

TRANSIT ASSET MANAGEMENT PLAN

2022



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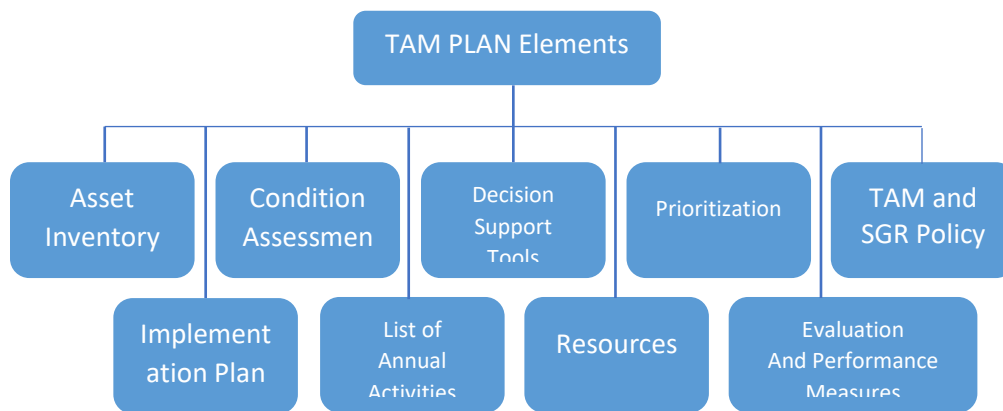


Executive Summary

Executive Summary

The Federal Transit Administration (FTA) released the Transit Asset Management (TAM) Final Rule in 2016. The overarching goal of a transit asset management (TAM) program is to ensure that transit providers manage their assets in a consistent and measurable state of good repair (SGR). The TAM Final Rule established minimum Federal requirements for transit asset management that will apply to all recipients and subrecipients of chapter 53 funds that own, operate, or manage public transportation capital assets. The rule also provided a definition of what a SGR encompasses.

FTA's final rule requires public transportation providers to develop a Transit Asset Management (TAM) plan. A TAM Plan involves all activities related to maintaining thousands of physical assets, such as rolling stock, maintenance facilities, administrative facilities, and stations in an SGR, and to the provision of a safe and reliable public transit service. Transit agencies are divided into two tiers in the TAM Final Rule. Tier 1 Agencies are those that have more than 100 buses on transit routes at any one time or have a fixed guideway. By this standard, VTA is a Tier 1 agency and must meet all nine of the TAM Plan Elements established in the final Rule.



TAM plans are required to include an asset inventory, condition assessments of inventoried assets, and a prioritized list of investments to improve the state of good repair of their capital assets. MAP-21 established the requirements, which have been confirmed by the FAST Act and the recently passed Bipartisan Infrastructure Law (IIJA/BIL), requires prioritizing capital investments based on performance, condition, and risk.

Santa Clara Valley Transportation Authority (VTA) provides bus, light rail, and paratransit services. VTA also serves as the Congestion Management Agency (CMA) for Santa Clara County. VTA and Bay Area Rapid Transit (BART) are cooperating on a major project to extend BART service south from Fremont and into Santa Clara County. Phase I (to Berryessa Station) was opened for revenue service in 2020. VTA has been studying route changes to better connect the new rapid transit stations to the VTA service network. When completed, each phase of the BART extension, the assets will become the property of VTA, requiring inspection and maintenance in the near term, and capital investments in the longer term.



The TAM Plan incorporates current asset management best practices, FTA guidance, and local policies that define practical and cost-effective asset management implementation for years to come. This Plan is a living document, which, consistent with Federal direction, will be updated every four years.

Development of this Transit Asset Management Plan included participation and input from many key stakeholders that have a role in asset management across VTA, including:

Executive Team: Carolyn Gonot, CEO/GM; Greg Richardson, CFO; Deborah Dagang Chief Planning and Programming Officer; Casey Emoto, Chief Engineering and Program Delivery Officer.

Asset Management Plan Development Team: Marcella Rensi, Deputy Director Grants and Allocations; Bruce Abanathie, Principal Planner/Asset Management Program Manager; David Mulenga, Sr. Planner TAM; Ayeh Khajouei, TP III TAM; Triana Crighton, TP II Grants and Allocations.

A large part of our TAM efforts is attributable to the TAM Workgroup

VTA Asset Management Working Group 2022

Name, Position	Division/Department	Purpose/Role
Greg Richardson, CFO	Finance and Budget.	Exec. of AM Program
Deborah Dagang, Chief	Planning and Programming	Transit & Environmental Planning. Became Exec. of TAM 9/1/2022
Marcella Rensi, Dep. Dir.	Grants and Allocations	AM Admin, CIP Dev.
Bruce Abanathie, Principal Planner	Grants and Allocations	AM Program Manager
David Mulenga, Sr. Planner	Grants and Allocations	AM Projects Manager
Chao Liu, Sr. Planner	Planning/GIS	Data - location capture
Terresa Lee, IT Systems Supv.	IT	Tech Assets, Software, SAP
Luke Travers, Sr. Bus. Systems Analyst	IT	Tech Assets, Software
Richard Bertalan, Chief Information Officer	IT	It Assets and Programs
Grace Ragni, Assistant Contoller	Finance & Budget	Capital Accounting
Murali Ramanujam, Toll Systems. Mgr.	Toll Systems/Traffic Eng.	Highway Assets (Express Lanes)
Arshad Syed, Sr. Transportation Engineer	Toll Systems/Traffic En.	Highway Assets (Express Lanes)
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Suja Prasad, Project Controls	ETPD	Cost Controls
Adolph Daaboul, Sr. Engineer	ETPD	Condition Assessments
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Mel Gonzales. WP&S	Operations	Way/Power/Signal/LR Stations
Diego Carillo, WP&S	Operations	Way/Power/Signal/Maintenance
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Lalitha Konanur, Manager	Ops Analysis and SCADA Systems	Performance Monitoring
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Adam Burger, Sr. Planner	Planning	SRTP Planner
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Antonio Tovar, Transit Systems Safety Supervisor	Systems Safety & Security	Safety Inspections, Performance, & Response
Susan Lucero, Safety Manager	Systems Safety & Security	Safety Inspections, Performance, & Response
Stephen Flynn, Sr. Policy Analyst	Grants and Allocations	Long term CIP
Michael Smith, acting Deputy Director Finance & Administration	Budget Director	Budget Information/Direction
Suet Nguyen, Sr. Management Analyst	Grants & Allocations	Asset Management Program Resource
SVBX Team (in addition to the TAM Team)		
Evelyn Ho	SVRT	O&M Agreement Engineer
Toby Hemphill	SVRT	
John Rowe	SVRT	
Express Lanes Team (FHWA Assets) (in addition to TAM Team)		
Murali Ramanujam, Toll Systems. Mgr.	Toll Systems/Traffic Eng.	Highway Assets (Express Lanes)
Arshad Syed, Sr. Transportation Engineer	Toll Systems/Traffic Eng.	Highway Assets (Express Lanes)
Gene Gonzalo, Engineering Group Mgr	Hwy Cap Prog	Express Lanes Dev. Mgr.
Charmaine Zamora, Proj. Dev. Engineer	Hwy Cap Prog	Express Lanes Designer and PM

Development of the 2022 TAM Plan

Development of the 2018 TAM Plan was centered around identifying asset management processes already in place at VTA and the processes required by the recently approved FTA program and best practices. The gaps analysis performed by VTA revealed several gaps in best practices, particularly a lack of agency wide coordination/communication among various divisions with asset management related functions to prioritize asset renewal based on a common understanding of condition, performance, and risk of the assets that make up the system. Improving VTA’s business processes, information tools, and asset re-investment decision making requires increased awareness and focus of asset management techniques. Since the completion of the 2018 TAM Plan, VTA has worked to improve this gap and has advanced its interdepartmental communications effectiveness.

Assessing the Maturity of the VTA TAM Program

In developing the 2022 TAM Plan we assess the progress in closing the gap between VTA practices and best practices since the 2018 TAM Plan. In so doing, we move from the development steps used to create the 2018 TAM Plan:

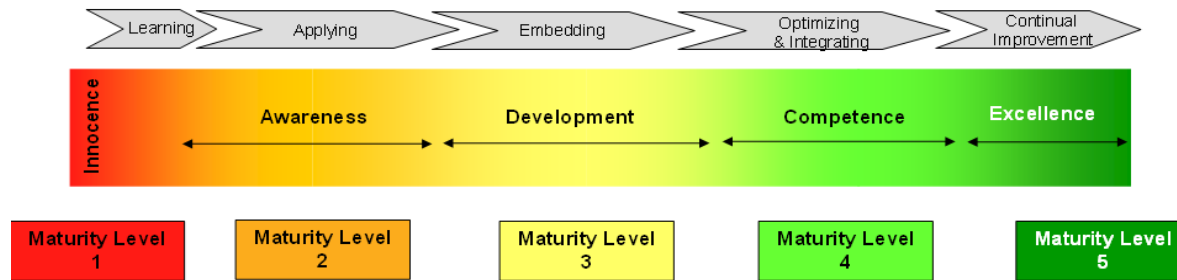
- The Diagnostic Phase establishing a TAM Baseline;
- The Blueprinting Phase setting Policy, goals, and Objectives, performing a Gaps Analysis and establishing a Performance Measurement Framework; and
- The Implementation Phase - developing the 2018 TAM Plan (as shown below)

TAM Plan Development Phases



In the preparation of the 2022 TAM Plan, with our focus being on how VTA has progressed in the development of the TAM Program. We move to the FTA Maturity Assessment Scale (as shown below) as our basis for TAM Plan development.

TAM Plan Maturity Scale



To assess VTA’s current level of Maturity we surveyed the TAM Workgroup using the recommended Key Areas of Good Asset Management Practice and asked them to rate the maturity of the program from their perspective (described below).

Table ES.2. Results of the Maturity Assessment Survey	
Key Areas of Good Asset Management Practice	Weighted Average in 2022
Asset Management Organizational Context	
How well has VTA defined organizational objectives and the needs of stakeholders	3.35
How do these shape the scope of the AM System?	2.93
Asset Management Vision & Leadership	
Does VTA Leadership lend its authority to supporting the AM System.	2.87
Asset Management Regulations/Performance (Ridership Forecasting, Regulations, Service Levels)	
Has VTA defined and quantified its external drivers of service	3.38
How well do these relate to the need for organizational objectives to drive AM processes	3.08
Asset Management Information Requirements	
How well does VTA define, record, analyze, and control required AM data a	3.06
Planning to Meet Asset Management Objectives	
What strategic and tactical planning processes does VTA utilize to ensure that risks are managed, that short, medium, and long-term plans are developed	2.64
Operational Planning and Control	
What processes are in place to ensure that plans are implemented, day to day maintenance requirements are defined and undertaken.	3.00
Asset Management Enablers & Support	
How well does VTA support ongoing implementation, application, and continual improvement of its AM system through staff development, communication, and change mgt.	2.57

Although the ratings show room for maturing still remains in all areas, all areas also showed an improvement over the 2018 TAM Plan ratings and VTA currently stands at generally the “embedding” or “development” level of maturity. The TAM Team and the TAM Workgroup are satisfied with this current level of maturity rating going into our first renewal of the TAM Plan.

In addition to the ratings, the TAM Team asked for specific comments related to the reason for the ratings provided by the Workgroup. VTA has already started using these comments to establish sub-workgroups to improve the areas identified as benefiting from improvement in both the ratings and comments. For example, since communication is still an area for improvement, one of our sub-workgroups is focused on improving communications among the various divisions and functional areas of asset management practice.

TAM Inventory, Financial Modeling, and Investment

One of the most improved and effective key areas of asset management is the tracking and financial modeling of the VTA TAM inventory. Santa Clara Valley Transportation Authority (VTA) operates and maintains approximately \$4.3 billion in physical assets. The inventory is maintained in the VTA’s Regional Transit Capital Inventory (RTCI) format for data sharing with FTA and the Bay Area Metropolitan Planning Organization, the Metropolitan Transportation Commission (MTC). The inventory is updated from various sources, mainly SAP Fiscal Asset Register, the Engineering Construction Library, and the operation’s database for fleet of both revenue and non-revenue vehicles.

VTA utilizes FTA’s TERM Lite program for financial modeling. From this program VTA is able to estimate its current and projected state of good repair (SGR) backlog and establish an investment priority program that includes an asset risk register.

TERM’s Prioritization Scoring: TERM Lite prioritizes reinvestment needs based on five investment criteria:

- Estimated asset condition (decay curve based),
- Reliability
- Safety / Security
- Impact of reinvestment on reliability, safety, and O&M costs (each as separate criteria),
- A user defined criterion (optional - VTA has added Risk as a criteria).

Table 3.5. Estimated Unconstrained Reinvestment Needs by VTA Asset Type in \$000s of Year of Expenditure Dollars

Category	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31
Facilities	\$64.3	\$89.8	\$92.0	\$84.4	\$88.1	\$74.9	\$97.2	\$121.4	\$124.8	\$132.8
Guideway Elements	\$17.0	\$32.3	\$37.2	\$44.5	\$91.3	\$80.1	\$68.5	\$86.5	\$95.3	\$107.5
Stations	\$22.9	\$64.4	\$72.9	\$89.7	\$93.1	\$98.9	\$144.8	\$191.9	\$225.0	\$245.2
Systems	\$62.8	\$112.0	\$91.4	\$55.4	\$59.9	\$54.7	\$85.9	\$106.3	\$179.2	\$207.0
Vehicles	\$73.7	\$29.8	\$20.7	\$2.2	\$3.0	\$12.8	\$2.4	\$33.8	\$19.9	\$5.0
TOTAL	\$240.6	\$328.3	\$314.2	\$276.2	\$335.3	\$321.4	\$398.7	\$539.9	\$644.2	\$697.6






TAM Policy, Goals, and Objectives

In addition to an approved AM Policy in place at VTA, VTA developed asset management goals and objectives to help define the policy direction for Asset Management activities and guide the agency’s efforts.

VTA’s Policy Statement

Identifies VTA’s investment in its asset base as critical to the economic vitality and quality of life in the region. VTA is committed to maintaining its assets in a State of Good Repair through financial stewardship and reinvestment, promoting a culture that supports asset management across the organization, and focusing on high-quality information and a risk-based approach as the basis for decision making.

Table 2.3. VTA TAM Goals and Objectives

Area	Proposed TAM Goal	Proposed Objectives
Safety 	Maintain VTA assets in a State of Good Repair to support a safe operating environment	<ul style="list-style-type: none"> • Maintain equipment in SGR • Measure and manage TAM-related risks • Document root cause analysis for asset failures
Fiscal sustainability 	Build and promote financial sustainability through the implementation of asset management best practices	<ul style="list-style-type: none"> • Establish linkage between multi-year SGR needs, annual budget process, and Capital Improvement Program. • Develop an objective method to prioritize capital projects and assess trade-offs between competing investments • Implement a minimum life cycle cost policy
Investing in assets/ SGR 	Invest in VTA assets and SGR	<ul style="list-style-type: none"> • Develop Plan and policy consistent with MAP-21 requirements • Establish clear capital replacement and rehabilitation plans, and monitor adherence • Develop asset management systems approach
Organizational efficiency 	Demonstrate organizational efficiency for asset management processes and outreach to member agencies	<ul style="list-style-type: none"> • Build understanding and support for asset management at the VTA executive level • Assess and implement toolbox to support data-driven asset management decisions • Improve and expand communications with member agencies regarding well-documented SGR needs and priorities
People and TAM culture 	Promote asset management culture at VTA	<ul style="list-style-type: none"> • Advance awareness for TAM across all levels at VTA • Develop and retain well trained TAM workforce

TAM Plan Implementation

implementation of the TAM Plan identifies how VTA will meet its asset management goals and external requirements related to the 2021 Infrastructure Investment and Jobs Act (IIJA) (also known as the Bipartisan Infrastructure Law ((BIL)). Integral to the Plan is the implementation of the policy, governance and accountability structure for implementation. Establishing direction for asset management practices, as well as defining divisional roles and responsibilities.

The 2022 TAM Plan establishes a timeline for VTA to implement its asset management action plan, using short term (years one and two), medium term (years three and four), and long term (five+ years) as the time designations. Implementation is divided into 21 action plans addressing tasks to advance TAM and SGR at VTA.

Silicon Valley Rapid Transit Program

The 2022 TAM Plan addresses a new set of assets which were added to VTA’s family of assets with the opening of the first phase of the Silicon Valley Rapid Transit (SVRT) line to Berryessa Station in the 2019/2020 Federal Fiscal Year (FFY). SVRT extends the Bay Area Rapid Transit (BART) system southward into Santa Clara County. All SVRT assets are owned by VTA. Because this represents a new set of assets (distinct from traditional VTA assets) with joint asset responsibilities shared between VTA, BART, and other jurisdictions these assets are described in a stand-alone chapter.



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CHAPTER 1

Introduction

1. Introduction






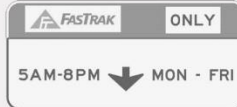
1.1 Background

The Federal Transit Administration (FTA) developed the Transit Asset Management (TAM) Program as a result of direction from the Moving Ahead for Progress in the 21st Century (MAP-21) Legislation (2012) and confirmed by the Fixing America’s Surface Transportation (FAST) Act (2015). FTA Published the Final Rule in June 2016.

The FTA defines asset management as *a strategic and systematic process through which an organization procures, operates, maintains, rehabilitates, and replaces transit assets to manage their performance, risks, and costs over their lifecycle to provide safe, cost-effective, and reliable service to current and future customers.* The term “asset” refers to physical equipment and infrastructure including rolling stock, guideways, stations, facilities, systems, tools, gantries, signs, etc. that makeup VTA’s transit and highway services. This TAM Plan is a working document that provides a strategy to coordinate various interdependent business processes, activities, and tools, thus enabling VTA the efficient management of its assets.

VTA completed and approved the original Transit Asset Management (TAM) Plan in advance of the October 2018 deadline. That TAM Plan met all FTA requirements for TAM Plans based on the 2016 guidance issued by FTA. This second installment of the TAM Plan will be an update of the 2018 TAM Plan; as the guidelines and requirements for TAM Plans have not changed, we will be addressing the changes in VTA’s TAM program in this 2022 TAM Plan

One of the largest transit networks in the San Francisco Bay Area, VTA continues to expand its service. VTA currently operates 440 buses along 54 routes: ranging from 30’ community buses to 60’ articulated buses. Included as part of the bus network, VTA operates a 7-mile bus rapid transit line with 1.4 miles of the exclusive busway and 10 stations (new since the 2018 TAM Plan). VTA operates 98 low floor light rail vehicles with three light rail lines in service along a 42-mile system network.

 <p>440 buses 30’ community buses and 60’ articulated buses 54 Bus Routes</p>	 <p>3 Bus Operation Buildings 1 Overhaul & Heavy Repair Building 1 Light Rail Operation Division 1 Main Headquarters Building</p>
 <p>98 Light Rail Vehicles 42-Mile System Network New 7-Mile RTL and 10 Stations</p>	 <p>Paratransit Services Paratransit Administration Building</p>
 <p>Phase I SVRT, 10.1 Miles & 2 Stations Phase II SVRT, underway Manage SVRT Assets</p>	 <p>Electronic Toll System Toll Message Signs, Cameras, Lane Controllers, and Sensors</p>

VTA is also the sponsor and architect of the extension of the Bay Area Rapid Transit (BART) system into Santa Clara County, known as the Silicon Valley Rapid Transit Project (SVRT). Phase I of the SVRT, adds approximately 10.1 miles of passenger rail track and two new stations. Phase I opened in 2020 and Phase II is underway. While VTA will own all assets and maintain capital responsibility, BART and VTA will jointly manage the assets, and BART will operate and maintain the rail service. VTA also operates a paratransit service with a VTA-owned paratransit administration building. VTA manages three bus-operating divisions, one that includes the overhaul and heavy repair (O&R), and one light rail operating division. VTA also owns the main administrative headquarters buildings at River Oaks and N. 1st Street, San Jose.





As the Congestion Management Agency responsible for the Express Lanes Program, VTA is responsible for electronic toll systems assets. Typical electronic toll systems assets include variable toll message signs, cameras, lane controllers, and sensors, as well as underlying network equipment. The valuation of these assets is relatively small compared to that of the transit assets. For completeness, an inventory of these assets is included in this TAM Plan.

VTA is led by a 12-member Board of Directors, including two members of the Santa Clara County Board of Supervisors, five San Jose City Council members, and five City Councilmembers selected from the 14 other cities in the county. VTA is a member of the Peninsula Corridor Joint Powers Board, which includes Caltrain commuter rail (providing one-third of the annual operating funds and capital funds for specified projects). VTA is also a member agency of Capitol Corridor Joint Powers Authority, which manages Amtrak Capital Corridor intercity rail service as well as a member of the Altamont Commuter Express (ACE) Joint Powers Authority (ACEJPA) which oversees the ACE service.

This TAM Plan examines current TAM practices, identifies program maturation since the 2018 TAM Plan, addresses FTA guidance, and updates the action plans first addressed in the 2018 TAM Plan that will help ensure that the VTA system continues to provide a safe, reliable, and high-quality service in the future. The benefits to VTA of the asset management activities described in this TAM Plan are listed in Table 1-1. The asset inventory and backlog calculations presented herein are based on a snapshot of the state of VTA assets and updated as of the writing of this TAM Plan. The TAM Plan is intended to set VTA on a course toward efficient and effective asset management.



Table 1.1. Benefits of Transit Asset Management for VTA

Agency Business Benefits	Results	
Improved customer service	<p>Improves on-time performance and service operations; vehicle and facility cleanliness; reduces missed trips, slow orders, and station shutdowns.</p> <p>Focuses investments on customer-centered goals and metrics</p>	
Improved productivity and reduced costs	<p>Maintains assets more efficiently, using condition-based approaches and using predictive and preventive maintenance strategies (where these can be employed) to reduce costs while improving service delivery.</p> <p>Benefits for SGR projects exceed expenditures. Example: A Benefit Cost Ratio of 2.6 to 2.8 was calculated for BART.</p>	
Optimized resource allocation	<p>Establish SGR requirements both in the short and long terms.</p> <p>Better aligns spending with the agency's goals and objectives to obtain the greatest return from limited funds.</p> <p>Incorporates life-cycle cost, risk, and performance trade-offs into capital programming and operations & maintenance budgeting.</p>	
Improved stakeholder communications	<p>Provides stakeholders with more accurate and timelier customer-centered performance indicators</p> <p>Provides tools to communicate forecasted performance metrics (including the level of service) based on different levels of funding.</p>	

Source: USDOT, FTA. Asset Management Guide: Focusing on the Management of our Transit Investments, 2013 and MTC

1.2 Content

The Plan addresses all of FTA's nine transit asset management rulemaking elements (NOTE: these are not listed in an intended outline order). These are listed in parentheses in the descriptions below, numbered 1 through 9.

This TAM Plan's required elements are contained within the following sections:

- **Chapter 1: Introduction** – This introduces the TAM Program and the TAM Plan, including its purpose and methodology.
- **Chapter 2: Capability and Condition Assessment** – This section provides a broad description of the “current asset management situation” at VTA: baseline TAM capabilities and

program maturity based on a survey of a broad base of staff participating in asset management, and business process reviews conducted in 2020. The section also contains a high-level list of VTA's asset inventory (Element 1), revisions to which were completed in June 2021. Finally, this section includes condition assessment (Element 2) ratings, and both physical inspections and modeled condition curves.

- **Chapter 3: Reinvestment Needs and Prioritization** – This provides a description of VTA's decision support tools and its capital project prioritization approach (Element 3) and investment priorities (Element 4). Provided below is the VTA capital asset backlog, followed by both constrained and unconstrained needs projections, updated to 2022. Analysis section 3 is based on the revised asset inventory, in 2022 dollars.
- **Chapter 4: Policy, Governance, and Accountability** – This section provides for the establishment of VTA's TAM policy and accountability (Element 5) which form the basis for VTA's vision for asset management. In addition, the section identifies further drivers for VTA's TAM policy consistent with FTA direction.
- **Chapter 5: Implementation** – This section contains the history and roadmap for VTA's Plan implementation. It regroups the following items: high-level schedule; governance; list of actions/milestones/resources (Elements 6-8); systems/ EAM; performance measures; and a process for continuous improvement (Element 9).
- **Chapter 6: Silicon Valley Rapid Transit (SVRT)** – This section contains the SVRT assets owned by VTA. It represents a new set of assets (distinct from traditional VTA assets) with joint asset responsibilities shared between VTA, BART, and other jurisdictions these assets are described in a stand-alone chapter.

1.3 Purpose

The main purpose of this TAM Plan is to continue to practice good asset management practices and recommend action plans for continued implementation and improvement that will help VTA transition from reinvestment decisions based on historical preferences and spending levels to a condition and risk-based SGR prioritization process. MAP-21 created new asset management requirements for FTA grantees to promote accountability and implement a strategic approach for assessing asset reinvestment needs and prioritizing these investments for bringing the nation's public transit systems into SGR.

VTA has improved its ability to manage and report on asset conditions, forecast costs for rehabilitation and replacement, and make optimal cost-effective investment prioritization decisions primarily through improved communication and collaboration among the departments and divisions of VTA responsible for asset creation and management.

One key purpose of this Plan is to continue to impress the importance of transit asset management to the entire VTA organization. Previous interviews with executives, workshops, and ongoing dialogue and discussion via the TAM Workgroup have helped to advance this process.

MAP-21 and subsequent transportation legislation require transit agencies to develop TAM Plans with capital asset inventories, condition assessments, and capital investment prioritization. The FTA released its Final TAM Rule in July 2016, which included a schedule for reporting performance targets and annual results of performance tracking, and a defined state of good repair.

FTA released additional rules regarding NTD annual reporting, which expanded inventory requirements and performance measures. The first narrative report to explain performance was reported in FY19. Table 1-2 summarizes these new reporting areas (nine “elements” for TAM and one for NTD).

Table 1.2. FTA Final Rule Plan Requirements

Element		Description
1	Asset Inventory	List of transit capital assets and their condition (TAM and NTD)
2	Condition Assessment	Asset condition ratings. Facilities / stations from on-site assessment
3	Decision Support Tools	Methodology / tools used to create Plan (e.g., TERM Lite)
4	Prioritization	Prioritized list of SGR projects, using criteria such as safety and cost
5	TAM and SGR Policy	Policies, strategies, and executive directions to support goals for Plan
6	Implementation Plan	Processes to follow to achieve the Plan
7	List of Annual Activities	Activities deemed critical to achieving TAM goals for the year
8	Resources	Estimate of financial resources necessary to implement the Plan
9	Evaluation	Continuous TAM improvement plan with milestones and timelines
NTD	Performance Measures	Agency and FTA required performance measures / targets

This TAM Plan was developed according to standards set by Institute for Asset Management (IAM) and the FTA.

- The International Standard for Asset Management Systems, ISO-55001:2014
- The FTA Asset Management Guidance.

In addition to meeting MAP-21 requirements, VTA’s Plan will help the agency manage and maintain its assets more effectively. The VTA TAM Plan provides guidance for the following:

- Implementation of business processes that integrate prioritized asset renewal needs to be based on condition and performance, with recommendations for programmed funding levels in the planning process and asset project selection in the annual budget process.
- Application of a phased approach for upgrading and integrating VTA’s current asset management databases into one centralized system.

- Development of an asset management culture at VTA and increasing the organizational efficiency of asset management processes and outreach to funding agencies.

1.4 Development of the 2022 TAM Plan

A VTA TAM program manager and project manager in the Grants and Fund Allocations Unit led this effort, with support from the General Manager, Division Directors, TAM Workgroup, additional Grants Staff, and asset managers. The Plan development was the focus of a 13-month, six-step process (Table 1.3).

The following steps identify the process of developing the 2018 TAM Plan and the modifications of that document to create the 2022 TAM Plan:

Table 1.3. VTA 2022 TAM Plan Steps
<p>Step 1: VTA's TAM Baseline</p> <p>For the 2018 TAM Plan; we performed an initial assessment to evaluate VTA's current awareness of asset management issues and capabilities, as they relate to agency characteristics, business processes, capacity to maintain assets in SGR, and resource availability. The assessment consisted of interviews with key executive stakeholders and two half-day Comprehensive Asset Management Review and Assessment (CAMRA) workshops with stakeholder groups aligned by major asset class.</p> <p>For the 2022 TAM Plan; we reexamined the elements established for the 2018 TAM Plan: the modifications and maturation of these elements and the TAM Program as a whole.</p>
<p>Step 2: Business process reviews (BPR)</p> <p>For the 2018 TAM Plan; Eight key asset management business processes were identified, analyzed in-depth, and then mapped, working with the owners of each process. Reviews consisted of mapping "as is" processes, and then formulating "to be" processes recommended by staff. In addition, the BPRs evaluated asset management processes based on the business process areas identified in FTA's Asset Management Guide.</p> <p>For the 2022 TAM Plan; These business processes were once again reviewed and assessed for improvement and streamlining. We assessed the progress toward the identified "to-be" processes.</p>
<p>Step 3: Define VTA's TAM Goals and Objectives</p> <p>For the 2018 TAM Plan; TAM goals and objectives unique to VTA were developed to create the TAM direction and guide the development of the TAM implementation program. TAM goals and objectives support VTA's overall mission, vision, and organizational goals. Elements of a TAM policy was also drafted to initiate the process of formally adopting a TAM policy.</p> <p>For the 2022 TAM Plan; The goals, objectives, and Tam Policy, approved in May 2019, were reexamined, and considered for further improvements and inclusion in a TAM procedure.</p>
<p>Step 4: Analyze Gaps</p> <p>For the 2018 TAM Plan; A gap analysis identified the differences between VTA's current baseline TAM capabilities and best practices/TAM vision to determine key areas for improvement and to help</p>

develop and meet VTA's TAM goals and objectives. The analysis provided an examination of gaps in practice relative to Federal guidance and best practices from other transit agencies. The gaps were organized by business process area and then matched to the TAM goals and objectives. This analysis forms the basis for the actions and initiatives contained in the Implementation program.

For the 2022 TAM Plan; We continue to evaluate our practices and analyze the gaps between our current position and our goals.

Step 5: Performance Measurement Framework

For the 2018 TAM Plan; A Performance Measurement framework was developed to provide a process for measuring VTA's performance in achieving SGR against VTA's TAM goals and objectives. The framework proposed candidate performance indicators to establish a baseline and monitor progress towards short-term and medium/long-term action plans to address asset management goals.

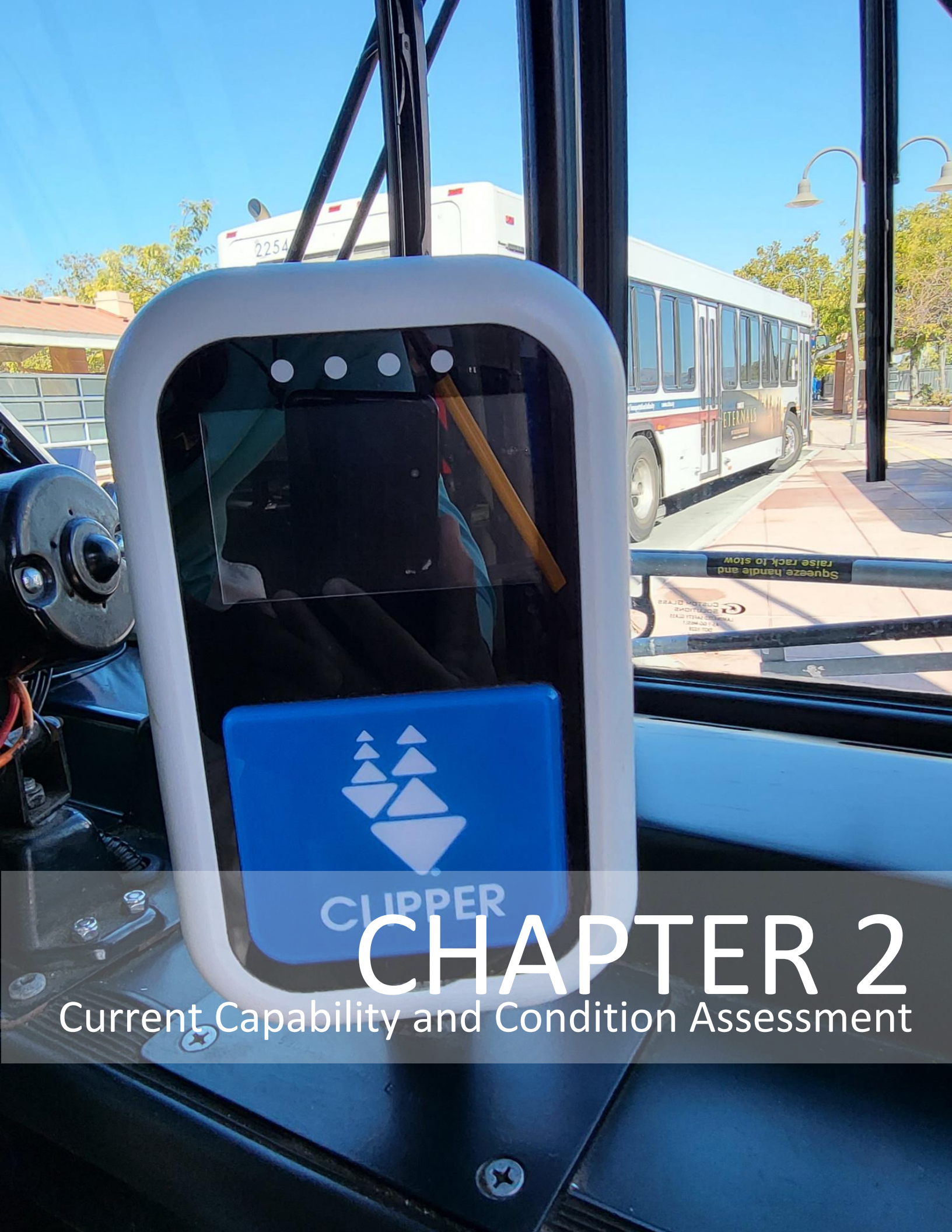
For the 2022 TAM Plan; Using the Performance Measurement Framework, we established performance targets for each of the asset categories and measured the results against the actual performance within the TAM program. We have met all performance targets established and continue to evaluate the asset performance and set targets for future TAM goals and objectives.

Step 6: Develop Plan Implementation Program

For the 2018 TAM Plan; VTA Developed an Implementation Plan Timeline. After the TAM Plan was approved, VTA followed the implementation program consisting of eight action bundles to identify actions to close VTA's TAM maturity gap and to establish a high-level framework to advance TAM goals and objectives. The eight Action Bundles were divided into Short Term (up to two years), Medium Term (2-4 year), and Long Term (4 years and beyond) time frames. These time frame assignments represent the time frame for the start of the action. The TAM Program Implementation plan has been updated for the 2022 TAM Plan.

The Implementation program. The roadmap for implementation includes a high-level schedule; governance; list of actions/ milestones/ resources; investment priorities; systems/ EAM; performance measures; and a process for continuous improvement.





CHAPTER 2

Current Capability and Condition Assessment

2. Current Capability and Condition Assessment

2.1 Background




For the development of the 2018 TAM Plan, VTA evaluated its existing asset management practices in three phases:

Table 2.1 Asset Management Practice Phase

Phase	Practice	Description
1	Asset Management and Maturity Baseline	A series of management interviews and facilitated Comprehensive Asset Management Review and Assessment (CAMRA) workshops attended by diverse staff involved with VTA’s Asset Management-related functions (i.e., both asset owners and asset management stakeholders).
2	TAM Maturity Assessment	
3	Asset Management Business Processes Review (BPR)	A review of existing “as is” processes, and the formulation of “to be” processes recommended by staff, have been incorporated into the continuous improvement program. In addition, the BPR evaluated Asset Management processes based on the Business Process Areas identified in FTA’s Asset Management Guide.

VTA staff started with a general understanding of asset management and a strong interest in improving and meeting FTA requirements. VTA identified key strengths and weaknesses for the 2018 TAM Plan and has updated those characteristics in the four years of practice for the 2022 TAM Plan.






Table 2.2. 2018 TAM Plan Strengths and Weaknesses

Key Strengths 	Areas of Improvement (over 2018 TAM Plan) 	Key Areas for Continuous Improvement 
<ul style="list-style-type: none"> • Defined organizational objectives and meeting the needs of stakeholders, • Prediction of impacts and trends in ridership, operations management, and • Failure and incident investigation. 	<ul style="list-style-type: none"> • Prioritization of projects in the annual budget, • Asset risk analysis, • Linkages between asset inventories, and • Gathering and control of information. 	<ul style="list-style-type: none"> • Communication, particularly interdivisional communication related to assets, • Data-driven budgeting process, • Integration of Asset Management not VTA Planning documents and coordination with the Safety Plan, • Delivery of capital asset renewal projects, • Knowledge retention and succession planning, and <p>Capital asset replacement investment lifecycle planning.</p>

2.2. TAM Plan Goals and Objectives

VTA developed TAM goals and objectives as part of the TAM Plan/Program development. The steps involved first reviewing VTA’s latest mission, vision, and organizational goals from the 2017 Strategic Plan; then VTA mapped the organizational goals to asset management; finally, five TAM goals were established to implement the VTA asset management policy and to promote TAM activities and program maturity. For each of these goals, objectives were identified. These objectives are intended to have outcomes that will help VTA advance its TAM goals (detailed in Table 2.3).

Table 2.3. VTA TAM Goals and Objectives

Area	Proposed TAM Goal	Proposed Objectives
Safety 	Maintain VTA assets in a State of Good Repair to support a safe operating environment	<ul style="list-style-type: none"> • Maintain equipment in SGR • Measure and manage TAM-related risks • Document root cause analysis for asset failures
Fiscal sustainability 	Build and promote financial sustainability through the implementation of asset management best practices	<ul style="list-style-type: none"> • Establish linkage between multi-year SGR needs, annual budget process, and Capital Improvement Program. • Develop an objective method to prioritize capital projects and assess trade-offs between competing investments • Implement a minimum life cycle cost policy
Investing in assets/ SGR 	Invest in VTA assets and SGR	<ul style="list-style-type: none"> • Develop Plan and policy consistent with MAP-21 requirements • Establish clear capital replacement and rehabilitation plans, and monitor adherence • Develop asset management systems approach
Organizational efficiency 	Demonstrate organizational efficiency for asset management processes and outreach to member agencies	<ul style="list-style-type: none"> • Build understanding and support for asset management at the VTA executive level • Assess and implement toolbox to support data-driven asset management decisions • Improve and expand communications with member agencies regarding well-documented SGR needs and priorities
People and TAM culture 	Promote asset management culture at VTA	<ul style="list-style-type: none"> • Advance awareness for TAM across all levels at VTA • Develop and retain well trained TAM workforce

2.3. Asset Management Maturity Assessment

The asset management maturity assessment was completed for the 2022 TAM Program through a survey and facilitated maturity workshops attended by VTA asset management stakeholders. The review included scoring (see scale - Figure 2.1) nine criteria in seven key areas of good asset management

practices (see Table 2.4) and providing comments on those criteria. The comments were reviewed and became the foundation for Focus Groups within the TAM Workgroup to address those areas for continuous improvement.

Figure 2.1. TAM Plan Maturity Assessment Scale

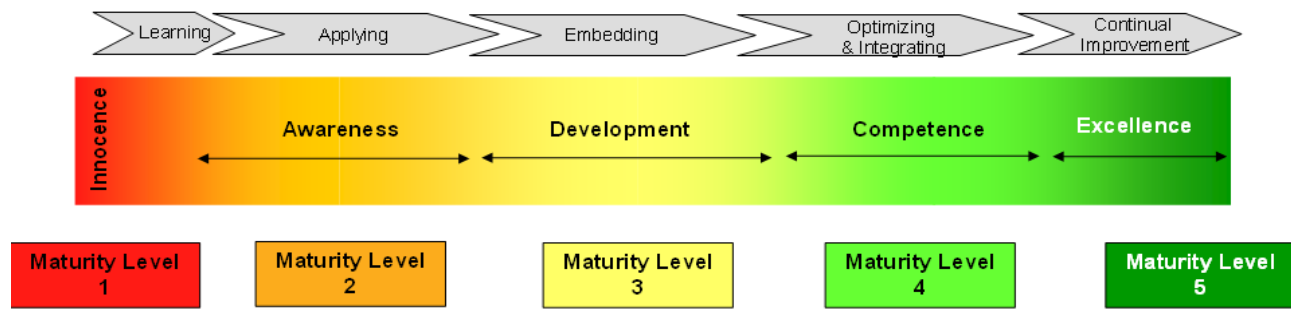


Table 2.4. Key Areas of Good Asset Management Practice

Asset Management Organizational Context
How well has VTA defined organizational objectives and the needs of internal and external stakeholders?
How do these shape the scope of the Asset Management system?
Asset Management Vision & Leadership
Does VTA leadership lend its authority to supporting the Asset Management system through appropriate direction, organizational design, resource allocation, etc.?
Asset Management Regulations/Performance (Ridership Forecasting, Regulations, Service Levels)
How has VTA defined and quantified its external drivers of service performance and targets (such as growth forecasts and service impacts)?
How well do these relate to the need for organizational objectives that could drive Asset Management processes and requirements?
Asset Management Information Requirements
How well does VTA define, record, analyze and control required Asset Management data and information?
Planning to Meet Asset Management Objectives
What strategic and tactical planning processes does VTA utilize to ensure that risks are managed and that the right short, medium and long-term plans are developed for its assets?
Operational Planning and Control
What processes are in place to ensure that plans are implemented, necessary day to day maintenance requirements are defined and undertaken effectively and efficiently, and any failures are promptly repaired and restored?
Asset Management Enablers & Support
How well does VTA support the ongoing implementation, application and continual improvement of its Asset Management system through staff development, communications and change management processes?

Table 2.5. Results of the Maturity Assessment Survey	
Key Areas of Good Asset Management Practice	Weighted Average in 2022
Asset Management Organizational Context	
How well has VTA defined organizational objectives and the needs of stakeholders	3.35
How do these shape the scope of the AM System?	2.93
Asset Management Vision & Leadership	
Does VTA Leadership lend its authority to supporting the AM System.	2.87
Asset Management Regulations/Performance (Ridership Forecasting, Regulations, Service Levels)	
Has VTA defined and quantified its external drivers of service	3.38
How well do these relate to the need for organizational objectives to drive AM processes	3.08
Asset Management Information Requirements	
How well does VTA define, record, analyze, and control required AM data a	3.06
Planning to Meet Asset Management Objectives	
What strategic and tactical planning processes does VTA utilize to ensure that risks are managed, that short, medium, and long-term plans are developed	2.64
Operational Planning and Control	
What processes are in place to ensure that plans are implemented, day to day maintenance requirements are defined and undertaken.	3.00
Asset Management Enablers & Support	
How well does VTA support ongoing implementation, application, and continual improvement of its AM system through staff development, communication, and change mgt.	2.57

The results of the surveys show that generally, the maturity of the VTA asset management program is at Level 3 or the Development/Embedding stage of maturity. The TAM Workgroup and Focus Groups will be working with all relative divisions of VTA to further mature and evolve the TAM Program for VTA.

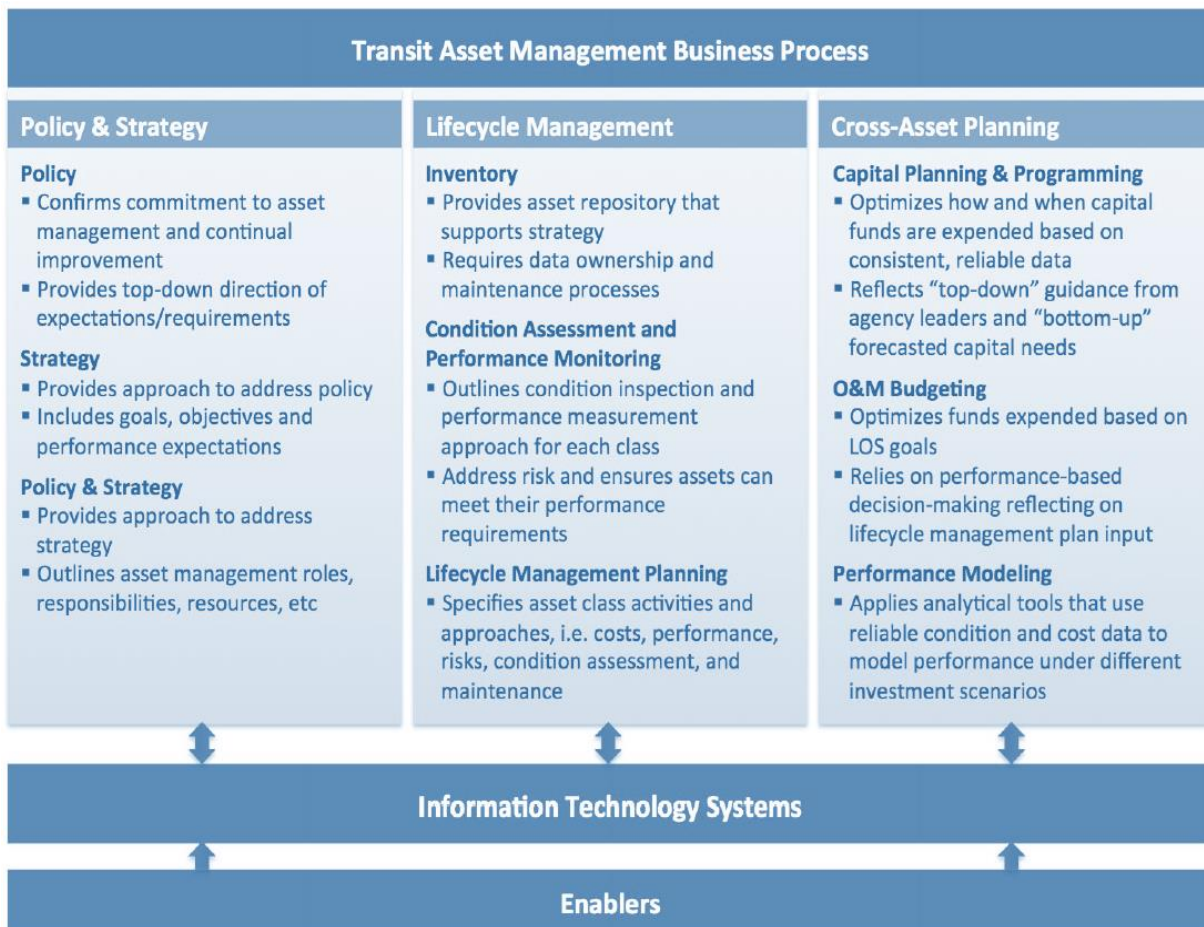
2.4. Asset Management Business Processes Review (BPR)

The VTA BPR included a review of existing data, documents, and organizational groups involved with Asset Management. The purpose of this task was to understand how Asset Management business processes function within VTA and how Asset Management information and decision-making are shared among stakeholders. Business processes were mapped per the business process areas identified in FTA’s Asset Management Guide: Asset Management Vision and Direction, Life-cycle Management, Cross Asset Planning and Management, Information Technology Systems, and Enablers. The relationships between these business process areas are shown below in Figure 2.2.

Stakeholder group interviews were conducted to understand VTA’s asset management business processes. The work in this task involved mapping where major aspects of the business process occur in VTA as well as identifying the key stakeholders and their respective roles and responsibilities. The results

of the BPR maps were used to document the strengths and weaknesses/gaps in the process steps and conduct a best practices assessment to identify implications for VTA. The intent of the last step was to suggest changes to a set of VTA’s business processes thereby increasing the effectiveness of staff and dissemination of institutional knowledge.

Figure 2.2. FTA Asset Management Business Process Areas



Source: USDOT, FTA. Asset Management Guide: Focusing on the Management of our Transit Investments. 2012.

The analysis of VTA’s business processes focused on life-cycle management and cross-asset planning and management as they include the core asset management related functions, vision, and direction; and IT systems and enablers, which support the lifecycle and cross-asset management process areas. VTA’s Asset Management team identified eight Asset Management business processes, as shown in Table 2.6 below.

Table 2.6. Asset Management Business Process at VTA

Business Process Area	Business Process	Primary Business Process Owners
Life-Cycle Management	Inventory	<ul style="list-style-type: none"> Operational Asset Owners/Maintainers
	Condition Assessment	<ul style="list-style-type: none"> EPD and Operational Asset Owners/Maintainers Wayside Systems Facilities
	Operations and Maintenance (Day-to-Day State of Good Repair [SGR])	<ul style="list-style-type: none"> Fleet Management Vehicle Maintenance Wayside Systems Facilities Management Maintenance of Way/ guideways
	Performance Monitoring	<ul style="list-style-type: none"> Service and Operations Planning Operations Analysis
Cross-Asset Planning and Management	Long-Term Capital Planning	<ul style="list-style-type: none"> Long Range Planning - Grants & Allocations
	Budgeting (Operations and Maintenance, Capital)	<ul style="list-style-type: none"> F&A- Budget
	Grants	<ul style="list-style-type: none"> Grants & Allocations
	Procurement and Financial Accounting	<ul style="list-style-type: none"> Procurement, Contract Materials Management (PCMM) Financial Accounting

Organizationally, asset management planning is led by the Asset Management Team in Grants, while day-to-day functions are spread across Operations, Finance, Engineering, and Vendor/Contract Management. Other groups such as Information Technology play a critical role in supporting and enabling the asset management business processes. As such, business process mapping was helpful to understand the roles and responsibilities of the various Divisions.

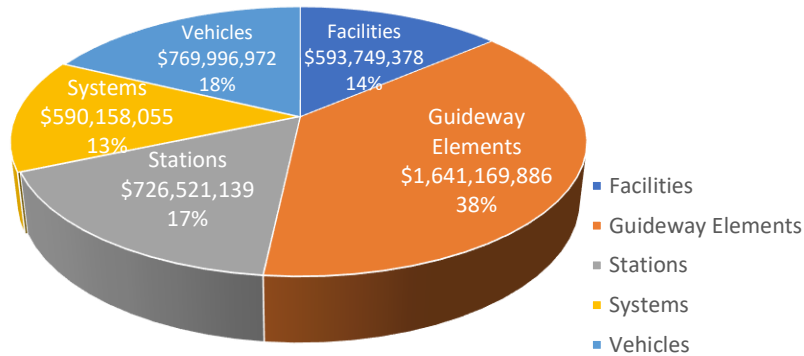
In addition to the identification of strengths and weaknesses in the business processes, the BPR served as an important input to identify opportunities for improvement based on best practices. The full Business Process Review (BPR) Report is available as a separate technical report.

2.5. VTA Transit Asset Inventory

Santa Clara Valley Transportation Authority (VTA) operates and maintains approximately \$4.3 billion in physical assets (see Figure 2.3). Maintaining VTA’s assets in a state of good repair is essential to

delivering safe, reliable, and efficient services to thousands of riders. However, this requires ongoing capital maintenance as well as periodic investments in rehabilitation and replacements.

Figure 2.3 Distribution of VTA’s existing assets by asset type



The inventory is maintained in the VTA’s Regional Transit Capital Inventory (RTCI) format for data sharing with FTA and the Metropolitan Transportation Commission (MTC). The inventory is updated from various sources, mainly SAP Fiscal Asset Register, the Engineering Construction Library, and the operation’s database for fleet of both revenue and non-revenue vehicles. The facilities and rail rehabilitation plans are also reviewed. VTA’s key assets (Figure 2.4), shows VTA’s current high-level transit inventory.

Figure 2.4. Distribution of VTA’s existing assets by asset type







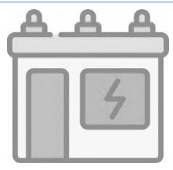
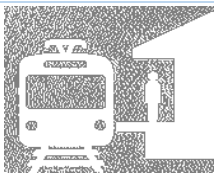

 81 miles of Revenue Track	 98 Light Rail Cars	 199 Paratransit Vehicles
 440 Revenue Buses	 347 Non-Revenue Vehicles	 4 Maintenance Facilities
 33 Traction Power Substations	 61 Light Rail Platform	 37 Park and Ride Lots

Table 2.7. VTA Highway Asset Inventory

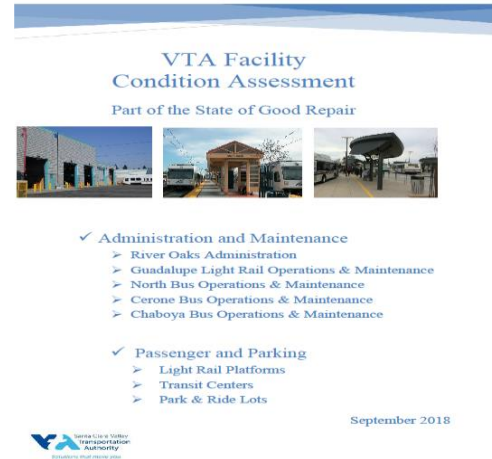
Equipment Type	Quantity	Total Price	Date Installed	Agency Useful Life
<u>Toll Reader Equipment</u>				
AVI Reader	8	\$76,000.00	2020	5-7 Years
Universal Toll Antenna (UTA)	8	\$16,000.00	2020	5-7 Years
VES Camera	8	\$80,000.00	2020	7-10 Years
VES Night Light	8	\$20,000.00	2020	7-10 Years
AVDS Overhead Laser	8	\$104,000.00	2020	5-7 Years
Enforcement Beacon	8	\$25,600.00	2020	5-7 Years
Total Toll Reader Equipment	48	\$321,600		
<u>VTMS Equipment</u>				
VTMS General Message LED Panel	8	\$96,000	2020	7-10 Years
VTMS Price LED Panel	11	\$132,000	2020	7-10 Years
VTMS General Message LED Panel (On-ramp)	1	\$10,000	2020	7-10 Years
VTMS Price LED Panel (On-Ramp)	1	\$10,000	2020	7-10 Years
VTMS Controller	36	\$360,000	2020	7-10 Years
VTMS Cabinet	9	\$40,500	2020	20 Years
Total VTMS Equipment	66	648,500		
<u>Remaining Roadside Equipment</u>				
Closed Circuit Television Camera	15	\$60,000	2020	5-7 Years
Wavetronix	9	\$67,500	2020	5-7 Years
Vehicle Sensor (In Ground)	4	\$2,000	2020	5 Years
Roadside Cabinet	15	\$67,500	2020	20 Years
Lane Controller	16	\$48,000	2020	7-10 Years
Pole Mount Cabinet	13	\$52,000	2020	20 Years
Network Switch	18	\$90,000	2020	7-10 Years
Uninterruptible Power Supply Module	18	\$72,000	2020	7-10 Years
Wireless Radio	2	\$67,500	2020	7-10 Years
Fiber Optic Cable (144 Strand 30,000ft)	1	\$500,000	2020	25 Years
Total Remaining Roadside Equipment	111	\$1,026,500		
<u>System Hardware Equipment</u>				
Traffic Operations Center (River Oaks)	1	\$63,984	2020	7 Years
Primary Server and Secondary Server	1	\$289,731	2020	7 Years
Total System Hardware Equipment	2	\$353,715		
Grand Total	302	\$2,350,315		

2.6. Condition Assessment

VTA conducted a physical assessment of facilities and produced a report in 2018 as shown below. The results aligned with TERM Lite results are shown in Table 2.8.

Table 2.8. VTA Facility Physical Condition Assessment Ratings

River Oaks Administration	4.50
Guadalupe Light Rail O & M	2.97
North Bus O & M	3.70
Cerone Bus O & M	3.59
Chaboya Bus O & M	3.34
Total Administration and Maintenance	3.62
Light Rail Platforms	3.56
Transit Centers	3.35
Park & Ride Lots	3.40
Total Passenger and Parking	3.44
Total All VTA Facilities	3.54



The TERM scale assigns numerical ratings based on conditions:

TERM Rating	Condition	Description
Excellent	4.8 - 5.0	No visible defects; new or near new condition; may still be under warranty if applicable
Good	4.0 - 4.7	Good condition, but no longer new; may be slightly defective or deteriorated, but is overall functional
Adequate	3.0 - 3.9	Moderately deteriorated or defective, but has not exceeded useful life
Marginal	2.0 - 2.9	Defective or deteriorated; in need of replacement; exceeded useful life
Poor	1.0 - 1.9	Critically damaged or in need of immediate repair; well past useful life

Source: www.transit.dot.gov

A summary of the most recent average condition rating estimates by asset class based on VTA's TERM Lite output as of June 2021 inventory is provided in Table 2.9. All categories are adequate.

Table 2.9. VTA Average SGR Condition Ratings by Assess Class (2021)

Category	Weighted Current Condition Score FY 21	Condition
Facilities	3.51	Adequate
Guideway Elements	3.82	Adequate
Stations	3.35	Adequate
Systems	3.05	Adequate
Vehicles	3.29	Adequate
VTA overall	3.50	Adequate

The equivalent average ratings aggregated instead by mode (including “system-wide” assets that are not specific) are provided in Table 2.10.

Table 2.10. VTA SGR Condition Ratings by Mode (2021)		
Category	Weighted TERM Condition Score	Condition
Para Transit	3.14	Adequate
Light Rail	3.57	Adequate
Bus	3.34	Adequate
System Wide ***	3.03	Adequate
VTA Overall	3.50	Adequate

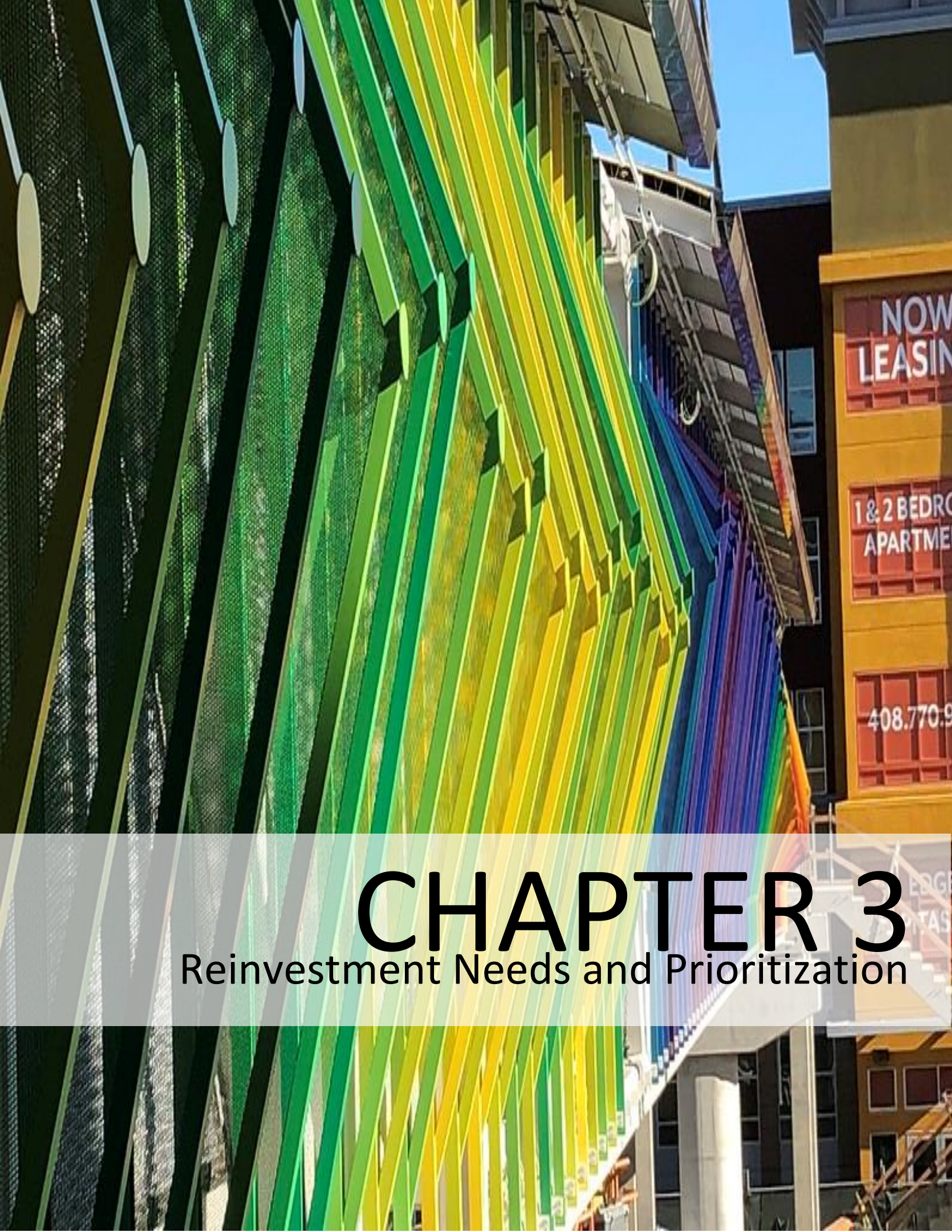
*** Includes Non-Revenue vehicles and other system-wide assets

Finally, Table 2.11 provides a detailed break out of the current distribution of asset conditions by asset category and mode. A review of this table indicates that, while all VTA assets are in adequate condition or better, there are some asset types that fall into marginal and poor condition rates.

Table 2.11. Asset Condition Distribution by Asset Category FY 21					
Category	Excellent	Good	Adequate	Marginal	Poor
Facilities	0%	16%	65%	11%	9%
Buildings	0%	17%	77%	4%	1%
Equipment	1%	9%	10%	41%	39%
Guideway Elements	0%	33%	57%	9%	0%
Guideway	0%	37%	57%	6%	0%
Special Structures	0%	97%	3%	0%	0%
Trackwork	0%	21%	57%	20%	1%
Stations	0%	13%	64%	21%	2%
Access	0%	6%	80%	12%	1%
Building	0%	20%	60%	1%	19%
Complete Station	0%	3%	81%	16%	0%
Platform	0%	17%	59%	24%	0%
Signage & Graphics	0%	0%	40%	6%	54%
Systems	0%	5%	44%	43%	7%

Communications	1%	13%	22%	34%	29%
Electrification	0%	7%	43%	50%	0%
ITS	0%	0%	0%	44%	56%
Revenue Collection	0%	0%	97%	3%	0%
Specialized IT	3%	0%	3%	89%	5%
Train Control	0%	0%	56%	44%	0%
Utilities	0%	0%	73%	27%	0%
Vehicles	0%	1%	80%	9%	10%
Non-Revenue Vehicles	1%	3%	14%	47%	35%
Revenue Vehicles	0%	0%	82%	8%	9%
VTA Overall	0%	18%	62%	16%	4%





CHAPTER 3

Reinvestment Needs and Prioritization

3. Reinvestment Needs and Prioritization

3.1. SGR Backlog

The VTA’s current backlog is estimated at approximately \$315 million (in 2021\$). This degree of backlog shows a more than \$65 million decrease from the 2018 backlog assessment. This value continues to include the cost to replace all assets that currently exceed their useful life but does not account for all of the cost of deferred rehab requirements. The distribution of this backlog is shown below in (Figure 3.1 and further elaborated in Tables 3.1 and 3.2). System assets are the highest followed by vehicles.

Figure 3.1. Backlog and Distribution

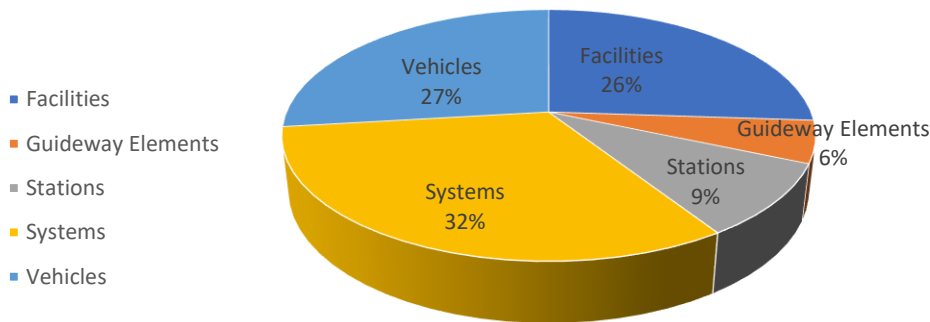


Table 3.1. Estimated VTA Backlog by Asset Sub-Category (FY 2021)

Category	Backlog Status FY 21	Percentage Distribution FY21
Facilities Total	\$82,185,460	26%
Buildings	\$8,292,724	3%
Equipment	\$73,892,736	23%
Guideway Elements	\$17,031,706	5%
Trackwork	\$17,031,706	5%
Stations	\$29,609,652	10%
Access	\$3,213,848	1%
Building	\$1,755,782	1%
Platform	\$12,255,308	4%
Signage & Graphics	\$12,321,402	4%
Systems	\$101,719,031	32%
Communications	\$42,262,881	13%
Electrification	\$21,005,518	7%
ITS	\$19,065,565	6%
Specialized IT	\$10,824,274	3%
Train Control	\$7,825,169	2%
Vehicles	\$84,778,361	27%
Non-Revenue Vehicles	\$13,685,324	4%
Revenue Vehicles	\$71,093,037	23%
VTA overall	\$315,324,210	100%

Table 3.2. VTA Backlog by Mode (FY 2021)

Category	Backlog Status FY 21	Percentage Distribution FY21
Para Transit	\$3,780,840	1%
Light Rail	\$124,388,185	39%
Bus	\$104,368,455	33%
System-Wide - (Non-Revenue Vehicles and Other Assets)	\$82,786,731	26%
VTA overall	\$315,324,210	100%

3.2. VTA's Condition Assessment Process

VTA is currently utilizing five different condition assessment approaches – with assessment approaches and location of data storage varying by asset types and purposes of analysis (Table 3.3)

Table 3.3. Condition Rating Systems in Use / Under Development at VTA

SYSTEM	SAP (PM)	SQL	ETID	TERM Lite	GIS
Rating Scale	Pass/Fail	1 to 6	Unknown	1 to 5	Linking with SAP
Where Stored	SAP servers and Data Warehouse	Server	Offline	TERM Lite	Enterprise ArcGIS System
Asset Types	All asset types except Structures and some IT assets.	Bridges Culverts Track (under development)	Facilities, Stations, Infrastructure	All Asset Types	Real Estate, Facilities, Stations, Bus Stops, Rail Infrastructure.
Approach	On-site assessment by Maintenance staff.	On-site assessment thru contract service	Periodic Engineering Condition Assessment for capital planning	Estimated condition	GIS and SAP system Synchronization
Limitations	System can be configured to include 1 – 5 rating scale and new SGR inspection types/tasks. May need engineering expertise for facilities/station SGR assessments.	Physical inspections for condition ratings are performed only for Structures. It changed to 1 – 5.	More needs driven. Not systematic or tied to TERM Lite asset inventory/projections. Findings should be incorporated into SGR assessments.	May differ from actual condition Needs capability to incorporate actual assessment findings.	Condition assessment data could be included. Need to integrate with other asset management systems, like SQL, EDIT, and TERM Lite.

Given this situation, VTA should work towards adopting and implementing a single, agency-wide condition assessment rating scale and methodology to ensure the scale is applied consistently across all asset types and user groups (so an assessed condition of “3” has the same meaning for rail cars as for track work and all other asset types). Two key points to keep in mind when evaluating potential rating approaches:

- **FTA Condition Assessment Requirements for Facilities:** The FTA Final TAM Rule requires that all grantees report on on-site condition assessments of all administrative buildings, maintenance facilities, and passenger stations (including park and ride lots and garages) – using FTA’s five-point condition rating scale.
- **Other Asset Condition Reporting:** FTA also requires that grantees submit condition estimates (e.g., such as age based modeled condition produced by TERM Lite) for vehicles, equipment, systems and guideways.

3.3. Decision Support Tools and Capital Project Prioritization

VTA has adopted TERM Lite to project and prioritize capital needs over a 10-year horizon, and to help support the identification of near-term projects. TERM Lite is an FTA decision support tool that helps transit agencies, including VTA, assess and prioritize SGR reinvestment needs subject to funding constraints. TERM Lite uses the process illustrated in Figure 3.2, to project reinvestment needs over a 10-year period. The inventory described in Chapter 2, along with pre-defined lifecycle activities (i.e., the cost and timing of rehabilitations, replacements, and annual capital maintenance), as deployed by the model to predict future needs.

Figure 3.2. TERM Lite Process for Projecting Reinvestment Needs



The model then uses a Multi-Criteria Decision Analysis (MCDA) approach to rank individual asset investments based on the criteria shown below in Figure 3.3. The prioritization criteria used in the model include asset condition (age-based estimates), service reliability ratings, safety and security

ratings, and O&M cost impacts. Asset conditions apply to individual assets as they decay, described above in Chapter 2, where the lower the condition the higher the priority for replacement. The ratings for the other criteria are based on the impact of each asset type on the defined outcome; for instance, a revenue vehicle will be rated much higher for service reliability than an elevator in an administrative building. Each criterion is then weighted against each other to determine how important those criteria are with respect to one another.

TERM Lite considers all the possible reinvestment actions with their respective priority in each year and reinvests in assets subject to funding constraints. This results in an SGR backlog forecast, where the lower priority assets are deferred for investment, and guidance on when each reinvestment should occur based on the higher priority rankings.

It is important to note that the prioritization routine in TERM Lite works at an individual asset level and only applies when there is a funding constraint.

3.3.1. Capital Project Prioritization

FTA's Final Rule calls for the development and implementation of objective methods and processes to identify and prioritize required reinvestment actions, ensuring that limited capital funds are allocated to those investments that best support VTA's TAM objectives (including service quality, safety and reliability). As part of an ongoing TAM implementation and improvement process, VTA will build on work to date (i.e., initial implementation of asset level prioritization through TERM Lite) and consider development of complementary processes (more project-oriented prioritization).

- **TERM Lite Implementation:** Resulting from VTA's adoption of TERM Lite, VTA is now able to conduct a high-level prioritization of investment needs at the asset level. Specifically, TERM Lite's prioritization routine provides an assessment of reinvestment actions VTA can take to address the goals of improving asset conditions, service reliability, and safety and reinvestments to help reduce O&M costs. TERM Lite's investment prioritization is intended to be "strategic" in nature and focuses on funding and investment requirements to address long-term investment goals and objectives.
- **TERM Lite Refinement:** Some agencies have developed modified versions of TERM Lite designed to provide enhanced prioritization support. Examples include:
 - **Investment Tier Analysis:** Segmenting investment needs into "Tiers" (tier 1, tier 2, ...) to help focus attention on the highest scoring projects
 - **Asset to Project Mapping:** This approach uses TERM Lite's existing prioritization scoring to group assets that are both related to each other (by location and/or function) and which also have upcoming reinvestment needs, into logical "projects." Users can then use this information to help identify locations and periods when these "projects" are forecast to occur, and then determine if an actual, coordinated reinvestment action is warranted.

3.3.2. Supporting Approaches

While TERM provides support for strategic and asset level prioritization, VTA would also benefit from tactical / project level prioritization. VTA should consider two approaches that are mutually supportive both with each other and with TERM Lite’s strategic prioritization:

- **Business Case Analysis.** Standard business case analysis (building off existing VTA process) rates projects based on implementation options for each investment, the cost and operational implications of potential investments (including both O&M and future reinvestment capital costs, including cost savings), and metrics for expected impacts on service reliability, safety, efficiency, rider experience and other desired impacts. Business case analyses should clearly segment projects that are critical to addressing potential operational and safety risks (“must haves”) from those that, while potentially desirable, offer more limited operational benefits.
- **Project Priority Scoring:** Invariably there are more projects with good business cases than can be funded, and for this reason it is helpful to implement an objective project scoring system to help determine which projects should be funded first. Scoring systems are designed to score projects on a range of criteria (e.g., safety, reliability, environmental benefits) leading to a combined, overall score that can be compared across projects. While results should only be used in combination with other decision factors (e.g., the potential need to coordinate across multiple investments and other planning efficiencies), scoring is most helpful in identifying those projects with the largest net benefits. There are several commercial scoring systems (e.g., Decision Lens, Expert Choice) as well as less expensive, home-grown approaches.

3.3.3. Investment Prioritization – VTA’s Ten Year Needs

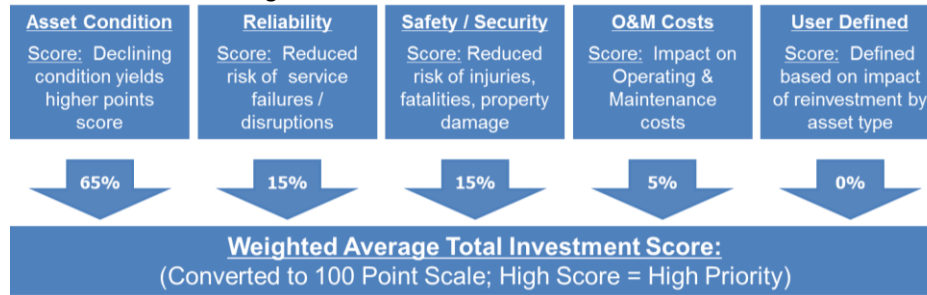
In addition to assessing VTA’s long-term reinvestment needs, the TERM Lite model has also categorized VTA’s reinvestment needs for the next 10-year period into three “Investment Tiers.” Within this analysis, each tier reflects a differing level of reinvestment priority, with “Tier 1” representing the highest priority needs (“what should we do first”) and “Tier 3” the lowest priority (“what do we do postpone if we have to”). The reinvestment tiers are based on the 100-point TERM lite prioritization scores. A brief description of TERM Lite prioritization scoring process, the conversion to investment tiers, and the resulting category replacement needs by investment priority tiers follow below.

TERM’s Prioritization Scoring: TERM Lite prioritizes reinvestment needs based on five investment criteria:

- Estimated asset condition (decay curve based),
- Reliability
- Safety / Security
- Impact of reinvestment on reliability, safety, and O&M costs (each as separate criteria),
- A user defined criterion.

TERM evaluates each asset using these criteria, with each criterion scored on a five-point scale (with 5 being the highest priority). The five criteria scores are then converted to a weighted average, which is then further adjusted to a 100-point scale (Figure 3.3, the criteria weights displayed here were used for the VTA analysis below).

Figure 3.3. TERM Lite Prioritization Scoring Based on Five Criteria



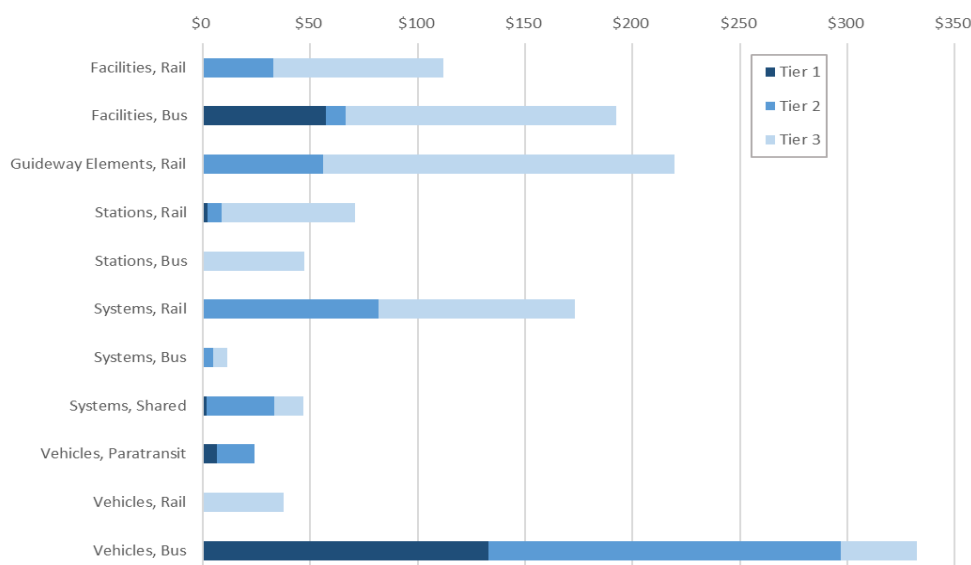
Finally, to help prioritize VTA’s reinvestment needs, these scores have been grouped into three investment tiers based on the prioritization scoring thresholds outlined below (Table 3.4).

Table 3.4. Investment Tier Thresholds

Tier	Prioritization Score Thresholds (100-point scale)	Description
Tier 1	Over 75	Highest Priority (do first)
Tier 2	65 to 75	Mid-Level Priority
Tier 3	Under 65	Lowest Priority (do if funds available)

Based on current TERM estimates, VTA faces roughly \$1.132 billion in unconstrained reinvestment needs over the next 10 years. Figure 3.4 presents these needs segmented into the three investment tiers described above. Based on this assessment, the highest priority reinvestment needs by dollar value are concentrated in bus vehicles and facilities replacement. VTA also faces other high priority (but lower total reinvestment needs) for paratransit vehicles, rail stations and shared systems. Tier 2 reinvestment needs are also concentrated in rail, paratransit and bus vehicles, rail systems, rail facilities, and rail tracks.

Figure 3.4. VTA Prioritized 10-Years Needs



In conclusion, VTA's 10-year needs are dominated by bus and rail revenue vehicle and facilities needs for both Tiers 1 and 2, followed by systems/train control in Tier 2 and track work for Tier 2.

3.4. 10-Year Reinvestment Needs Forecast (Unconstrained and Constrained)

3.4.1. Unconstrained Analysis

For VTA's Strategic Plan, the TERM Lite model was run with no funding constraint and a 2.2% cost inflation. The resulting unconstrained analysis for the next 10 years, shown in Table 3.5, indicates a total need of \$4 billion over this timeframe.

Table 3.5. Estimated Unconstrained Reinvestment Needs by VTA Asset Type in \$000s of Year of Expenditure Dollars										
Category	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31
Facilities	\$64.3	\$89.8	\$92.0	\$84.4	\$88.1	\$74.9	\$97.2	\$121.4	\$124.8	\$132.8
Guideway Elements	\$17.0	\$32.3	\$37.2	\$44.5	\$91.3	\$80.1	\$68.5	\$86.5	\$95.3	\$107.5
Stations	\$22.9	\$64.4	\$72.9	\$89.7	\$93.1	\$98.9	\$144.8	\$191.9	\$225.0	\$245.2
Systems	\$62.8	\$112.0	\$91.4	\$55.4	\$59.9	\$54.7	\$85.9	\$106.3	\$179.2	\$207.0
Vehicles	\$73.7	\$29.8	\$20.7	\$2.2	\$3.0	\$12.8	\$2.4	\$33.8	\$19.9	\$5.0
TOTAL	\$240.6	\$328.3	\$314.2	\$276.2	\$335.3	\$321.4	\$398.7	\$539.9	\$644.2	\$697.6

A 10-year analysis is included here to highlight the needs that VTA is facing beyond the 10 years in the Strategic Plan. The initial high need of \$240.6 m in FY 22 is not practicable to implement. Needs from FY22 to FY31 are significant.

3.4.2. Constrained Analysis

VTA's constrained investment needs of \$106 million will be about \$1.13 billion over a 10-year period and will result in ever-increasing SGR backlog.

Table 3.6. Estimated Constrained Reinvestment Needs by FTA Asset Type in \$millions of years of expenditure										
Transit Capital Categories	FY 22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31
Revenue Vehicles & Equipment	\$72.65	6.53	79.89	8.48	21.88	102.55	4.02	56.22	119.04	27.3
Non-Revenue Vehicles & Equipment	5.77	2.72	1.72	5.99	0.83	0.8	2.11	0.16	0	2.39
Operating Facilities & Equipment	3.98	40.32	6.59	10.57	0.76	7.2	22.04	2.12	0	5.16
Light Rail Way, Power & Signal	7.5	15.37	2.63	60.42	42.55	1.55	54.55	58.93	0.24	54.98
Passenger Facilities	4.52	28.32	7.69	18.61	9.68	0	24.95	0.28	0	22.1
Information Systems & Technology	11.54	12.7	9.45	5.91	36.27	1.88	8.31	0.26	0.7	10.05
Grand Total	105.98	105.98	108	110	112	114	116	118	120	122

Table.3.6.a. VTA Transit Capital Budget Bi-Annual Category

Transit Capital Categories	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	10-Year Total
Revenue Vehicles & Equipment	\$72.7	\$6.5	\$79.9	\$8.5	\$21.9	\$102.6	\$4.0	\$56.2	\$119.0	\$27.3	\$498.6
Non-Revenue Vehicles & Equipment	\$5.8	\$2.7	\$1.7	\$6.0	\$0.8	\$0.8	\$2.1	\$0.2	\$0.0	\$2.4	\$22.5
Operating Facilities & Equipment	\$4.0	\$40.3	\$6.6	\$10.6	\$0.8	\$7.2	\$22.0	\$2.1	\$0.0	\$5.2	\$98.8
Light Rail Way, Power & Signal	\$7.5	\$15.4	\$2.6	\$60.4	\$42.6	\$1.6	\$54.6	\$58.9	\$0.2	\$55.0	\$298.8
Passenger Facilities	\$4.5	\$28.3	\$7.7	\$18.6	\$9.7	\$0.0	\$25.0	\$0.3	\$0.0	\$22.1	\$116.2
Information Systems & Technology	\$11.5	\$12.7	\$9.5	\$5.9	\$36.3	\$1.9	\$8.3	\$0.3	\$0.7	\$10.1	\$97.1
Total VTA	\$106.0	\$106.0	\$108.0	\$110.0	\$112.0	\$114.0	\$116.0	\$118.0	\$120.0	\$122.0	\$1,132.0

The tables above show the alignment of the FTA asset types with the VTA Transit Capital Budget Bi-Annual and SRTP Categories to estimate our reinvestment needs.

The following is a TERM Lite analysis of the expected impact of this constrained funding stream on VTA’s SGR backlog over the next 10-year period. VTA’s SGR backlog is projected to increase from about \$106 million in 2022 to roughly \$1.132 billion over 10 years.

In addition to increasing the size and value of the SGR backlog, the anticipated funding gap is also projected to result in a decline in the average condition of VTA’s current assets over the same 10 years. Figure 3.6 indicates the percentage of marginal and poor assets.

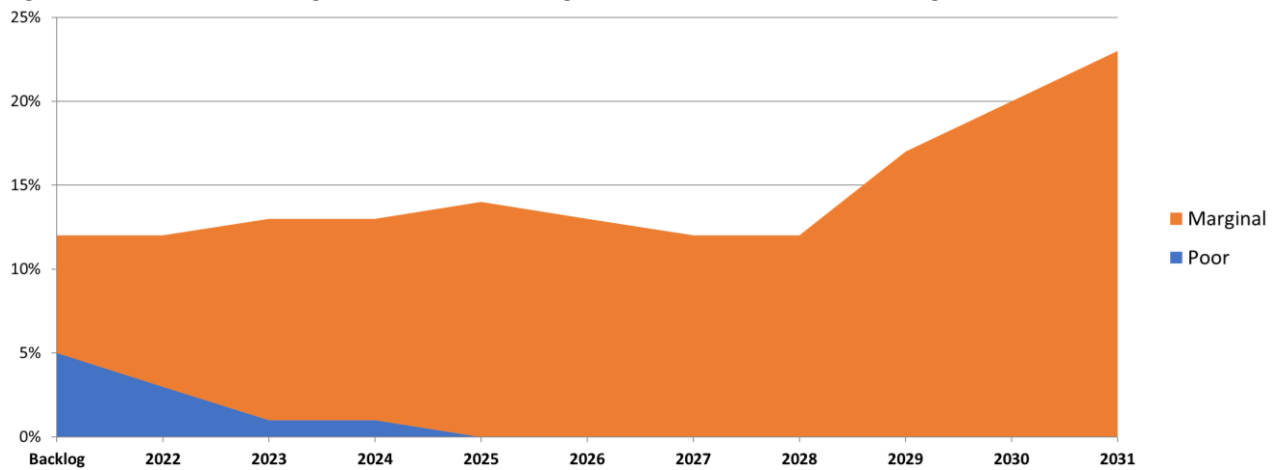
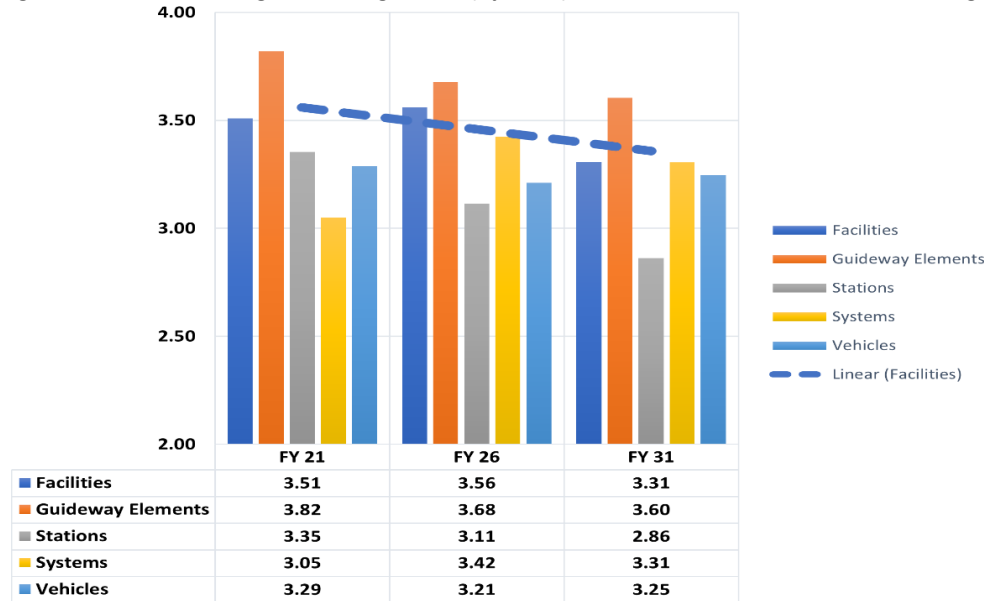
Figure 3.6. Estimated Percentage of VTA’s Assets in Marginal or Poor Condition under Funding Constraint


Figure 3.7f illustrates the decline in condition scores of stations and facilities assets. Facilities score starting at 3.51 in FY 22 and decline to 3.31 by FY 31. Similarly, stations that start at 3.35 and ends at 2.86 in FY 31.

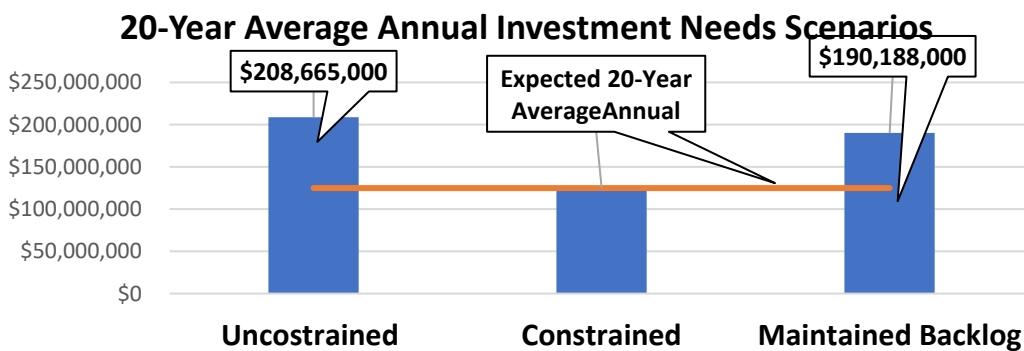
Figure 3.7. Estimated Weighted Average Trend (by value) Condition of VTA’s Assets under Funding Constraint

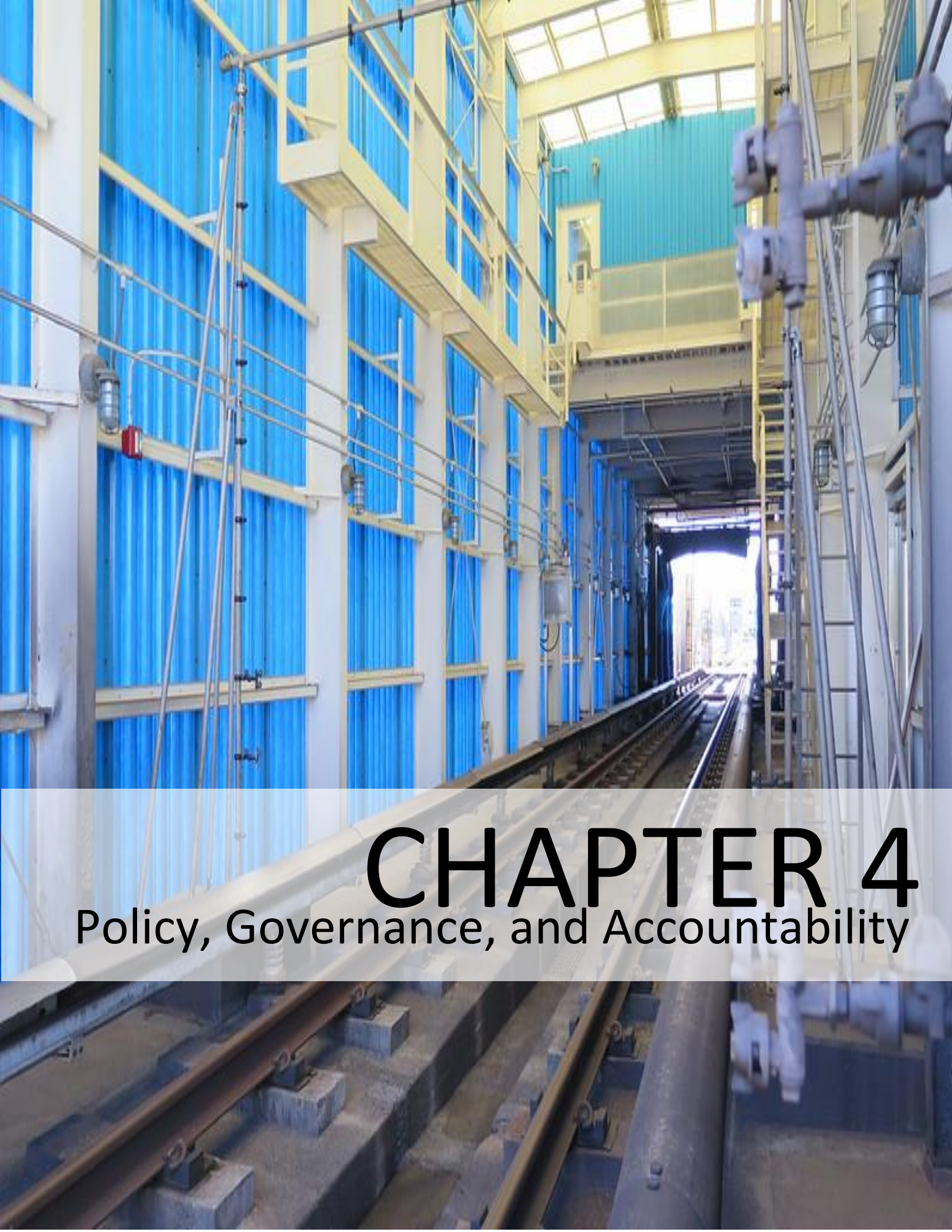


3.5. Strategic Capital Investment Plan (SCIP) Scenarios for Reinvestment Prioritization

TERM Lite has been used to forecast the unconstrained, Constrained and maintain-backlog needs over a 20-year period for the purposes of the 20-year Strategic Capital Investment Plan. Figure 3.8 below indicates the results.

Figure 3.8. Scenarios for 20-Year Average Investment Needs





CHAPTER 4

Policy, Governance, and Accountability

4. Policy, Governance, and Accountability

4.1. Background

VTA has developed TAM goals and objectives to guide the TAM program, to develop the agency's TAM Plans, and facilitate the maturing of the TAM program. In addition, a policy has been developed to direct the path of asset management and as a foundation for establishing and formally adopting a VTA TAM Procedure. Together, these form the basis for VTA's future vision for asset management to be integrated into the functional aspects of VTA's plans, policies, and procedures. This chapter addresses FTA TAM Element 5.

4.2. Asset Management Policy

The asset management goals, objectives, and policy discussed in Chapter 4 define the policy direction for asset management activities. The development of the Asset Management Plan provides the asset management framework to guide asset management implementation and development of action plans to improve agency TAM maturity. Formal adoption and communication of VTA's asset management policy and progress in asset management implementation will be critical in advancing a common understanding of the role and outcomes for asset management at VTA.

According to the FTA, an agency asset management policy "provides top-down direction to the entire agency. This direction can be vital for an asset management initiative because, depending on the selected implementation path, it can require organization-wide change." Like any other policy, the asset management policy should be visible and used by executive leadership to communicate direction and expectations. In addition to communicating senior commitment, an asset management policy will foster a culture that values asset management and links responsibilities with strategic planning activities. With a common understanding of the need and asset management goals and objectives, various VTA divisions such as Operations, Engineering, Capital Planning, and Finance, can better coordinate and cooperate to accomplish VTA's asset management goals and objectives.

4.2.1. VTA TAM and SGR Policy

VTA's investment in its asset base is critical to the economic vitality and quality of life in the region. VTA is committed to maintaining its assets in a State of Good Repair through financial stewardship and reinvestment, promoting a culture that supports asset management across the organization, and focusing on high-quality information and a risk-based approach as the basis for decision making.

The purpose of the policy is to communicate to management, staff, and the public, VTA's commitment to maintaining VTA-owned assets in a State of Good Repair and to foster a culture of continuous improvement in asset management planning and performance.

Implementation of this policy will result in the development and maturation of an agency-wide Asset Management Culture at VTA. This policy provides a baseline for the development of Asset Management Procedures that will provide a framework for actions and systematic methodologies for identifying, evaluating, and prioritizing the acquisition, maintenance, repair, and replacement of VTA's capital assets.

4.3. Roles and Responsibilities

Implementation of the policy is a responsibility shared by all divisions within VTA.

Overall Responsibility – The VTA General Manager has overall responsibility for overseeing the development of asset management plans and procedures, in cooperation with the executive leadership team and reporting to the VTA Board of Directors on the status of asset management (AM) for VTA. For the purpose of this Policy and the Moving Ahead for Progress in the 21st Century (MAP-21) Legislation, the General Manager is the “Accountable Executive” as identified in the Federal Transit Administration (FTA) Final Asset Management Rule.

Day-to-Day Responsibility – The lead responsibility for VTA’s asset management function rests with the Planning & Programming Division (PPD), specifically under the Deputy Director for Grant and Allocations the Transit Asset Management (TAM) Program Manager in the Grant and Allocations. Key responsibilities of the Asset Management Team are the maintenance and updating of the asset inventory and the development and updating of the Asset Management Plan as required by FTA.

Division Support – All Divisions will support VTA’s TAM policy by participating in technical working group discussions and strategy; providing asset development, replacement, and management data leading to a complete and accurate capital asset inventory; developing and maintaining risk register elements; developing asset management criteria; implementing TAM Plan actions; and other asset management related activities in cooperation with the TAM Team - with particular support stemming from the following divisions:

- The division responsible for Operations will continue to accomplish condition assessments, maintenance, rehabilitation, and replacement planning currently undertaken; and communicate data pertinent to AM and SGR repair to the TAM Team.
- The division responsible for Engineering and Construction will continue to develop construction activities and condition assessments in cooperation with Operations, document project and asset costs, and communicate pertinent AM information to the TAM Team.
- The division responsible for Finance & Budget will provide the TAM Team access to necessary records, add detail to financial accounting data to facilitate a linkage for asset management to the budgeting process, and collaborate on other AM related activities.
- The division responsible for Information Technology and Procurement/Contracts will support and facilitate the implementation of asset management/decision-making support tools, develop life cycle cost procedures, implement life cycle cost into procurement procedures, and other asset management related activities in collaboration with the TAM Team.

4.4. TAM Plan, Geographic Information System (GIS) Group

Since the adoption of the 2018 TAM Plan, Geographic Information System (GIS) has been set up to assist in data collection, task scoping and prioritization, workflow identification, and a communication mechanism.

There are several benefits of utilizing GIS in asset management. First, GIS provides a platform that increases efficiency of data collection for the asset registry. Labor-intensive and time-consuming

inventory capture processes can be improved by using location-enabled handheld electronic device apps or LiDAR technologies. Second, asset data are captured in a standard format, which are readily available for analysis and integration with enterprise SAP system. Third, integration of enterprise GIS and SAP systems can provide a common understanding and record tracking of asset locations, geometry, and streamline the workflow by synchronizing asset records of the two systems, set up notifications and work orders for real-time maintenance information, and provide access to data across departments and locations, without having to deal with siloed data that's difficult to find, access and maintain.

Taking advantage of these benefits, VTA GIS and SAP teams have been working together to make substantial improvements on technology-based asset management processes. For several ongoing asset management projects, GIS technologies have been used for capturing fixed assets, facility assets and SVBX assets by using location-enabled field data collection apps. Currently the GIS data of the following transit assets have been incorporated into SAP system:

- Light Rail Stations
- Pressure Washers
- SVBX Escalators and Elevators
- SVBX ROW Signage Roadway Signage
- Transit Centers
- Park & Ride Lots
- Administrative Building Site

The two teams are also working on cataloging the LiDAR data of VTA's light rail right of way assets. Light Detection and Ranging (LiDAR) is a technology used to create dense point clouds and high-resolution imagery synchronized with point clouds with accurate location information of assets. Point clouds are being converted to GIS compatible format that will be integrated with both GIS and SAP systems. The efforts have significantly improved the efficiency of asset capture, mitigated the exposure to work zone injuries, and ensured the accurate asset and rapid data conversation. In the upcoming years, the following light rail right of way assets will be integrated into both GIS and SAP systems:

- Track Centerlines
- Rails
- Switches
- Frogs
- Mileposts
- Signals
- Signs
- Grade Crossings
- Protection Devices
- Fixed Derails
- Overhead Wires
- Electrical Poles
- Traction Power Poles
- Ballast Profile Diagrams
- Road Crossing Crown Diagrams
- End of Track
- Curves
- Tunnel Portals
- Detectors
- Prefab Shelters
- Fiber Optic Line Markers
- Building Edges, Walls, Fence

GIS, facility, TAM Team, and engineering teams are collaborating on the development of the VTA facilities master plan. In the current phase, location-based information on facilities and equipment is captured by utilizing GIS tools. A GIS dashboard is being created to visualize the maintenance and operational processes, examine the existing conditions, and facilitate the assessment of future business needs. These tools provide a common base of information to multiple stakeholders and establish a shared understanding of conditions and potential solutions.

GIS team has established regular working sessions with the SVSX GIS consultant on developing and sharing SVSX-related asset data among various teams on the Esri ArcGIS online portal. Infrastructure assets can be better viewed in relation to how the asset interacts with the surrounding ecosystem. By utilizing the tool of GeoBIM, asset information helps the stakeholders involved in planning and design to better understand how natural and existing built environments connect with the new assets to be built.

GIS provides a technology platform for integration, visualization, analysis, and communication, which strengthens and streamlines the asset management processes. With these benefits, GIS is a critical tool for tackling common obstacles to effective and efficient asset management. It is imperative to acknowledge that a common, GIS-centric approach should be implemented with an agency-wide perspective. Continuation of integration of GIS capabilities with TAM requires strong leadership. Currently, the GIS approach has been implemented in the aforementioned projects and has been integrated in SAP. However, a unified and standard approach should be established and utilized to have maximum impact and benefit. This will take several steps:

- A clear vision of how GIS will be used should be set up first, which should include data collection, task scoping and prioritization, workflow identification, and communication mechanism.
- TAM group and GIS team can identify several manageable initiatives with support from champions from each department.
- Follow-up meetings can be arranged to demonstrate the progress and get feedback from users.

4.5. Drivers for VTA TAM Program Implementation

Implementation of VTA's TAM program is driven by a set of enablers, among them the policy itself (highest level), the implementation plan identified in the current TAM Plan, FTA guidance and best practices, and VTA procedures developed.

The *FTA Asset Management Guide: Focusing on the Management of our Transit Investments* (FTA TAM Guide) published in 2012, and updated in 2015 and 2016, was the primary source used to organize and describe best practices for opportunities for improvement. The FTA TAM Guide provides the clearest picture of potential requirements as well as identifying practices in common use.

The FTA TAM Guide has five distinct Business Process "areas" as follows.

- **Asset Management Vision and Direction** – Led by policy and strategic planning processes to address the question: "What policy and strategic objectives should the VTA TAM strategy advance?"
- **Lifecycle Management** – Data-driven set of activities to evaluate the lifecycle cost, condition, and performance of each class of assets—ideally during the design/procurement stage

- **Cross Asset Planning and Management** – Enterprise-level decision-making processes, including capital planning and operations and maintenance budgeting, are used to communicate the level of service that can be delivered at different funding levels, and make performance-based decisions in financially constrained capital plans and budgets.
- **Information Technology Systems** – A critical TAM component that allows for data-driven, performance-based decision-making.
- **Enablers** – Supportive processes and activities to ensure that the asset management business processes can be successful.

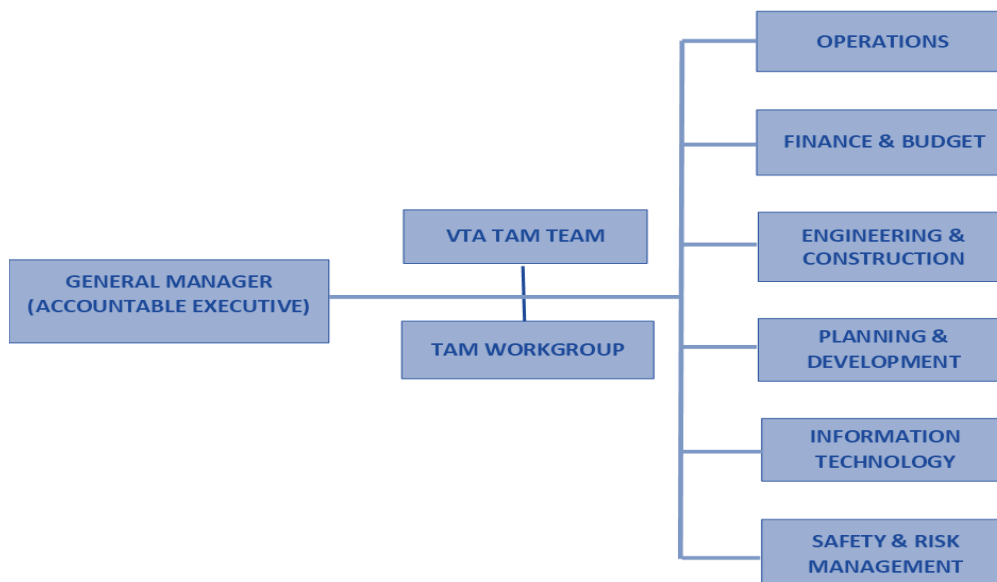
4.5.1 Governance and Accountability

Establishing a governance structure and obtaining executive sponsorship is critical for successful implementation. Above all, a transparent and well-planned governance structure clarifies roles and supports effective communications across the entire organization.

The development of VTA’s TAM Plan required engaging VTA executives, asset owners, and stakeholders in various VTA divisions performing asset management related functions. This process helped provide visibility into asset management practices at VTA, increased awareness, and created an opportunity to educate staff on the importance of asset management practices.

Figure 4.1 shows an organizational chart for asset management implementation and the relationships between staff and leaders that play a role in asset management at VTA. An advisory group has been created, identified in the asset management action plans, to provide direction and help develop and implement business processes. Specific technical working groups can be added at a later time.

Figure 4.1. Governance Structure for Asset Management Implementation



Descriptions of the roles and responsibilities of each of the stakeholders in the organizational chart are listed below. These stakeholders are important to establish an asset management-oriented culture at VTA and to ensure consistency and implementation of asset management practices agency-wide.

General Manager: The General Manager occupies a special role for the TAM program implementation. As the Accountable Executive, the General Manager has ultimate responsibility for the safety and asset management systems, TAM practices and policy, and control or direction over the human and capital resources needed to develop and maintain the safety and TAM plans.

VTA TAM Team: The VTA TAM Team oversees the implementation of VTA's asset management program. This includes the development and implementation of the asset management plan, data gathering and documenting, SGR analyses, and asset management performance reporting.

TAM Working Group (TAM-WG): The TAM-WG will serve as an advisory resource on technical issues, including setting standards, measuring performance and risk, and prioritizing needs for reinvestment as well as monitoring other asset management functions. The TAM-WG includes staff with responsibility for managing specific assets and/ or performing asset management-related processes. Members will represent the asset owners and the various engineering groups as well as other groups involved in implementing asset management. The asset management TAM-WG meets on an as-needed basis to discuss topics such as; recommended maintenance and rehabilitation processes and schedules, critical needs for implementation of the new asset management system, and generation of condition and performance information. The TAM-WG works with the Asset Management Team on designated issues involving capacity for project delivery, prioritization of investments, and implementing or changing asset management business processes.

Asset Owners: Asset owners are the closest to the day-to-day tactical SGR activities. Most, but not all, reside in Operations. Asset owners are critical stakeholders in asset management.

Divisions: The divisions identified on the right of Figure 4.1 are important stakeholders and contributors to this TAM Plan and its implementation.

VTA will monitor performance and develop appropriate documentation to track progress of asset management implementation and respond to MAP-21 requirements, to ensure accountability.





CHAPTER 5

Implementation

5. Implementation

5.1. Background

The TAM Plan implementation program is a guide for VTA to incorporate asset management principles into management practices and to establish the foundation for continual improvement and long-term maturity. This implementation program regroups several different items ranging from critical initiatives, schedule, to governance and continuous improvement.

The implementation process will assess areas for improvement and tools for action planning. It builds on the Gaps Analysis completed for the 2018 TAM Plan, the development of goals and objectives, and the steps needed to achieve those goals and objectives in the short, medium, and long terms for the TAM Program.

This Chapter addresses FTA TAM Elements 6 through 9. The other TAM Plan elements are addressed in prior Chapters. The subsections of the Implementation Program are as follows:

Section 5.1 Implementation Timeline & Action Plan– Provides an overview of the sequence and duration of action plans, as they relate back to the asset management goals and objectives, as well as prospective resource requirements for proposed action plans (TAM elements 6, 7, 8).

Section 5.2 Communication and Change Management – Describes the process for communicating and transitioning of currently unlinked asset management functions at VTA to a more mature state with business processes and tools that will enable informed decision-making, ensuring a safe, reliable, high quality, and cost-effective service. Change management is a stakeholder-involved process, whereby changes to asset management practices are formally introduced, vetted, and implemented by and with the TAM Stakeholders (represented by the TAM Workgroup).

Section 5.3 Continuous Improvement Plan – The TAM Vision and this Plan set objectives, strategies, and performance measures for continually improving how VTA manages its Assets. To successfully implement this Plan and advance the agency’s TAM maturity, VTA continues to undertake an annual review of progress and performance measures in conjunction with our NTD reporting. (TAM element 9).

Section 5.4 Systems Analysis – The program calls for a thorough analysis of systems requirements. The present data collection, maintenance, and analysis of systems capacity are reviewed, and capabilities are compared with the established systems requirements.

Section 5.5 Performance Measures and SGR targets – Specific asset management performance measures are proposed for implementation, providing improved insights into SGR vision and direction, and displaying results to provide decision-makers with current information on progress.

5.2. Implementation Timeline & Action Plan

This section establishes the Asset Management policy and governance structure for Plan implementation at VTA and identifies how VTA will meet its asset management goals and external requirements related to the 2021 Infrastructure Investment and Jobs Act (also known as the Bipartisan

Infrastructure Law ((BIL)). Integral to the Plan is the development of a policy, governance and accountability structure for implementation. Establishing direction for asset management practices, as well as defining divisional roles and responsibilities.

Table 5.1 establishes a timeline for VTA to implement its asset management action plan, using short term (years one and two), medium term (years three and four), and long term (five+ years) as the time designations.

Table 5.1. VTA Plan Implementation Schedule

Identified Tasks by Action Plan Bundle	ACTION PLAN (AP) #	Proposed Action Plan (AP)	*TAM Plan Element Numbers	Progress toward goal (since 2022)	Action Plan (AP) Time Designation						Annual Improvements
					Short term		Medium term		Long term		
					1	2	3	4	5	6	
Data Collection & Management											
Physical asset data collection using a consistent format and common condition rating scale.	AP-1	An inventory format has been developed based on TAM principles, data has been entered and modeled utilizing TERM Lite. We will continue to refine and manage the data annually.	1,2,4,5,6,7, and 9	Baseline complete with annual improvements.							
Resolve lack of institutional knowledge of SAP and its resulting system. capabilities and/or limitations	AP-2	Software requirements assessment was accomplished in 2019. Finance and IT decided on SAP-EAM. SAP S4HANA has been installed in a limited manner. Continue installation, implementation, and education.	1, 4, and 7	Partially Completed							
Data collection and management to meet current transportation legislation and final TAM rules and reporting requirements	AP-3	Continue to manage inventory, condition assessment, and SGR backlog in adherence to IJJA/BIL Guidance and final TAM rules.	1, 2, 4, 5, and 6	Baseline complete with annual improvements							
Resolve multiple data sources, repositories, and systems currently in use by migrating to a universal source.	AP-4	Consolidate data entry systems into a universal data source that can be used for multiple data platforms addressing all asset classes. Should be accomplished by the implementation of SAP-EAM and completion of AP-2.	1 - 4	Ongoing							
Decision Support Tools											
Develop Performance measures dashboard for NTD Reporting	AP-5	Implement an updated performance measurement framework in a dashboard for current performance that is easily accessible to staff.	1-4 and 6-9	Performance Measures tracked annually							

Identified Tasks by Action Plan Bundle	ACTION PLAN (AP) #	Proposed Action Plan (AP)	*TAM Plan Element Numbers	Progress toward goal (since 2022)	Action Plan (AP) Time Designation						Annual Improvements	
					Short term		Medium term		Long term			
					1	2	3	4	5	6		
Develop asset records at consistent levels of detail	AP-6	Ensure all assets are tracked in the asset inventory system for entry into TERM Lite and align data (common identifier) to extract SAP information	1-4	Ongoing								
Operations and Maintenance Planning												
Perform (non-rolling stock) condition assessment of assets based on standardized condition rating	AP-7	Develop a condition rating schedule and procedure for facilities and infrastructure to provide a more accurate demonstration of needs.	1, 2, 4, 6, 7, 9,	Partially Completed								
Establish a process to prioritize asset improvements based on condition.	AP-8	Implement asset improvement program, linking capital reinvestment needs with the budgeting process; prioritizing projects across asset classes based on TERM Lite prioritization assessment	2-4 and 6-7	Ongoing								
Capital Planning												
Develop a stronger connectivity between asset condition-based investments and the budget	AP-9	Develop a consistent TERM Lite condition rating-based project funding priority forming the foundation of the Strategic Capital Investment Plan (SCIP)	2-4 and 7	Ongoing								
Link investment prioritization to a needs-based planning framework	AP-10	Decision support tools to include estimation of capital investments over time and prioritization of investment needs over time	3 and 4	Ongoing								
Risk-based Framework												
Develop risk-based maintenance plans.	AP-11	Implement TAM-risk-based maintenance planning (Risk register developed in 2019)	1, 2, 7	Ongoing								
Develop risk-based investment framework	AP-12	Establish risk-based approach consistent with federal guidance and industry best practices	3, 5, 6	Not started								
Change Management												
Manage Staff turnover and succession planning as it affects TAM	AP-13	Encourage agency-wide staff succession planning and include TAM documentation in new staff onboarding	7	Not Started								
Formalize communication and change management approach in place	AP-14	Develop an overall communication strategy. Explain why maintenance, rehabilitation, and renewal investments are needed internally and externally.	6 and 8	Not started								

Identified Tasks by Action Plan Bundle	ACTION PLAN (AP) #	Proposed Action Plan (AP)	*TAM Plan Elements	Progress toward goal (since 2022)	Action Plan (AP) Time Designation						Annual Improvements
					Short term		Medium term		Long term		
					1	2	3	4	5	6	
No formal learning and development program for TAM and EAM system	AP-15	Provide general asset management training for affected employees.	7	Not Started							
TAM Goals & Objectives											
Develop formally defined TAM Roles and responsibilities	AP-16	Identify, through collaborative discussions with staff and leadership, roles and responsibilities of all departments, and divisions.	7	Ongoing							
Prepare and adopt 2022 TAM Plan stating clear vision, goals, and objectives for TAM.	AP-17	Formally adopt a TAM Plan with vision, goals, policy, and objectives developed through change management principles to ensure that TAM is a priority within the agency and to engage leaders to support implementation of TAM actions, goals, and objectives.	7	TAM Plan to be completed in 2022, other actions to be Ongoing.							
No continual improvement program in place	AP-18	Implement Continuous Improvement Plan	7	Not started							
Staff must be willing to work across department and functional boundaries for successful TAM	AP-19	Design cross-functional training and opportunities to help engage staff across department and functional boundaries for successful TAM	6	Not started							
Performance Measures											
Develop and track performance measures	AP-20	Implement updated performance measurement framework and develop dashboard easily accessible by staff	1-4 and 6-9	Ongoing							
Develop central repository for report submission	AP-21	Implement updated performance measurement reporting that is easily accessible by staff	1-4 and 6-9	Ongoing							

*The numbers indicate TAM plan elements on table 2.1.

5.2.1. MAP-21 Requirements

Table 5.2 lists how VTA has implemented TAM programs that will address the various requirements introduced by MAP-21 legislation with its action plans.

Table 5.2. VTA Initiatives addressing MAP-21 Requirements

MAP-21 Final TAM Rule	MAP-21 & Final Rule Reference	VTA Compliance Approach by Action Plan (AP)
Develop a TAM Plan	5326(b); 625.17; 625.25	AP-4 standards for reporting; AP-19 asset management plan development
Develop a TAM Plan that includes capital asset inventories	5326(a)(2)(A); 625.41	AP-2, AP-8, AP-17; asset management plan development; data management
Develop a TAM Plan that includes condition assessment	5326(b)(2) & 5326(a)(2)(A); 625.41	AP-1 condition rating; AP-10 linking capital reinvestment needs with the budgeting process
Develop an asset management plan that includes use of a decision support tool that allows for estimation of capital investment needs over time	5326(b)(2) & 5326(a)(2)(A); 625.53	AP-1 Federal TERM Lite condition rating scale; AP-11 link to capital reinvestment needs; asset categories, asset classes, individual assets
Develop an asset management plan that includes investment prioritization	5326(b)(2) & 5326(a)(2)(A); 625.33	AP-8; AP-9; AP-10 TAM principle-based asset inventory; consistent data formatting
Report on the condition of the system	5326(b)(3) & 625.41	AP-1 condition assessment methods; AP-7 update asset management system
Provide a description of any change in condition since the last report	5326(b)(3) & 625.29	AP-2; data accessibility/ performance analysis; AP-7 update asset management system; AP-8 asset inventory developed based on TAM principles
Provide performance targets in relation to SGR performance measures	5236(c)(2); 625.43	AP-5 data collection to match performance measurement requirements; AP-11 prioritization criteria; AP-12 performance monitoring & investment prioritization
Report on the progress toward meeting the performance targets	5326(c)(3)(A); 625.45	AP-9 performance dashboard; AP-11 prioritization criteria
Provide subsequent fiscal year performance targets	5326(c)(3)(B); 625.45	AP-4 SGR backlog management; AP-10 performance-based planning & prioritization; AP-13 TAM-based maintenance planning; AP-18 performance measurement monitoring

With implementation of the proposed Action Plans, VTA can successfully address all MAP-21 requirements. Chapters 2 and 3 summarized some of VTA’s key compliance areas (e.g., inventory, asset condition and SGR backlog).

5.2.2. Communications and Change Management

Successful asset management implementation requires good communication, including ongoing dialogue and progress updates, and change management. Change management is an active process used to build awareness, enlist the participation of key stakeholders, implement the changes required, and sustain the change over time to achieve the asset management goals. Especially for business process change, it is important to reach agreement on the need to make the change (for example across Operations, Planning and Finance & Budget) as well as the need to support the change through to

implementation. A common approach for change management is the ADKAR acronym, which is a useful aid for understanding and promoting organizational change. The acronym represents the need to have:

- A – Awareness of the need for change
- D – Desire to participate and support the change
- K – Knowledge of how to change
- A – Ability to implement required skills and behaviors
- R – Reinforcement to sustain the change

Perhaps one of the most important actions in this respect is the development of an internal asset management communications system (AP-15 through AP-21), which will deliver regular communication to key staff about the importance of asset management, the key actions being conducted, and progress on those actions.

5.3. Continuous Improvement Plan

The TAM Vision and this Plan set objectives, strategies, and performance measures for continually improving how the VTA manages its assets. To successfully implement this Plan and advance the agency's TAM maturity, an annual review of progress and performance measures will influence the revision of these documents and the development of new projects to further VTA's progress towards the TAM Vision.

The main components of the continuous improvement plan involve paying close attention to stakeholder involvement; processes, mainly TAM Plan monitoring and updates; and finally risk management.

5.3.1. Stakeholder Involvement

Efficient management of VTA's transit assets depends not just on VTA employees, but also on external stakeholders. These are partner agencies, customers/community, regulators, vendors, all of which have their own expectations from the transit system:

Customers/community: VTA would not exist if not for the customers that use its transit service. VTA's customers depend on transit for jobs, education, healthcare, shopping, and entertainment. Additionally, VTA's customers trust that the equipment and operators will get them to their destination safely. When a customer is injured due to infrastructure or equipment failure, or operator error, VTA risks losing its most important stakeholder.

Regulators: The Federal Transit Administration (FTA), Federal Railroad Administration (FRA), Environmental Protection Agency (EPA), California Public Utilities Commission (CPUC) and Occupational Safety and Health Administration (OSHA).

Vendors: The performance and pricing of service providers, contractors, consultants, material suppliers, and other vendors directly affect VTA's ability to deliver projects on time and on budget. Issues with vendor performance and/or pricing may have a profound impact on the performance of the transit system at large.

This TAM Plan was written with an understanding of what each stakeholder expects from the transit system and is designed to help meet those expectations, while simultaneously balancing VTA's internal priorities. Stakeholders should be engaged in meaningful ways in the implementation of the actions from this Plan.

5.3.2. TAM Plan Updates and Monitoring

Executive management (starting from the accountable executive) will play a strong role in shaping objectives, communications and performance targets in the Plan. VTA TAM sponsors from executive management will help ensure alignment with other strategic planning documents.

PPD is responsible for implementation of the TAM Plan, with the support from the governance structure. The milestones laid out in the implementation plan ought to be tracked and reported on regular intervals.

At least every four years the Plan will be reviewed and revised as necessary. These revisions will require input from various internal and external stakeholders. VTA will strive for better asset performance, risk reduction, and agency cost savings with each revision of the TAM Plan.

5.3.3. Risk Management

VTA Conducted a Risk Management Process in 2020. It was based on a 2D-Risk Assessment Matrix shown in the Table below.

Figure 5.1. Risk Assessment Matrix

2D RISK ASSESSMENT MATRIX

		Probability of Occurrence				
		Improbable (1)	Remote (2)	Occasional (3)	Probable (4)	Frequent (5)
Potential Impact	Negligible - 1	Insignificant	Insignificant	Low	Low	Low
	Marginal - 2	Insignificant	Low	Low	Low	Moderate
	Moderate - 3	Low	Low	Moderate	Moderate	Elevated
	Critical - 4	Moderate	Moderate	Elevated	Elevated	High
	Catastrophic - 5	Moderate	Moderate	Elevated	High	High

The Table below indicates an example of scores but is not comprehensive of all scores.

Table 5.3. Priority Risk Score		
Row Labels	Sum of Priority Risk Score	Mitigation
Overhead system failure (sagging, pantograph catching, age, heat)	340	Monthly/annual inspections; Maintenance; Rehab program, replacement wire based on wear; Additional supports (Mall Area)
SCADA system failure	288	Radios as back up comms; Fail over to redundant servers; Patches/upgrade/replace/health monitor; PM equipment; Equipment replacement
Track pumping at Crossings	200	Inspect 2x week/Operator reports; Ultrasonic; Testing; Slow Zones; Capital Project (for correction)
Track Pumping in embedded track	200	Inspect 2x week/Operator reports; Ultrasonic; Testing; Slow Zones; Capital Project (for correction)
Switch Points Gapping	200	Operator reports; Manual switch operation (staffing); Corrective maintenance
Non-Trailable (Rigid) Switches derailing second car	180	Monthly Switch inspection program; Operator training
Paving cracks and unevenness - transit centers	176	Repair program; Self-reported
Paving cracks and unevenness - parking facilities	176	Repair program; Self-reported
Water Line Failure - Ops/Maint Facilities	176	Portapoties and sink stations provided
Wheel Axle Press Failure	156	Annual maintenance; capital project - replacement
Truck lock-up or wheel derailment	152	Maintenance/rebuild
Generator failure - Guadalupe	152	New UPS to back up power SCADA/Rail Systems (data specifically) - limited run time; Other = qrtl maint, PM, Inspections
HVAC failure at data centers	144	Quarterly maint; PM program; Inspections; Redundant system
HVAC Failure (office spaces) - Note increased impact due to COVID	144	Portable unitsRedistribute air with EM systemPM program
Internet/server network failure	144	Active monitor; PM; Patches; Fail over
Generator failure - paratransit	144	Quarterly maint; PM program; Inspections
Timber Tie Failure	140	Inspect 2x week; Tie replacement; Rehab program

Track Pumping due to Ballast Failure	140	Inspect 2x week; Ballast Tamping; Regular Maintenance; Rehabilitation Program; Slow Zones
Generator Failure - River Oaks (during a power outage)	136	UPS (only 4 hours) – temporary; Fail over to Guadalupe
2001 and 2002 buses chassis structure fatigue failures	132	Inspect every 2K miles; Repairs in-house
2001 and 2002 buses parts unavailability	132	Alternative parts from Purchasing; Evaluated by Bus Maint; Replace bus fleets
2001 and 2002 buses fastener fatigue failures	132	Inspect every 6K miles; Repairs in-house
Hegenscheidt Machine Failure	132	Annual maintenance; capital project - replacement
CAD/AVL system failure	128	Radios as back up comms; Fail over to redundant servers; Patches/upgrade/replace/health monitor; PM equipment; Equipment replacement
SAP Enterprise Resource Program (ERP) and Enterprise Asset Management (EAM) system failure	128	Active monitor; PM; Patches; Fail over
Concrete spalling under direct fixation tracks (e.g., San Carlos/Woz Way) - compliance issue only	120	Inspection program; Capital project planned
Tamper and liner failure - can't tamp track	112	PM program; Tamp by hand
Rounded Ballasts	112	Inspect 2x week Tie replacement Rehab program
Generator failure - bus	112	Quarterly maint; PM program; Inspections
Badge Reader Break-Down (fail to unlock doors, localized impact)	112	Security Guards at failed locations; Some PM/CM in failure
Bus hybrid battery packs failure	104	Monitoring amp ratings regularly ; Rebuild
Bridge Failure - Elevated sections along 87, Hamilton Station, etc.	104	Inspection program – annual; Capital project for major repairs
Bus high voltage cable failures on hybrid drive system	96	Inspect every 6K miles; Repairs in-house
Fire suppression system failure - at data center	88	Quarterly maint; PM program; Inspections
Fiber or network cabling failure between sites	88	Active monitor; PM; Patches; Fail over
Bus Traction motor failures on hybrid buses	88	Corrective maintenance
7.5 Ton Crane Failure	88	Inspection; capital project - overhaul
Train Lift Failure	80	Quarterly maint; PM program; Inspections

Charging infrastructure failure - 5 vehicles	80	Monitoring actively - EMP
Fuel Tank Leak - Underground	76	Monitoring system
Fuel island failure - above ground components	76	Inspections; Repairs
Failure at-grade crossings	76	Inspections; Repair in-house; Replaced as needed; Officers man the crossing; Fail safe system - fails to safe position
Fault Monitoring System past useful life	72	Repairs as needed; Capital project for replacement
UPS Failure - yard power	72	Inspection; PM program
Propane System Failure - odor, flames, explosion - 30K tank, Cerone	72	Reduce size of tank
Paint Booth Failure	72	Quarterly maint PM program Inspections
Substation major component failure (transformer, rectifier, switchgear)	64	Monthly/annual inspections; Maintenance; Rehab program, replacement wire based on wear; Additional supports (Mall Area)
Single Point Failure for entry into Younger LRV Yard	60	Concept Design for redundancy
Switch Points Pumping	60	Camera System undercarriage of cars
Trapeze Ops failure	60	Radios as back up comms; Fail over to redundant servers; Patches/upgrade/replace/health monitor; PM equipment; Equipment replacement
SVRC Radio server failure	60	Back ups available
Crane Cable Failure	52	Inspection; capital project - overhaul
Significant wear and tear on segments (e.g., Half Grand) of embedded curved tracks that require replacement	48	Inspections 2x week; Weld sections/maintenance program; Rehab program - replacement of curves
HVAC failure	44	Maintenance/rebuild
Wastewater Treatment Plant Failure	44	Quarterly maintain; PM program; Inspections
CCTV failure	36	Repair, patches, upgrades; Newer CCTV has warning/older can not monitor health
Telecommunications (phone) Systems Failure	32	Active monitor; PM; Patches; Fail over

5.4. Systems Analysis

Interviews with VTA staff revealed multiple challenges in using current software to support efficient TAM decision making. These challenges include, but are not limited to:

- VTA's primary database/ fixed asset system, SAP, is not considered user-friendly and many of its available features are not well understood and cannot easily be accessed by VTA users, most notably the query and user report writing capability. SAP has Data Warehouse capabilities, but they are unknown to, are not available to, or are not configured for use by many VTA users. Staff have resorted to manual data reports using Excel spreadsheets to circumvent the issues with SAP reporting features.
- Some data types are not recorded at the level of granularity needed for TAM analysis.
- VTA began using Decision Lens in 2010, to assist with their participation in the Federal New Starts process. The members of the Capital Working Group (two representatives from each division) populated the criteria, per the distributed template. Each CWG member ranks all proposed projects, then the consolidated results and projects are listed by rank in the criteria. The list of projects includes reinvestment projects, but also expansion and new technology projects. While some staff have found the process helpful, the overall take-away is that the annual update cost of \$125,000 is deemed too high for the limited value provided. There is a spreadsheet version of the project ranking system that is used when Decision Lens is not available.
- Lack of regular end-user training and work instructions for staff, both new and current, in how to use and extract data from the various modules of SAP.
- Shortage of IT staff dedicated to managing SAP and data migration from non-SAP EAM systems.
- Users in general are focused on the short-term usage of systems and do not prioritize long-term process improvements, which is exacerbated by high staff turnover.
- A functional EAM is pivotal for balancing VTA's asset needs, as noted below.

5.4.1. EAM Functionality

EAM systems have continued to grow in functionality to support more sophisticated TAM programs in recent years. EAM systems now focus on managing assets throughout their lifecycle instead of just on maintenance management or work orders (or the EAM system pulls in data from the existing MMS). Functional augmentations include:

- Expanded Asset Inventory & Information
- Definable Asset and Location Hierarchies
- Asset Configuration Management
- Asset Condition Assessment Interface
- Asset Transitioning
- Asset Reliability & Performance Measurement
- Capture of Life-Cycle Costs Across All Life Stages
- Major Capital Maintenance Planning

The SAP system required a significant commitment to purchase, install, and update. The SAP system has undergone two major improvements in the past two years: integration of GIS system and LiDAR data collection, which provide capabilities of streamlining the process of asset registry, synchronizing data sources of different systems, and offering a holistic view of asset management and rehabilitation needs. However, more in-depth assessment of the SAP system is needed for further enhancement. One option,

to be examined during a requirements analysis, is to negotiate with SAP to determine if the present system can be upgraded to include more EAM functionality, and possibly be linked to other VTA systems, so that some more advanced applications can be deployed. Applications can include (but are not limited to) the following:

- SCADA
- Linkage to Document Management System for As-built drawings/O&M manuals/parts
- Automated Data Collection Systems
- Asset Degradation Modelling and Analysis
- Decision Support Systems
- Asset Specific Inspection Programs
- Yard Map/Lot Map and AVL
- Asset Replacement Scheduling and Forecasting
- Mobile Computing and User Data Entry Improvement
- Data Warehousing, Analysis, and Reporting
- Product Life Cycle/Product Data Management
- Automated Time Capture/Time Clock

5.4.2. EAM Recommendations

The following are the conclusions gathered from the analysis of VTA, peer agencies and the EAM industry:

- An EAM system should support data-driven decision-making and promote a comprehensive and mature TAM program.
- VTA would greatly benefit from a system requirements analysis of the present EAM system, along with staff development and training to increase user proficiency with SAP and TERM Lite.
- Continuation of integrating GIS capabilities with TAM can enhance the asset management process, break “silos of excellence”, and facilitate coordinated decision making.

VTA would also benefit from a more coordinated approach to EAM and IT implementation using Standard Operating Procedures (SOPs) instead of its current “siloesd” approach.

5.5. Performance measures and SGR Targets

5.5.1. Existing Performance Measure

Per the new FTA TAM rules, agencies must set targets for the following SGR performance measures, which focus on condition and useful life. As part of the annual review process, VTA will review performance reporting to identify areas for improvement, and ultimately shape the refinement of the objectives, strategies, and implementing projects/actions for future iterations of this Plan. This does not preclude mid-year review of performance reporting and interim adjustments to TAM objectives, strategies, and implementing projects/actions as needed.

The performance measure for rolling stock (both revenue and non-revenue) is the percent of vehicles that are at or beyond the agency’s useful life benchmark (ULB). The current VTA bus fleet has a wide range of vehicle ages for instance, most of the articulated bus fleet are 14 years old and due for replacement, with delivery of new buses projected in 2018. The 35’ bus fleet will be 17 years old at replacement; due to the requirement that VTA keep these buses running in revenue service, the agency must undertake a 2nd midlife overhaul (power packs, transmission). At present, a third-party contractor

is overhauling the 40' 1998/ 1999 buses (due back in service in 2017). In summary, of the 440 buses in the current inventory, 61% are past 12 years old and therefore beyond their useful life benchmark.

Light rail vehicles are still new, as the original fleet of high floor LRVs was replaced from 2002 to 2005 by 100 low floor cars manufactured by Kinki Sharyo. VTA recognizes that the fleet will reach the 30-year mark at the same time, and thus they must look at overhauling some cars to extend their useful lives during the replacement period.

1. **Rolling Stock** (bus and rail) – The percentage of revenue vehicles within an asset class that have either met or exceeded their useful life benchmark (ULB)

Table 5.5. Rolling Stock Performance

Vehicle Class	Performance			Target FY 22
	FY 19	FY 20	FY 21	
Light Rail	0%	0%	0%	0%
Bus Articulated -60ft	0%	0%	0%	0%
Bus - 35ft & 40ft	35%	30%	29%	27%
Para Transit - Automobiles	16%	16%	0%	0%
Para Transit- Minivans	30%	30%	33%	30%
Para Transit - Cutaways	40%	40%	41%	40%
Vintage Trolley	100%	100%	100%	100%

Defining track segments is key to determining the benchmark for the percentage of slow zone operations. Discussion among workshop participants resulted in agreement that one mile per zone is appropriate, given that the VTA track mile total is 82. Currently VTA track maintenance issues monthly reports on slow zones, and an annual report after the conclusion of the calendar year. Current percent of “slow zones” versus total guideway mileage is 0.5%. It was agreed that, going forward, two percent or less of the 82 track segments requiring slower than posted speed is realistic and achievable.

2. **Infrastructure** (rail fixed-guideway, track, signals, and systems) – The percentage of track segments with performance restrictions (i.e. what percentage of revenue miles are slow zones)

Table 5.6. Infrastructure Performance

Mode of Guideway	DRM of Guideway	Performance			Target FY 22
		FY 19	FY 20	FY 21	
Light Rail	Total System is 80 DRM	0.88%	0.88%	2.87%	2.50%

The FTA requires one composite condition rating for each facility, from bus and rail maintenance facilities to stations. Surveying of the major components (e.g. HVAC, superstructure, elevators, and parking lots) is required, with each component receiving a score. The scores are then averaged to arrive

at the overall rating for a given facility. The Engineering and Transportation Infrastructure Division (ETID) conducts some of the assessments for facilities (stations and other passenger-facing amenities). GIS, facility, and engineering teams are working together to streamline the approaches for assessment of maintenance buildings and equipment. Throughout the process, the responsibilities will be clearly defined for assessing facilities and the inspection can be done through using location-enabled tools and dashboards. These records will be synchronized with SAP and Term Lite records, which will improve the rating by applying consistent rating scores.

- Facilities** – The percentage of facilities (maintenance facilities and stations) within an asset class, rated below condition 3 on the TERM scale

Facilities by Type	Performance			Target FY 22
	FY 19	FY 20	FY 21	
Light Rail Stations (61)				
Light Rail Platforms (87)				
Bus Transit Centers (29)	0%	0%	0%	0%
Park & Ride Lots (37)				

Non-revenue vehicles are generally held over past their useful life benchmarks, as purchase and renewal of these assets tends to be cut from capital programs due to funding shortages. An example cited is a small fleet hybrid automobiles, which continue to be part of the fleet and in fair to good condition although most are over 12 years old. Specialized track maintenance vehicles include heavy rail vehicles, car movers, tamper cars, and utility trailers. These vehicles have a range of ULB, from 15 to 30 years, depending upon usage and routine maintenance protocols. Due to lack of funding 50% of track maintenance vehicles are operated well past the 15-year mark, while being maintained at or close to SGR.

- Equipment** – The percentage of non-revenue vehicles that have either met or exceeded their ULB.

Vehicle Class	Performance			2021 Target	2022 Target
	FY 19	FY 20	FY 21		
Automobiles (126)	49%	40%	60%	38%	50%
Truck and Other Rubber Tire vehicle (11)	43%	55%	52%	47%	49%
Steel Wheel Vehicles (3)	100%	100%	100%	100%	100%

Per the FTA TAM Final Rule, beginning in 2018 (for the 2019 fiscal year), VTA must report on progress versus performance targets for a designated set of performance measures. The categories of performance measures are detailed below.

Table 5.9. VTA Category of Performance Measure 2021					
	At or Beyond ULB	Within ULB	Fleet Total	ULB	Percentage At or Beyond ULB
Articulated Buses					
4300 Series	0	29	29	14	0%
8300 Series	0	46	46	14	0%
TOTAL Articulated Buses	0	75	75	14	0%
BUSES (100 -7500 Series)					
100 Series	0	70	70	14	0%
200 Series	0	20	20	14	0%
1000 Series (40 ft)	31	0	31	14	100%
2000 Series (40 ft)	25	0	25	14	100%
2100 Series -(35 ft)	14	0	14	14	100%
2200 Series (40 ft)	37	0	37	14	100%
4100 Series	0	38	38	14	0%
4200 Series	0	10	10	14	0%
4400 Series	0	15	15	14	0%
6200 Series	0	10	10	14	0%
6400 Series	0	33	33	14	0%
7400 Series	0	56	56	14	0%
7500 Series	0	5	5	14	0%
TOTAL BUSES (100 -7500 Series)	107	257	364	14	29%
GRAND TOTAL BUSES	107	332	439	14	24%
Paratransit					
Vintage Trolley	1	0	1	60	100%
Light Rail Vehicles	0	98	98	30	0%
Para Transit Automobiles	0	56	56	6	0%
Para Transit Minivans	31	63	94	5	33%
Para Transit Cutaways	20	29	49	7	41%
TOTAL Paratransit	51	148	199		26%
NON-REVENUE VEHICLES					
Automobile	76	50	126	10	60%

Truck Heavy Duty	70	8	78	10	
Truck Light Duty	0	5	5	10	0%
Truck Special	24	15	39	10	62%
VAN	20	67	87	10	23%
SUV	0	9	9	10	0%
Electric Golf Cart	0	1	1	10	0%
Total Truck and Other Rubber Tired Vehicles	114	105	219	10	52%
Steel Wheel Vehicles	2	0	2	25	100%
TOTAL EQUIPMENT	192	155	347	45	55%

5.5.2. Proposed Performance Measure and SGR Targets

Table 5.10 on the following page shows the proposed high-level performance measures that address each of the VTA TAM goals and objectives. The proposed measures highlighted are those that directly address the FTA Final TAM rules performance measures. Also, shown in the table is a proposed implementation timeframe for each measure, broken down between near term (less than two years) and long term (more than two years). Note some measures are listed several times, to ensure each objective was addressed by at least one measure. Developing a procedure for conducting condition assessments is key to several of the performance targets as well as improving the quality and timeliness of condition data available.

The following summarizes the major types of proposed performance measures:

- Vehicles: Age, mileage, availability, mean distance between failures (MDBF);
- Guideway Elements: Age, condition inspections;
- Facilities/Stations: Age, availability, failure rates, corrective/preventive maintenance ratios;
- Systems: Age, availability, mean time between failures (MTBF), delays caused by failure;
- Goal areas: Percent of asset management action plans completed.

VTA currently tracks basic operational level performance measures supporting SGR, including:

- Age (Remaining Useful Life)
- Car availability (by fleet, car type)
- Number of delays (actual and cascading)
- Passenger complaints (by malfunction type: e.g., HVAV, door, PA)

Table 5.10. VTA TAM proposed performance Measures

Goals	Objectives	ID	Proposed Performance Measure	Implementation Timeframe		
				Near Term (<2 YRS)	Mid/Long Term (>2 YRS)	
(1) Maintain VTA assets in a State of Good Repair to support a safe operating environment	Document root cause analysis for asset failures	1.1.1	Percent reduction in asset failures	Already Implemented		
	Maintain equipment in SGR	1.2.1	Percent of facilities with a condition rating of less than 3.0 on the TERM scale	●		
		1.2.2	Percent of guideway directional route miles with performance restrictions	●		
		1.2.3	Percent of non-revenue support service and maintenance vehicles that have met or exceeded their useful life	●		
		1.2.4	Percent of revenue vehicles that have met or exceeded their useful life by asset class	Already Implemented		
		1.2.5	Mean Miles Between Failure (MMBF)	Already Implemented		
		1.2.6	Mechanical Delays (and as a percent of total system delays)	Already Implemented		
	Measure and manage TAM-related risks	1.3.1	Percent of asset projects approved in budget that match priority for risk and resiliency		●	
	(2) Build and promote financial sustainability through implementation of asset management best practices	Develop objective method to prioritize capital projects and assess trade-offs between competing investments	2.1.1	Percent current backlog approved in budget/SGR funding programmed for short and long-term plans		●
			2.1.2	Percent of asset projects approved in budget that match priority for risk and resiliency		●
2.1.3			Percent reduction in backlog		●	
Establish linkage between multi-year SGR needs, annual budget process and Capital Improvement Program		2.2.1	Investment required to achieve SGR outcomes (e.g., maintain backlog; Percent annual reduction in backlog)	●		
		2.2.2	Ratio of SGR assets approved in budget to Short Range Transportation Plan/ Long Range Transportation Plan SGR programmed funding	●		
		2.2.3	Ratio of SGR needs to available funding	●		
Develop asset management Systems approach		3.1.1	Percent of assets with performance Targets	●		
		3.1.2	Percent of related TAM Action Plan actions completed/ deferred	●		

	Establish clear capital replacement and rehabilitation plans, and monitor adherence	3.2.1	Backlog - Cost to bring assets into SGR	●	
	Establish clear capital replacement and rehabilitation plans, and monitor adherence Assess and implement tools to support data driven asset management decisions	3.3.1	Backlog - Replacement Value	●	
		3.3.2	Backlog - Weighted average of (asset value * condition rating) versus (asset value * minimum condition rating)	●	
		3.3.3	Percent of assets with performance targets	●	
		3.3.4	Percent of assets with complete data in TAM database	●	
(4) Demonstrate organizational efficiency for asset management processes and all-agency outreach	Improve and expand communications with all staff regarding SGR needs and priorities	4.1.1	Percent current backlog approved in budget/SGR funding programmed in SRTP/LRTP	●	
	Improve and expand communications with staff re SGR needs and priorities. Advance awareness of TAM across all levels at VTA	4.2.1	Percent of asset projects approved in budget that match priority for risk and resiliency		●
		4.2.2	Percent reduction in backlog		●
		5.1.1	TAM policy adopted	Already Implemented	●
(5) Promote asset management culture at VTA	Develop and retain well trained TAM workforce	5.2.1	Percent of TAM related positions staffed and trained on TAM processes	●	
		5.2.2	Ratio of TAM related staff to total TAM staff needed	●	





CHAPTER 6

Silicon Valley Rapid Transit Assets

6. Silicon Valley Rapid Transit Assets

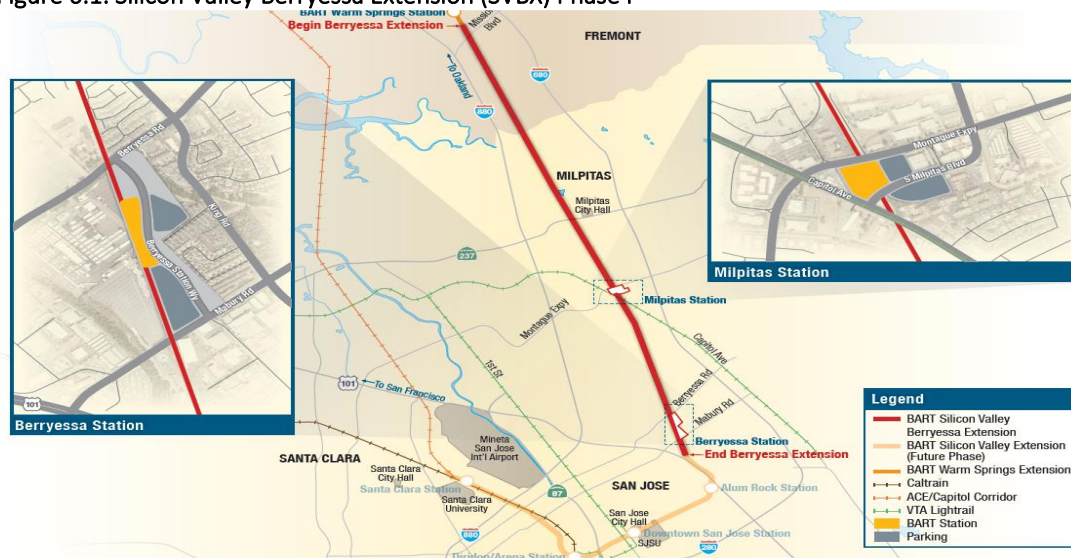
6.1. Background

This section addresses a new set of assets which were added to VTA’s family of assets with the opening of the first phase of the Silicon Valley Rapid Transit (SVRT) line to Berryessa Station in the 2019/2022 Federal Fiscal Year (FFY). SVRT extends the Bay Area Rapid Transit (BART) system southward into Santa Clara County. All SVRT assets are owned by VTA. Because this represents a new set of assets (distinct from traditional VTA assets) with joint asset responsibilities shared between VTA, BART, and other jurisdictions these assets are described in this stand-alone chapter. Future TAM plans may incorporate the SVRT assets directly with VTA’s asset base.

6.2. SVRT Corridor and Project

The Phase I SVRT project, Silicon Valley Berryessa Extension (SVBX) project represents a 10-mile extension of the BART heavy rail system from Fremont to Berryessa Road in San Jose. The SVBX project has been built on a former Union Pacific freight railroad right-of-way, linking the Warm Springs/South Fremont BART Station in Fremont to the Berryessa/North San Jose BART Station with an intermediate station (Milpitas BART Station) adjacent to the existing VTA Milpitas Light Rail Station in Milpitas. The SVBX is a two-track, third rail powered, exclusive guideway heavy rail system operating under automatic train control. The project included the purchase of 40 new BART passenger cars for operation on the extension, two multi-level parking structures and two bus transit centers as well as improvements to the existing BART-Hayward rail car storage and maintenance yard. The project is expected to serve 46,000 average weekday trips by 2035. Turnover dates for the SVBX assets occurred early in 2018 with Revenue Service starting in June 2020.

Figure 6.1. Silicon Valley Berryessa Extension (SVBX) Phase I



The Phase II SVRT project, Silicon Valley San Jose Extension (SVSX), is planned to run 6.5 miles from the Berryessa Station/North San Jose Station through downtown San Jose to the City of Santa Clara. The project is planned to include four stations, five miles of single bored subway tunnel, 48 heavy rail vehicles, two parking structures and a maintenance facility.

Given the timing of the two extensions, this chapter is primarily concerned with SVBX or Phase I assets.

6.3. Governance

Governance of the assets directly related to the passenger movement service follow a general rule:

1. VTA owns the assets.
2. BART operates and maintains them.
3. BART generates capital needs projections and
4. VTA reviews, approves, and funds the capital needs.

Other VTA SVBX service-related assets that VTA owns, operates, and maintains, such as stations campuses and parking structures, fall under the same governance structure as with existing VTA assets. The Comprehensive Agreement, signed by VTA and BART, as well as the newer Operations & Maintenance (O&M) Agreement, define the separation of duties, governance relationships and funding, as these relate to SVBX assets. The O&M Agreement supersedes the Comprehensive Agreement with regards to any provision related to ongoing operations, maintenance, or costs of operating the SVRT Extension.

Some assets such as specialized rail maintenance vehicles (e.g., high bucket trucks, tampers, high rail flatbed trucks) are both owned and maintained by BART. Given that VTA funds will be used for replacement of these vehicles, VTA will maintain some responsibility for asset inventory and condition capital reporting. In practice, BART will conduct the measurement of the asset conditions and report on the assets as the operator/maintainer, but VTA will report on the assets as the agency with capital responsibility. Table 6.1 illustrates the division of primary responsibility for all major SVBX asset types.

As illustrated in the table, VTA is responsible for the inventory development and for most of the reporting. This extends to State of Good Repair target setting and relevant NTD reporting. BART will incorporate the VTA-developed asset inventory of BART-maintained SVBX assets; however, this information will be integrated with BART's Maximo software at a different level of granularity. Since VTA is the owner of the assets, VTA's RTCI /TERM Lite inventory is the inventory of record for FTA and for TAM purposes. A process of reconciliation of the two inventories will be required, to accurately report to the National Transit Database (NTD).

Table 6.1. SVBX Asset Responsibility

Asset Category / Type	Assets	Own	Maintain	Capital Replacement Responsibility	Inventory Maintenance ¹	Asset Condition Assessment ²	Condition Reporting to NTD (A-10 to A-70)	SGR Performance Target Reporting to NTD (A-90) ³
GUIDEWAY & TRACK	- Guideway - Track - Track Structures - Pump Stations	VTA	BART	VTA	BART	BART	BART & VTA	BART & VTA
	Soundwalls	VTA	VTA or BART, DOL	VTA	VTA	VTA or BART, DOL	N/A ⁴	N/A ⁴
	Fencing	VTA	VTA or BART, DOL	VTA	VTA	VTA or BART, DOL	N/A ⁴	N/A ⁴
	UPRR Bridge	VTA	VTA	VTA	VTA	VTA	VTA	VTA
	UP Service Road Bridge	VTA	VTA	VTA	VTA	VTA	VTA	VTA
	BART Bridge	VTA	BART	VTA	BART	BART	BART & VTA	BART & VTA
	Relocated UPRR Trackwork	UPRR	UPRR	UPRR	N/A	UPRR	N/A	N/A
	Maintenance Access Road	VTA	VTA	VTA	VTA	VTA	VTA	VTA
Other Roads	Various	Various	Various	Various	Various	Various	Various	
STATIONS	- Station building - Platform, Concourses - Elevators, Escalators	VTA	BART	VTA	BART	BART	BART & VTA	BART & VTA
	Station Campuses	VTA	VTA	VTA	VTA	VTA	VTA	VTA
	Bus Transit Centers	VTA	VTA	VTA	VTA	VTA	VTA	VTA
	Parking Structures	VTA	VTA	VTA	VTA	VTA	VTA	VTA
FACILITIES	Hayward Yard assets added for SVBX	BART	BART	BART	BART	BART	BART	BART
	Police Facility	VTA	BART	VTA	BART	BART	BART & VTA	BART & VTA
VEHICLES	BART Cars	VTA	BART	VTA	BART	BART	BART & VTA	BART & VTA
	Non Revenue Vehicles: Tampers, Hi-Railers, etc.	BART	BART	VTA	VTA	BART	VTA	VTA
SYSTEMS	- Train Control - Traction Power - Communications - Safety/Security (CCTV) - Fare Collection	VTA	BART	VTA	BART	BART	BART & VTA	BART & VTA

6.4. SVBX Asset Inventory

6.4.1. Inventory Process

The SVBX asset inventory was developed by VTA SVBX project staff and consultants during the 2015-2017 years and updated at the start of Revenue Operations. The inventory development process also included coordination with BART staff to incorporate their requirements. The SVBX Inventory has been compiled by VTA for assets to be operated and maintained by BART under the VTA/BART O&M Agreement, and for assets to be maintained by VTA, such as the Station Parking Garages.

Early on, it was recognized that the required inventory data flows would affect multiple departments within VTA and some external entities including BART. VTA Asset Management Staff will need to annually turnover asset information to BART for the assets that they are maintaining.

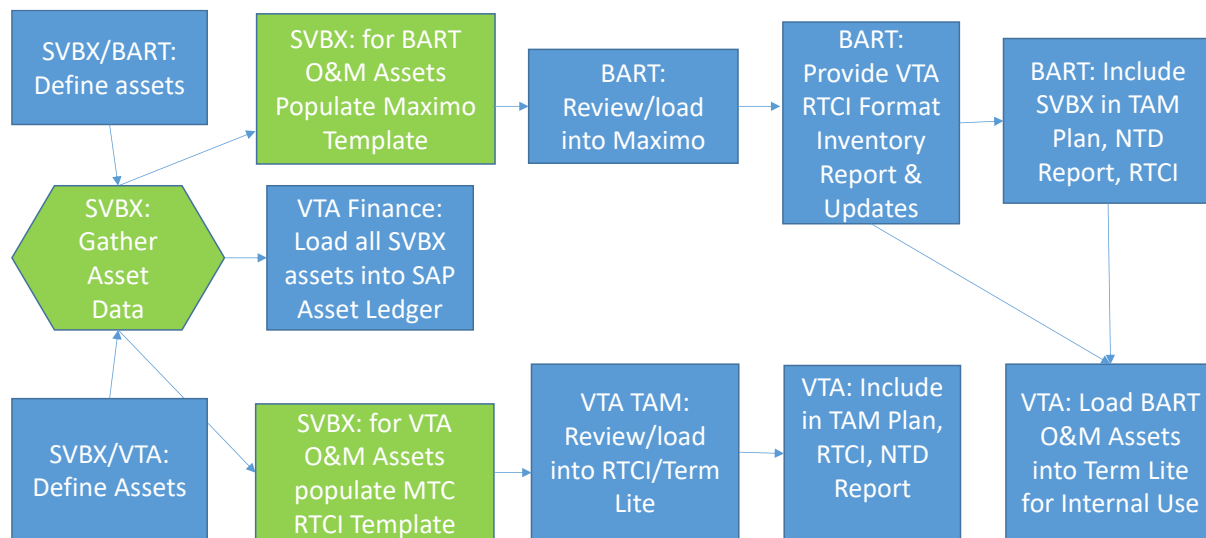
The VTA TAM Team is responsible, in collaboration with the SVBX Team and other VTA personnel affected by the SVBX project, for development and coordination of the TAM inventory for SVBX. The SVBX inventory has been compiled by VTA and identifies the assets to be operated and maintained both by BART (such as the guideway) and by VTA (such as the parking facilities), as well as those assets with a shared responsibility among the two agencies. BART’s operations and maintenance activities will continue to be in accordance with the VTA/ BART O&M Agreement.

VTA, as the owner, maintains an overall inventory for SVBX assets at a level of detail sufficient for NTD and TAM reporting purposes, accounting for the value of all SVBX assets. The level of detail for VTA assets are also sufficient to allow VTA to manage and maintain those assets, using RTCI and Term Lite. This requires VTA to perform activities including conducting condition assessments, monitoring useful life and forecasting capital investment needs to maintain SGR.

The initial start-up inventory data for BART O&M assets was turned over to BART for loading into its Maximo Asset Management System and was prepared at a similar level of detail to other assets owned, operated and maintained by BART. BART manages and maintains these assets using Maximo, including conducting condition assessments, forecasting, and monitoring useful life and capital investment needs. BART provided VTA with an initial record and ongoing updates from Maximo of its SVBX asset inventory for VTA use and for (VTA/BART) reporting to the Metropolitan Transportation Commission (MTC) for Regional Transit Capital Inventory and capital needs forecasting purposes.

VTA’s final inventory process is presented in Figure 6.2 below.

Figure 6.2. SVBX Asset Inventory Process Flow



As mentioned above, given this unique arrangement, the reconciliation of the two inventories is critical, as is the clarification of which party prepares what reporting (refer to Figure 6.2).

6.4.2. Inventory Description

The overall SVBX Inventory, including assets operated and maintained both by BART and by VTA, is maintained by VTA at the level of detail needed to allow NTD reporting of assets by VTA, based on information provided by BART. The inventory is summarized in Figure 6.2 below.

Table 6.2. SVBX Asset Inventory

VTA Asset	Count
Heavy rail cars	40
Heavy Rail Stations	2
Parking Garages	2
Parking Lots	2
Station Elevators	3
Station Escalators	7
Pedestrian Overcrossing Elevators	1
Pedestrian Overcrossing Escalators	2
Administrative buildings	1
Maintenance facilities	0
Guideway (track, structures, and systems: route miles)	10
Substations (Traction Power/High Voltage)	6/2
Train Control Houses/Rooms	6
Source: Preliminary SVBX Asset Register, 5/2017	

BART will conduct NTD service reporting for SVBX assets (e.g., operating costs, revenue service miles, etc.). VTA will report as responsible for capital investments.

The NTD level of detail and NTD Form number for reporting assets by VTA is:

- 1) Administrative and Maintenance Facility Inventory (A-10)
 - a) BART Police Zone Facility (PZF) – square feet
- 2) Passenger and Parking Facility Inventory (A-20)
 - a) BART Stations – square feet
 - b) Campus and Surface Parking - spaces
 - c) Parking Structures – spaces
 - d) Ancillary Buildings – square feet
 - e) Bus Transit Centers – bus bays, square feet
 - f) Milpitas BART – LRT Pedestrian Overcrossing- linear feet
- 3) Rail Fixed Guideway Inventory (A-50)
 - a) Guideway – At Grade, Elevated Concrete, Retained Fill, Retained Cut, Cut and Cover. Total for each in linear feet/Track feet.
 - b) Substation Buildings
 - c) Substation Equipment - % of total value by year range
 - d) Third Rail/Power Distribution – % of total value by year range

- e) Train Control/Signaling - % of total value by year range
- 4) Track Inventory (A-55)
 - a) Tangent Track – track feet
 - b) Curved Track – track feet
 - c) Special Track (Double crossover, single crossover, turnout) - each
- 5) Service Vehicle Inventory (A-60) - Agencies are required to report service vehicle inventory if they are responsible to fund replacement, regardless of ownership.
- 6) Revenue Vehicle Inventory (A-70) – BART Reports. The NTD reporting requirements focus on the public transportation use of the revenue vehicles and not on how they were funded or their ownership.
- 7) Asset module performance targets (A-90) – VTA will report based on information provided by BART. The performance areas to be reported at this time include:
 - a) Rolling stock: the percentage of revenue vehicles beyond their useful life
 - b) Equipment: The percentage of non-revenue service vehicles (by type) that exceed the ULB.
 - c) Facilities: The percentage of facilities (by group) that are rated less than 3.0 on the Transit Economic Requirements Model (TERM) Scale.
 - d) Infrastructure: The percentage of track segments (by mode) that have performance restrictions. Track segments are measured to the nearest 0.01 of a miles.

VTA TAM Inventory level of detail for BART Operated & Maintained Assets is not as granular as the BART Maximo asset register, since construction cost breakdowns tend to stop at the system location level and cannot be accurately parsed down to the individual equipment items within a location. BART prefers to include many of the equipment items within a location. An example is Traction Power Substations (TPSS), of which SVBX has six. The BART Maximo register breaks each of these down further into an average of 50 component assets. VTA has one asset at each TPSS location for equipment and one for the structure, which reflects the available cost breakdown details. Similar higher-level representation of assets occurs in other categories for VTA. The more granular BART Maximo Inventory details will roll up to these higher-level assets in the overall VTA Asset Inventory.

VTA Inventory Level of Detail for VTA O&M Assets, maintained in Term Lite, is similar to the VTA Overall asset detail level for BART O&M Assets, and to the level of detail in the current VTA RTCI inventory. Some SVBX VTA assets reside along the SVBX Right of Way, while most are at the two station campuses.

- 1) Passenger Facilities & Parking – NTD categories with additional details for component systems such as CCTV, Roofing, HVAC, Parking Revenue System and Elevators, which have different useful life from the building, to allow for VTA capital forecasting.
- 2) Guideway – same categories as NTD Reporting, with additions for:
 - a) Sound Walls
 - b) Fencing
 - c) Maintenance Access Road/Personnel Bridge

- d) UPRR Bridges (note that all but one is owned by VTA. The Warren Avenue bridge is owned by the City of Fremont. The Mission Blvd. UPRR bridge will be maintained by Caltrans, however, VTA will have capital responsibility)

6.4.3. Condition Assessment

With Revenue Operations opening in June 2020, SVBX assets were in brand new condition. Actual condition assessment of assets is scheduled according to maintenance practices of both VTA and BART. The reporting of condition assessment to FTA is, in the majority of cases, VTA's responsibility as illustrated in Table 6.1.

The actual measurement of condition assessments is conducted by the agency responsible for maintenance of those assets. For instance, BART vehicles, stations, track, guideway, traction power, etc., are maintained, and condition assessed, by BART. Station campuses and parking structures are maintained, and condition assessed, by VTA. In both cases, VTA is ultimately responsible for condition assessment reporting to FTA.

