that VTA can enact to implement the measures and achieve the objectives described under each measure. Some measures can be quantified in terms of their GHG reduction potential, depending on the level of detail included in each measure and associated implementing actions. The hierarchy of strategies, measures, and implementing actions serves as VTA's framework for reducing GHG emissions and is visualized in **Figure 1** below.



Source: Ascent 2023.

Figure 1 Hierarchy of Strategies, Measures, and Implementing Actions

2.2 STRATEGY AND PRIORITIZATION CRITERIA DEVELOPMENT

Preliminary Draft Strategies and Measures

To help inform the strategy development process, Ascent and VTA staff first reviewed background information and materials, including existing local, regional, and statewide plans, and other documents that address GHG reduction strategies or related policies. Upon completing this review and following completion of the GHG emissions inventory updates and forecast (see memo to VTA dated February 27, 2023: "GHG Emissions Inventory and Forecast for Countywide Transportation and VTA Transit Operations"), a preliminary set of 51 GHG reduction measures were developed and included into an Excel-based matrix known as the "GHG Reduction Workbook."

The GHG Reduction Workbook was organized into four separate worksheets which align with the four focus areas identified in Section 2.1. After obtaining VTA staff feedback on the first preliminary draft GHG Workbook, a second preliminary draft of the GHG Reduction Workbook was prepared to incorporate VTA staff feedback by revising,

consolidating, removing, or adding strategies and measures. Additionally, specific implementing actions were also drafted and added to the second preliminary draft GHG Reduction Workbook under each measure. Further revisions were made in response to additional VTA comments, and the draft strategies, measures, and implementing actions, are analyzed and discussed in detail in Section 3 of this memo.

Prioritization Criteria

Prioritization criteria were developed to inform staff of the relative potential for each measure to contribute to achieving GHG emission reduction goals, as well as other consideration including cost effectiveness, degree of jurisdictional control, implementation timing, and co-benefits related to environmental, equity, public health, quality of life, and engagement goals.

The full set of prioritization criteria are presented and defined in detail below in Table 1. Further details on scoring results for all measures relative to the prioritization criteria and rationale for the scoring results can be found in Section 3. Abbreviated scoring results are also included in the attached GHG Reduction Workbook in Excel format.

Table 1 Prioritization Criteria and Scoring Rubric

Prioritization Criteria	Description	Scoring Rubric
GHG Reduction Potential	GHG Reduction Potential represents a qualitative assessment of the potential scale of GHG emissions that will be reduced or avoided if a measure is implemented. This is determined based on the scale of applicable GHG emissions in the updated inventory and forecast relative to scale of reductions that would typically be achieved by the measure as defined. Where applicable, the relative scale of GHG Mitigation Potential may be informed by the *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity*, published by the California Air Pollution Control Officers Association (CAPCOA, 2021) and the memo to VTA dated February 27, 2023: "GHG Emissions Inventory and Forecast for Countywide Transportation and VTA Transit Operations." Note that only some of the GHG reduction measures have been quantified, and quantification details are reported in more detail under Section 4 of this memo where applicable, along with a summary of methods and assumptions used to quantify GHG reductions.	▶ Low = The measure has a low (between 0%-2%) GHG reduction potential. ▶ Medium = The measure has a medium (between 3%-5%) GHG reduction potential. ▶ High = The measure has a high (over 5%) GHG reduction potential.
Cost Effectiveness	Cost Effectiveness represents a broad qualitative assessment of the potential costs to implement a measure relative to GHG reduction potential. Full quantitative estimates of implementation costs are not included in the scope of this analysis, but rather order-of-magnitude conceptual costs relative to GHG reduction potentials are qualitatively described.	▶ Low (Costs Outweigh Benefits) = Conceptual implementation costs are high relative to GHG reduction potential. ▶ Medium (Benefits Match Costs) = Conceptual implementation costs are moderate relative to GHG reduction potential. ▶ High (Benefits Outweigh Costs) = Conceptual implementation costs are low relative to GHG reduction potential.

Prioritization Criteria	Description	Scoring Rubric
Jurisdictional Control	Jurisdictional Control represents the degree of control that VTA has in ensuring specific implementing actions are taken such that the GHG reduction measure can be fully achieved. VTA's jurisdictional control varies, depending on the focus area and associated GHG emissions sectors addressed as well as the unique characteristics of each measure and its associated implementing actions.	▶ Low = VTA is the "influencer" – This means VTA does not have any direct control over measure implementation, but VTA may have the ability to partner, coordinate with, or influence actions of others. ▶ Medium = VTA is the "regulator" or "initiator" – This means that VTA may have some degree of jurisdictional control, either directly or indirectly, but is not solely responsible for taking all actions required to achieve the full potential of the measure. For example, VTA may act as a regulator or initiator for some measures and their implementing actions, but the broader community or other agencies may also need to respond with some degree of action. ▶ High = VTA is the "actor" – This means that VTA has sole authority and full jurisdictional control over the measure and is likely to be the sole actor. This primarily applies to strategies and measures focused on VTA's internal operations (e.g., buildings and facilities, revenue, and non-revenue fleet).
Implementation Timeframe	For each measure, the Implementation Timeframe is conceptually estimated in terms of how long it will take to fully implement the measure and achieve GHG reductions. The Implementation Timeframe considers various assumptions either implicit in the measure itself as defined, or as outlined in the implementing actions such as the status of technology availability, whether or not a study/program/policy needs to be created or updated, or funding and staffing needs.	▶ Long-Term (6+ Years) = Measure could be operational after 6+ years. ▶ Mid-Term (3-5 Years) = Measure could be operational in the next 3 to 5 years. ▶ Near-Term (1-2 Years) = Measure could be operational in the next 1 to 2 years.
Co-Benefits	Each measure was assessed for its potential to result in positive outcomes for the following co-benefit categories, using a simple "Yes/No" score: Environmental Quality, Racial and Social Equity, Public Health, Quality of Life, and Community Engagement. See the GHG Reduction Workbook for co-benefit scoring results.	Each measure was assessed for its potential to result in positive outcomes for the following co-benefit categories, using a simple "Yes/No" score: Environmental Quality, Racial and Social Equity, Public Health, Quality of Life, and Community Engagement. See the GHG Reduction Workbook for co-benefit scoring results.

Source: Ascent 2023.

3 ANALYSIS OF DRAFT GHG REDUCTION STRATEGIES, MEASURES, AND IMPLEMENTING ACTIONS

The draft GHG reduction strategies, measures, and implementing actions, along with results of the qualitative analysis of the GHG reduction potential and other criteria outlined in Section 2, are presented in this section. The results of the quantitative GHG reduction analysis for certain measures are discussed in further detail under Section 4 (Quantitative GHG Analysis). The GHG Reduction Workbook in Excel format, which includes all draft strategies and measure and prioritization scoring results, is attached separately.

A summary of all 39 draft GHG reduction strategies and measures is shown in Table 2 below, organized according to the four focus areas previously described (i.e., Transportation and Land Use, Buildings and Facilities, Fleet and

Employee Commute, Materials and Waste). Each of the four focus areas, along with their respective strategies, measures, and implementing actions, are discussed in further detail in **Sections 3.1 through 3.4**, including analysis results of each measure using the prioritization criteria defined in **Table 1**.

The prioritization criteria scoring results in Section 3.1 through 3.4 also include rationale statements that explains why specific scores were assigned across most of the criteria. Please note, however, that this memo does not include a detailed measure-by-measure series of rationale statements for each of the co-benefit categories. Co-benefit scoring can be found in the separate GHG Reduction Workbook file attached to this memo in Excel format, which allows for a quick visual scan of potential co-benefits achieved. Many measures were determined to achieve multiple co-benefits across most of the co-benefit categories, given the primary focus of all measures on improving the sustainability and overall performance of both countywide transportation and VTA operations.

Table 2 GHG Reduction Strategies and Measures Summary

Focus Area	Strategy	Measure
Transportation and Land Use (TL)	TL-1: Sustainable Roadway Networks and Pricing	TL-1.1: Assist VTA member agencies in implementing SB 743 and mitigating VMT from new land development projects and transportation projects.
		TL-1.2: Continue to build out the countywide Express Lane network to use roadway pricing as a tool to provide reliable travel options and generate a revenue stream for projects that improve the operations of HOV lanes and transit.
		TL-1.3: Maximize the efficacy and performance of HOV lanes by converting to HOT lanes and using occupancy requirements, improved enforcement, and establish an infrastructure that will increase the ability to create dedicated lanes for transit and emerging technologies.
	TL-2: Safe and Accessible Active Transportation for All	TL-2.1: Increase bicycle and pedestrian infrastructure and improve the safety of existing facilities, prioritizing investments in disadvantaged communities.
		TL-2.2: Encourage and support efforts to plan and build walkable and bikeable communities, accessible to people of all income levels and races.
		TL-2.3: Support local, county, state, and federal efforts to promote use of electric bicycles as an alternative to driving.
		TL-2.4: Support education and encouragement programs that promote replacing polluting travel with low-emission travel.
	TL-3: Fast, Frequent, and Reliable Public Transportation for All	TL-3.1: Improve reliability and convenience of existing transit services through increased frequency of service, extended service hours, and improved facilities at stops and stations, prioritizing improvements that serve disadvantaged communities.
		TL-3.2: Increase transit travel speed and reliability through transit-signal priority, dedicated bus lanes, and new or expanded Rapid bus service.
	TL-4: Sustainable Land Use, Planning, and Development	TL-4.1: Collaborate with member agencies in advanced planning efforts to increase residential and employment densities and expand mixed-use development potential near rail stations, along Frequent Network bus routes, and in priority development areas (PDAs).
		TL-4.2: Increase development around transit stations and along transit corridors to facilitate multi-modal, carbon-neutral neighborhoods that are sustainable and resilient.
		TL-4.3: Strategically repurpose underutilized parking lots or other vacant lots at or near VTA transit stations and major transit stops into lively mixed-use, transit-oriented communities with activated ground floor uses that increase transit ridership, help provide revenue for transit capital investments and operations, and reduce VMT.
		TL-4.4: Provide people of all generations and backgrounds with affordable housing and access to the necessities of daily life available within a short walk, bicycle ride, or transit trip.

Focus Area	Strategy	Measure
		TL-4.5: Work with member agencies and other partners to focus development where it already exists (i.e., promote infill development) and reduce the impact of development and transportation infrastructure on the environment by protecting open space, conserving and restoring habitat, enhancing biodiversity, increasing carbon sequestration, and improving wildlife connectivity.
	TL-5: Smart Parking and Curbside Management	TL-5.1: Support local efforts to reduce or eliminate minimum parking standards and institute parking maximums, require "unbundling" of parking costs from commercial leasing or residential rental rates, support shared parking, and introduce demand-based parking pricing in public on- and off-street parking facilities.
		TL-5.2: Provide EV charging infrastructure at VTA parking facilities open to the public.
	TL-6: Smart Mobility and Transportation Demand Management (TDM)	TL-6.1: Increase participation in smart commute and mobility options throughout the county including bicycle sharing, ridesharing, car-sharing, mobility-as-a-service, guaranteed ride home programs, carpools, vanpools, and other emerging options.
		TL-6.2: Channel the deployment of autonomous vehicles, ride-hailing services, and other new mobility options toward high passenger-occupancy and low VMT-impact service models that complement transit.
		TL-6.3: Expand TDM programs and services in partnership with member agencies, employers, schools, and residential communities.
Buildings and Facilities (BF)	BF-1: Clean and Renewable Energy	BF-1.1: Decarbonize existing VTA buildings by phasing out fossil fuel usage and electrifying water heating and space heating or using renewable fuels such as renewable natural gas (RNG) where appropriate.
		BF-1.2: Increase renewable energy, battery storage, and microgrid installations in existing VTA buildings, and/or procure 100% renewable options through local community choice energy (CCE) providers, where applicable.
		BF-1.3: Require all new VTA buildings to be 100% electric and include on-site renewable energy systems with battery storage and microgrids and achieve net-zero standards where feasible.
		BF-1.4: Increase use of electricity and alternative fuels in construction equipment on VTA projects.
	BF-2: Energy Efficiency and Reliability	BF-2.1: Upgrade outdoor lighting at VTA buildings, and at park-and-ride lots and stations, to LEDs or other high-efficiency lighting.
		BF-2.2: Reduce energy use in VTA buildings through conservation best practices consistent with LEED®, ENERGY STAR®, or other standards.
		BF-2.3: Update VTA's building and construction policies, specifications, and practices to increase energy efficiency, and complete energy audits of existing buildings.
		BF-2.4: Consider installing microgrids with battery storage to power critical assets during power outages and provide ancillary services to the grid.
Fleet and Employee Commute (FE)	FE-1: Zero-Emission Vehicles	FE-1.1: Accelerate zero-emission bus (ZEB) and paratransit zero-emission vehicles (ZEV) replacements to ramp up and reduce GHG emissions faster, relative to existing regulations and expected phase-out timelines.
		FE-1.2: Replace VTA diesel trucks and other non-revenue VTA vehicles with ZEVs.
		FE-1.3: Expand electric vehicle (EV) and electric bicycle charging infrastructure at VTA buildings to support VTA fleet EVs and employee bicycles.

Focus Area	Strategy	Measure
	FE-2: Zero-Emission Equipment	FE-2.1: Use cleaner fuel, such as renewable diesel, for off-road equipment and construction equipment where feasible.
		FE-2.2: Require ZEV or low-emission vehicle (LEV) equipment in VTA projects.
	FE-3: Operational Efficiency	FE-3.1: Maximize the operational efficiency of VTA vehicles, including reducing vehicle idling.
	FE-4: Employee Commute	FE-4.1: Monitor employee commute patterns to understand employee behaviors, needs, and overall contributions to VTA's operational GHG inventory.
		FE-4.2: Encourage and enable VTA employees to use transit, carpool, bike, and telecommute to work to reduce single-occupancy vehicle commute trips and VMT.
Materials and Waste (MW)	MW-1: Waste Management, Reduction, and Recycling	MW-1.1: Require procurement and operational practices that avoid generation of waste (e.g., reusable materials, reduced packaging, and compostable products).
		MW-1.2: Increase recycling and organic waste diversion at all facilities.
		MW-1.3: Require food waste composting and composting of biomass generated from landscape maintenance.
		MW-1.4: Reduce the generation of construction and demolition (C&D) waste in VTA projects, and increase sustainable materials use and recovery.

Source: Ascent 2023.

3.1 TRANSPORTATION AND LAND USE (TL)

The Transportation and Land Use (TL) focus area provides VTA a significant opportunity to reduce GHG emissions associated with the countywide transportation system. The strategies, measures, and implementing actions under this focus area address the overall efficiency of the transportation system itself, the behaviors and potential choices made by those who use it, as well as current and future land use plans, land development projects, and community design approaches in both cities and unincorporated county areas that relate to transportation activity.

Reducing vehicle miles traveled (VMT) is a key objective and metric associated with TL focus area strategies and measures. As noted in VTA's updated GHG emissions inventory and forecast, countywide VMT is projected to increase over time unless specific actions are taken. While accelerating the transition to zero-emission vehicles in light duty vehicles and supporting infrastructure are critically important policies, focusing on ZEVs alone is not enough to solve the climate crisis. As noted in the California Air Resources Board (CARB) 2022 Scoping Plan, per capita VMT must be reduced statewide by 25 percent by 2030 and 30 percent by 2045. CARB notes that "approximately 30 percent of light duty vehicles on the road in 2045 will still burn fossil fuels even with all new car sales being ZEVs by 2035" (2022: 4). Thus, countywide VMT reductions are essential to achieving both local and statewide GHG reduction goals.

Avoiding or reducing vehicle trips and VMT is also essential to reducing harmful air pollution generated from fossil fuel combustion and braking and tire wear across all vehicle types, which impacts public health. Reducing vehicle trips and VMT by expanding transportation choices and more sustainable land use patterns also helps to reduce automobile dependency and long commutes associated with urban sprawl and improves overall quality of life.

Finally, investing in a sustainable transportation system and promoting sustainable land use patterns and development decisions also help to advance housing and climate equity, as critically needed affordable housing and supporting transit and infrastructure will meet the needs of vulnerable and historically marginalized members of the community.

Strategy TL-1: Sustainable Roadway Networks and Pricing

Measures under this strategy are focused on improving the sustainability and efficiency of the existing roadway network through pricing, mitigation of transportation impacts from land use projects, and monitoring and enforcement mechanisms. Some of the measures under this strategy are also closely related and/or may depend on or support implementation of measures under other strategies in the TL focus area, and those relationships are noted where applicable.

Measure TL-1.1: Assist VTA member agencies in implementing SB 743 and mitigating VMT from new land development projects and transportation projects.

Senate Bill (SB) 743 required that all transportation impact analysis for projects that are subject to environmental review under the California Environmental Quality Act (CEQA) use VMT as the metric for assessing transportation impacts and mitigation, effective July 1, 2020. VTA is already assessing VMT impacts during review of VTA's proposed projects that require environmental review under CEQA, and as a countywide transportation agency VTA has been supporting efforts to implement SB 743 associated with land use and land development projects by its member agencies (i.e., 15 cities and the County of Santa Clara). However, VTA can extend these efforts, especially in developing opportunities for countywide or regional VMT mitigation approaches. VTA recently began the "Equitable VMT Mitigation Program for Santa Clara County" study funded by Caltrans that will evaluate the feasibility of a countywide VMT exchange, VMT mitigation bank, or similar program that works across jurisdictional boundaries and enhances equity. The study is expected to be completed in late 2024. Based on the results of the study, VTA will evaluate and determine the best approach to implementing such a potential program, in coordination with its member agencies.

Implementing Actions

- Evaluate the feasibility of a countywide VMT exchange, VMT mitigation bank, or similar program that helps mitigate transportation impacts from land use projects in a way that reduces VMT and GHG emissions, works across jurisdictional boundaries, and enhances equity.
- If determined to be feasible, work with VTA's member agencies to implement a countywide VMT mitigation program.

Table 3 Measure TL-1.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	GHG reductions for this measure are not quantifiable at this time as no specific program has been proposed and will require the completion of a feasibility study. However, the GHG reduction potential is estimated to be medium because mitigation requirements for new development would ensure that VMT-reducing measures are implemented, leading to associated reductions in GHG emissions.
Cost Effectiveness	Medium	A countywide VMT exchange, VMT mitigation bank, or similar program could help to reduce the overall costs of VMT mitigation (and associated GHG reductions) by scaling up and/or aggregating VMT reductions and providing a framework for cost-sharing. For more information, see "Implementing SB 743: Design Considerations for Vehicle Miles Traveled Mitigation Bank and Exchange Programs," UC Berkeley, August 2022 (Implementing-SB-743-August-2022.pdf (berkeley.edu) .
Jurisdictional Control	Medium	VTA is leading the feasibility study and would have significant influence over implementation of this measure if a countywide program is determined to be feasible. However ultimately CEQA review and any associated mitigation requirements and enforcement are within the jurisdiction of the lead agency with authority to approve or carry out a specific project, and development of a countywide program would require buy-in from all or many of VTA's member agencies.
Implementation Timeframe	Mid-Term	Completion of the feasibility study is targeted for late 2024. The timing for potential development and launch of a program is currently unknown because the feasibility study has not been completed yet.

Source: Ascent 2023.

Measure TL-1.2: Continue to build out the countywide Express Lane network to use roadway pricing as a tool to provide reliable travel options and generate a revenue stream for projects that improve the operations of HOV lanes and transit.

VTA is already using dynamic roadway pricing on existing Express Lanes to manage demand, as it helps to regulate the number of users in specific lanes on certain freeway segments. While dynamic pricing helps to improve travel reliability, it can also encourage more carpooling and transit ridership. Expanding the Express Lane network may also have the potential to generate additional revenue to support transit enhancements or other measures that reduce VMT and GHG emissions, and thus this measure could be "bundled" with other measures under other strategies.

Implementing Actions

- Develop and implement an Express Lanes Strategic Plan to explore options that will achieve VTA's goals for reducing VMT and GHG emissions while also managing travel demand and improving reliability.
- Collaborate with regional partners to explore region-wide Bay Area tolling and the future of Express Lanes and dynamic pricing in Santa Clara County relative to potential shifts in regional policy.

Table 4 Measure TL-1.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	Pricing strategies can help to both reduce Single-Occupant Vehicle demand and improve travel reliability; however potential reductions in vehicle trips or VMT are uncertain. GHG reduction potential for this measure will vary considerably depending on the timing and scale of implementation, along with how this measure is implemented in combination with other strategies and measures related to improving or expanding active transportation, transit, and other modes.
Cost Effectiveness	Medium	For similar reasons noted above under GHG Reduction Potential, cost effectiveness is difficult to assess given uncertainties about implementing actions and timing. Some costs could be incurred to expand infrastructure for dynamic pricing on express lanes, but the scale on investments relative to GHG reductions is unknown at this time.
Jurisdictional Control	Medium	VTA has jurisdictional control over dynamic pricing of authorized express lanes in Santa Clara County. New authorization is required to expand the Express Lanes program to other freeway segments. The effectiveness of this measure also depends on actions by the community and behavioral response.
Implementation Timeframe	Mid-Term	Timeframe is dependent on availability of funding. A dedicated amount of funding for the Silicon Valley Express Lanes Program or successfully securing grant funds can accelerate the delivery of the entire Express Lanes Program. Funding projects through financing will extend the implementation timeframe for the delivery of the Express Lanes network. Additional information regarding implementing actions is required.

Source: Ascent 2023.

Measure TL-1.3: Maximize the efficacy and performance of HOV lanes by converting to HOT lanes and using occupancy requirements, improved enforcement, and establish an infrastructure that will increase the ability to create dedicated lanes for transit and emerging technologies.

VTA staff noted in preliminary review of the draft measures that HOV lanes are most effective when they carry larger numbers of carpools and vanpools, as well as transit buses, to achieve increased person throughout. High functioning HOV lanes with enhanced enforcement can reduce travel times and can make transit faster/more attractive.

Implementing Actions

- Conduct a feasibility study to explore options and potential costs for improving HOV performance. Following completion of study, develop and implement recommendations.

Table 5 Measure TL-1.3 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low-Medium	The scale of GHG reductions is difficult to quantify at this stage. Completion of a feasibility study will identify what specific actions would need to be taken. The effectiveness of this measure may also depend on how this measure is implemented in combination with other measures that are focused on improving transit service or carpooling options.
Cost Effectiveness	Medium	For similar reasons noted above under GHG Reduction Potential, cost effectiveness is difficult to assess given uncertainties about implementation actions and timing. Costs would be incurred to adjust HOV lane operations and increase enforcement, but the specific options and their associated costs and scale on investments relative to GHG reductions is unknown at this time.
Jurisdictional Control	Medium	VTA has some degree of jurisdictional control HOV lanes and their operations and enforcement, however the effectiveness of this measure also depends on actions by the community and behavioral response.
Implementation Timeframe	Mid-Term	Completion of the feasibility study could be expected in the near term. Specific modifications to HOV lanes and enforcement pursuant to study findings could be completed mid-term.

Source: Ascent 2023.

Strategy TL-2: Safe and Accessible Active Transportation for All

VTA can work with local and regional agencies to increase or improve pedestrian and bicycling infrastructure by filling gaps, improving connectivity to transit, addressing safety issues such as improving crossings or removing other types of barriers, building new infrastructure, and upgrading existing transportation infrastructure to more comfortable, lower-stress designs. VTA can also support operational improvements to increase safety and/or reduce delay for pedestrians and bicyclists and improve maintenance of existing infrastructure. VTA can also prioritize support for bicycle and pedestrian projects that have the highest potential to result in GHG emissions reductions.

Measure TL-2.1: Increase bicycle and pedestrian infrastructure and improve the safety of existing facilities, prioritizing investments for disadvantaged communities.[1]

Implementing Actions

- Conduct a study to identify under-served areas and develop a program to prioritize active transportation investments for disadvantaged communities, in partnership with member agencies. For example, there could be opportunities to align with SB 1000 requirements to address active transportation for disadvantaged communities in environmental justice elements in local general plan updates.
- Advocate for adequate funding for bicycle and pedestrian capital projects and maintenance from existing funding sources and identify new funding streams where necessary.

Table 6 Measure TL-2.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low-Medium	Improving bicycle and pedestrian infrastructure can help to reduce vehicle trips and VMT. The scale of VMT and associated GHG reductions is dependent on the scale of improvements. Low to medium GHG reductions could be expected depending on outcomes of studies and/or local planning and capital investments. The effectiveness of this measure may also depend on how this measure is implemented in combination with other measures under the Sustainability Roadways and Pricing strategy (TL-1).
Cost Effectiveness	Medium	Costs would be incurred to expand or improve bicycle and pedestrian infrastructure, however specific improvements and their associated costs and the scale on investments relative to GHG reductions is unknown at this time.
Jurisdictional Control	Medium	VTA has some degree of jurisdictional control over local revenues. VTA can also be an influencer by working collaboratively with local cities and the County on local public works projects on roadways and rights-of-way when mutual goals present themselves. VTA also has some degree of influence when advocating for or pursuing funding from regional, state, and federal funding sources. When multi-jurisdictional projects cross member agency boundaries, VTA is well suited to lead project delivery.
Implementation Timeframe	Mid-Term	Completion of a feasibility study could be expected in the near term. Specific improvements could be completed in the near, mid-, or even long-term, depending on the scope and scale of improvements defined and study recommendations.

Source: Ascent 2023.

Measure TL-2.2: Encourage and support efforts to plan and build walkable and bikeable communities, accessible to people of all income levels and races.

Implementing Actions

- Collaborate with planners and public works officials from member agencies by participating in development project reviews, community planning, or corridor planning efforts, to ensure pedestrian/bicycle infrastructure and connectivity to transit are included in projects and area-wide plans.
- Promote and provide local support/technical assistance for using VTA's Community Design and Transportation Manual, Bicycle Technical Guidelines, and Pedestrian Access to Transit Plan.
- Support collaborative funding opportunities for shared investments between VTA and partner agencies.

[1] The term "disadvantaged communities" is defined by State law as areas that can include either of the following: (a) areas that are disproportionately affected by environmental pollution and other hazards that can lead to negative health effects, exposure, or environmental degradation, or (b) areas with concentrations of people that are of low income, high unemployment, low levels of homeownership, high rent burden, sensitive populations, or low levels of educational attainment (CA Health and Safety Code, Section 39711). The California Environmental Protection Agency (CalEPA) identifies these areas in further detail using the CalEnviroScreen tool. SB 535 (2012) requires that at least 25% of California Climate Investments be targeted specifically in disadvantaged communities. For more information, see https://oehha.ca.gov/calenviroscreen/sb535.

Table 7 Measure TL-2.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions are difficult to quantify for this measure. VTA would be acting in a coordinating or supporting role. Potential is considered low.
Cost Effectiveness	Low	Implementing costs associated with this measure are assumed to be relatively low given that VTA staff already coordinate and collaborate with local agencies. The scale of these costs relative to GHG reductions is unknown, however, as GHG reduction potential is not estimated.
Jurisdictional Control	Low	VTA does not have jurisdiction over local planning or project approvals, however VTA can influence local planning and public works project decision-making by coordinating and collaborating with local agencies to promote effective use of VTA's guidance.
Implementation Timeframe	Variable	The timeframe for this measure is variable, based on ongoing coordination and collaboration with local agencies which spans all timeframes. The timeframe for retrofitting neighborhoods, new development construction, or public improvement construction may also vary considerably depending on the scope or scale of proposed plans or projects.

Source: Ascent 2023.

Measure TL-2.3: Support local, county, state, and federal efforts to promote the use of electric bicycles as an alternative to driving.

Implementing Actions

- Implementing actions from Measures TL-2.1 and TL-2.2 may also apply to this measure.
- Seek funding through programs such as Metropolitan Transportation Commission's (MTC's) Bike Share Capital Program and California's Active Transportation Program, among others, which support electric bicycle and bicycle sharing projects.
- Work to expand access and incentivize the use of electric bicycles and bicycle sharing in Santa Clara County by emulating current programs across the Bay Area, such as the "Richmond-San Rafael E-bike Commuter Program," collaborating with relevant partners, as needed.

Table 8 Measure TL-2.3 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions are not quantifiable for this measure. Reduction potential is estimated to be low as VTA would be acting in a coordinating or supporting role, and the scope and scale of electric bicycle usage is undefined at this time.
Cost Effectiveness	Medium	Implementing costs associated with this measure are assumed to be relatively low given that VTA staff already coordinate and collaborate with local agencies. The scale of these costs relative to GHG reductions is unknown, however, as GHG reduction potential is not estimated.
Jurisdictional Control	Low	VTA would act in an influencing role under this measure by supporting existing efforts.
Implementation Timeframe	Variable	Timeframe for this measure is variable, based on ongoing coordination and collaboration with other agencies noted.

Source: Ascent 2023.

Measure TL-2.4: Support education and encouragement programs that promote replacing polluting travel with low-emission travel.

Implementing Actions

- Support local and countywide Safe Routes to Schools efforts by providing funding and facilitating information-sharing.
- Support local and countywide events that promote walking and biking, such as Viva CalleSJ and Bike to Wherever Days, by providing funding, cross-promoting, and facilitating information-sharing.

Table 9 Measure TL-2.4 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions are not quantifiable for this measure. Reduction potential is estimated to be low as this measure involves VTA acting in a coordinating or supporting role.
Cost Effectiveness	Medium	Implementing costs associated with this measure are assumed to be relatively low given that VTA staff already coordinate and collaborate with local agencies. The scale of these costs relative to GHG reductions is unknown, however, as GHG reduction potential is not estimated.
Jurisdictional Control	Low	VTA would act in an influencing role under this measure by supporting existing efforts.
Implementation Timeframe	Variable	Timeframe for this measure is variable, based on ongoing coordination and collaboration with other agencies noted.

Source: Ascent 2023.

Strategy TL-3: Fast, Frequent, Reliable, and Equitable Public Transportation

In 2022, VTA kicked off a planning initiative known as "Visionary Network: A Blueprint for Aspirational Transit Service in Santa Clara County." Visionary Network will "define how transit service in Santa Clara County should look over the next 30 years, including street corridors it should serve in the future, how often buses and trains should arrive, how early and late-night service should run, and what bus stops and stations should look like and provide. By the end of the process, it should reflect a shared vision between VTA, each of the 15 member agency cities, and all residents of the county." (VTA 2022a).

Measure TL-3.1: Improve reliability and convenience of existing transit services through increased frequency of service, extended service hours, and improved facilities at stops and stations, prioritizing improvements that serve disadvantaged communities.

Improving VTA transit service frequency, hours, and facilities will help to increase transit ridership, which is associated with reducing VMT and associated GHG emissions.

Implementing Actions

- Implement VTA's annual transit service plans based on the Visionary Network's transit vision and recommended service enhancements.
- Pursue new funding streams to support increased service, stops, reliability, extended hours, and capital projects identified in the Visionary Network.
- Implement service changes pursuant to available funding, in accordance with adopted service plans, and in compliance with VTA's service equity policies.

Table 10 Measure TL-3.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium-High	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA GHG Handbook. Applicable measures may include T-25: Extend Transit Network Coverage or Hours, and T-26: Increase Transit Service Frequency. GHG reduction potential could range from medium to high, depending on the scope/scale of improvements identified and funded for implementation. T-25 GHG Mitigation Potential is up to 4.6%, while T-26 is up to 11.3% of GHG emissions from vehicle travel in the community.
Cost Effectiveness	Medium	Increases in capital and operational costs for expanding or improving transit service frequency, hours, and facilities, could be substantial but would be expected to result in medium to high GHG reductions over time.
Jurisdictional Control	Medium	VTA has direct operational control over transit services, hours, and facilities. However, VTA's ability to make service changes or improve the quality of facilities are subject to funding availability.
Implementation Timeframe	Mid- to Long-Term	Specific improvements could be completed in the near, mid-, or even long-term, depending on the specific scope and scale of improvements that need to be defined and their associated costs and available funding sources. However given current challenges associated with impacts of the COVID-19 pandemic and lack of available funding, mid- to long-term implementation may be a more reasonable assumption.

Source: Ascent 2023.

Measure TL-3.2: Increase transit travel speed and reliability through transit-signal priority, dedicated bus lanes, and new or expanded Rapid bus service.

Implementing Actions

- Collaborate with member agencies and other relevant partners to make transit faster and more reliable with solutions like transit signal priority (TSP) and transit-only lanes.
- Implement TSP, dedicated lanes, and other improvements in collaboration with member agencies.
- Support member agencies through collaborative grant writing and project management of transit priority improvements.

Table 11 Measure TL-3.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions for this measure may be quantifiable using one or more methods outlined in the CAPCOA GHG Handbook. Applicable CAPCOA Measures may include T-27: Implement Transit-Supportive Roadway Treatments. GHG reduction potential would likely be low, based on GHG Mitigation Potential ranking for T-27 of up to 0.6% of GHG emissions from vehicle travel in the community.
Cost Effectiveness	Low	Expansion of infrastructure to support TSP, dedicated bus lanes, or expand bus service would require a modest degree of capital and operational spending across local agencies in the county. Given that the estimated GHG reduction potential for this measure is low, cost effectiveness would appear to be low.
Jurisdictional Control	Medium	VTA has jurisdictional control over operations of Rapid bus service, however the installation of TSP and dedicated bus lanes requires coordination with member agencies with jurisdiction over roadways, signals, and other supporting infrastructure.
Implementation Timeframe	Mid- to Long-Term	Specific improvements could be completed in the near, mid-, or even long-term, depending on the specific scope and scale of improvements that need to be defined and their associated costs and available funding sources. However, given current challenges associated with the impacts of the COVID-19 pandemic and lack of available funding, mid- to long-term implementation may be a more reasonable assumption.

Source: Ascent 2023.

Strategy TL-4: Sustainable Land Use, Planning, and Development

Sustainable land use, planning, and development are critical and complementary to transportation-system focused measures to reduce VMT and associated GHG emissions. VTA's guiding principles for integrating land use and transportation reflect the values of equity, partnership, sustainability, and resilience (VTA 2023a).

- Equity: An outcome and process that enables just and fair access to opportunities so that all can participate and thrive.
- Partnership: an ongoing process to build shared understanding and common ground with local jurisdictions, community, developers, and other institutions to achieve meaningful results.
- Sustainability: integrating social, cultural, economic, and environmental conditions to reduce impacts on future generations.
- Resilience: ability to account for vulnerabilities (e.g., existing inequities) and withstand the impacts of varying types of adversity (e.g., economic or climate related changes).

The guiding principles overlap and are strengthened when implemented together. The principles represent how VTA will work closely with local jurisdictions on land use planning efforts (e.g., land development projects and long-range plans) at the earliest planning stages. They can also provide a framework to expand mobility options in sustainable locations (e.g., promoting growth near VTA's Frequent Network), and to preserve and enhance VTA operations and the quality of service VTA provides. The principles form the foundation of a transparent, comprehensive, and streamlined process for VTA, including VTA internal procedures, development review process, and other tools to facilitate well-integrated and structurally safe development adjacent to transit facilities, and ensure early and ongoing coordination. Successful implementation of these principles will create high-quality, equitably built environments that enable multimodal access, support fast and efficient transit operations, and create transit ridership.

Measure TL-4.1: Collaborate with member agencies in advanced planning efforts to increase residential and employment densities and expand mixed-use development potential near rail stations, along Frequent Network bus routes, and in priority development areas (PDAs).

VTA's Land Use and Transportation (LUTI) program seeks to strengthen coordination of land use and transportation strategies with local jurisdictions and the development community by promoting equitable and sustainable development and expanding mobility options. As part of the LUTI Program, VTA manages a Development Review Program to engage in local near-term land development projects and long-range land use and transportation policies (e.g., General Plans or Specific Plans) to encourage a multimodal/transit-integrative planning approach (VTA 2023a).

Implementing Actions

- Continue coordinating and collaborating with member agencies on advanced planning efforts through the LUTI Development Review Program and regularly scheduled collaboration meetings, including on General Plan updates, station area plans, neighborhood/corridor plans, zoning code updates, or other area-wide planning efforts, to ensure that densities, floor-area ratios, and land use designations are transit-supportive and aligned with existing system and planned transit investments.
- Support member agencies through collaborative grant writing and project management of land use plans surrounding transit stations and priority corridors.
- Promote and provide local support/technical assistance for using VTA's Community Design and Transportation (CDT) Manual and other resources.

Table 12 Measure TL-4.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions are not quantifiable for this measure. GHG Reduction Potential is also considered low as VTA only plays a coordinating or supporting role.
Cost Effectiveness	Medium	Implementation costs associated with this measure are assumed to be relatively low given that VTA staff already coordinate and collaborate with local agencies. The scale of these costs relative to GHG reductions is unknown, however, as GHG reduction potential is not estimated.
Jurisdictional Control	Low	VTA does not have jurisdiction over local city and county land use planning, however VTA can influence local planning and project-level decision-making by coordinating and collaborating with local agencies during preparation or updates to land use plans and by promoting effective use of VTA's guidance.
Implementation Timeframe	Variable	The timeframe for this measure is somewhat variable, based on ongoing coordination and collaboration with local agencies which spans all timeframes.

Source: Ascent 2023.

Measure TL-4.2: Increase development around transit stations and along transit corridors to facilitate multi-modal, carbon-neutral neighborhoods that are sustainable and resilient.

Implementing Actions

- Collaborate with member agencies to increase and facilitate (1) commercial and mixed-use development in or near job centers and (2) residential, commercial, and mixed use near rail stations, along Frequent Network bus routes, and in priority development areas (PDAs).

Table 13 Measure TL-4.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions are not quantifiable for this measure. GHG Reduction Potential is considered low as this measure involves VTA acting in a coordinating or supporting role, and the scope and scale of job density increases is undefined currently.
Cost Effectiveness	Medium	Implementation costs associated with this measure are assumed to be relatively low given that VTA staff already coordinate and collaborate with local agencies. The scale of these costs relative to GHG reductions is unknown, however, as GHG reduction potential is not estimated.
Jurisdictional Control	Low	VTA does not have jurisdiction over local city and county land use planning, however VTA can influence local planning and project-level decision-making by coordinating and collaborating with local agencies during preparation or updates to land use plans and by promoting effective use of VTA's guidance.
Implementation Timeframe	Variable	The timeframe for this measure is somewhat variable, based on ongoing coordination and collaboration with local agencies which spans all timeframes.

Source: Ascent 2023.

Measure TL-4.3: Strategically repurpose underutilized parking lots or other vacant lots at or near VTA transit stations and major transit stops into lively mixed-use, transit-oriented communities with activated ground floor uses that increase transit ridership, help provide revenue for transit capital investments and operations, and reduce VMT.

Transit-oriented development (TOD) refers to projects built in compact, walkable areas that have easy access to public transit, ideally in a location with a mix of uses, including housing, retail offices, and community facilities. TODs are generally described as places within a 10-minute walk (0.5 mile) of a high-frequency rail transit station (either rail, or bus with headways less than 15 minutes) (CAPCOA 2021: Appendix A).

Implementing Actions

- Continue to implement VTA's Transit-Oriented Communities (TOC) policy and TOD Development Programs.
- Catalyze equitable and inclusive TOCs with thorough public engagement, resulting in thoughtful placemaking and place-keeping.
- Focus on priority joint development parcels first and parcels that have the potential for achieving the highest VMT reductions and ridership improvements.

Table 14 Measure TL-4.3 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA GHG Handbook. Applicable measures may include T-3: Provide Transit-Oriented Development; however, the cited reduction potential of up to ~30% is local (not regional as would be the case for VTA) so this measure is considered medium.
Cost Effectiveness	Medium	Implementation costs associated with this measure are assumed to be relatively low given that VTA staff already coordinate and collaborate with local agencies. The scale of these costs relative to GHG reductions is unknown, however, as GHG reduction potential is not estimated.
Jurisdictional Control	Medium	VTA has jurisdictional control over VTA-owned sites and has discretion over decisions to approve ground leases or disposition of land for development projects, however VTA does not have direct control of lands in TOD areas that are not owned by VTA. VTA staff working through the TOD Program have influence and can partner with local agencies and the development community to facilitate TOD project development.
Implementation Timeframe	Variable	Timeframe for this measure is variable, based on ongoing coordination and collaboration with local agencies and the development communities to plan and build TOD projects.

Source: Ascent 2023.

Measure TL-4.4: Provide people of all generations and backgrounds with affordable housing and access to the necessities of daily life available within a short walk, bicycle ride, or transit trip.

As noted in VTA's 2022 Affordable Housing Report, VTA increased its Affordable Housing Policy goals in June 2022 to ensure that 40% of its residential TOD development portfolio will be developed as affordable units. The Board also increased its affordable set-aside in market-rate projects to 25%. All of VTA's affordable units must serve households earning 60% of Santa Clara County's Area Median Income (AMI) or below, and half of VTA's affordable units must serve households earning 50% of AMI or below. To achieve these goals, the VTA TOD program is working with Santa Clara County, local jurisdictions, and the development community to produce mixed-income and 100% affordable housing projects throughout VTA's service area. VTA's recently updated projections indicate that its active current pipeline and future development sites will create approximately 2,600 affordable units (VTA 2023b).

Implementing Actions

- Continue to work through VTA's TOD program with local jurisdictions and the development community to produce mixed-use, mixed-income, and 100% affordable housing projects, consistent with VTA's Affordable Housing Goals.
- Implement FTA-funded TOC Playbook implementation activities in Downtown San Jose, 28th Street/Little Portugal Station, and Santa Clara Station, in partnership with the cities of San Jose and Santa Clara and surrounding communities.

Table 15 Measure TL-4.4 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures outlined in the CAPCOA GHG Handbook. Applicable measures may include T-4: Integrate Affordable and Below Market Rate Housing; however, the cited reduction potential of up to ~30% is local (not regional as would be the case for VTA) so this measure is considered medium.
Cost Effectiveness	Medium	Implementation costs associated with this measure are assumed to be relatively low given that VTA staff already coordinate and collaborate with local agencies. The scale of these costs relative to GHG reductions is unknown, however, as GHG reduction potential is not estimated.
Jurisdictional Control	Medium	VTA has jurisdictional control over VTA-owned sites and has discretion over decisions to approve ground leases or disposition of land for housing projects, however VTA does not have direct control lands in TOD areas that are not owned by VTA. VTA staff working through the TOD Program have influence and can partner with local agencies and the development community to facilitate housing development.
Implementation Timeframe	Variable	Timeframe for this measure is variable, based on ongoing coordination and collaboration with local agencies and the development communities to plan and build TOD projects.

Source: Ascent 2023.

Measure TL-4.5: Work with member agencies and other partners to focus development where it already exists (i.e., promote infill development) and reduce the impact of development and transportation infrastructure on the environment by protecting open space, conserving and restoring habitat, enhancing biodiversity, increasing carbon sequestration, and improving wildlife connectivity.

Implementing Actions

- Explore opportunities for VTA to support local and regional efforts to protect and enhance natural and working lands. Partnering agencies could include Santa Clara Valley Open Space Authority, Santa Clara Valley Habitat Plan, City of San Jose, Santa Clara Valley Land Trust, Peninsula Open Space Trust, Mid-Pen Open Space District, the Metropolitan Transportation Commission / Association of Bay Area Governments (MTC/ABAG), or others.
- Collaborate with regional stakeholders to explore the potential for creating a transfer of development rights (TDR)[2] program to (1) prioritize compact development in closer proximity to transit corridors, and (2) avoid conversion of open space to low-density development, especially areas identified as high priority for conservation. A TDR program could potentially identify TOD/TOC areas in VTA's network as receiving areas for TDRs.
- Explore VTA opportunities to partner with existing community organizations in providing transportation services that increase equitable access to local open space to support recreational and educational opportunities, with a priority emphasis on increasing open space access in historically marginalized and disadvantaged communities.

[2] For more information on TDR and examples used in other regions in CA and elsewhere, see Smart Climate Action through Transfer of Development Rights.

Table 16 Measure TL-4.5 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	The scale of GHG reductions is difficult to quantify at this stage. VTA would be acting in an exploratory role, and further study would be necessary to identify what specific actions would need to be taken. Potential is considered low.
Cost Effectiveness	N/A	Cost effectiveness is unknown at this stage.
Jurisdictional Control	Low	VTA does not have jurisdiction over lands it does not own, however it can act as an influencer in its role as a coordinating entity in collaboration with other agencies in the county and the region on broader growth management and conservation issues.
Implementation Timeframe	Mid-Term	Initiation of coordination and collaboration efforts could occur in the near term, however initiation and completion of any exploratory studies noted in the implementing actions, and implementation of recommendations pursuant to studies may take several years.

Source: Ascent 2023.

Strategy TL-5: Parking Management and Pricing

Measure TL-5.1: Support local efforts to reduce or eliminate minimum parking standards and institute parking maximums, require "unbundling" of parking costs from commercial leasing or residential rental rates, support shared parking, and introduce demand-based parking pricing in public on- and off-street parking facilities.

Implementing Actions

- Develop and implement demand-based pricing policies at existing VTA-owned off-street parking lots or garages.
- Promote and provide local support/technical assistance for using VTA's CDT Manual, which includes guidance for "Rethinking Parking Requirements" and "Parking Management."

Table 17 Measure TL-5.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	The scale of GHG reductions of this measure is difficult to quantify at this stage. VTA would be acting in a promotional role; however, VTA's implementing demand-based pricing policies would reduce GHG emissions (CAPCOA T-12: Price Workplace Parking). However, CAPCOA's cited reduction potential of up to ~20% is local (not regional as would be the case for VTA) so this measure is considered low in combination with VTA's support role.
Cost Effectiveness	Medium	Implementation costs are assumed to be moderate. While VTA staff already coordinate and collaborate with local agencies, establishing and implementing a new demand-based pricing policy would create a new program and additional workload. The scale of these costs relative to GHG reductions is unknown, however, as GHG reduction potential is not estimated.
Jurisdictional Control	Medium	VTA has direct control over parking lots and garages owned by VTA. VTA can coordinate and support local agency efforts to address parking standards and pricing.
Implementation Timeframe	Variable	The timeframe for this measure is variable, based on ongoing coordination and collaboration with local agencies.

Source: Ascent 2023.

Measure TL-5.2: Provide EV charging infrastructure at VTA parking facilities open to the public.

Implementing Actions

- Identify existing VTA facilities where additional publicly accessible EV charging stations, charging infrastructure, and solar canopies with EV charging could be installed. Develop an implementation plan and policy that identifies funding and/or agreements with vendors for installation and maintenance.

Table 18 Measure TL-5.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA GHG Handbook (e.g., CAPCOA T-14: Provide Electric Vehicle Charging Infrastructure - Expanding EV charging infrastructure supports increased consumer adoption of all types of EVs, However, the cited reduction potential of up to ~12% is local (not regional as would be the case for VTA) so this measure is considered low.
Cost Effectiveness	Medium	Potential implementation costs will vary depending on the results of studies and scale of EV charging installations in existing parking facilities.
Jurisdictional Control	High	VTA has direct control over its parking facilities
Implementation Timeframe	Near-Term	Given that VTA has direct control over and has already been installing EV charging in its parking facilities, increased/expanded installations could be accelerated assuming reasonable costs and funding availability and/or agreements with vendors can be negotiated in a timely manner.

Source: Ascent 2023.

Strategy TL-6: Smart Mobility and Transportation Demand Management (TDM)

Measures under this strategy address smarter and more effective use of the existing transportation system through TDM, along with guiding a range of new or emerging smart mobility solutions in ways that are consistent with VTA's sustainability and climate goals. VTA has an opportunity to support proven strategies for TDM across the countywide transportation system that reduce vehicle trips and VMT, while also ensuring that new and emerging mobility solutions are integrated with public transit services and will not adversely impact VTA ridership or increase VMT.

TDM measures can also be applied to VTA employee commuting and internal operations, which are addressed more specifically under the Fleet and Employee Commute (FE) focus area later in this memo.

Measure TL-6.1: Increase participation in smart commute and mobility options throughout the county including bicycle sharing, ridesharing, car-sharing, mobility-as-a-service, guaranteed ride home programs, carpools, vanpools, and other emerging options.

Implementing Actions

- Expand VTA's guaranteed ride home program to ease commuter anxiety and encourage transit use.
- Launch and expand a countywide web-based incentive platform that offers rewards and discounts to encourage use of alternative modes of travel other than solo driving.
- Increase marketing activities for all smart commute and mobility options.

Table 19 Measure TL-6.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA (e.g., T-5: Implement Commute Trip Reduction Program (Voluntary), T-6: Implement Commute Trip Reduction Program (Mandatory Implementation and Monitoring), T-7: Implement Commute Trip Reduction Marketing, T-8: Provide Ridesharing Program, T-9: Implement Subsidized or Discounted Transit Program, T-10: Provide End-of-Trip Bicycle Facilities). The maximum cited reduction potential of up to ~30% is mostly local (not regional as would be the case for VTA) so this measure is considered medium.
Cost Effectiveness	Medium	VTA would likely play a supporting role and costs could be low to modest, depending on VTA's specific role in relationship to existing programs or services.
Jurisdictional Control	Medium	VTA may have some degree of control over local trip reduction actions where transit services or on-road systems under VTA's authority are integrated with local programs. VTA can also influence local programs through collaborative efforts where VTA plays a supportive or coordinating role.
Implementation Timeframe	Variable	Timeframe for this measure is variable, based on ongoing coordination and collaboration with local agencies.

Source: Ascent 2023.

Measure TL-6.2: Channel the deployment of autonomous vehicles, ride-hailing services, and other new mobility options toward high passenger-occupancy and low VMT-impact service models that complement transit.

Autonomous vehicles (AVs), ride-hailing services (also sometimes referred to as "transportation network companies," or TNCs), and other new mobility options could increase VMT and GHG emissions unless specific actions are taken to ensure that public health, safety, and environmental goals are achieved (OPR 2018).

Implementing Actions

- Explore partnering with local AV startups to develop a pilot program that integrates AV deployment with measures designed to further local sustainability and climate goals in the county.
- Encourage ride-hailing services like Uber/Lyft to focus on high passenger-occupancy rides and improve access to or complement transit usage.

Table 20 Measure TL-6.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions are not quantifiable for this measure. GHG Reduction Potential is also considered low as VTA only plays an exploratory or supporting role.
Cost Effectiveness	N/A	Cost effectiveness is unknown at this stage.
Jurisdictional Control	Medium	VTA's jurisdictional control over VTA transit services and express lanes on the roadway system could play a role in how this measure is implemented. VTA can also play an influencing role by coordinating and collaborating with the private sector and regional, state, or federal agencies in how AVs, TNCs, and emerging technologies and systems that may deployed in the future will be deployed and regulated.
Implementation Timeframe	Mid- to Long-Term	While ride-sharing companies are already operating, AV systems are not yet broadly deployed but would be expected over the long term. Measure implementation could begin in the near- to mid-term on partnership formation or pilot program development, but realistically, AV deployment will likely extend into the long-term timeframe.

Source: Ascent 2023.

Measure TL-6.3: Expand TDM programs and services in partnership with member agencies, employers, schools, and residential communities.

VTA's CDT Manual includes a section entitled "Transportation Demand Management." Topics and possible actions in the CDT Manual include:

- Changing the cost of commuting.
- Helping communities leave their cars at home.
- TDM and the development process.
- Formation of Transportation Management Associations (TMAs).
- Sustainable mode education, infrastructure, and accessibility.
- Transit and TOD.

Implementing Actions

- Coordinate and collaborate with member agencies to implement TDM recommendations consistent with VTA's CDT Manual and other best practices guidance.
- Coordinate and collaborate with member agencies, employers, and existing transportation management associations (TMAs) to increase options and identify opportunities for VTA to support connectivity across modes and services. Establish performance metrics and targets to measure the success of VTA's TDM strategies to decrease single-occupant vehicle (SOV) commuting.
- Consider forming a countywide TMA or joining existing local transportation management associations (TMAs). VTA is actively exploring its role in countywide TDM efforts similar to other countywide transportation authorities in the region.

Table 21 Measure TL-6.3 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA (e.g., T-5: Implement Commute Trip Reduction Program (Voluntary), T-6: Implement Commute Trip Reduction Program (Mandatory Implementation and Monitoring), T-7: Implement Commute Trip Reduction Marketing, T-8: Provide Ridesharing Program, T-9: Implement Subsidized or Discounted Transit Program, T-10: Provide End-of-Trip Bicycle Facilities). The maximum cited reduction potential of up to ~30% is mostly local (not regional as would be the case for VTA) and VTA would be serving a coordination role, so this measure is considered medium.
Cost Effectiveness	Medium	VTA would likely play a supporting role and costs could be low to modest, depending on VTA's specific role in relationship to existing or new programs or services.
Jurisdictional Control	Medium	VTA may have some degree of control over local trip reduction actions where transit services or on-road systems under VTA's authority are integrated with local programs. VTA can also influence local programs through collaborative efforts where VTA plays a supportive or coordinating role.
Implementation Timeframe	Variable	Timeframe for this measure is variable, based on ongoing coordination and collaboration with local agencies.

Source: Ascent 2023.

3.2 BUILDINGS AND FACILITIES (BF)

The Buildings and Facilities (BF) focus area strategies, measures, and implementing actions are centered on reducing energy usage and decarbonizing the energy used in all structures across VTA's internal operations. In general, VTA facilities include buildings (e.g., maintenance facilities, office buildings) and transit facilities (e.g., bus stops, transit stations), which are located throughout Santa Clara County. The two primary strategies under this focus area include **BF-1: Clean and Renewable Energy**, and **BF-2: Energy Efficiency and Reliability**.

Strategies and measures under this focus area, particularly Strategy BF-2, align with and support VTA's Sustainability Plan 2020 targets to reduce building energy consumption by 15% by FY 2025 and 40% by FY 2040, in addition to GHG emissions targets (VTA 2020: 5). Currently, VTA is not on-track to meet these targets. Building energy consumption has only decreased by approximately 6% since the established baseline of FY 2009 and has been flagged by VTA staff as an area needing improvement.

Strategy BF-1: Clean and Renewable Energy

This strategy is focused on facilitating VTA's transition to clean and renewable energy in its buildings and facilities. It includes the decarbonization of existing buildings, continuing expanding renewable energy and battery storage across existing buildings and facilities, and ensuring that future new buildings are carbon-free and incorporate renewable energy to the maximum extent possible.

Measure BF-1.1: Decarbonize existing VTA buildings by phasing out fossil fuel usage and electrifying water heating and space heating or using renewable fuels such as renewable natural gas (RNG), where appropriate.

Implementing Actions

- Conduct studies and develop a comprehensive building retrofit program/plan that identifies energy efficiency measures, electrification opportunities, and facility-specific decarbonization, renewable energy, and energy storage solutions. For example, converting Cerone Division from propane to electric sources of heating and replacing the natural gas radiant heaters in maintenance bays with electric heaters.
- Identify funding needs and sources to fund or finance retrofits, along with potential incentives from energy utilities or other sources.

Table 22 Measure BF-1.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	The scale of GHG reductions is difficult to quantify at this stage. Completion of studies will identify what specific actions would need to be taken. The GHG reduction potential for this measure is medium, based on the scale of reduction potential and overall magnitude of GHG emissions in the Energy sector of VTA's GHG inventory.
Cost Effectiveness	Medium	Specific costs are unknown currently, but the general range of costs to implement efficiency, electrification, or other decarbonization-focused building retrofits vary considerably across equipment, lighting, appliance, or HVAC replacements/upgrades. Costs for such measures can also be offset by energy savings and/or fuel switching.
Jurisdictional Control	High	VTA-owned buildings and facilities are under the direct jurisdictional control of VTA.
Implementation Timeframe	Mid	Implementation timeframes may vary, based on when studies are completed, and programs/plans are put in place and funded. While studies could begin in the near-term, retrofits may take more time to complete and could be phased in or coordinated with expected lifecycle of equipment and replacement schedules.

Source: Ascent 2023.

Measure BF-1.2: Increase renewable energy, battery storage, and microgrid installations in existing VTA buildings, and/or procure 100% renewable options through local community choice energy (CCE) providers, where applicable.

Implementing Actions

- Actions from Measure BF-1.1 may also apply to this measure.

Table 23 Measure BF-1.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	The scale of GHG reductions is difficult to quantify at this stage. The GHG reduction potential for this measure is medium, based on the scale of reduction potential and overall magnitude of GHG emissions in the Energy sector of VTA's GHG inventory.
Cost Effectiveness	Medium/High	Specific costs are unknown at this time, but the general range of costs to implement renewable energy will vary considerably depending on which approach (e.g., on-site installation vs. procuring renewable options from CCE providers) or technology is used. Procuring 100% renewable energy from a CCE may be considered a more cost-effective option. Currently, procuring 100% renewable energy from the two Santa Clara Valley CCEs (Silicon Valley Clean Energy and San Jose Clean Energy), which in 2030 are anticipated to serve 96% of VTA fleet electric load, has similar costs to procuring the default energy mix from PG&E,[3] making the incremental shift to an 100% relatively inexpensive. However, these rates will change depending on weather, utility hedging strategies, and the cost impact of future energy procurement.
Jurisdictional Control	High	VTA-owned buildings and facilities are under the direct jurisdictional control of VTA.
Implementation Timeframe	Mid-Term	Implementation timeframe may extend into mid-term, based studies to be completed, and time to get programs/plans in place and funded.

Source: Ascent 2023.

Measure BF-1.3: Require all new VTA buildings to be 100% electric and include on-site renewable energy systems with battery storage and microgrids and achieve net-zero standards where feasible.

Implementing Actions

- Update VTA's Green Building Policy (adopted in 2018) to require 100% electric for all new construction. This may require VTA facility staff to identify specific standards or specifications per building codes, including reach codes, and/or rating systems, to achieve these outcomes.[4] For example, the new Cerone OCC Building is an opportunity to build a 100% electric and/or net-zero building.
- Implement the amended policy in all new building design and construction projects moving forward, and evaluate space requirements, costs, financial incentives, and efficiencies for each potential technology used on a project-by-project basis.

[3] See Joint Rate Comparisons for Silicon Valley Clean Energy (SVCE) and San Jose Clean Energy (SJCE) , available respectively at https://www.pge.com/pge_global/common/pdfs/customer-service/other-services/alternative-energy-providers/community-choice-aggregation/svce_rateclasscomparison.pdf and https://www.pge.com/pge_global/common/pdfs/customer-service/other-services/alternative-energy-providers/community-choice-aggregation/sjce_rateclasscomparison.pdf. For SVCE, the GreenPrime product is 100% renewable (see: https://svcleanenergy.org/greenprime/), and for its B-19 S (Business Medium-High Use) customers, the GreenPrime rate is currently less than 1 percent above the PG&E rate. For SJCE, the TotalGreen product is 100 percent renewable, and for its B-19 S customers, the rate is less than one tenth of 1 percent above PG&E.

[4] See the Building Decarbonization Coalition's 2022 Reach Code Implementation Resources page for examples: https://buildingdecarb.org/resource/2022-reach-code-implementation-resources.

Table 24 Measure BF-1.3 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	The GHG reduction potential for this measure is low, based on the scale of reduction potential being limited to avoiding new emissions from new VTA buildings and the overall magnitude of GHG emissions in the Energy sector of VTA's operational inventory.
Cost Effectiveness	Medium	Specific costs are unknown at this time, but the general range of costs to implement all-electric development will vary considerably depending on which codes, construction methods, or technologies are used in the design and construction of new buildings. All-electric buildings may have similar or even lower up-front costs than a mixed-fuel building in some cases, particularly when considering the avoided costs of natural gas infrastructure. Additionally, switching to high-efficiency electric for various end uses may result in substantial cost savings over the life cycle of improvements as natural gas prices have been increasing.
Jurisdictional Control	High	VTA-owned buildings and facilities are under the direct jurisdictional control of VTA.
Implementation Timeframe	Mid-Term	While updates to VTA's policy could be achieved in the near term, full implementation timeframes depend on when new building projects are funded, designed, and constructed.

Source: Ascent 2023.

Measure BF-1.4: Increase use of electricity and alternative fuels in construction equipment on VTA projects.

The Bay Area Air Quality Management District (BAAQMD) provides funding to equipment owners to help offset costs of converting off-road equipment to ZEV or alternative fuels.[5] Additionally, several air districts now include guidance for use of electric and alternative fuels in construction equipment in mitigation measures.[6] CARB is also working on the Zero-Emission Forklifts program and forthcoming regulations.[7]

Implementing Actions

- Develop and adopt specifications for electric and alternative fuel equipment that must be used in VTA construction projects. Specifications may also be identified in air quality or GHG mitigation measures that are required per CEQA documents prepared for projects in which VTA is designated as the CEQA lead agency.

Table 26 Measure BF-1.5 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	The GHG reduction potential for this measure is limited to avoiding future emissions associated with the construction equipment used in new VTA buildings. Construction emissions are also finite and low compared to operational emissions and thus, the GHG reduction potential from avoided emissions is considered low.
Cost Effectiveness	Medium	Specific costs are unknown at this time, as the range of costs to implement use of low or zero emission equipment in new construction projects varies considerably and depends on which approach or technology is used and to which class of equipment that standards and specifications would apply. Capital costs to purchase cleaner fuel vehicles may be high, although as ZEV options increase in the marketplace, they will likely decline over time. Fueling infrastructure may be required, which will add to the upfront cost of transitioning to cleaner fuel vehicles. However, fuel costs and savings compared to gasoline and diesel will vary depending on the type of fuel and market conditions. It is feasible to expect reduced fuel costs from cleaner fuels with an increased market and overall fuel cost savings over the life of the vehicle fleet. (CAPCOA T-30: Use Cleaner Fuel Vehicles)
Jurisdictional Control	High	VTA has direct control over specifications and standards that are required in VTA construction projects
Implementation Timeframe	Near	Updates to VTA's policies and specifications for construction equipment could be completed in the near term.

Source: Ascent 2023.

[5] See https://www.baaqmd.gov/funding-and-incentives/businesses-and-fleets/off-road-vehicles
[6] See https://www.airquality.org/LandUseTransportation/Documents/Ch6ConstructionMitMeasuresFINAL5-2016.pdf
[7] See Zero-Emission Forklifts | California Air Resources Board

Strategy BF-2: Energy Efficiency and Reliability

Measure BF-2.1: Upgrade outdoor lighting at VTA buildings, and at park-and-ride lots and stations, to LEDs or other high-efficiency lighting.

Implementing Actions

- Conduct a study and develop a comprehensive plan that (1) identifies and prioritizes buildings and parking lots in need of more efficient replacement outdoor lighting, such as LEDs or other more efficient technologies; and (2) secure/allocate funding and labor to replace lighting.

Table 27 Measure BF-2.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	The scale of GHG reductions is difficult to quantify at this stage. Completion of a study will identify what specific actions would need to be taken. The GHG reduction potential for this measure is low based on the scale of reduction potential and overall magnitude of GHG emissions in the Energy sector of VTA's GHG inventory.
Cost Effectiveness	High	High-efficiency lighting upgrades are generally cost effective. More energy-efficient lighting options may have greater upfront installation costs. However, the replacement of less efficient lighting with more efficient bulbs reduces energy consumption and thereby reduces energy costs over time which may result in net cost savings over the lifespan of the investment. Additionally, the rated life of more efficient bulbs is typically longer than less efficient ones, which reduces the frequency of replacement costs (Source: CAPCOA Handbook, Measure E-7: Higher Efficacy Public Street and Area Lighting).
Jurisdictional Control	High	VTA-owned buildings and facilities are under the direct jurisdictional control of VTA.
Implementation Timeframe	Mid	Implementation timeframes may vary, based on when studies are completed and projects are identified, funded, and constructed.

Source: Ascent 2023.

Measure BF-2.2: Reduce energy use in VTA buildings through conservation best practices consistent with LEED®, ENERGY STAR®, or other standards.

Implementing Actions

- Conduct a study and prioritize projects to retrofit buildings with energy-saving features such as dimmer switches or timers, replace older inefficient plug-load appliances with higher-efficiency ENERGY STAR® rated appliances, or implement conservation best practices through occupant behavioral changes (e.g., turning off lights in an empty room, unplugging appliances when not needed). Identify actions that could be taken in both LEED® and non-LEED® certified buildings.
- Identify and secure funding sources needed to complete retrofits.

Table 28 Measure BF-2.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	The GHG reduction potential for this measure is low, based on the scale of reduction potential and overall magnitude of GHG emissions in the Energy sector of VTA's GHG inventory. Conservation-based approaches to reducing energy usage can be helpful as part of an overall energy efficiency and conservation program for an agency's operations; however, conservation-based reductions are typically much lower than reductions from efficiency upgrades in building heating and cooling, water heating, and lighting.
Cost Effectiveness	High	Conservation best practices typically include low-cost actions and can be cost-effective relative to energy savings achieved.

Prioritization Criteria	Score	Rationale
Jurisdictional Control	High	VTA-owned buildings and facilities are under the direct jurisdictional control of VTA.
Implementation Timeframe	Mid	Implementation timeframes may vary, based on when studies are completed and projects are identified, funded, and constructed.

Source: Ascent 2023.

Measure BF-2.3: Update VTA's building and construction policies, specifications, and practices to increase energy efficiency, and complete energy audits of existing buildings.

Implementing Actions

- Update VTA's Green Building Policy (adopted in 2018) to increase energy efficiency in all existing and new buildings. This update may be coordinated or included with the implementation action under Measure BF-1.3.
- Conduct an energy audit of existing buildings to identify cost effective energy efficiency improvements and identify funding sources to complete appropriate energy efficiency upgrades.
    - The River Oaks Administrative Offices used over 3 million kWh of electricity in FY22. Of VTA's five major divisions, it has the highest usage of grid electricity (the Light Rail Division has the highest). Despite past efforts to update the building management system, energy usage continues to be high. In an effort to increase energy efficiency, a more rigorous effort to improve the HVAC system and lighting controls should be undertaken.

Table 29 Measure BF-2.3 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	The GHG reduction potential for this measure is medium, based on the scale of reduction potential and overall magnitude of GHG emissions in the Energy sector of VTA's GHG inventory.
Cost Effectiveness	High	Specific costs are unknown at this time, but the general range of costs to increase energy efficiency will vary considerably depending on which codes, construction methods, or technologies are used in the design and construction of new buildings or retrofits to existing buildings. Energy audits generally recommend upgrades that appear to be the most cost effective in terms of achieving energy and cost savings relative to project costs.
Jurisdictional Control	High	VTA-owned buildings and facilities are under the direct jurisdictional control of VTA.
Implementation Timeframe	Near Mid	Updating VTA's policy could be completed in the near term, while completing energy audits and identifying and completing energy efficiency retrofits in existing buildings could be a near-mid term program.

Source: Ascent 2023.

Measure BF-2.4: Consider installing microgrids with battery storage to power critical assets during power outages and provide ancillary services to the grid.

Implementing Actions

- Conduct a feasibility study to determine where and how microgrids or battery storage could be implemented at VTA facilities with existing solar generation. Based on findings, develop recommendations and secure funding based on prioritized project opportunities.

Table 30 Measure BF-2.4 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	Microgrids are generally focused on providing energy reliability and operational resilience. They can help to reduce GHG emission when appropriately designed with on-site renewables combined with battery storage. The extent to which microgrids can be deployed in VTA operations, however, is unknown and results of feasibility study may help to determine the scale of GHG reduction potential that could be expected. See CAPCOA E-23: Use Microgrids and Energy Storage (non-quantified measure).
Cost Effectiveness	Low	Cost effectiveness is currently unknown. Feasibility study findings may provide more information once completed.
Jurisdictional Control	High	VTA-owned buildings and facilities are under the direct jurisdictional control of VTA.
Implementation Timeframe	Long-Term	Completion of a feasibility study could be completed in the near-term, with recommendation implemented thereafter in the mid- to long-term, depending on study findings and recommendations.

Source: Ascent 2023.

3.3 FLEET AND EMPLOYEE COMMUTE (FE)

The Fleet and Employee Commute (FE) focus area includes strategies, measures, and implementing actions that reduce emissions in both the Revenue and Non-Revenue Fleet and the Employee Commute sectors in VTA's updated Transit Operations GHG emissions inventory and forecast. The four strategies under this focus area include: **FE-1 Zero-Emission Vehicles, FE-2 Zero-Emission Equipment, FE-3 Operational Efficiency, and FE-4 Employee Commute**.

Strategies and measures under this focus area are also intended to align with and support VTA's Sustainability Plan 2020 targets to reduce revenue fleet energy consumption, in addition to the plan's GHG emissions targets.

Strategy FE-1: Zero-Emission Vehicles

Measure FE-1.1: Accelerate zero-emission bus (ZEB) and paratransit zero-emission vehicles (ZEV) replacements to ramp up and reduce GHG emissions faster, relative to existing regulations and expected phase-out timelines.

Several laws and regulations are now mandating that both transit agency revenue fleets and other classes of privately-owned vehicles begin transitioning to zero-emission vehicles by specific target years.[8]

VTA is actively working to transition affected revenue and non-revenue vehicles to zero-emission technology as quickly as possible, but VTA may also consider accelerating transition of affected vehicles ahead of expected phase-out timelines in existing regulations. These efforts, along with any accelerated efforts, will require a substantial commitment to increase funding for purchases and operations and maintenance and sufficient staffing resources.

Implementing Actions

- Allocate sufficient VTA staff and funding resources to successfully support the ZEB transition pursuant to existing regulatory requirements.
- Identify potentially feasible pathways to accelerating ZEB and paratransit ZEV replacements, including timelines/phasing strategies resource needs.
- Champion efforts to get more funding to accelerate ZEB and paratransit ZEV replacements.

[8] See VTA Transit Operations GHG Emissions Inventory and Forecast memo, Table 19, page 29 for a list of legislative reductions and associated regulations.

Table 31 Measure FE-1.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	High	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA (e.g., T-30: Use Cleaner Vehicles). The GHG reduction potential for this measure is high, based on the scale of reduction potential and overall magnitude of GHG emissions in VTA's GHG inventory.
Cost Effectiveness	Medium	Replacing existing internal combustion vehicles with ZEVs would have a substantial cost based on current costs of ZEVs in these vehicle classes. An accelerated replacement program could be designed to align as closely as possible with lifecycle replacements that already would have occurred, such that incremental costs of replacement would be minimized, particularly as zero-emission technologies are deployed and more widely adopted over the next 10 years which may reduce ZEV costs.
Jurisdictional Control	High	VTA-owned revenue and non-revenue vehicles and specific replacement decisions are under the direct operational control of VTA.
Implementation Timeframe	Variable	Timeframe for this measure is variable, given VTA's ongoing efforts combined with future actions to identify potential ZEV acceleration pathways and funding resources.

Source: Ascent 2023.

Measure FE-1.2: Replace VTA diesel trucks and other non-revenue VTA vehicles with ZEVs.

Implementing Actions

- Develop and implement a ZEV replacement plan to replace non-revenue internal combustion engine (ICE) vehicles with ZEVs as opportunities arise and take advantage of funding opportunities and/or rebates to minimize cost to VTA.

Table 32 Measure FE-1.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA (e.g., T-30: Use Cleaner Vehicles). The GHG reduction potential for this measure is medium, based on the scale of reduction potential and overall magnitude of GHG emissions in VTA's GHG inventory.
Cost Effectiveness	Medium	Replacing existing non-revenue fleet vehicles with ZEVs would have a substantial cost based on current costs of ZEVs in these vehicle classes. VTA can align ZEV replacements to match up as closely as possible with lifecycle replacements that already would have occurred, such that incremental costs of replacement could be minimized, particularly as zero-emission technologies are deployed and more widely adopted over the next 10 years which may reduce ZEV costs.
Jurisdictional Control	High	VTA-owned non-revenue vehicles and specific replacement decisions are under the direct operational control of VTA.
Implementation Timeframe	Variable	Implementation for this measure is variable, given VTA's ongoing efforts combined with future actions to identify potential ZEV acceleration pathways and funding resources.

Source: Ascent 2023.

Measure FE-1.3: Expand electric vehicle (EV) and electric bicycle charging infrastructure at VTA buildings to support VTA fleet EVs and employee bicycles.

This measure promotes expansion of EV charging infrastructure to support EVs in VTA's fleet which can apply to both revenue and non-revenue vehicles. Implementation of this measure will also need to be coordinated with the two previous ZEV measures under this strategy.

Measure TL-5.2 under the Smart Parking and Curbside Management Strategy above is similar, however Measure TL-5.2 is focused on public-facing EV charging infrastructure to support community members who use VTA's publicly accessible parking facilities at transit stations or other locations. There could be some overlap between the two measures, depending on configuration of VTA parking facilities at VTA's office buildings, the degree of public access to EV chargers at existing VTA buildings, and VTA's approach to deploying EV charging infrastructure in partnership with existing vendors.

Implementing Actions

- Identify existing facilities where additional EV charging stations could be installed and develop an implementation plan including securing funding and/or any agreements with vendors for installation and maintenance.

Table 33 Measure FE-1.3 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA (e.g., T-14: Provide Electric Vehicle Charging Infrastructure). The GHG reduction potential for this measure is high, based on the scale of reduction potential and overall magnitude of GHG emissions in VTA's GHG inventory. Because this measure is focused on supporting the transition of VTA's revenue and non-revenue fleet, reductions are considered medium.
Cost Effectiveness	Medium	Potential implementation costs and cost effectiveness relative to GHG reductions achieved will vary depending on results of studies and scale of EV charging installations at existing facilities.
Jurisdictional Control	High	VTA has direct control over its buildings and facilities.
Implementation Timeframe	Variable	The timeframe for this measure will vary, depending on the pace and scale of ZEV replacements determined under other measures, different types of charging that may be needed to support light, medium, or heavy-duty vehicles, and potential variation in charging operations to support effective use of ZEVs across revenue vs. non-revenue fleet vehicles.

Source: Ascent 2023.

Strategy FE-2: Use Cleaner-Fuel for Off-Road and Construction Equipment

Measure FE-2.1: Use cleaner fuel, such as renewable diesel, for off-road equipment and construction equipment where feasible.

Implementing Actions

- Explore and implement appropriate solutions to procure renewable diesel for use in VTA off-road equipment.
- Update VTA's construction policies, specifications, and practices to require or encourage equipment that produces zero- or low-emissions where feasible.

Table 34 Measure FE-2.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA (e.g., C-1-B: Use Cleaner-Fuel Equipment). The GHG reduction potential for this measure is low, based on the scale of reduction potential and overall magnitude of GHG emissions in VTA's GHG inventory.
Cost Effectiveness	High	Renewable diesel is generally similar in cost to regular non-renewable diesel
Jurisdictional Control	High	VTA has direct control over VTA-owned equipment
Implementation Timeframe	Near	Renewable diesel purchasing may be feasible to accomplish in the near term. Renewable diesel is typically readily available in California.

Source: Ascent 2023.

Measure FE-2.2: Require ZEV or low-emission vehicle (LEV) equipment in VTA projects.

Implementing Actions

- Update VTA's construction policies, specifications, and practices to require the use of zero-emissions or low-emissions equipment in VTA projects where feasible.

Table 35 Measure FE-2.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA (e.g., C-1-B: Use Cleaner-Fuel Equipment). The GHG reduction potential for this measure is low, based on the scale of reduction potential and overall magnitude of GHG emissions in VTA's GHG inventory.
Cost Effectiveness	High	Equipment powered by cleaner-fuels tend to be more expensive to purchase and install than less clean models. These costs may be offset by savings in fuel use and maintenance.
Jurisdictional Control	High	VTA has direct control over specifications required for VTA construction projects.
Implementation Timeframe	Near	Updating VTA's policies, standard specifications, and practices could be completed in the near term.

Source: Ascent 2023.

Strategy FE-3: Operational Efficiency

Measure FE-3.1: Maximize the operational efficiency of VTA vehicles, including reducing vehicle idling.

This is a near- to mid-term measure designed to reduce GHG emissions from idling, especially in heavy-duty on-road vehicles or off-road equipment which may take longer to transition to ZEV technology.

Implementing Actions

- Consider deploying software on VTA fleet vehicles to monitor vehicle trips, VMT, and idling via engine analytics.
- Train VTA staff to operate diesel trucks, heavy-duty vehicles, and off-road equipment more efficiently and enforce current "no-idling" policies.

Table 36 Measure FE-3.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions are not quantifiable for this measure because data on the VTA fleet's idling time is not available.
Cost Effectiveness	Low-Medium	Costs associated with this measure vary. Software deployment costs could be considerable; however, education and training costs would be minimal. Restricting vehicle idling time beyond regulation will reduce fuel consumption, leading to long-term net cost savings.
Jurisdictional Control	High	VTA has direct control over vehicles and driver/operator training and performance.
Implementation Timeframe	Near-Mid	Training could begin in the near term. If determined to be feasible and funded, deploying software and monitoring systems could be deployed in the near- to mid-term.

Source: Ascent 2023.

Strategy FE-4: Employee Commute

Measure FE-4.1: Monitor employee commute patterns to understand employee behaviors, needs, and overall contributions to VTA's operational GHG inventory.

Implementing Actions

- Conduct a new employee commute survey, annually or at least every five years, to understand commute patterns and quantify associated trips and VMT. Incorporate findings into future GHG inventory updates.

Table 37 Measure FE-4.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions are not quantifiable for this measure. GHG Reduction Potential is also considered low as VTA would be conducting a study. Monitoring activities alone do not reduce GHG emissions, however monitoring activities are complementary to other measures and implementing actions under this strategy.
Cost Effectiveness	Medium	Costs of updating VTA's employee commute survey are relatively low.
Jurisdictional Control	Medium	VTA can conduct employee surveys, however employee engagement and responses may be required.
Implementation Timeframe	Variable	This is an ongoing measure, as the survey will be updated every five years.

Source: Ascent 2023.

Measure FE-4.2: Encourage and enable VTA employees to use transit, carpool, bike, and telecommute to work to reduce single-occupancy vehicle commute trips and VMT.

VTA has an opportunity to develop a more comprehensive policy to support "active transportation" among employees and to adopt a more comprehensive TDM program to help reduce commute trips and VMT. Additionally, VTA is planning to launch a new Guaranteed Ride Home (GRH) program in June 2023, and VTA implemented a vanpool subsidy program (expanding on a regional program) in 2021; both of these programs will be available to VTA employees and the general public.

Implementing Actions

- Develop and adopt an official VTA policy that supports an active workplace culture that makes it easier to walk, bike, share rides, or take transit, and provide training to ensure managers fully and consistently integrate mobility programs and policies into their departments.

- In coordination with implementation of Measure TL-6 (Smart Mobility and TDM), develop and launch a comprehensive TDM program for VTA employees and/or align VTA's efforts with existing local TMAs.
- Encourage and increase employee bicycle use, promote safe riding, and incentivize bicycle commuting.
- Review VTA facilities to identify opportunities to increase amenities that encourage bicycling, such as bicycle parking/storage, shelters, end-of-trip facilities (e.g., repair stands, bicycle wash stations, showers, locker rooms), and electric bicycle charging infrastructure. Identify funding necessary to expand amenities as needed.
- Improve support for teleworking for applicable employees by expanding technology and remote access to information and services.

Table 38 Measure FE-4.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Medium	GHG reductions for this measure may be quantifiable using one or more methods outlined in the applicable GHG reduction measures in the CAPCOA (e.g., T-5: Implement Commute Trip Reduction Program (Voluntary), T-6: Implement Commute Trip Reduction Program (Mandatory Implementation and Monitoring), T-7: Implement Commute Trip Reduction Marketing, T-8: Provide Ridesharing Program, T-9: Implement Subsidized or Discounted Transit Program, T-10: Provide End-of-Trip Bicycle Facilities). The maximum cited reduction potential of up to ~30% is mostly local (not regional as would be the case for VTA) so this measure is considered medium.
Cost Effectiveness	Medium	Potential costs to change internal policies and implement employee-facing programs are low to modest and will depend on the scope and scale of programs and specific services offered. Cost effectiveness may be medium, depending on projected employee participation and actual trip or VMT reductions resulting from new programs or services.
Jurisdictional Control	Medium	VTA has control over employee-facing incentive programs and improving on-site amenities, however successful TDM depends on employee participation and choices made on how to commute to work. VTA can also influence changes in employee commuting by participating in or joining local programs or TMAs and promoting local programs for VTA employees.
Implementation Timeframe	Variable	Timeframe for implementation may include a near-term action (e.g., adopting/updating VTA policy), and near- to mid-term actions to develop and launch new programs and upgrade VTA facilities as needed.

Source: Ascent 2023.

3.4 MATERIALS AND WASTE (MW)

The Materials and Waste (MW) focus area includes strategies, measures, and implementing actions that reduce GHG emissions associated with solid waste generated by VTA's operations and disposed in landfills. The primary strategy under this focus area is MW-1: Waste Management, Reduction, and Recycling.

The strategy and measures under this sector are aligned with and supportive of VTA's Sustainability Plan 2020 targets for increasing waste diversion to 50% by FY 2025 and 80% by FY 2040 (VTA 2020: 5), implying landfill rates of 50% by FY 2025 and 20% by FY 2040. Currently, VTA is not on track to meet these targets and has recognized, in annual sustainability reports, that it needs to step up efforts to increase waste diversion which has remained stagnant at approximately 30% for several years.

Strategy MW-1: Waste Management, Reduction, and Recycling

Measure MW-1.1: Require procurement and operational practices that avoid generation of waste (e.g., reusable materials, reduced packaging, and compostable products).

Implementing Actions

- Review procurement policies and procedures; update as needed. For example, StopWaste developed a Sustainable Procurement Policy template that provides a framework and core strategies for waste reduction and avoiding waste generation that can be used by government agencies (StopWaste 2022). CalRecycle also provides State guidance for Environmentally Preferable Purchasing (EPP) and includes guidance on tools, resources, and a range of possible standards or guidelines to use for becoming a "Zero Waste Community" (CalRecycle 2023a, 2023b).
- Develop training for VTA staff on sustainable purchasing, procurement, and operations to maximize avoidance of waste generation.
- Conduct periodic waste audits to measure the success of existing efforts and inform potential changes to policies or procedures, as necessary.

Table 39 Measure MW-1.1 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	The scale of GHG reductions associated with changes in procurement and operations would likely be low, based on the overall lower magnitude of waste sector emissions compared to other sectors and uncertainties in terms of policy and procedural changes.
Cost Effectiveness	Medium	Costs for implementing changes in procurement and operations to avoid waste are expected to relatively low, and when compared to GHG reduction potential a modest degree of cost effectiveness.
Jurisdictional Control	High	VTA has direct control over its procurement and operational policies and procedures.
Implementation Timeframe	Near	Changes in VTA operating policies and procedures could be implemented in the near-term.

Source: Ascent 2023.

Measure MW-1.2: Increase recycling and organic waste diversion at all facilities.

Implementing Actions

- Inventory facilities and identify needs for additional bins to ensure adequate recycling and food waste bins are available in all VTA buildings, including proper signage to inform and educate staff and the public on placing waste in the proper bins for waste, recycling, and food waste/compostable waste disposal.
- Identify potential costs and funding sources to implement, as needed.

Table 40 Measure MW-1.2 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	Each ton of waste diverted from landfills to recycling or composting reduces methane emissions. If the VTA Sustainability Plan 2020 waste diversion targets were achieved for 2040, this would result in an overall reduction of approximately 916 MT CO_2e relative to projected levels in that year. In percentage terms, this 916 MTCO_2e represents about 2 percent of VTA"s total 2021 operational emissions (39,431 MT CO_2e).
Cost Effectiveness	Medium	Costs for implementing changes to increase recycling and organic waste diversion are relatively low, compared to GHG reduction potential.
Jurisdictional Control	Medium	VTA has control over its facilities and placement of bins and signage, however the success of this measure also depends on employee participation and action to increase recycling and proper food waste disposal.
Implementation Timeframe	Near	Completion of an inventory could be completed in the near-term, along with deployment of bins, signage, and training.

Source: Ascent 2023.

Measure MW-1.3: Require food waste composting and composting of biomass generated from landscape maintenance.

Implementing Actions

- Develop and implement a program/plan to provide composting at appropriate site(s) at VTA facilities, and/or identify external contracting opportunities to ensure that compostable materials are diverted to an existing composting facility.
- Identify potential costs and funding sources to implement, as needed.

Table 41 Measure MW-1.3 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	GHG reductions would likely be relatively low compared to current conditions and overall scale of the waste sector of VTA's inventory.
Cost Effectiveness	Medium	Costs for implementing changes to increase recycling and organic waste diversion are relatively modest, compared to GHG reduction potential.
Jurisdictional Control	Medium	VTA has control over its facilities, however reliance on external contractors could affect VTA's control over waste management and diversion outcomes.
Implementation Timeframe	Mid	Program development and identification of on-site vs. off-site options may take several years to fully implement.

Source: Ascent 2023.

Measure MW-1.4: Reduce the generation of construction and demolition (C&D) waste in VTA projects, and increase sustainable materials use and recovery.

Implementing Actions

- Coordinate with permitting agencies and design professionals to determine sustainable materials, C&D diversion requirements, etc., to meet existing codes (e.g., CALGreen), and/or achieve green ratings (e.g., LEED®, Envision) consistent with VTA's Green Buildings Policy.
- Update VTA specifications and Green Buildings Policy to increase the use of recycled materials and the diversion of C&D waste from disposal to recycling and reuse.

Table 42 Measure MW-1.4 Prioritization Scoring and Rationale

Prioritization Criteria	Score	Rationale
GHG Reduction Potential	Low	C&D waste from construction is not included in VTA's emissions inventory. However, GHG reduction potential is expected to relatively low in consideration of limited construction activities.
Cost Effectiveness	Medium	Potential costs would likely be low to moderate to include C&D diversion and reuse in project specifications.
Jurisdictional Control	Medium	VTA has control over specifications for new construction, however full implementation ultimately requires contractor actions to fulfill diversion requirements for C&D waste generated.
Implementation Timeframe	Variable	Implementation of this measure spans all timeframes. Coordination could begin in the near-term to define specific standards or codes that apply, however full implementation would occur during future construction projects across near/mid/long term.

Source: Ascent 2023.

4 QUANTITATIVE GHG ANALYSIS

This section describes the results of GHG emissions reduction quantification for all GHG reduction measures that were determined to be quantifiable (Section 4.1). It also contains an analysis of total estimated GHG reductions from the draft measures relative to VTA's updated baseline and forecasts emissions and VTA's GHG reduction targets in the VTA Sustainability Plan 2020 (Section 4.2).

4.1 QUANTIFICATION OF GHG REDUCTION MEASURES

To create a list of quantifiable measures, the following steps were performed. First, any measures that were deemed unquantifiable (per the "GHG Reduction Potential" table entries in Section 3) were removed from the list. Second, measures for which no activity data were available were removed from the list—for example, no data on future VTA construction projects was included in the inventory or forecast, so measures such as Measure BF-1.5 ("Increase use of electricity and alternative fuels in construction equipment on VTA projects") were removed from consideration. Third, measures only pertaining to GHG reductions for a specific project or site were removed from the list, as specific site-level analysis is not in the scope of this memo. The remaining measures were included in the analysis.

Table 43 below shows the GHG reduction quantification results for these eight remaining measures. A positive number represents a reduction in emissions, and a negative number represents an increase (only one measure, TL-3.1, results in an increase in emissions in VTA Operations, due to additional VMT generated by increasing the frequency of transit services). Results were calculated separately for 1) VTA operations only, including its transit fleet, waste, employee commute, and building emissions and 2) the entire Santa Clara County on-road transportation and rail transportation sectors, which together comprise the countywide transportation inventory (VTA 2023c: 9). As a shorthand, the table and the proceeding text in Section 4 uses "VTA Operations" and "Countywide Transportation" for items 1) and 2) above, respectively.

For Measures TL-3.1, FE-1.2, and FE-4.2, the methods used to quantify GHG emissions are based on those used in the *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity: Designed for Local Governments, Communities, and Project Developers*. This document was prepared under the direction of the California Air Pollution Control Officers Association (CAPCOA), and will be referred to in the proceeding text using "CAPCOA" as a shorthand. It describes methods for quantifying emissions reductions from the implementation of mitigation measures, and thus can be used to create climate action plans, master plans, and general plans. Other GHG reduction measures were quantified using techniques developed by Ascent, which are described in detail below.

Table 43 VTA and Countywide Transportation Emissions Reductions, $MTCO_2e$ / Year

Measure	VTA Operations 2030	VTA Operations 2040	VTA Operations 2045	VTA Operations 2050	Countywide Transportation 2030	Countywide Transportation 2040	Countywide Transportation 2045	Countywide Transportation 2050
TL-3.1: Improve reliability and convenience of existing transit services through increased frequency of service, extended service hours, and improved facilities at stops and stations, prioritizing improvements that serve disadvantaged communities.	-4,573	-381	0	0	7,420	12,305	12,168	13,240
TL-3.2: Increase transit travel speed and reliability through transit-signal priority, dedicated bus lanes, and new or expanded Rapid bus service.	942	6	0	0	942	6	0	0
BF-1.1: Decarbonize existing VTA buildings by phasing out fossil fuel usage and electrifying water heating and space heating or using renewable fuels such as renewable natural gas (RNG) where appropriate.	68	295	463	675				
BF-1.2: Increase renewable energy, battery storage, and microgrid installations in existing VTA buildings, and/or procure 100% renewable options through local community choice energy (CCE) providers, where applicable.	63	22	0	0				
FE-1.1: Accelerate zero-emission bus (ZEB) and paratransit zero-emission vehicles (ZEV) replacements to ramp up and reduce GHG emissions faster, relative to existing regulations and expected phase-out timelines.	5,543	0	0	0	5,543	0	0	0
FE-1.2: Replace VTA diesel trucks and other non-revenue VTA vehicles with ZEVs.	394	692	859	1,041	394	692	859	1,041
FE-4.2: Encourage and enable VTA employees to use transit, carpool, bike, and telecommute to work to reduce single-occupancy vehicle commute trips and VMT.	32	14	9	7	32	14	9	7
MW-1.2: Increase recycling and organic waste diversion at all facilities.	570	916	1,101	1,294				
Total reductions	**3,039**	**1,564**	**2,432**	**3,017**	**14,331**	**13,017**	**13,036**	**14,288**

Notes: $MTCO_2e$ = metric tons of carbon dioxide equivalent; RNG = renewable natural gas; VMT = vehicle miles traveled; VTA = Santa Clara Valley Transit Authority; ZEB = zero-emission bus; ZEV = zero-emission vehicle.

Source: Ascent 2023.

Key assumptions and notes that help to explain the quantification methods used and results for each quantified measure are discussed below (see Attachment 2: Measures Quantification Workbook for further detail):

- Measures related to building electrification and municipal waste (i.e., BF-1.1, BF-1.2, MW-1.2) were only counted as reducing VTA's GHG emissions, as these items do not affect the County's transportation emissions. Other measures reduce GHG in both VTA operations and the County's transportation sector because they reduce tailpipe emissions in the VTA fleet, which is a subset of the vehicles in the County.
- For the Visionary Network, an implementation start date of 2025 was assumed, with full implementation of the Visionary Network goals by 2040. 2040 was chosen to match VTA's target year in the Sustainability Plan (VTA 2020: 4).
- TL-3.1 was calculated as the sum of two measures from CAPCOA: "T-25. Extend Transit Network Coverage or Hours" and "T-26. Increase Transit Service Frequency" (2021: 178-187).
  - For T-25, it was assumed that transit service hours (or "span" of service) would increase by 5, 16, 21, and 27 percent in 2030, 2040, 2045, and 2050, respectively. These values were linearly interpolated based on the Visionary Network goal of 16 percent by 2040 (VTA 2023e), which implies an approximately 1 percent increase per year. These percentages were applied to the following values from CAPCOA: transit mode share, elasticity of transit demand, statewide mode shift factor, and a ratio of vehicle trip reduction to VMT. The result was a percentage reduction in GHG emissions from community VMT, which was then applied to communitywide on-road vehicle emissions for passenger cars only. Commercial vehicles were excluded from the calculation, as increasing transit hours would not displace commercial activities such as moving freight.
  - For T-26, it was assumed that transit frequency would increase by 18, 54, 72, and 91 percent in 2030, 2040, 2045, and 2050, respectively. These percentages were linearly interpolated based on VTA Visionary Network modeling data (VTA 2023d), which shows an approximately 4 percent increase in frequency each year from 2025 to 2040. These percentages were applied to the following values from CAPCOA: transit mode share, vehicle mode share, statewide mode shift factor, and elasticity of transit ridership with respect to frequency of service.
  - These reductions were then offset by the increased emissions from additional transit VMT that would be required to implement increased hours and frequency.
- TL-3.2 was calculated assuming a 20 percent increase in bus speed by 2040, per the Visionary Network plan (20 percent represents the middle of the range of the plan's possible increases of 10 to 30 percent; see VTA 2023f). A current average bus speed of 11.6 miles per hour was assumed (VTA 2022b). These increases in bus speed result in increased fuel efficiency (and therefore less fuel consumption and lower emissions). To quantify this reduction in fuel consumption, data on the relationship between bus speed and fuel consumption from the California Air Resources Board's EMisson FACtor 2021 Model (EMFAC) was used (CARB 2023).
- BF-1.1 reductions were calculated using the following steps. First, it was assumed that VTA's entire building stock can be retrofitted to use electricity instead of natural gas at the heating source, and that VTA would begin electrification efforts on July 1st, 2026. Second, the following assumptions were made for the percent of building stock that can be electrified: 6 percent by 2030, 25 percent by 2040, 40 percent by 2045, and 58 percent by 2050 (based on Mozingo: 297, prorated for July 1st, 2026 start date). Third, it was assumed that if a building was electrified, the energy required to provide a given amount of heat would only be 78 percent of the energy from natural gas, based on the Annual Fuel Utilization Efficiencies (AFUE) of both fuels (ESC n.d.). Fourth, emissions factors from electricity were applied to the electrified buildings, and subtracted from the reductions from removing the gas heat.
- BF-1.2 reductions were considered to be equal to current legislative-adjusted BAU electric emissions from buildings since these emissions would fall to zero. Note that this measure was evaluated separately from BF-1.1, so the effects of additional electrification are not included.
- FE-1.1 reductions were calculated assuming that 100 percent of paratransit and bus VMT could be electrified by 2040, a target date in keeping with the goal in the Sustainability Report. A linear increase in electric VMT was

calculated to reach this 100 percent target, equating to approximately 5 percent of 2021 values per year. Assuming this rate of electrification, paratransit and bus VMT would be approximately 47 percent electrified by 2030, representing an increase from the current legislative-adjusted electrification forecast of 23 percent. This increase in electrification results in a reduction in emissions factor of approximately 242 grams of CO2e per VMT, as shown in Table 44 below. This reduction in emissions factor was applied to total bus VMT to calculate total emissions reductions. Only 2030 is shown in Table 44 because in all scenarios, the bus and paratransit fleet is fully electric already by 2040, so there is no effect in 2040 and 2045.

Table 44 Bus and Paratransit fleet emissions factors in 2030, grams CO2e/VMT

Current legislative-adjusted scenario (23 percent of VMT electrified)	844
Accelerated (47 percent of VMT electrified)	602
Reduction in emissions factor	242

- FE-1.2 was calculated using Formula A1 from CAPCOA measure "T-30. Use Cleaner Fuel Vehicles" (CAPCOA 2021: 203-209). This formula uses existing emissions factors for conventional vehicles, battery efficiencies (in kWh per mile) derived from EMFAC, and the carbon intensity of electricity. 2050, the latest year in the forecast horizon, was chosen as the target year for full electrification because electrification of these vehicles (many of which are heavy-duty trucks) will likely take longer than passenger car and light-duty vehicles, due to the lack of commercially available heavy-duty electric vehicles. To calculate electrification targets for earlier years, linear interpolation was used. This resulted in percentages of 31, 66, and 83, and 100 percent of the non-revenue fleet being converted to electric by 2030, 2040, 2045, and 2050 respectively.
- FE-4.2 used CAPCOA measure "T-5. Implement Commute Trip Reduction Program (Voluntary)" to calculate emissions reductions (CAPCOA 2021: 83-85). There was no data available on which of VTA's employees would be eligible for transit, carpool, bike to work, or telecommute (some employees may not be eligible due to job duties or work schedule). Therefore, as an upper bound estimate, it was assumed that 100 percent of employees were eligible for transit, carpool, biking to work, or telecommute.
- MW-1.2 assumed landfill rates of 40 percent, 20 percent, 10 percent, and zero percent in 2030, 2040, 2045, and 2050 respectively. These percentages were linearly interpolated based on the Sustainability Plan landfill rate targets of 50 percent by 2025 and 20 percent by 2040. The percentages were applied to a forecast of VTA waste tonnage per year based on a linear regression of historical data. The result was compared to the waste tonnage based on current legislative-adjusted forecast landfill rates (63, 55, 52, and 48 percent for 2030, 2040, 2045, and 2050, respectively) to obtain a reduction quantity.

In summary, the implementation of all quantifiable measures would result in a GHG emission savings of 3,017 MT CO2e by 2050 for VTA operations only, and 14,288 for countywide transportation. This is equivalent to removing approximately 729 and 3,451 gasoline-powered passenger cars from the road for a year, respectively.

4.2 ANALYSIS OF ESTIMATED GHG REDUCTIONS RELATIVE TO BASELINE, FORECASTS, AND ADOPTED TARGETS

VTA OPERATIONS

VTA's Sustainability Plan 2020 established a GHG emissions reduction target of 90 percent below a 2009 baseline by 2040 (i.e., 2040 emissions should be 10 percent of 2009 levels) for VTA operations. Without implementing the measures described above, VTA is projected to reduce emissions by approximately 93 percent by 2040, and 95 percent by 2050. This is due largely to VTA's Zero Emission Bus Program, and additional legislative reductions described in the VTA Transit Operations GHG Emissions Inventory and Forecast memo. If the proposed measures are

implemented, VTA is projected to reduce emissions by approximately 96 percent by 2040 and 99 percent by 2050. Both of these reduction percentages exceed the 2040 target of 90 percent reduction in the Sustainability Plan and the statewide goal of reducing GHG emissions 85% by 2045 under Assembly Bill 1279 (2022).[9] By focusing on GHG reductions across all sectors in VTA's operational inventory, VTA is providing substantial contributions on the path to carbon neutrality.

Table 45 Comparison of VTA Operations GHG Reductions to 2009 Baseline, 2040 Target, and Legislative-adjusted BAU Forecast

Scenario	Quantity	Units
2009 Baseline Emissions for VTA transit operations	69,895	MT CO_2e
2040 Target emissions level (90% reduction below 2009)	6,989	MT CO_2e
Legislative-adjusted BAU forecast emissions without measure implementation in 2040	4,546	MT CO_2e
Legislative-adjusted BAU forecast emissions with measure implementation in 2040	2,982	MT CO_2e
Emissions reductions without measure implementation in 2040	93%	Percent
Emissions reductions with measure implementation in 2040	96%	Percent
Legislative-adjusted BAU forecast emissions without measure implementation in 2050	3,629	MT CO_2e
Legislative-adjusted BAU forecast emissions with measure implementation in 2050	613	MT CO_2e
Emissions reductions without measure implementation in 2050	95%	Percent
Emissions reductions with measure implementation in 2050	99%	Percent

COUNTYWIDE TRANSPORTATION

VTA does not have established GHG reduction targets for countywide transportation emissions. Table 46 below summarizes the total GHG reductions from quantified GHG reduction measures that are applicable to countywide transportation and compares these reductions to total forecasted emissions in the forecast years. These reductions represent between 0.54 percent and 2.2 percent, depending on the year, of total County passenger vehicle transportation emissions (defined as the sum of emissions from drive-alone trips, carpool, autonomous vehicle, and transportation network company VMT) in each of the forecast years, as shown in the table below.

Table 46 Countywide Transportation GHG Reductions from Measure Implementation (MT CO_2e)

	2030	2040	2045	2050
GHG Reductions from quantified measures applicable to Countywide Transportation	14,331	13,017	13,036	14,288
Total legislative-adjusted countywide transportation emissions forecasts for passenger vehicles	2,654,587	1,194,896	810,104	649,078
Reductions as percent of total forecast emissions	0.54%	1.09%	1.61%	2.20%

GHG quantification and reduction values discussed in Sections 4.1 and 4.2 were adjusted following VTA's review of the revised draft GHG Memo to reflect changes in measure quantification methods, adjustments to assumptions or calculations. Final quantification will also need to consider and incorporate staff's final comments and direction on which measures should be included or not included in the CAAP in the next section.

[9] AB 1279 (2022) and the 2022 Climate Change Scoping Plan established a statewide 85% GHG emissions reduction target by 2045, as well as a net-zero GHG target in 2045 assuming that any remaining emissions would be offset by carbon capture, utilization, and storage projects and associated regulations; natural sequestration; or a combination thereof.

5 RECOMMENDATIONS

This section provides recommendations to VTA staff regarding GHG reduction measures that should be prioritized for inclusion in the CAAP, along with a brief discussion of why certain measures should not be included.

5.1 RECOMMENDED GHG REDUCTION MEASURES

After reviewing the results of the draft GHG reduction measures analysis in Section 3 (including staff's comments on the first draft of this Memo), along with the quantification results in Section 4, Ascent recommends that 33 out of the 39 measures analyzed in Section 3 be prioritized in the CAAP. This includes seven out of the eight quantified measures discussed in Section 4. The full proposed list of measures for inclusion in the CAAP is shown in Table 47 below, followed by a brief explanation of why these measures should be included.

Table 47 Proposed GHG Reduction Measures for the CAAP

Focus Area	Strategy	Measure
Transportation and Land Use (TL)	TL-1: Sustainable Roadway Networks and Pricing	TL-1.1: Assist VTA member agencies in implementing SB 743 and mitigating VMT from new land development projects and transportation projects.
		TL-1.2: Continue to build out the countywide Express Lane network to use roadway pricing as a tool to provide reliable travel options and generate a revenue stream for projects that improve the operations of HOV lanes and transit.
	TL-2: Safe and Accessible Active Transportation for All	TL-2.1: Increase bicycle and pedestrian infrastructure and improve the safety of existing facilities, prioritizing investments in disadvantaged communities.
		TL-2.2: Encourage and support efforts to plan and build walkable and bikeable communities, accessible to people of all income levels and races.
		TL-2.3: Support local, county, state, and federal efforts to promote use of electric bicycles as an alternative to driving.
		TL-2.4: Support education and encouragement programs that promote replacing polluting travel with low-emission travel.
	TL-3: Fast, Frequent, and Reliable Public Transportation for All	TL-3.1: Improve reliability and convenience of existing transit services through increased frequency of service, extended service hours, and improved facilities at stops and stations, prioritizing improvements that serve disadvantaged communities.
		TL-3.2: Increase transit travel speed and reliability through transit-signal priority, dedicated bus lanes, and new or expanded Rapid bus service.
	TL-4: Sustainable Land Use, Planning, and Development	TL-4.1: Collaborate with member agencies in advanced planning efforts to increase residential and employment densities and expand mixed-use development potential near rail stations, along Frequent Network bus routes, and in priority development areas (PDAs).
		TL-4.2: Increase development around transit stations and along transit corridors to facilitate multi-modal, carbon-neutral neighborhoods that are sustainable and resilient.
		TL-4.3: Strategically repurpose underutilized parking lots or other vacant lots at or near VTA transit stations and major transit stops into lively mixed-use, transit-oriented communities with activated ground floor uses that increase transit ridership, help provide revenue for transit capital investments and operations, and reduce VMT.
		TL-4.4: Provide people of all generations and backgrounds with affordable housing and access to the necessities of daily life available within a short walk, bicycle ride, or transit trip.

Focus Area	Strategy	Measure
		TL-4.5: Work with member agencies and other partners to focus development where it already exists (i.e., promote infill development) and reduce the impact of development and transportation infrastructure on the environment by protecting open space, conserving and restoring habitat, enhancing biodiversity, increasing carbon sequestration, and improving wildlife connectivity.
	TL-5: Smart Parking and Curbside Management	TL-5.1: Support local efforts to reduce or eliminate minimum parking standards and institute parking maximums, require "unbundling" of parking costs from commercial leasing or residential rental rates, support shared parking, and introduce demand-based parking pricing in public on- and off-street parking facilities.
		TL-5.2: Provide EV charging infrastructure at VTA parking facilities open to the public.
	TL-6: Smart Mobility and Transportation Demand Management (TDM)	TL-6.1: Increase participation in smart commute and mobility options throughout the county including bicycle sharing, ridesharing, car-sharing, mobility-as-a-service, guaranteed ride home programs, carpools, vanpools, and other emerging options.
		TL-6.3: Expand TDM programs and services in partnership with member agencies, employers, schools, and residential communities.
Buildings and Facilities (BF)	BF-1: Clean and Renewable Energy	BF-1.1: Decarbonize existing VTA buildings by phasing out fossil fuel usage and electrifying water heating and space heating or using renewable fuels such as renewable natural gas (RNG) where appropriate.
		BF-1.2: Increase renewable energy, battery storage, and microgrid installations in existing VTA buildings, and/or procure 100% renewable options through local community choice energy (CCE) providers, where applicable.
		BF-1.3: Require all new VTA buildings to be 100% electric and include on-site renewable energy systems with battery storage and microgrids and achieve net-zero standards where feasible.
		BF-1.4: Increase use of electricity and alternative fuels in construction equipment on VTA projects.
	BF-2: Energy Efficiency and Reliability	BF-2.1: Upgrade outdoor lighting at VTA buildings, and at park-and-ride lots and stations to LEDs or other high-efficiency lighting.
		BF-2.2: Reduce energy use in VTA buildings through conservation best practices consistent with LEED®, ENERGY STAR®, or other standards.
Fleet and Employee Commute (FE)	FE-1: Zero-Emission Vehicles	FE-1.2: Replace VTA diesel trucks and other non-revenue VTA vehicles to ZEVs.
		FE-1.3: Expand electric vehicle (EV) and electric bicycle charging infrastructure at VTA buildings to support VTA fleet EVs and employee bicycles.
	FE-2: Zero-Emission Equipment	FE-2.1: Use cleaner fuel, such as renewable diesel, for off-road equipment and construction equipment where feasible.
		FE-2.2: Require ZEV or low-emission vehicle (LEV) equipment in VTA projects.
	FE-3: Operational Efficiency	FE-3.1: Maximize the operational efficiency of VTA vehicles, including reducing vehicle idling.
	FE-4: Employee Commute	FE-4.1: Monitor employee commute patterns to understand employee behaviors, needs, and overall contributions to VTA's operational GHG inventory.
		FE-4.2: Encourage and enable VTA employees to use transit, carpool, bike, and telecommute to work to reduce single-occupancy vehicle commute trips and VMT.

Focus Area	Strategy	Measure
Materials and Waste (MW)	MW-1: Waste Management, Reduction, and Recycling	MW-1.1: Require procurement and operational practices that avoid generation of waste (e.g., reusable materials, reduced packaging, and compostable products).
		MW-1.2: Increase recycling and organic waste diversion at all facilities.
		MW-1.4: Reduce the generation of construction and demolition (C&D) waste in VTA projects, and increase sustainable materials use and recovery.

Source: Ascent 2023.

We recommend that seven out of the eight quantifiable measures identified under Section 4 be included in the CAAP (see discussion further below under subsection 5.2 regarding removal of FE-1.1). It is important to include as many quantifiable measures as possible in the CAAP, and of those that are quantifiable and recommended, they appear to be feasible and are generally aligned with VTA's sustainability goals.

Many of the recommended measures are difficult to quantify at the plan level because quantification is not possible without project-specific details, however several of them are still considered to have at least medium GHG reduction potential and thus should still be included.

While some of the recommended GHG reduction measures were found to have low GHG reduction on their own individually, they may still have considerable GHG reduction potential as a group within a particular strategy or group of strategies. For example, regarding the suite of measures identified under Strategy TL-4: Sustainable Land Use, Planning, and Development; Strategy TL-5: Parking Management and Pricing; and, Strategy TL-6: Smart Mobility and TDM, VTA has an ongoing opportunity to support and collaborate in planning, development review, and community design-focused activities of member agencies who may have a higher degree of jurisdictional control over local land use or right of way improvements under these strategies.

Finally, many of the recommended measures achieve several co-benefits, including addressing the needs of disadvantaged communities, or protecting the environment and public health.

5.2 GHG MEASURES RECOMMENDED FOR REMOVAL

We recommend that the following six measures not be considered further for inclusion in the CAAP. Specific reasons are included under each measure.

- TL-1.3 (Enhance the efficacy and performance of HOV lanes)
  - This measure will not be included in the CAAP following discussions with VTA staff. VTA has no jurisdiction and limited influence over HOV lanes, which are under the jurisdiction of Caltrans and enforced by the California Highway Patrol.
  - Measure TL-1.2 is a priority for VTA at this time, given that federal and state agencies are actively supporting local efforts to transition HOV lanes to Express Lanes.
- TL-6.2 (Channel the deployment of autonomous vehicles, ride-hailing services, and other new mobility options…)
  - VTA's jurisdictional control over AV's and other privately operated services is low and the implementation timeframe and approach are unclear.
  - Staff comments on this measure expressed concern regarding VTA's lack of authority or ability to form partnerships with these private companies, largely due to their track record of very limited cooperation with public agencies around the United States. Staff comments also indicated that without a clear sense of how

this measure would be implemented in practice and given the lack of helpful precedents or examples, it may not be worth exploring or developing further.

- BF-2.3 (Update VTA's policies…to increase energy efficiency and complete energy audits of existing buildings)
  - Staff comments indicated that this measure overlaps with Measure BF-1.1 (Decarbonize existing buildings) as both include implementing actions that relate to energy efficiency. Rather than combine measures together, we recommend removing BF-2.3 altogether if VTA staff agrees that the implementation actions for BF-1.1 would include audits of existing facilities that could address both energy efficiency and decarbonization approaches when considering a holistic, comprehensive approach to energy in existing VTA buildings.
- BF-2.4 (Microgrids)
  - Edits to BF-1.2 and BF-1.3 include references to microgrids as part of increasing renewable energy, battery storage, and microgrids in existing or new buildings. Thus, a separate measure for microgrids is not included for GHG reduction purposes.
- FE-1.1 (Accelerate zero-emission bus (ZEB) and paratransit zero-emission vehicles (ZEV) replacements…)
  - Staff comments indicated that the ZEB transition is already occurring at a measured pace that balances cost, risk, and potential disruptions to VTA's ability to provide service; and that accelerating the transition could result in serious costs from making wrong decisions that could harm VTA's ability to provide reliable service to the public.
  - As noted in the VTA inventory and forecast, existing laws and regulations are either in place or are reasonably foreseeable and would result in substantial reduction and eventual elimination of revenue and non-revenue GHG emissions over the long-term, regardless of whether VTA accelerates ZEB and paratransit replacements. Thus, achievement of VTA's longer-term 2040 target would not be impeded by eliminating this measure.
- MW-1.3 (Require food waste composting and composting of biomass generated from landscape maintenance)
  - Staff commented that the State already requires composting of organics via SB 1383, and that therefore, MW-1.3 is not needed.
  - Staff also pointed out that MW-1.2 addresses recycling and organic waste diversion more broadly and could overlap with the intent of this measure.

5.3 NEXT STEPS

In conclusion, the menu of strategies, measures, and implementing actions identified in this section represent the most effective way to reduce GHG emissions based on the prioritization criteria. They will be included in the draft CAAP for consideration by stakeholders and the public. Refinements will continue to be made based on the input received during the CAAP review process.

6 REFERENCES

California Air Pollution Control Officers Association. 2021 (December). *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity*. Final Draft. Available: https://www.airquality.org/ClimateChange/Documents/Final%20Handbook_AB434.pdf. Accessed May 24, 2023.

California Air Resources Board. 2022 (November). *Climate Change Scoping Plan, Appendix E: Sustainable and Equitable Communities*. Available: https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-e-sustainable-and-equitable-communities.pdf. Accessed May 24, 2023.

California Department of Resources Recycling and Recovery. 2023a. Environmentally Preferable Purchasing (EPP). Available: https://calrecycle.ca.gov/EPP/. Accessed May 24, 2023.

———. 2023b. Zero Waste Communities. Available: https://calrecycle.ca.gov/ZeroWaste/Communities/. Accessed May 24, 2023.

California Air Resources Board's EMisson FACtor 2021 Model. 2023. Available: https://arb.ca.gov/emfac/. Accessed June 23, 2023.

CalRecycle. *See* California Department of Resources Recycling and Recovery.

CAPCOA. *See* California Air Pollution Control Officers Association.

CARB. *See* California Air Resources Board.

Energy Solutions Center. N.d. Natural Gas Furnaces. Available: https://naturalgasefficiency.org/for-residential-customers/heat-gas_furnace/#:~:text=All%20furnaces%20built%20and%20sold,furnace%20with%20standing%20pilot%20%E2%80%93%2050%25. Accessed May 24, 2023.

EMFAC. *See* California Air Resources Board's EMisson FACtor 2021 Model.

ESC. *See* Energy Solutions Center.

Governor's Office of Planning and Research. 2018. *Automated Vehicle Principles for Healthy and Sustainable Communities*. Available: https://opr.ca.gov/docs/20181115-California_Automated_Vehicle_Principles_for_Healthy_and_Sustainable_Communities.pdf. Accessed May 24, 2023.

Mozingo, Louise. 2021 (January). Zero-Carbon Buildings in California: A Feasibility Study.

OPR. *See* Governor's Office of Planning and Research.

Santa Clara Valley Transportation Authority. 2020. *Sustainability Plan 2020*. Available: https://www.vta.org/sites/default/files/2020-06/SustainabilityPlan2020_Accessible_0.pdf. Accessed June 26, 2023.

———. 2022a. Visionary Network. Available: https://www.vta.org/projects/visionary-network. Accessed May 24, 2023.

———. 2022b. *Transit First in San Jose*. Available: https://www.vta.org/blog/transit-first-san-jose#:~:text=Average%20VTA%20bus%20speeds%20have,traveled%2011.6%20miles%20per%20hour. Accessed June 26, 2023.

———. 2023a Guiding Principles of Land Use – Home Page. Available: https://www.vta.org/cdt/guiding-principles-land-use-home-page. Accessed May 24, 2023.

———. 2023b (March). *2022 Affordable Housing Report, VTA Transit-Oriented Development*. Available: https://www.vta.org/sites/default/files/2023-03/VTA-2022-Affordable-Housing-Report-Final-3-29-23.pdf. Accessed May 24, 2023.

———. 2023c (February). *GHG Emissions Inventory and Forecast for Countywide Transportation and VTA Transit Operations (Final).* Prepared by Ascent Environmental, Sacramento CA.

———. 2023d (June). Chen, Peter. Senior Transportation Planner. VTA, San Jose, CA. June 22, 2023—email message transmitting Visionary Network modeling data.

———. 2023e (June). Soriano-Ramos, Janice. Senior Transportation Planner. VTA, San Jose, CA. June 23, 2023—email message regarding VTA hours of operations in the Visionary Network.

———. 2023f (June). *Santa Clara Valley Board Action 8408.* Available: http://santaclaravta.iqm2.com/Citizens/Detail_LegiFile.aspx?Frame=&MeetingID=3929&MediaPosition=&ID=8408&CssClass= Accessed June 26, 2023.

StopWaste. 2022 (June). *Sustainable Procurement Policy Template*. Version 1.0. Available: https://www.stopwaste.org/sites/default/files/Sustainable%20Procurement%20Policy%20Template%20Final.pdf. Accessed May 24, 2023.

VTA. *See* Santa Clara Valley Transportation Authority.

ATTACHMENT 1 – GHG REDUCTION MEASURES WORKBOOK

A copy of the draft GHG Reduction Measures Workbook file in Excel format will be transmitted with this memo. While not embedded in this Word document directly, the separate Excel file is considered an attachment to and supportive of the information contained in this memo. Please see the main body of the memo for an explanation of the GHG Reduction Measures Workbook and its purpose and contents.

ATTACHMENT 2 – MEASURES QUANTIFICATION WORKBOOK

A copy of the draft Measures Quantification Workbook file in Excel format will be transmitted with this memo. While not embedded in this Word document directly, the separate Excel file is considered an attachment to and supportive of the information contained in this memo. Please see the main body of the memo for an explanation of the Measures Quantification Workbook and its purpose and contents.

This page intentionally left blank.