RTA

2018

Transit Asset Management Plan

CDM Smith

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2018 Transit Asset Management Plan

Prepared by:

CDM Smith

DOCUMENT CONTROL HISTORY

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Draft A	09/28/2018	Initial draft, meeting all requirements set forth in the FTA Final Rule (49 CFR 625)

AGENCY SELF-CERTIFICATION

Agency Name	The Regional Transit Authority
Accountable Executive Title	Chief Executive Officer (CEO)
Accountable Executive Name	Stephen Bland
Date	9-28-2018
Signature	Stephen O Bland

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LIST OF ABBREVIATIONS

AIM	Asset Inventory Module of National Transit Database
APC	Automated Passenger Counters
AVL	Automatic Vehicle Location
BoD	Board of Directors
CAD	Computer Aided Dispatch
CDO	Chief Development Officer
CEO	Chief Executive Officer
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CMAQ	Congestion Mitigation and Air Quality
DOT	Department of Transportation
FAST	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
KPI	Key Performance Indicator
MAP-21	Moving Ahead of the Progress in the 21st Century Act
MPO	Metropolitan Planning Organizations
MTA	Metropolitan Transit Authority
NERA	Nashville & Eastern Railroad Authority
NERC	Nashville & Eastern Railroad Corporation
NTD	National Transit Database
PTC	Positive Train Control
PTMS	Public Transportation Management System
RTA	Regional Transit Authority
SGR	State of Good Repair
SOP	Standard Operating Procedures
STBG	Surface Transportation Program
STIP	State Transportation Improvement Program
TAM Plan	Transit Asset Management Plan
TAM	Transit Asset Management
TCRP	Transit Cooperative Research Program
TDOT	Tennessee Department of Transportation
TERM	Transit Economic Requirements Model
TSG	Transit Solutions Group
ULB	Useful Life Benchmark
UZA	Urbanized Areas

Section 1

1. INTRODUCTION AND BACKGROUND

A Transit Asset Management Plan (TAM Plan) is a strategic and systematic planning tool to manage transit capital assets based on careful planning and improved decision-making and is required of all providers by the Federal Transit Administration (FTA). A TAM Plan uses transit asset condition to guide how to manage capital assets and prioritize funding to improve or maintain the overall transit fleet and facilities to a target level of State of Good Repair (SGR). The Federal government defines State of Good Repair as "the condition in which an asset is able to operate at a full level of performance." (49 CFR § 625.5) A TAM Plan is essentially a business model that evaluates asset condition to develop a prioritized asset replacement strategy. This document outlines the Middle Tennessee Regional Transit Authority's (RTA) TAM Plan.

1.1. The Regional Transit Authority of Middle Tennessee (RTA)

The Regional Transportation Authority (RTA) of Middle Tennessee was created by state statute in 1988 and is led by a board of city and county mayors and community leaders, as listed in Table 1.

RTA operates 10 regional bus routes between downtown Nashville and the following cities: Clarksville, Dickson, Franklin, Gallatin, Hendersonville, Joelton, La Vergne, Murfreesboro, Smyrna, Springfield, and Spring Hill, (some of them under contract by *Gray Line of Tennessee*). RTA works closely with the WeGo Public Transit (Formerly known as Nashville Metropolitan Transit Authority (MTA)) linking riders with 45 routes provided throughout Davidson County. In addition, RTA's rideshare program organizes vanpools for commuters throughout Middle Tennessee.

The RTA also oversees the Music City Star regional commuter rail. The first segment of the regional rail connects Davidson and Wilson counties. The East Corridor utilizes a 32-mile section of track belonging to

the Nashville & Eastern Railroad Authority. Tracks, signals and bridges were upgraded and replaced, and various grade crossings have been improved since the start of service in 2006. There are currently six stations: Riverfront, Donelson, Hermitage, Mt. Juliet, Martha and Lebanon. Three trains provide weekday morning and evening service each peak period.

Table 1. RTA's County, City and Town Members

Cheatham County
- Ashland City

Davidson County
- Belle Meade
- Goodlettsville
- Nashville

Dickson County
- Dickson

Maury County
- Columbia

Montgomery County
- Clarksville

Robertson County
- Springfield

Rutherford County
- La Vergne
- Murfreesboro

Smyrna **Sumner County**
- Gallatin
- Goodlettsville
- Hendersonville
- Portland
- Westmoreland
- White House

Williamson County
- Brentwood
- Franklin
- Spring Hill

Wilson County
- Lebanon
- Mt. Juliet

The agency also offers Vanpool service (a regional transportation solution to help Middle Tennesseans lower their commute costs and extend the life of their personal vehicles. *VanStar* is RTA's vanpool provider), and

The RTA Board of Directors consists of mayors of the member cities and towns. The Board sets policies regarding the operation of the RTA. RTA management oversees the day-to-day operation of the RTA following the policies set by the Board. Figure 1 shows the map of RTA's regional transportation services, and Figure 2 shows the organizational chart of the agency.

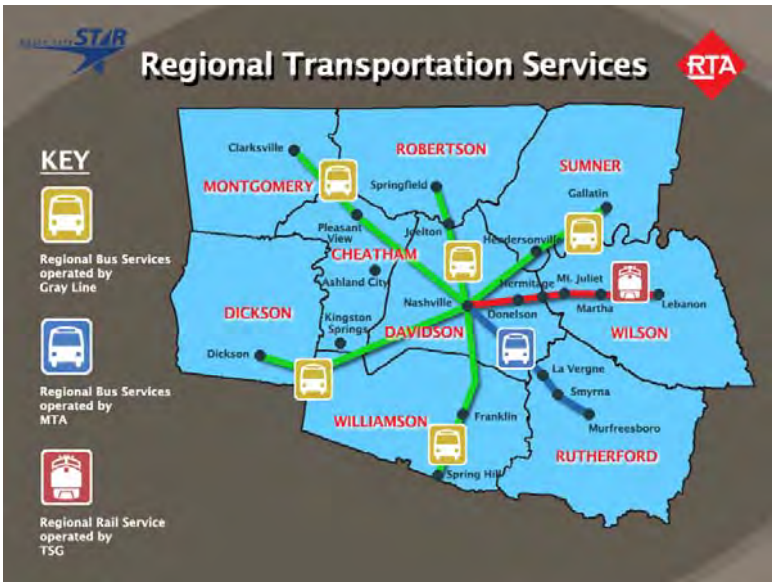

Figure 1. RTA's Regional Transportation Services Map

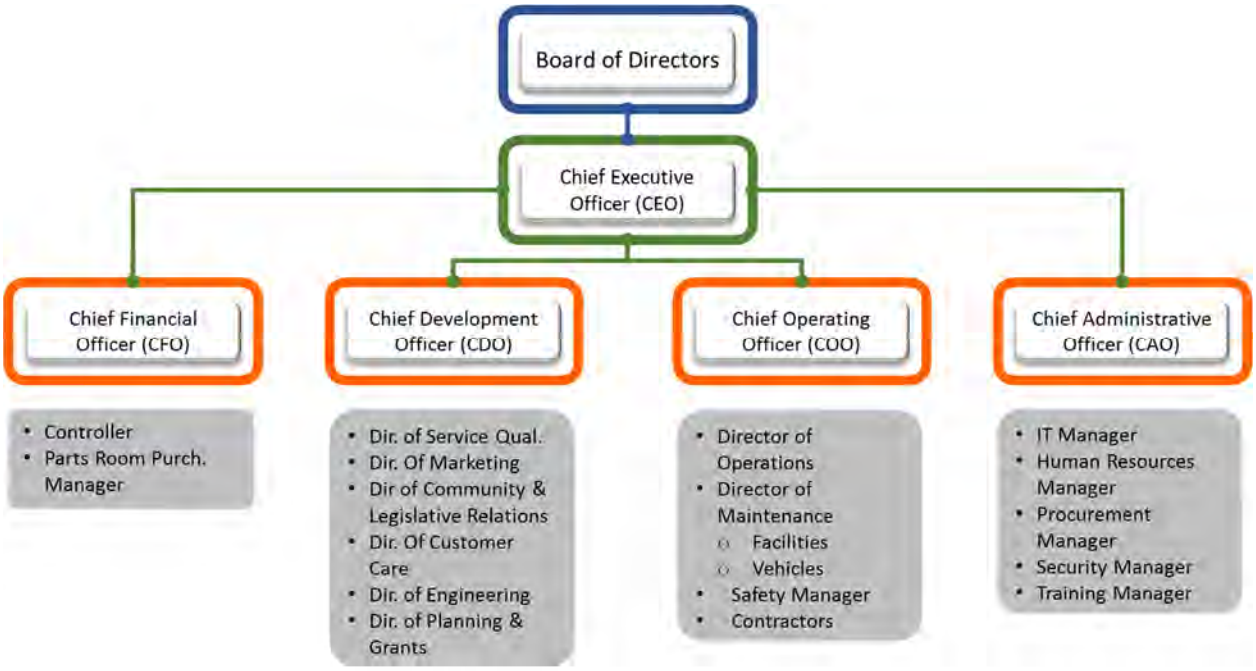

Figure 2. Middle Tennessee RTA Organizational Chart

1.2. Policy Context of the TAM Plan

The requirements for a TAM Plan fit within the overall context of transportation planning and the emphasis on performance planning that was established by MAP-21. Table 1 lists eight topic areas for performance planning as mandated by MAP-21 and carried forward by the FAST ACT. The development of a Transit Asset Management Plan is just one of the linked planning efforts to be developed under the FTA and the Federal Highway Administration (FHWA), and the requirements are set forth in the US Department of Transportation's final transit asset management rulemaking (49 CFR § 625), released on July 26, 2016.

Table 2. Performance Planning Mandated by MAP-21

FTA	FHWA
National Public Transit Safety Plan	Highway Asset Management Plan
Transit Asset Management Plan	Pavement and Bridge Condition
Public Transportation Agency Safety Plan	Safety Performance
	Highway Safety Improvement Plan
	System Performance and CMAQ

49 CFR § 625 carries out the mandate of 49 USC § 5326 for transit asset management to

… define the term state of good repair and to establish minimum Federal requirements for transit asset management that apply to all recipients and subrecipients of chapter 53 funds that own, operate, or manage public transportation capital assets. This final rule requires public transportation providers to develop and implement out transit asset management (TAM) plans. TAM plans must 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. This final rule also establishes state good repair standards and four state of good repair (SGR) performance measures. Transit providers are required to set performance targets for their capital assets based on the SGR measures and report their targets, as well as information related to the condition of their capital assets, to the National Transit Database.

1.3. The Purpose of a Transit Asset Management Plan (TAM Plan)

RTA has a wide variety of capital assets to operate and maintain, including revenue vehicles, non-revenue vehicles, equipment, and facilities. RTA, as a steward of these assets and provider of transit service to the public, must maintain, rehabilitate, and replace these physical assets to sustain a State of Good Repair (SGR) at the agency, and to provide reliable, safe service to passengers. Transit Asset Management (TAM) provides a set of tools and plans to guide RTA in managing its assets, in prioritizing its capital investment, and in achieving and maintaining SGR.

A TAM Plan is built upon certain fundamental questions a transit provider needs to answer when planning their capital investment. These questions are:

- What is the minimum level of budget needed to perform recommended asset rehabilitation and replacement work?
- How will the asset rehabilitation and replacement impact transit performance?
- What if this level of budget is increased or cut? What if no money is available to invest in the system? What will be the impact of these scenarios on the performance of the system?
- How should the budget be prioritized to get the most optimum performance improvement? Which assets should be replaced or rehabilitated first, and why?

Figure 3 illustrates these fundamental questions and how answering them will help the transit provider with their prioritized capital investment plan.

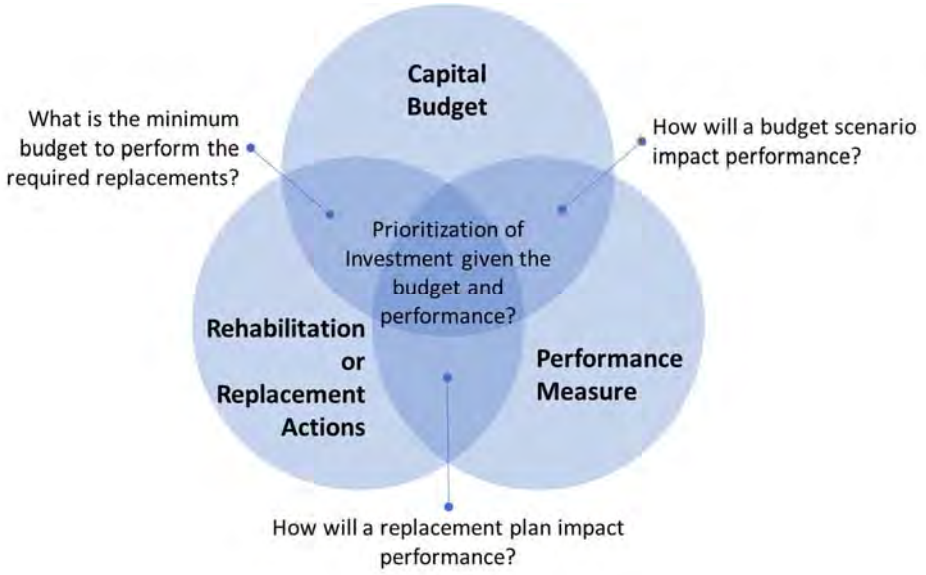

Figure 3. Elements of an SGR Framework to Prioritize Asset Replacement (Adopted from TCRP Report 157[1])

RTA relies heavily on the available data for the asset inventory, asset condition, current performance, and budgetary data to answer these questions, and therefore having accurate, quality, comprehensive data is a pillar of a successful transit asset management planning.

The TAM Plan is meant to be a strategic management plan that will assist RTA in:[2]

- **Improving Stakeholder Communications:** by providing more accurate and timely data-driven knowledge that can be used in decision-making process; by providing current and forecasted performance indicators that illustrate the outcomes of investments and decisions.
- **Improving Customer Service:** by improving on-time performance and service operations; vehicle and facility conditions, reduce delays due to failures; focusing investments around customer-centered objectives.
- **Improving Cost Effectiveness:** by preserving and maintaining assets more effectively; utilizing preventive and predictive strategies to invest more efficiently.
- **Optimizing Resource Allocation:** by aligning investments with the agency's overall goals and objectives as well as agency's TAM goals and objectives; focusing on return of investment (ROI) by incorporating lifecycle costs, risk, and trade-off analyses.

These are considered the "drivers" of TAM practice at the RTA and are illustrated in Figure 4.

[1] TCRP Report 157, "State of Good Repair: Prioritizing the Rehabilitation and Replacement of Existing Capital Assets and Evaluating the Implications for Transit," Transportation Research Board (TRB), Sponsored by Federal Transit Administration, 2012.

[2] "Creating a Transit Asset Management Program," American Public Transportation Association (APTA), Recommended Practice #APTA-SGR-TAM-RP-001-13, August 2013.

Figure 4. Drivers of TAM Practice at RTA

Addressing the fundamental questions on prioritized capital investment, meeting all applicable FTA requirements, and developing a process that provides a useful and beneficial strategic plan defines the purposes of a TAM Plan. Table 3 lists some of the characteristics of what a TAM Plan is intended to be, and to not be.

1.4. Successfully Developing and Implementing the TAM Plan

A TAM Plan is considered effective when it is successfully implemented, is adopted as part of the decision-making process and is supported at all vertical and horizontal levels of the agency. Figure 5 illustrates the four critical steps in approaching a TAM Plan implementation. These steps include preparing the agency for implementation, assessing agency maturity, developing the TAM Plan, and implementing the TAM Plan.

Table 3. Purposes of a Transit Asset Management Plan (TAM Plan)

A TAM Plan is NOT....	A TAM Plan IS....
An isolated new planning tool that is unrelated to other planning efforts.	One aspect of coordinated performance-based planning as established in MAP-21 and the FAST ACT.
A simple list of best practices in asset management.	A plan outlining specific steps for RTA to improve their asset management practices and processes.
A pointless planning exercise with no useful real-world application.	A framework to support decisions for optimized asset management within a given budget scenario.
A reference tool applicable only for the occasional tough decision.	A comprehensive plan supporting all asset management decisions.
A one-time effort to check off Federal requirements.	A foundation for optimizing long-term asset management.
A static plan.	A strategic plan with annual reports on performance targets, progress, and a four-year update cycle.

The multiple sections of this plan address these critical steps. Developing a comprehensive, agency-specific TAM Plan is one of these critical steps. TCRP Report 172[3] proposes a framework for developing a TAM Plan

[3] TCRP Report 172, "Guidance for Developing a Transit Asset Management Plan," Transportation Research Board (TRB), Sponsored by Federal Transit Administration, 2014.

as a logical, multi-step approach which can be tailored to the needs and size of the transit provider agency. The same approach has been used to develop this TAM Plan. Figure 6 shows how TCRP Report 172 charts the flow of information and the relationship between TAM Plan elements.

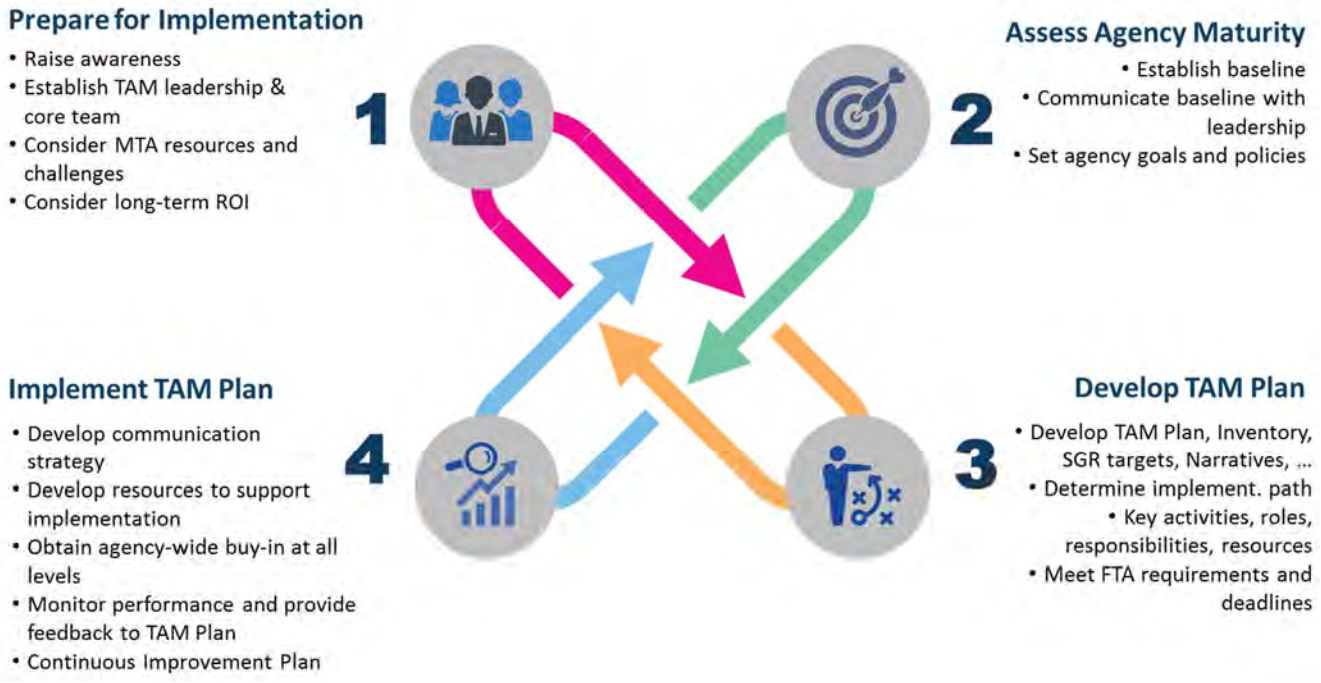

Figure 5. Four Critical Steps in Successfully Implementing a TAM Plan[4]

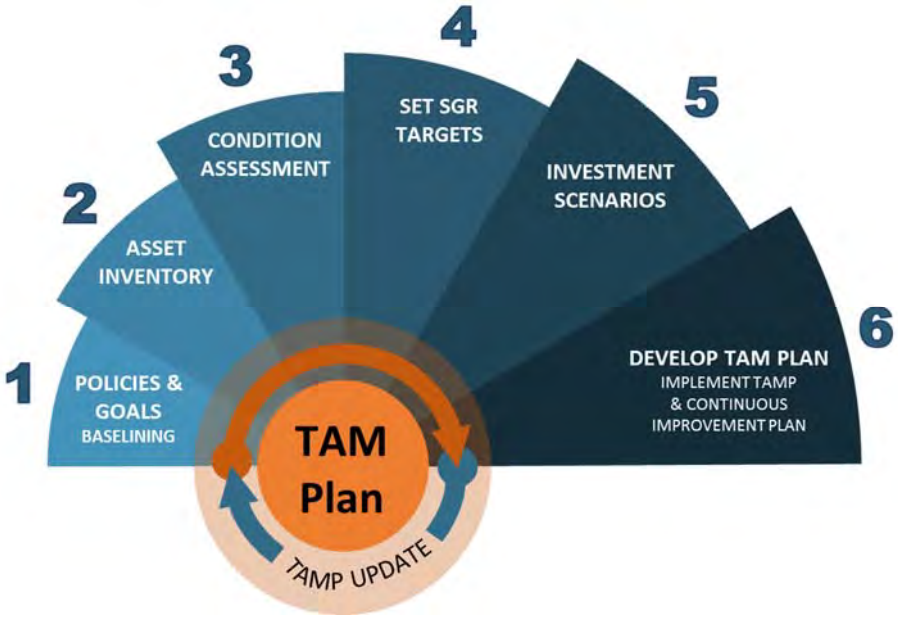

Figure 6. Multi-Step Approach in Developing a Transit Asset Management Plan (TAM Plan)[5]

[4] "Transit Asset Management Guide: Focusing on the Management of Our Transit Investments," FTA Report No. 0098, 2016.

[5] TCRP Report 172, "Guidance for Developing a Transit Asset Management Plan," Transportation Research Board (TRB), Sponsored by Federal Transit Administration, 2014.

1.5. Time Horizon for TAM Plan Update and Data Submissions

Beginning in 2018, RTA must submit ongoing annual data and reports to the FTA's National Transit Database (NTD), which must include updated information on:

- Condition assessments and analysis of asset performance.
- A narrative report on changes in the fleet's condition and the progress which has been made in achieving the annual targets.
- Targets for the next fiscal year.

In addition, the RTA TAM Plan is required to be updated in its entirety at least every four years and amended whenever there is a significant change in the asset inventory or management conditions. The four-year cycle for the TAM Plan update was specifically designed to coincide with the cycle for the State Transportation Improvement Program (STIP). Although coordination between the TAM Plan and the STIP is not required, it is encouraged as a way to minimize duplication of effort.

The final rule (49 CFR § 625) set the deadline for developing the first complete TAM Plan to comply with the requirements as October 2018. The time horizons for the first round of TAM Plan development, the annual updates and narrative reports, and the four-year full update are listed in Table 4.

Table 4. Time Horizons for TAMP Implementation and Ongoing Updates [6]

Task	Time Horizon	
Complete compliant TAM Plan (1st required) Share TAM Plan with planning partners Report FY18 AIM* data to NTD** (1st required) Submit targets for FY19 to NTD (1st required)	October 2018	Four-Year Cycle
Report FY19 AIM data to NTD Submit targets for FY20 to NTD Submit narrative report to NTD (1st required)	October 2019	
Report FY20 AIM data to NTD Submit targets for FY21 to NTD Submit narrative report to NTD	October 2020	
Report FY20 AIM data to NTD Submit targets for FY21 to NTD Submit narrative report to NTD	October 2021	
- Complete Updated TAM Plan - Share TAM Plan with planning partners	October 2022	

* Asset Inventory Module of National Transit Database

** National Transit Database

1.6. From Vision to Plan and Strategy for TAM

Successful implementation of a transit asset management (TAM) practice at an agency will require agency-wide change, which will need to be supported by a vision and a set of top-down directions and policies. The vision and these policies should be highly visible, and frequently used by the agency's

[6] "Transit Asset Management: Frequently Asked Questions," https://www.transit.dot.gov/TAM/gettingstarted/htmlFAQs, Accessed May 15, 2018.

executive leadership team to communicate the importance and the role of TAM practices in meeting the expected level of service objectives.[7] Figure 7 illustrates the hierarchy of vision to strategic plan and continuous improvement for an agency. Vision, policies and goals, if supported by the executive level and adopted across the agency, will create shared understanding, motivation, and coordination among the staff at all levels. Therefore, having a set of solid vision, policies, and goals, is the cornerstone of effective and successful TAM implementation. The following sections outline these for RTA's TAM practice. Objectives, Resources, Implementation Plan, and Continuous Improvement plan will be outlined in the later sections of this TAM Plan.

1.7. RTA Transit Asset Management Vision

RTA has adopted the following as its TAM vision:

> *The Transit Asset Management (TAM) Plan has been developed to provide a strategic direction inclusive of roles and responsibilities for the Middle Tennessee Regional Transit Authority (RTA) and its contractors, to maintain its assets in a State of Good Repair (SGR). The plan will emphasize the goal of promoting a culture of asset management at RTA that will support how the Agency makes decisions and allocates funds for stewardship of transit assets strategically, maximizing the lifecycle of each component to make the best use of constrained resources. These decisions are supported by timely, reliable data that is collected once, monitored and reviewed regularly, and used many times.*

Figure 7. Vision to Strategic Plan Hierarchy

1.8. RTA Transit Asset Management Policies and Goals

RTA's TAM policies and goals address the principles that guide decisions related to TAM at the agency, and where RTA wants to be after implementation of the TAM Plan.

[7] FTA Transit Asset Management Guide: Focusing on the Management of Our Transit Investments, FTA Report No. 0098, 2016

These high-level policies and goals cover multiple aspects of the agency's operation, from setting the policies, to organizational efficiency, fiscal sustainability, human resources, as well as other aspects including tools, data, and the need for continuous improvement. These policies and goals, outlined in Table 5, will be the basis for developing the TAM implantation plan later in this TAM Plan.

Table 5. RTA's TAM Policies and Goals

Focus	Proposed TAM Policy	Proposed Goals
Policy	Provide agency-wide direction and leadership to increase the RTA's asset management practice maturity	■ Ensuring the agency has well-defined vision, policies and goals, and these are reviewed as part of the continuous improvement plan ■ Identify the factors that drive the TAM objectives (TAM enablers) ■ Integrate TAM with the agency's business processes and link TAM Plan to other internal and external plans
Organizational Efficiency & Effectiveness	Improve organizational efficiency by employing effective asset management processes	■ Build understanding and support for asset management at all levels of RTA, including executive level ■ Improve and expand communications with RTA's departments and contractors regarding well-documented SGR needs and priorities ■ Document and manage organizational knowledge and lessons-learned
Fiscal Sustainability	Foster financial sustainability by implementing asset management and promoting the TAM culture at the agency	■ Adopt TAM processes and SGR needs as part of RTA's annual budgeting process and Capital Improvement Program (CIP) ■ Promote preservation of existing assets while planning for addition of new assets and replacement of existing assets ■ Utilize objective methods to prioritize capital projects
Human Capital	Promote asset management culture at RTA and develop the human capital necessary for TAM implementation	■ Promote TAM across all levels at RTA ■ Promote knowledge sharing within the agency, and with contractors ■ Recruit, develop and retain well-trained TAM workforce ■ Develop succession plan for key roles at the agency
Safety	Maintain RTA assets in State of Good Repair (SGR) to support a safe operating environment	■ Maintain vehicles, equipment, infrastructure systems and facilities in SGR ■ Promote a safety culture at the agency, and align asset and safety management practices ■ Proactively review and communicate safety-related issues with the staff ■ Use asset data and subject matter expertise to identify and avoid or minimize road calls and

Focus	Proposed TAM Policy	Proposed Goals
		failures and move toward a proactive management of assets ■ Identify recurring asset issues and failures and provide a plan to address the root of the issue
State of Good Repair (SGR) Investments	Invest in RTA assets and SGR and promote the culture of "Asset Stewardship" at all levels of the agency	■ Maintain vehicles, equipment, infrastructure systems and facilities in SGR ■ Develop TAM Plan and policies in compliance FTA TAM Rule (49 CFR § 625) ■ Develop and implement preventive and proactive capital asset maintenance, replacement and rehabilitation plans
Tools	Provide infrastructure and tools to support data-driven decision-making for asset management	■ Assess and implement tools to support data driven asset management decisions across stakeholder agencies ■ Utilize historical data and trends to inform future decisions ■ Ensure investment decisions are based on the assessment of business benefits, are transparent, and are clearly communicated
Data	Collect relevant, timely, and accurate data that can support the decision-making process and TAM processes	■ Highlight the need for collecting the right data, at the right time, in the right format ■ Develop data management protocols to ensure the data collection supports multiple agency needs ■ Improve data sharing across stakeholder agencies so multiple departments benefit from data collection (data collected once, used by many), while following information security standards ■ Address identified business critical services and the information systems that support those services
Continuous Improvement	Meet all FTA requirements at each deadline, and continue to develop the processes, tools, and data for an optimum return on investment	■ Continue meetings of the TAM Steering Committee to identify issues and coordinate solutions ■ Evaluate the ongoing TAM processes, implementation costs, and benefits ■ Monitor TAM programs in other agencies to evaluate best practices

1.9. TAM Roles and Responsibilities at RTA

FTA requirements call for each provider to designate a single Accountable Executive, who is ultimately responsible for carrying out the plan. For RTA, the Chief Executive Officer (CEO) of the agency will serve as the Accountable Executive. FTA will update their Certifications and Assurances to reflect the TAM Plan requirements. The current TAM Plan and its annual Narrative Reports and data submittals to NTD will be reviewed by FTA as part of their Triennial Reviews, State Management Reviews, and MPO Certification Reviews.

RTA's departments and offices have a shared commitment for developing the TAM Plan, policies and goals, and the implementation roadmap to ensure successful implementation of Transit Asset Management practices at RTA. TAM roles and responsibilities within RTA are outlined below and illustrated in Figure 8.

Enforcement Responsibility: Enforcement of the policy will be the responsibility of the Chief Executive Officer (CEO), the Accountable Executive for RTA.

Overall Responsibility: The Chief Development Officer (CDO) has overall responsibility for managing the Transit Asset Management program and for overseeing the development of asset management plans and procedures, in cooperation with the executive leadership team, and reporting to the CEO on the status of asset management for the agency.

Agency TAM Coordinator: Coordinating the TAM Steering Committee will be conducted by the agency's Director of Planning and Grants, who will report directly to the CDO.

TAM Steering Committee: The steering committee will support TAM policies and goals will ensure that all parts of the asset management process are functioning together as a unit and will support the TAM program with the adequate resources. These may include human capital improvements, developing clear roles and responsibilities for TAM tasks, development of new skills and qualifications, hiring new staff, and acquisition and implementation of new tools and systems. These are critical to a successful TAM Plan implementation. The steering committee will also meet regularly during the development of the TAM Plan, during the implementation phase of the TAM Plan, and will serve as the advisory board to the TAM Plan development team.

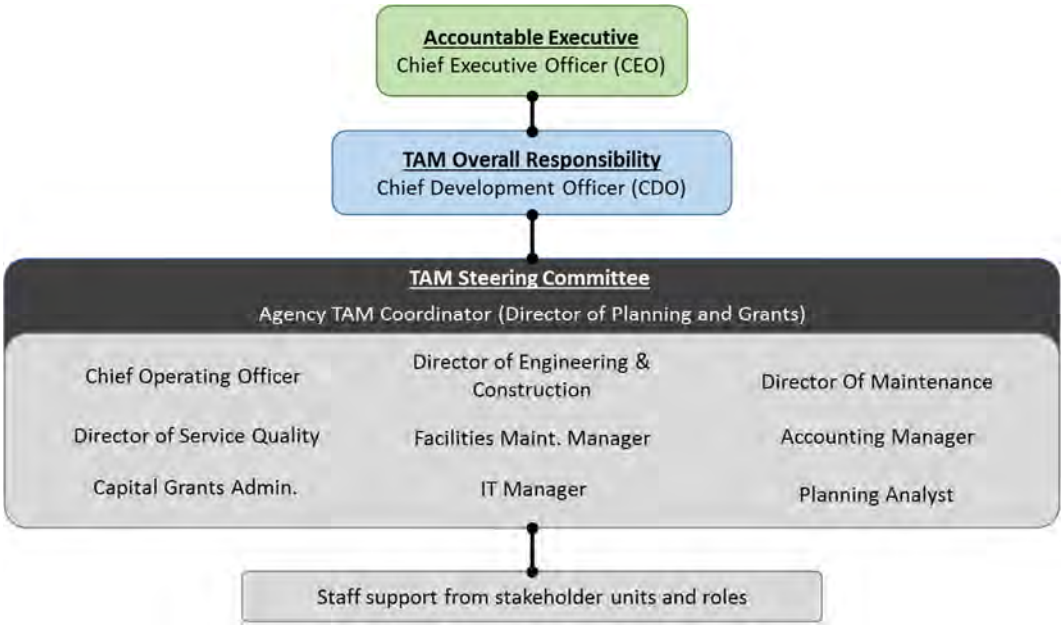

Figure 8. RTA TAM Roles and Responsibilities Chart

1.10. Compliance with the FTA Rule (49 CFR Part 625)

1.10.1. Classification of Transit Providers

In 49 CFR §625, FTA has outlined the requirements for the TAM Plans. 49 CFR § 625.5 defines two tiers of transit providers:

Tier I Transit Provider	Tier II Transit Provider
■ Operate rail ■ Own, operate, or manage 101 or more vehicles in revenue service during peak regular service across all fixed route mode of transportation ■ Own, operate, or manage 101 or more vehicles in revenue service during peak regular service in one non-fixed route mode of transportation	■ Own, operate, or manage 100 or less vehicles in revenue service during peak regular service across all non-rail fixed route modes ■ Own, operate, or manage 100 or less vehicles in revenue service during peak regular service in any one non-fixed route mode ■ Are a subrecipient under the Section 5311 Rural Area Formula Program ■ Are an American Indian tribe

Based on this classification, the RTA is considered a Tier I provider, and should meet the requirements set forth for these agencies, as outlined below.

1.10.2. TAM Plan Content Requirements

49 CFR § 625.25 outlines the TAM Plan required elements for Tier I agencies. These requirements are listed in Section 2 of this TAM Plan, outlines RTA's self-assessment, baselining and gap assessment to establish maturity of TAM practices at the agency. This will also set the basis for the TAM Implementation Plan.

Required TAM Plan element #1, the inventory of capital assets, is addressed by Section 3 in this TAM Plan. This task involves developing an accurate inventory of revenue vehicles, non-revenue vehicles, equipment, and facilities. In addition, this section addresses required TAM Plan element #2, condition assessment of all inventoried assets.

Required TAM Plan element #3 is a decision support tool, which is documented as Section 5 of this TAM Plan. This task utilizes a customized prioritization tool that is based on the Transit Asset Prioritization Tool (TAPT) developed by FTA.

Required TAM Plan element #4 is the resulting list of prioritized asset replacement projects by year. This element of the TAM Plan is addressed in Section 6, which calculates pipelined prioritized projects for current funding levels and for three additional investment scenarios for comparison.

Required TAM Plan element #5 is TAM and State of Good Repair (SGR) policy. This element is addressed in Section 1 of this TAM Plan, which outline the TAM vision, policies and goals for the agency, and in Section 4, which defines SGR at RTA, performance targets, and asset replacement and maintenance policies.

The implementation strategy and list of key annual activities are included as Section 7 in order to provide RTA with a more comprehensive and complete TAM Plan process. That section will include a set of activities to guide the initial implementation and the long-term improvement of the TAM practice. Each activity will have timeframe for implementation, priority for implementation, and level of resources needed for that activity. This section address requirements #6, #7, and #8 for TAM Plans.

Monitoring the ongoing performance of the TAM Plan is part of the Evaluation Plan listed as TAM Plan element #9 for Tier I providers and is included as Section 8 of this TAM Plan to provide guidance on how RTA will monitor and evaluate implementation.

Section 9 of this TAM Plan provides a checklist for compliance with the FTA Final Rule.

Table 6 and compared with this TAM Plan’s sections for compliance.

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Table 6. Summary of the TAMP Sections Meeting FTA 49 CFR § 625.25 Requirements

49 CFR §625.25(b)	FTA Rule Requirement	Section of this TAMP
-	-	Section 2 – Self-Evaluation, Baselining and Gap Assessment
1	Inventory of Capital Assets	Section 3 – Asset Inventory and Performance Assessment
2	Condition Assessment	Section 3 – Asset Inventory and Performance Assessment
5	TAM and SGR Policy	Section 1 – Introduction (Vision, Policies, and Goals) Section 4 – State of Good Repair and Performance Targets
3	Decision Support Tool	Section 5 – Asset Prioritization and Decision Support Tool
4	Investment Prioritization	Section 6 – Capital Budget and Investment Prioritization
6	Implementation Strategy	Section 7 – TAM Implementation Roadmap and Activities
7	List of Key Activities over Plan Horizon Period	Section 7 – TAM Implementation Roadmap and Activities
8	List of Resources for TAM Plan	Section 7 – TAM Implementation Roadmap and Activities
9	Evaluation and Monitoring Plan	Section 8 – Continuous Improvement Plan (CIP) of TAM Practices

Section 2

2. SELF-EVALUATION, BASELINING AND GAP ASSESSMENT

This section outlines the current transit asset management (TAM) capabilities at RTA at the time of this project (April 2018). To determine the level of TAM maturity at RTA, a detailed questionnaire was developed (Appendix A) based on FTA's TAM Maturity Agency Self-Assessment Tool.[8] The questionnaire addressed 15 topic areas related to TAM practices and each topic area included multiple questions:

1. Policy
2. Strategy
3. Inventory
4. Condition Assessment and Performance Monitoring
5. Lifecycle Management Planning
6. Capital Planning and Programming
7. Operations and Maintenance Budgeting
8. Performance Modeling
9. Asset Management Information Systems
10. Enablers of TAM – Organization and Leadership

[8] https://www.transit.dot.gov/TAM/resources/tools/SelfAssessment

11. Enablers of TAM – Skills and Training
12. Enablers of TAM – Continuous Improvement
13. Enablers of TAM – Communications
14. Enablers of TAM – Values and Culture
15. Enablers of TAM – Project Management

The respondents were asked to rate each question based on a predefined 1-5 scale, as illustrated in Figure 9.

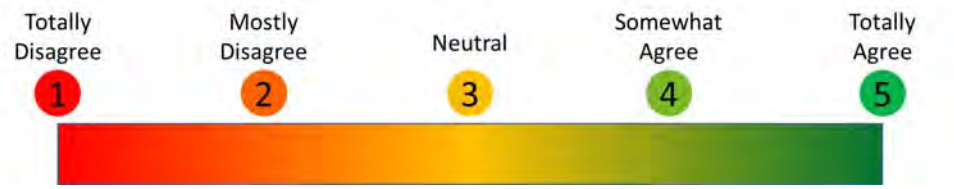

Figure 9. TAM Maturity Assessment Questionnaire, Rating Scale

This questionnaire was shared with RTA's managers and chiefs to document the current practices at RTA. This was followed by a series of facilitated interviews attended by a wide range of executives and staff involved with RTA's TAM functions, to determine the current state of resources available to support TAM at RTA, and also where these resources (human capitals, processes, systems, and tools) reside at the agency.

This collaborative baselining exercise identified key strengths and areas for improvement at the agency that served as reference for Gap Assessment and the recommended strategies as part of the Implementation and Improvement Roadmap, to increase RTA's TAM capabilities.

2.1. Baselining Interview Participants

A total of 19 RTA staff were interviewed as part of this process. Interviews were scheduled as group meetings and were facilitated by the Chief Development Officer (CDO) of RTA. Table 7 lists the RTA staff who were interviewed.

Table 7. RTA Staff Interviewed as part of Baselining Process

Contracted Staff Roles (Through Collaboration with WeGo Public Transit)	
Chief Development Officer	Security Manager Information Technology Manager
Chief Financial Officer	Manager of Vehicle Maintenance
Chief Operating Officer	Facilities Maintenance Manager
Chief Administrative Officer	Planning Analyst
Director of Service Quality	Facilities Maintenance Supervisor
Director of Maintenance	
Director of Engineering and Construction	**Contractors:**
Operations Supervisor	TMA Group Business Dev. and Operations Dir. (Partner Agency)
Capital Grants Administrator	Transit Solutions Group (TSG) General Manager (Partner Agency)
Procurement Manager, DBE Liaison Officer	
Accounting Manager	

2.2. Findings of Baselining for RTA

Interview notes were summarized and reviewed to identify improvement opportunities, as well as any challenges the agency is facing and any desired resources, processes, and tools the agency wishes to have for their TAM practice. These summarized notes are organized below based on the main subject areas of the baselining questionnaire:

Policy

There are agency-wide Standard Operating Procedures (SOP) and vehicle maintenance management guidelines that the agency has adopted. These SOPs, developed in 2017, outline specific instructions on how to proceed for specific tasks and/or on certain situations. A list of these SOPs is presented in Table 8. Other departments are in the process of converting or publishing their procedures.

- RTA is ready to take on the change. Communication across the agency will be required to get buy-in from all staff.
- There is a need for vision, policies, and goals for TAM practice at RTA to support this change at the agency.

Table 8. List of WeGo's Standard Operating Procedures (SOP)

Title	Reference Number
Bus/VanOperator Sign in Procedure	2017-OP-001
Bus Operator Pre-Trip Inspection Procedures	2017-OP-002
Van Operator Pre-Trip Inspection Procedure	2017-OP-003
Service Animal Policy & Procedures	2017-TR-001
Supervisor Vehicle Assignment	2017-OP-005
Probing Policy & Procedures	2017-MN-006
Operations in Inclement Weather	2017-OP-007
Supervisor Accident/Incident Response	2017-OP-008

Strategy

- There is trust between the executives and the staff. The executive team supports the TAM efforts and has communicated the priority of developing and implementing a TAM Plan at RTA.
- There are grey areas of responsibility between departments and staff. The agency is still evolving after the recent change in the executive level management. The state-of-the-practice at RTA is seen as excellent within departmental “silos”, but coordination between silos is seen as problematic.
- RTA is a relatively new agency in its new organizational form (In December 2008, the Nashville Metropolitan Transit Authority (WeGo) management team became the managers of the RTA's regional services) compared to its counterpart agency, the WeGo. Thus, the agency is still evolving, and the roles and responsibilities of executives and staff are being further refined. Almost all RTA staff also have responsibilities for WeGo.

Inventory

- RTA is using multiple systems to track inventory of its assets. Each department (e.g. accounting, maintenance) use their own system for this purpose and these systems do not communicate directly.

- RTA maintains an inventory of its fixed assets in BNA Fixed Asset® system. The administrative buildings are the property of the Nashville WeGo, and all assets are separate between the two agencies.
- The RTA also oversees the Music City Star regional passenger rail service. The first segment of the regional rail connects Davidson and Wilson counties. The East Corridor utilizes a 32-mile section of track belonging to the Nashville & Eastern Railroad Authority (NERA). Tracks, signals, and bridges have been upgraded and replaced, and various grade crossings have been improved. RTA has contributed to the capital improvement of this 32-mile section and thus this will be included in the TAM Plan as part of RTA's shared infrastructure assets.
- There are six rail stations: Riverfront, Donelson, Hermitage, Mt. Juliet, Martha and Lebanon. Hamilton Springs station will be opened later this year. Three trains provide weekday morning and evening service each peak period.
- The RTA has park and ride facilities at the Donelson, Hermitage, Mt. Juliet, Martha, Hamilton Springs and Lebanon stations, as well as Greensboro North in Gallatin.
- RTA maintains an inventory of its rail cars through TSG (Transit Solutions Group), which has served as the RTA's Music City Star commuter rail operator since the inception of commuter service in greater Nashville in 2006.
- RTA offers regional express buses (operated by Gray Line Tennessee and WeGo) that connect to the Nashville WeGo system, supported by cities, counties and Tennessee DOT. This weekday service provides commuter transportation between downtown Nashville and Cheatham, Montgomery, Robertson, Rutherford, Sumner and Williamson counties. Gray Line is responsible for inventory, maintenance, and condition assessment of its buses. RTA pays a fee to Gray Line for these services.
- RTA is planning to purchase buses for its regional express routes. These will be operated by Gray Line, but RTA will have direct capital responsibility over these assets.

Condition Assessment and Performance Monitoring

- RTA has not conducted facility condition assessments based on FTA guidelines and is planning to perform these assessments of its six passenger stations (the seventh station is under construction) as part of this TAM Plan development.
- Limited records for facility maintenance are accessible.
- Computer machines send out health checks to the server, and their software update status are automatically checked frequently.
- Nashville & Eastern Railroad Corporation (NERC) is responsible for inventory and condition assessment of the 32-mile section of the tracks used by Music City Star commuter rail service. However, RTA has contributed to the capital improvement of this section and NERC provides condition and performance information of this section to RTA. RTA conducted a track assessment in December of 2016.

- TSG provides train service and equipment maintenance in Lebanon, Tennessee, and is able to draw upon its affiliated freight and construction companies, especially NERC, for this purpose.
- Gray Line operates the regional express buses for RTA, and it is responsible for maintenance and condition assessment of its buses. RTA does not have direct capital responsibility over these assets. However, RTA is planning to purchase several buses that will be operated by Gray Line. Once purchased, RTA will have capital responsibility over those assets.
- RTA ridership data is recorded manually for Gray Line operated commuter buses and the commuter rail. WeGo operated buses have Automated Passenger Counters (APCs) and fareboxes that record ridership.
- Vans used for Vanpool service are maintained at dealerships with logs tracking conditions of each vehicle. RTA is the owner and Title holder on these vehicles. These logs are sent to RTA for record keeping. The vehicles are part of the RTA vanpool fleet, but TMA Group manages the program for RTA under the brand VanStar. The fleet and management contract is awarded through a competitively bid process. There is at least one wheelchair accessible vehicle in the RTA vanpool fleet.
- Vanpool vehicle miles are tracked in two ways:
    - Monthly activity reports from the Vanpool coordinator, which record beginning and ending odometer readings for each trip.
    - Vehicles are equipped with GEOTAB GPS tracking devices which track the miles on the vehicles.

  These two systems, along with Coordinator training are what flag the mileage intervals for preventive maintenance.

Lifecycle Management Planning

- Facilities for RTA do not have a lifecycle management plan.
- Currently, age, mileage, and visual inspection is used for assessing the condition of RTA's rail cars and locomotives. This data is recorded and maintained by TSG.
- Thorough assessments are to be completed soon for RTA rail cars and locomotives.
- The rail cars are over 50 years old, locomotives are 33 years old, and the mileage and dates of major overhauls of the units before RTA's acquisition of the assets was not recorded.
- IT equipment has typical expected life cycles, based on industry standards and manufacturer suggestions.

Capital Planning and Programming

- RTA is planning to purchase a few buses that will be operated by Gray Line. TDOT Improve Act funds will fund bus purchases for RTA. Match for these funds is from Metro Nashville.
- The executive team wants to see data which will support investment decisions. RTA would like to move toward data-driven decision-making, especially for capital planning and programming.

- RTA would like to have a proactive plan for the future and explore different funding scenarios and how they would affect asset performance.
- The current capital planning does not consider asset performance and is mostly developed based on historic capital planning trends.
- IT department uses expected lifecycle for capital planning.

Operations and Maintenance Budgeting

- RTA has not conducted assessment of its facilities but is planning to do so as part of this TAM Plan development.
- Facility maintenance is more reactive than preventive. Failures in the facility drive operations and the budget towards fixing those issues. RTA would like to have the funds to support the preventive maintenance program for their facilities that would drive the budget while preserving their facilities in a State of Good Repair (SGR).
- TSG provides train service and equipment maintenance at NERC's Lebanon, Tennessee facilities. RTA does not have capital responsibility for these facilities and pays for a lease of these facilities and rental of equipment.

Performance Modeling

- There is currently no performance modeling for facilities or rolling stocks. Most decisions are made based on subjective information and effects of capital decisions on performance of assets are not considered in capital planning.

Asset Management Information Systems

- ***BNA Fixed Assets*** is software used by finance department tracks inventory of fixed assets and vehicles. The system also tracks age and condition of assets and uses straight-line depreciation to calculate the residual value for the assets based on the acquisition data, acquisition value, and the age of asset. This system is mostly used for accounting and tax purposes and for reporting asset values to the government. Asset condition is subjective and is not informed by the maintenance department.
- ***Asset Change Form*** is used for tracking condition, disposal, movement and alteration of assets. This form is not used widely at the agency, and most staff are not aware of this form. The form is supposed to inform the BNA system of the change in asset inventory data or condition.

Enablers – Organization and Leadership

- Most chiefs, directors, and managers at WeGo also serve a role for RTA, and this can affect efficiency and effectiveness of the organization. Roles and responsibilities need to be clearly defined, especially for directors and managers when it comes to differentiating between their roles between the two agencies for which the serve, RTA and WeGo.
- Some roles have not been clearly defined between WeGo and RTA. An example being facility maintenance responsibilities for assets.

- Executive group has communicated the need for documenting procedures and developing department-specific Standard Operating Procedures (SOP) for the agency. RTA's departments have initiated this process and SOPs are being developed, with some developed in 2017.
- The agency currently lacks vision and mission statements, but is working on developing these statements, which will be communicated across the agency.

Enablers – Skills and Training

- Maintenance staff need more training as they are not trained for the required skills. Some of them come from vehicle maintenance arena and are being utilized for facility maintenance work. There is a need for job-specific training.
- Procurement and Accounting have documented processes. FTA looks at these departments heavily and therefore there was a requirement for documenting the process. WeGo's Procurement Dept fulfills procurement needs for RTA
- Most other departments do not have documented procedures and processes. The executive team has requested a documentation of the processes involved in each department.
- IT security team is part of Metro IT and going through training (Secure the Human).

Enablers – Continuous Improvement

- The agency does not practice Continuous Improvement. RTA would like to use the TAM Plan development and implementation as an opportunity to continuously improve its practices and processes.

Enablers – Communication

- Historically communication has been compartmentalized but there is an active approach by department heads and management to move toward open communications.
- Lack of communication on asset condition (or change in asset inventory data) between departments is an issue. Data cannot be shared between the accounting department's BNA system and other systems. Data regarding shared assets that are owned, operated, or maintained by third parties is lacking.
- Communication takes place at the individual level due to the relationships built between department heads. There is a need for institutionalized communication protocol to ensure information and knowledge is communicated vertically and horizontally systematically through proper channels across the agency.

Enablers – Value and Culture

- There is a lack of understanding within the lower line staff of the importance of processes and procedures, and also about the differentiation between WeGo and RTA. Most staff wear two hats at the agencies, and most of the work at RTA is being done through heroic efforts of WeGo managers.
- The staff may not recognize how their effort contributes to the success and performance of the agency at large.

- The vision of “asset stewardship” exists at the individual level, especially at the executive level. However, this should be part of the agency’s vision and mission and should be advocated across all levels of the agency and adopted by all staff.
- There needs to be clear vision, mission, policies and goals for RTA that would create the agency culture, clear path, direction, and roles for staff for RTA’s work.

Enablers – Project Management

- Much needed growth opportunity exists within the Engineering and Construction department to contribute to the TAM practices, especially capital planning and programming.
- Some Project leads/Managers have training or documentation for how to do not monitor performance of contractors effectively.

2.3. TAM Maturity Assessment for RTA

A four–level maturity model was used to determine RTA’s TAM maturity. This model is illustrated in Figure 10. As shown in this figure, as agencies recognize the need for a structured, agency-wide plan, develop and implement the plan, and continuously improve their practices, they move up the maturity level. This means implementing change at the agency, and will require executive buy-in and support, and agency-wide commitment.

To determine the current level of maturity, responses to the self-assessment questionnaire were used. Each category of questions got a total score based on the maximum score of 5 for each question and the sum of average respondent scores. Percentage ratio of the latter to the former was calculated for each category, and was used to determine the maturity for each category as illustrated in Figure 10.

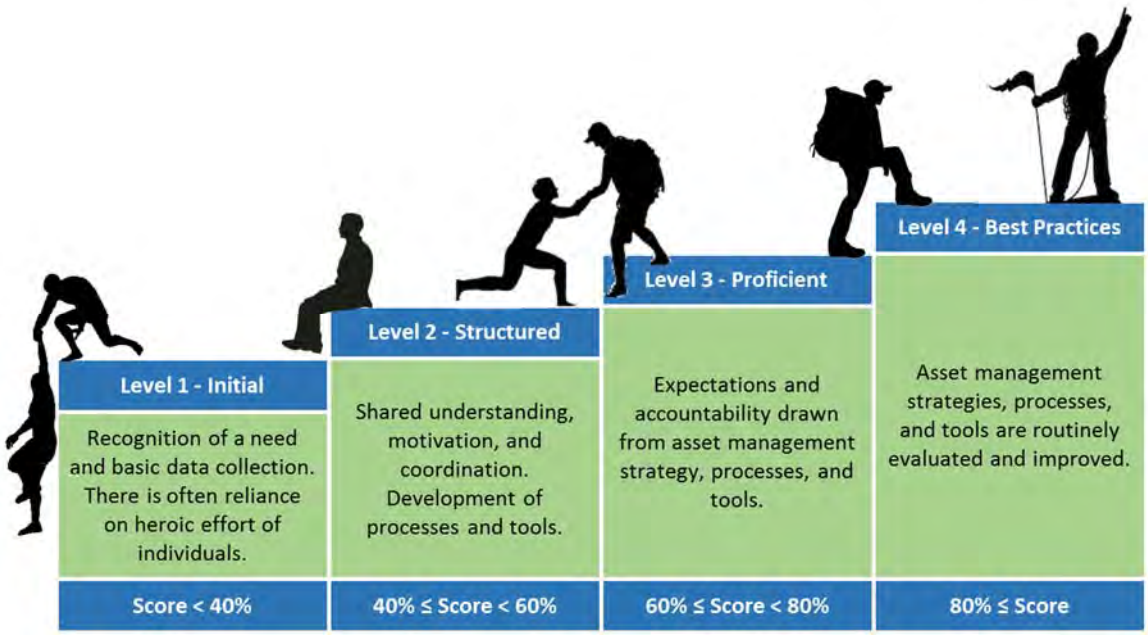

Figure 10. Four Levels of TAM Maturity

Figure 11. TAM Maturity Assessment for RTA

Results of the maturity assessment for RTA is illustrated in Figure 11 for the 15 aspects of TAM. As shown, RTA is more mature in some categories than others. For example, RTA is considered to be at "Structured" level (Level 2) for inventory, condition assessment, capital planning, operation and maintenance budgeting, communications, value and culture, and project management. The agency is at "Initial" level (Level 1) for other categories.

Overall, the agency got an average maturity rating of 42% across all categories, which puts the agency in the lower "Structured" level (Level 2) for TAM practices.

2.4. Gap Assessment

The information collected through extensive interviews with RTA staff provided insight into where the agency is with their current TAM practices and provided the information for baselining. In addition, as part of a meeting with the steering committee, the agency defined its TAM vision, and developed policies and goals for their TAM practices, which are outlined in Section 1 of this TAM Plan.

The gaps between where the agency currently is (baselining), and where they want to be in the future (goals) established the basis for the TAM Plan development and implementation strategy. These will be the improvement opportunities for the agency to raise their maturity level to "Best Practices" level (Level 4), which is where the agency aspires to be after successful implementation of the plan. This is illustrated in Figure 12. Table 5 provides more details on the gap assessment for RTA based on the goals set by the TAM Steering Committee.

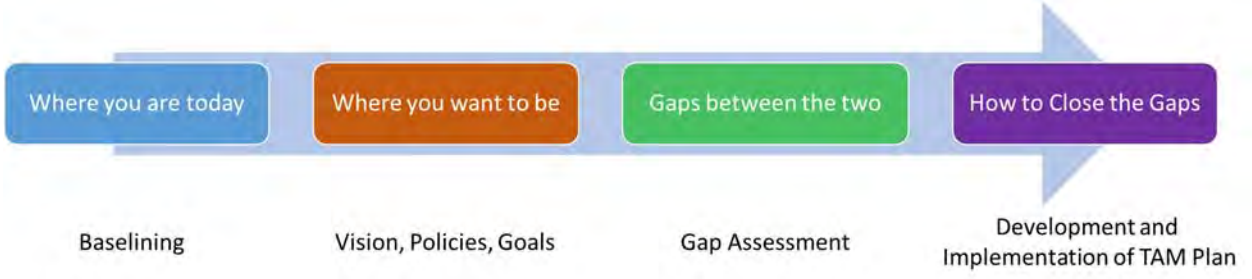

Figure 12. Purpose of Gap Assessment

Table 9. TAM Gap Assessment for RTA

Focus	TAM Policy	TAM Goals	Current Practice
Policy	Provide agency-wide direction and leadership to increase the RTA's asset management practice maturity.	■ Ensuring the agency has well-defined vision, policies and goals, and these are reviewed as part of the continuous improvement plan ■ Identify the factors that drive the TAM objectives (TAM enablers) ■ Integrate TAM with the agency's business processes and link TAM Plan to other internal and external plans	■ TAM vision, policies, and goals did not exist at RTA, but as part of this TAM Plan, these were developed and adopted by the agency (Section 1). ■ TAM drivers were identified as part of this TAM Plan (Section 1). ■ TAM Plan is currently not part of agency's business processes.
Organizational Efficiency & Effectiveness	Improve organizational efficiency by employing effective asset management processes	■ Build understanding and support for asset management at all levels of RTA, including executive level ■ Improve and expand communications with RTA's departments and contractors regarding well-documented SGR needs and priorities ■ Document and manage organizational knowledge and lessons-learned	■ The executive suite at RTA recognizes the importance of TAM for the agency, but this recognition does not flow down the organization. ■ There is no established communication across RTA's departments and with contractors. Current state of communication is based on individual relationships and not institutionalized. ■ Organizational knowledge and processes are not documented. Even though, some departments (e.g. procurement) have initiated this process, other departments have not documented their knowledge and processes.
Fiscal Sustainability	Foster financial sustainability by implementing asset management and promoting the TAM culture at the agency	■ Adopt TAM processes and SGR needs as part of RTA's annual budgeting process and Capital Improvement Program (CIP). ■ Promote preservation of existing assets while planning for addition of new or rehabilitated assets and replacement of existing assets. ■ Utilize objective methods to prioritize capital projects	■ Capital planning is not based on TAM processes and SGR needs. Currently, capital planning does not consider effects of budgeting scenarios on future asset performance. ■ The agency has a PM plan for its vehicles and facilities. Asset maintenance, especially for facilities, is reactive and mostly deals with repairing existing conditions.

Focus	TAM Policy	TAM Goals	Current Practice
			■ Focus is on maintaining existing assets, while there is a need for expansion. ■ Capital projects are not prioritized to address improving existing asset conditions. ■ Three rail passenger cars are available for rehabilitation, but there is no performance-driven plan to rank and prioritize projects for their rehabilitation along with projects for maintenance or replacement of the operating cars.
Human Capital	Promote asset management culture at RTA and develop the human capital necessary for TAM implementation	■ Promote TAM across all levels at RTA ■ Promote knowledge sharing within the agency, and with contractors ■ Recruit, develop and retain well-trained TAM workforce ■ Develop succession plan for key roles at the agency	■ There is no agency-wide recognition of the need for structured TAM practices. ■ The agency has not established a practice to document institutional knowledge of the senior staff, and this knowledge of the agency's assets, tools, and processes is not shared within the agency. ■ The agency has not institutionalized utilizing senior, experienced staff to mentor junior staff (apprenticeship). ■ Roles and responsibilities are not well defined for RTA's staff. Most of WeGo's senior staff wear two hats and handle RTA's work based on heroic efforts. There is a need for defining roles and responsibilities for RTA. ■ The agency does not have a workforce that is trained for TAM procedures and tools. ■ The agency does not have succession plan for key, senior staff.

Focus	TAM Policy	TAM Goals	Current Practice
Safety	Maintain RTA assets in State of Good Repair (SGR) to support a safe operating environment	■ Maintain vehicles, equipment, infrastructure systems and facilities in SGR. ■ Promote a safety culture at the agency, and align asset and safety management practices ■ Proactively review and communicate safety-related issues with the staff. ■ Use asset data and subject matter expertise to identify and avoid or minimize road calls and failures and move toward a proactive management of assets ■ Identify recurring asset issues and failures and provide a plan to address the root of the issue.	■ RTA does not have SGR policies and targets that support safe operating environment, even though the agency at large has adopted a safety culture. ■ Asset performance data and subject matter expertise are not used to identify issues or failures that can be avoided through a proactive management of assets. ■ Many recurring issues are reported while the root causes are not addressed. ■ RTA does not have lines of systematic communication with its third-party operators (TSG and Gray Line) about how they monitor and maintain safety of their assets RTA recognizes the need for better communication and documentation of procedures to ensure best-practices in maintaining a safe operating environment for their users.
State of Good Repair (SGR) Investments	Invest in RTA assets and SGR and promote the culture of "Asset Stewardship" at all levels of the agency	■ Maintain vehicles, equipment, infrastructure systems and facilities in SGR. ■ Develop TAM Plan and policies in compliance FTA TAM Rule (49 CFR § 625). ■ Develop and implement preventive and proactive capital asset maintenance, replacement and rehabilitation plans.	■ RTA does not have SGR policies and targets that support their capital investment decisions. ■ The agency does not have a TAM Plan in compliance with FTA TAM Rule. ■ The agency does not have proactive, preventive maintenance of their assets.
Tools	Provide infrastructure and tools to support data-driven decision-making for asset management	■ Assess and implement tools to support data driven asset management decisions across stakeholder agencies. ■ Utilize historical data and trends to inform future decisions.	■ The tools and systems that are utilized by RTA's departments do not support data driven decision making, and in many cases do not provide the stakeholder with the knowledge they need to make decisions. ■ There are multiple "legacy" systems that collect data (in many cases data for the

Focus	TAM Policy	TAM Goals	Current Practice
		■ Ensure investment decisions are based on the assessment of business benefits, are transparent, and are clearly communicated.	same asset or performance, e.g. condition) in different databases, and these legacy systems are not connected and do not communicate, leading to "silo-ed" organization. ■ Historical data and trends are not documented and not used for decision making. ■ Business benefits of capital investments are not studied in many cases, which include effects of budget allocations and funding scenarios on future asset performance through performance and lifecycle modeling.
Data	Collect relevant, timely, and accurate data that can support the decision-making process and TAM processes	■ Highlight the need for collecting the right data, one time, at the right time, in the right format. ■ Develop data management protocols to ensure the data collection supports multiple agency needs. ■ Improve data sharing across stakeholder agencies so multiple departments benefit from data collection (data collected once, used by many).	■ The data collected by the RTA's departments do not follow a universal data management plan, and in many cases the data is not collected at the right time, or in the right format. ■ In some cases, the same data is collected by multiple departments in different formats for different purposes, while the data can be collected once and used many times by multiple departments.
Continuous Improvement	Meet all FTA requirements at each deadline, and continue to develop the processes, tools, and data for an optimum return on investment	■ Continue meetings of the TAM Steering Committee to identify issues and coordinate solutions. ■ Evaluate the ongoing TAM processes, implementation costs, and benefits. ■ Monitor TAM programs at other agencies to evaluate best practices.	■ A TAM steering committee was formed as part of the TAM Plan development effort, and the committee monitors ongoing TAM processes, implementation costs, and benefits. The committee is meeting monthly during the development phase. ■ The steering committee should continue meeting regularly to evaluate ongoing TAM processes, implementation costs, and benefits.

Focus	TAM Policy	TAM Goals	Current Practice
			■ RTA has only recently started monitoring TAM programs at other peer agencies to inform their TAM practices and evaluate best practices. ■ The steering committee monitors both RTA and WeGo TAM Plan development and will serve as an advisory board for both agencies' TAM programs.

Section 3

3. INVENTORY AND PERFORMANCE ASSESSMENT

The required asset inventory is a listing of RTA's assets which meet certain criteria as specified in the TAM rule (49 CFR § 625). Assets include rolling stock, facilities, infrastructure, and equipment that support the delivery of public transportation services. Unlike some other FTA programs such as Public Transportation Management System (PTMS), all assets must be reported in the TAM Plan regardless of whether or not they were purchased with FTA funds or are still under lien. Defined assets include:

- Rolling Stock (Revenue Vehicles)
- Service Vehicles (Non-revenue)
- Equipment with an acquisition value of $50,000 or greater
- Facilities, including all passenger facilities (except for bus stops)
- Infrastructure (limited to rail fixed guideway assets)

Individual bus stops and shelters are typically excluded from a TAM Plan. However, no FTA rules prohibit their inclusion in a TAM Plan, and they may be added to the inventories for the sake of providing a more thorough and complete inventory of capital assets.

3.1. Performance

The FTA's TAM rule (40 CFR § 625) and recent changes to the National Transit Database (NTD) reporting requirements will require transit agencies, such as RTA, to submit asset inventory, condition assessments, performance targets, and a narrative report to the NTD annually in addition to developing a

Transit Asset Management (TAM) plan. The TAM rule established the performance measures for capital asset categories. These performance measures provide a framework for transit providers to establish their current asset performance state, and also monitor performance of their assets over time to evaluate the outcomes of capital investment decisions. These performance measures are listed in Table 10.

Table 10. Performance Measures for Transit Asset Categories[9]

Asset Category	FTA established Performance Measure
Rolling Stock	% of revenue vehicles exceeding ULB*
Equipment	% of non-revenue service vehicles exceeding ULB
Facilities	% of facilities rated under 3.0 on the TERM** scale
Infrastructure	% of track segments under performance restriction

* ULB: Useful Life Benchmark
** Transit Economic Requirements Model (TERM)

For the case of RTA assets, *Infrastructure* refers to the tracks of the Music City Star commuter rail service. It should be noted that the performance measures are the percentage of the number of assets that are not in a state of good repair (SGR). In other words, lower performance measures indicate better state of good repair (SGR).

For vehicles (either revenue or non-revenue service vehicles), the performance measure is based on Useful Life Benchmark, which is "*the expected lifecycle of a capital asset for a particular transit provider's operating environment, or the acceptable period of use in service for a particular transit provider's operating environment.*"[9] FTA indicates that the ULB is not the same as the useful life definition used for FTA grants program. The FTA default ULB values for different types of assets are listed in Appendix B.

For facilities, performance is reported based on the percentage of facilities (by group) that are rated less than 3.0 on the TERM Scale. NTD requires reporting four types of facilities, which are grouped into two classes for the purpose of performance measurement and target setting:

- Administrative and Maintenance
- Passenger and Parking

Facility condition data is required to be fully updated at least every four years, and transit providers can choose to conduct condition assessment on a quarter of their facilities every year, at a minimum, to ensure all facilities (with direct capital responsibility) are evaluated in the four-year cycle.

The TERM scale assigns numerical ratings based on condition and guidelines, summarized in Table 11.

[9] https://www.transit.dot.gov/PerformanceManagement, accessed on June 28, 2018.

Table 11. TERM Scale Facility Condition Ratings[10]

TERM Rating	Condition	Description
5	Excellent	No visible defects, new or near new condition, may still be under warranty if applicable
4	Good	Good condition, but no longer new, may have some slightly defective or deteriorated component(s), but is overall functional
3	Adequate	Moderately deteriorated or defective components; but has not exceeded useful life
2	Marginal	Defective or deteriorated component(s) in need of replacement; exceeded useful life
1	Poor	Critically damaged component(s) or in need of immediate repair; well past useful life

FTA's facility condition assessment guidebook[10] suggests developing the facility asset hierarchy, by breaking down the facility (asset) into components, and each component into sub-components or items. Condition assessment will then be conducted at the item level, and condition of items will roll up to the condition of components, which in turn, roll up to the condition of the facility. This is illustrated in Figure 13, and the asset hierarchy for RTA's assets is outlined in Appendix C.

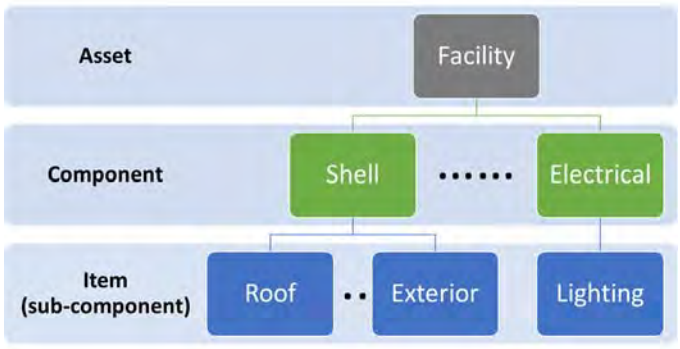

Figure 13. Concept of Facility Asset Hierarchy, Components, and Items

In addition to these performance measurements, RTA also monitors other Key Performance Indicators (KPI) to track its operation and customer service. These KPIs are not directly part of the TAM Plan but may be monitored separately to track its effectiveness. As outlined in TCRP Report 198, maintaining the SGR targets for assets has a direct impact on service quality[11], as shown in Figure 14. As the TAM Plan serves to improve capital asset performance and reliability over time by improving the overall SGR, KPIs should also improve over time as well. The KPIs include (but are not limited to):

[10] FTA Facility Condition Assessment Guidebook, July 2017

[11] TCRP Report 198, "The Relationship Between Transit Asset Condition and Service Quality", Transit Cooperative Research Program, 2018.

- Service Quality
  - Ridership
  - Revenue miles
  - Scheduled trips
  - Missed trips
  - On-time performance
- Safety
  - Number of accidents
- Customer care
  - Number of complaints

For example, RTA's ridership exceeded 258,000 rides on buses (both Gray Line buses and WeGo's buses operated on RTA routes) and exceeded 185,000 riders on Music City Star commuter rail in Fiscal Year 2017.

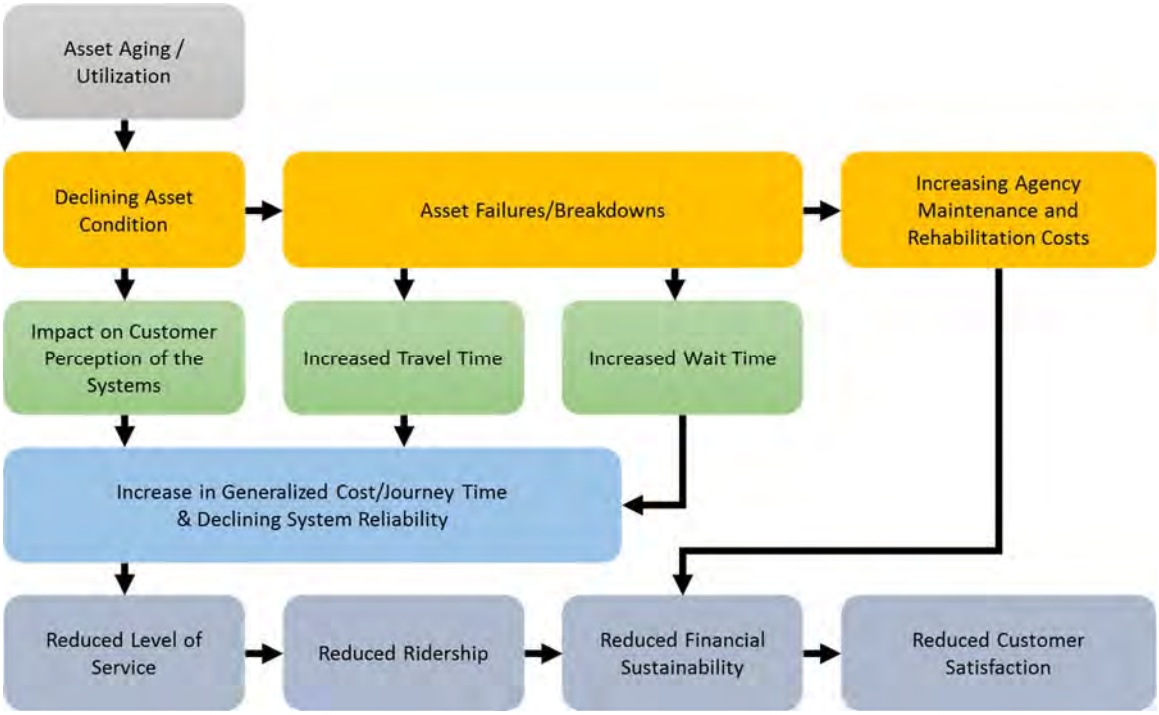

Figure 14. Relationship Between Asset Condition, Service Quality, and Customer Satisfaction[11]

The following will describe RTA's inventory of rolling stock, non-revenue vehicles, equipment, and facilities, and will outline the current performance measures.

3.2. Rolling Stock (Rail Cars and Locomotives)

RTA's rolling stock for its Music City Star commuter rail that are in service include three locomotives, three cab cars, and five trailer cars (listed in Table 12 and Table 13). Some of these assets are shown in Figure 15. The car inventory (including cabs and trailers) shows that all cars have an age of either 50 or 57 years, which exceed the Useful Life Benchmark (ULB) of 39 years for rail cars, and accordingly, 100% of

these vehicles have exceeded the ULB. All locomotives have an age of 33 years, and thus 0% of the assets exceed the ULB of 39 years for locomotives.

Table 12. RTA's Rail Car Inventory (As of June 2018)

Car Type	Year Built	Manufacturer	Unit Number	Construction Type
Cab Car	1968	Pullman-Standard	400	Smooth-Side Carbon Steel
Cab Car	1968	Pullman-Standard	401	Smooth-Side Carbon Steel
Cab Car	1968	Pullman-Standard	402	Smooth-Side Carbon Steel
Coach/Trailer	1961	Pullman-Standard	500	Smooth-Side Carbon Steel
Coach/Trailer	1961	Pullman-Standard	501	Smooth-Side Carbon Steel
Coach/Trailer	1961	Pullman-Standard	502	Smooth-Side Carbon Steel
Coach/Trailer	1961	Pullman-Standard	503	Smooth-Side Carbon Steel
Coach/Trailer	1961	Pullman-Standard	504	Smooth-Side Carbon Steel

Table 13. RTA's Rail Locomotive Inventory (As of June 2018)

Car Type	Year Built	Manufacturer	Unit Number	Model
Locomotive	1985	General Motors	120	EMD F40PH-2
Locomotive	1985	General Motors	121	EMD F40PH-2
Locomotive*	1985	General Motors	122	EMD F40PH-2
Locomotive	1985	General Motors	381	EMD F40PH-2

* Currently out of service due to mechanical issues.

Figure 15. RTA's Music City Star Locomotives (Left) and Rail Cars* (Right)

3.3. Rolling Stock (Buses)

RTA's rolling stock includes two Gilling hybrid buses, both with 9 years age, and thus none of them exceed the ULB of 14 years for buses.

3.4. Rolling Stock (Vanpool Vans)

VanStar is RTA's vanpool provider and manager of the van fleet. At the time of this report (June 2018), RTA owned 41 Vanpool vans. This van fleet has an average age of 6.3 years and an average mileage of 73,903. RTA has adopted a ULB of 8 years for its vans which matches the FTA default ULB, and accordingly 37% of its vans (total of 15) have met or exceeded the ULB, with an average mileage of 85,430.

3.5. Non-Vehicle Equipment and other Fixed Assets

TAM rule (49 CFR § 625) requires inclusion of non-vehicle equipment (fixed assets) with an acquisition value (original cost) more than $50,000. Table 14 summarizes these assets for RTA. These assets are listed in Appendix D. RTA also owns a total of about $135,233 worth of fixed assets with acquisition value less than $50,000. Equipment such as communication and security systems that have individual components with an acquisition cost under $50,000 are included if the cost of the system meets the threshold and is included in the capital budget as a line item, but no such systems were detailed in the RTA capital budget.

Table 14. RTA's Non-Vehicle Equipment with Acquisition Value More Than $50,000

Item	Total Acquisition Value *
Land	$2,968,343
Greensboro Park & Ride	$978,429
Station	$11,301,126.42
Fare Collection Equipment	$652,371

* As of June 2018

3.6. Facilities

The TAM rule also requires inclusion of facilities (except bus stops and facilities over which RTA does not have direct capital responsibility except passenger stations) disregarding their value. RTA owns passenger facilities that are listed in Table 15 along with details of condition inspection ratings for their components. These facilities were inspected between June and August 2018 based on FTA's guidelines and proposed asset hierarchies and components. RTA plans to conduct facilities inspections annually and report the conditions to FTA through the NTD (National Transit Database). It should be noted that RTA shares Riverfront Charging Station with WeGo Public Transit (formerly known as Nashville MTA). According to FTA's rule, only one of the agencies need to report shared facilities, and thus RTA is reporting this facility in this TAM Plan.

Table 15. RTA's Facility Ratings (Based on 2018 Ratings)

Facility Name	Type	TERM Rating										
		Substructure	Shell	Interiors	Conveyance	Plumping	HVAC	Fire Protection	Electrical	Equipment	Site	Facility Rating
Riverfront Station[12]	Passenger Station	3.5	4.0	3.0	-	4.5	4.5	-	4.0	4.0	3.0	3.8
Donelson Station	Passenger Station	-	-	-	-	-	-	-	-	4.0	3.0	3.5
Hermitage Station	Passenger Station	-	-	-	-	-	-	-	-	4.0	3.0	3.5
Mt. Juliet Station	Passenger Station	-	-	-	-	-	-	-	-	4.0	3.0	3.5
Martha Station	Passenger Station	-	-	-	-	-	-	-	-	4.0	3.0	3.5
Lebanon Station	Passenger Station	-	-	-	-	-	-	-	-	4.0	3.0	3.5
Hamilton Springs Station[13]	Passenger Station	-	-	-	-	-	-	-	-	-	-	NA
Greensboro Park and Ride	Park and Ride	-	-	-	-	-	-	-	-	-	4	4

Based on these condition assessments, none of the facilities was rated less than 3.0 on the TERM[14] scale which translates to 100% of total RTA's reported facilities in the State of Good Repair (SGR). According to FTA, the performance measures for facilities is the percent of facilities rated 3.0 or less on the TERM scale, and it is not based on the size, value or the level of responsibility for the asset. The average facility rating for RTA is 3.6.

3.7. Fixed Guideway Tracks

RTA operates its Music City Star commuter rail service on a total of 31.58 miles of fixed guideway tracks belonging to the Nashville & Eastern Railroad Authority. Tracks, signals and bridges were upgraded and replaced, and various grade crossings have been improved since the start of service in 2006, and RTA contributed to the capital improvement of the tracks. According to 49 CFR § 625, RTA is including these fixed guideway tracks because of the shared capital responsibility.

Performance of the fixed guideway infrastructure should be reported based on the percentage of track segments with performance

[12] This facility is shared with WeGo Public Transit. RTA will report this facility in their TAM Plan.

[13] Under construction at the time of this report (June 2018)

[14] The Transit Economic Requirements Model (TERM) is an analysis tool developed for the Federal. Transit Administration (FTA) and designed to estimate transit capital investment needs.

restrictions (49 CFR § 625). FTA has published a guidebook[15] that outlines the process for calculating and reporting performance of fixed guideway infrastructure.

Appendix E includes an inventory of RTA's track segments, design speeds, and speed restrictions, and the segments that have performance restrictions. A total of 4.3 miles of the track segments have speed restrictions, which, based on FTA guidelines, leads to a SGR performance of 13.5% of RTA's fixed guideway tracks with restrictions.

3.8. Gray Line Buses (Not owned by RTA)

Under contract by Gray Line of Tennessee, RTA operates 10 regional bus routes between downtown Nashville and the following cities: Clarksville, Dickson, Franklin, Gallatin, Hendersonville, Joelton, Springfield, and Spring Hill, as well as three route services operated by WeGo Public Transit under contract with RTA (La Vergne, Murfreesboro, and Smyrna). RTA works closely with the WeGo Public Transit (Formerly known as Nashville MTA) linking riders with 45 routes provided throughout Davidson County.

Even though RTA does not own the bus fleet, since its commuters ride on these buses, RTA works closely with the Gray Line of Tennessee and audits their maintenance records to ensure safety of the bus fleet and its commuters. RTA does not have capital responsibility for the Gray Line buses, and so does not use a capital plan or a TAM Plan to ensure the SGR of the fleet. Rather, SGR is imposed through the contract with Gray Line to ensure that the fleet is in good condition.

Even though Gray Line buses are not a part of the RTA TAM Plan, they are referenced here in order to provide a complete picture of RTA operations. The summary inventories and conditions reported Table 7 do not include the Gray Line buses.

3.9. Summary of Performance Measures

Table 16 summarizes the performance measures for RTA assets.

Table 16. Summary of RTA Asset Performance Measures for FY2108

Asset	Performance	FY18 Performance
Rolling Stock (Rail Cars)	% exceeding ULB	100%
Rolling Stock (Locomotives)	% exceeding ULB	0%
Rolling Stock (Vans)	% exceeding ULB	35%
Bus	% exceeding ULB	0%
Tracks	% of Segments w/ Restriction	13.5%
Facilities	% below 3.0 TERM Rating	0%

[15] FTA TAM Infrastructure Performance Measure Reporting Guidebook: Performance Restriction (Slow Zone) Calculation, April 2017.

Section 4

4. STATE OF GOOD REPAIR (SGR) AND PERFORMANCE TARGETS

A robust fleet-wide State of Good Repair (SGR) that will preserve transit capital assets and support quality customer service is the goal of RTA. The capital expenditures that are necessary to maintain a State of Good Repair include preventative maintenance, routine maintenance, rehabilitation or overhaul, and replacement. Defining the SGR for RTA's assets will enable the agency to set appropriate targets, use the targets as benchmarks to track progress, and provide direction and guidance in the prioritization of capital improvements and maintenance[16]. The SGR policy is closely aligned with RTA's mission and goals.

4.1. Defining State of Good Repair (SGR)

SGR is defined by FTA as "*the condition in which a capital asset is able to operate at a full level of performance*" (TAM Final Rule 49 USC 625, §625.5). The SGR is considered to be met for a particular asset when the asset:

- Is performing its designed function.
- Is operable and reliable (not imposing the risk of stranding passengers in unsafe or unhealthy situations).
- Has met or recovered the lifecycle investments.

This SGR definition has been adopted for this TAM Plan. The definition of SGR is important because it relates to the appropriate targets and measure progress relative to a set benchmark. The SGR therefore

[16] TCRP Report 172, Guidance for Developing a Transit Asset Management Plan, 2016

provides direction and guidance for the entire TAM Plan process of systematic and data-driven asset management.

The TAM Final Rule established three performance measures which are a minimum national standard for transit operators. These performance measures are summarized in Table 17.

Table 17. Summary of SGR Performance Measures

Asset Category	FTA established Performance Measure
Rolling Stock	% of revenue vehicles exceeding ULB
Equipment	% of non-revenue service vehicles exceeding ULB
Facilities	% of facilities rated under 3.0 on the TERM scale
Infrastructure	% of track segments* (by mode) that have performance restrictions.

* Track segments are measured to the nearest 0.1 mile.

The purpose of the SGR policy is to keep the assets in SGR through setting these targets and optimizing the capital investment plan to achieve these targets. Failure to achieve or maintain SGR leads to safety risks for the users of public transit; decreased system reliability, more road calls, and shorter distances between failures; higher maintenance costs; and lower system performance and eventually lower customer satisfaction (Section 3, Figure 3.2).

4.2. SGR Policy and Maintenance Plan

The SGR performance of vehicles, equipment, facilities, and infrastructure is directly affected by the preventative, corrective, and routine maintenance that they receive.

RTA does not currently have a comprehensive asset maintenance plan. The Vanpool vans are being operated by VanStar, and their maintenance follows the suggested maintenance plan by the manufacturer. These vans received routine maintenance at the manufacturer dealership location. The revenue buses received the routine maintenance at WeGo Public Transit maintenance facilities. This was identified as a TAM practice gap at the agency. This gap will be addressed as part of the implementation of this TAM Plan.

Maintenance of passenger stations falls under multiple jurisdictions. Some of the routine maintenance is done by Transit Solutions Group (TSG) (operator of the Music City Star commuter rail service), while municipalities, where the stations are located, are responsible for cleaning and other types of routine maintenance. In addition, RTA is responsible for the capital improvement of these stations. The extent of these responsibilities is not clearly defined, which was also identified as a gap in asset management at the agency, to be addressed as part of the implementation of this TAM Plan. The Hamilton Springs Station was under construction at the time of this report.

The Greensboro Park and Ride was originally constructed by RTA but is currently maintained by the City of Gallatin.

The Music City Star rail cars are operated by TSG and maintained at the TSG facilities. RTA operates the Music City Star service on the tracks owned by Nashville & Eastern Railroad Authority. RTA partially paid for track, signal and bridge upgrades and replacements, and for various grade crossing improvements.

However, RTA does not have direct capital responsibility over these tracks, and thus does not manage maintenance of these assets.

RTA does not have direct capital responsibility over Gray Line of Tennessee buses, and these assets are operated and maintained by the owner. However, RTA conducts audit of maintenance and safety records for these assets regularly to ensure safety and state of good repair.

The SGR policy for each asset category, including replacement policies practiced by RTA, is outlined below.

4.3. Performance Targets

Through a review of RTA's asset inventory, summary of asset performance measures, the current and future budget outlook, the agency's SGR policy, and the future ability to replace assets, the TAM Steering Committee set the SGR performance targets for its asset categories. These targets meet the requirements of FTA final rulemaking on transit asset management and performance reporting, and also are achievable and reasonable for RTA, given its fiscal constraints. The following section outlines these performance targets for different asset classes. The following sections outline RTA's policy and plan for each asset category.

4.3.1. Rolling Stock (Rail Cars and Locomotives)

RTA's TAM Steering Committee decided the agency will replace its rail cars and locomotives based on their age to maintain the ULB-based SGR targets. Currently, 100% of RTA's rail cars have exceeded the ULB of 39 years for these assets. RTA is planning to replace all rail cars by the end of 2019 with cars built in 1985, which will improve their performance to 0% by 2022. However, this measure will increase to 100% again in 2024.

All the locomotives were built in 1985 (33 years old) and thus none of them exceed the ULB of 39 years for these assets. Respectively, the Committee adopted a target of 0% for Fiscal Year 2019, and 0% for Fiscal Year 2022 (on average, they will be 37 years in 2022). There is no plan for replacement of locomotives in the next 4 years, but RTA is planning to conduct major overhaul on these assets. Based on this plan and the procurement timeline, the Committee decided to adopt a target of 0% for Fiscal Year 2019 through 2022.

4.3.2. Rolling Stock (Buses)

RTA currently owns two Gillig hybrid buses, both with an age of 9 years. Comparing to a ULB of 14 years for buses, none of these assets exceed the ULB through 2022, and thus the Committee adopted a target of 0% through 2022.

4.3.3. Rolling Stock (Vanpool Vans)

The RTA Vanpool fleet included 41 vans (as of July 2018). The TMA Group (The TMA Group – Franklin Transit – VanStar) manages the vans for RTA, and they propose the list of van replacements to RTA every year. These replacements are currently done based on a mileage threshold of 100,000 miles. Currently, 35% of these vans have met or exceeded the ULB of 8 years. The Committee adopted a target of 60% for Fiscal Years 2019 and 70% for 2022. These targets will be communicated with the MTA Group.

4.3.4. Facilities

RTA shares the administration facility located on Myatt Drive in Madison, TN, with WeGo Public Transit. That facility is reported as part of WeGo's TAM Plan. In addition, RTA owns multiple passenger stations and the Greensboro Park and Ride. Based on the condition assessments conducted in June through August 2018, all of these facilities were rated 3.0 and above on the TERM scale, and thus 0% are not in the SGR.

RTA does not anticipate any major changes to these facilities, and therefore adopted a target of 0% through Fiscal Year 2022.

4.3.5. Infrastructure

As noted in Section 3, currently 13.5% of RTA's tracks have performance restrictions. These restrictions are not based on condition, but based on other factors that cannot be improved, unless through track re-design and re-construction. RTA does not anticipate any changes to these tracks, except for maintaining the current condition and routine and corrective maintenance. Therefore, the Committee adopted the target of 13.5% through Fiscal Year 2022.

4.4. Summary of Performance Targets

Table 18 provides a summary of current performance measures for RTA's asset categories, and its targets for Fiscal Year 2019, and 2022.

Table 18. Summary of Performance Measures and Targets

Asset Category	Performance	FY18 Performance	FY19 Target	FY22 Target
Rolling Stock (Rail Cars)	% exceeding ULB	100%	100%	0%
Rolling Stock (Locomotives)	% exceeding ULB	0%	0%	0%
Rolling Stock (Vans)	% exceeding ULB	35%	60%	70%
Bus	% exceeding ULB	0%	0%	0%
Tracks	% of Segments w/ Restriction	13.5%	13.5%	13.5%
Facilities	% below 3.0 TERM Rating	0%	0%	0%

Section 5

5. ASSET PRIORITIZATION AND DECISION SUPPORT TOOL

This section outlines the capital investment decision process including decision support tool that is used for the development of this TAM Plan.

5.1. Transit Asset Prioritization Tool (TAPT)

Transit Cooperative Research Program (TRCP) Reports 157[17] (Phase 1) and 172[18] (Phase 2) (both sponsored by FTA) outlined the outcomes of a two-phased research program that developed a framework for transit SGR and described a set of steps in applying the framework, including development of an investment plan. The framework was then further developed into the Transit Asset Prioritization Tool (TAPT) spreadsheet, that can be utilized to develop a prioritized capital investment plan for vehicles and facilities. According to TCRP 172, the TAPT tool "*can assist a transit agency in developing its TAM Plan but the fundamental goal of the tool is to help transit agencies optimize their asset rehabilitation and replacement decisions*."

TAPT tool is used for the purpose of this report for developing the investment plan. Chapter 3 of TCRP Report 172 provides step-by-step instructions for using TAPT, and TCRP Report 157 provides information

[17] TCRP Report 157, "State of Good Repair: Prioritizing the Rehabilitation and Replacement of Existing Capital Assets and Evaluating the Implications for Transit," Transportation Research Board (TRB), Sponsored by Federal Transit Administration, 2012.

[18] TCRP Report 172, "Guidance for Developing a Transit Asset Management Plan," Transportation Research Board (TRB), Sponsored by Federal Transit Administration, 2014.

on the modeling approach and defaults used in the model. Therefore, the current TAM Plan will not cover those details.

5.2. Asset Deterioration Models and Prioritization Framework

The objective of the prioritization is to recommend a set of alternatives to maximize the return on capital investment in replacing rolling stocks and service vehicles and rehabilitating the facilities while meeting the SGR performance targets and budget constraints. For this purpose, a set of deterioration models is needed to forecast the condition of assets in the future based on the analysis year data and historic information. National averages and experiences of other agencies can be instrumental in developing useful deterioration models.

The TAPT has multiple models built in that can be customized based on the specific needs and experiences on the agency. At the same time, the analysis can also use the default values which are based on national averages. These are explained in TCRP Report 172.

This TAM Plan will utilize the TAPT mileage-based models for commuter rail locomotives and commuter rail coach cars, and also condition-based models for tracks and passenger stations.

5.3. Prioritization of Replacement for VanPool Fleet

RTA is developing a replacement plan for its VanPool fleet. The plan, scheduled to be done in Fiscal Year 2020, will maximize the utilization of the fleet, and will develop a lifecycle plan for retirement of vehicles. At this point, RTA retires the vans once they reach 100,000 miles threshold, which is the warranty threshold for these vans. Working with the Steering Committee, it was decided to retire (and not replace) vans based on this approach in 2018, and then not retire or replace any vans moving forward through 2022. This was the consensus among the Committee members as the viable plan until the detailed replacement plan is developed.

Section 6

6. CAPITAL BUDGET AND INVESTMENT PRIORITIZATION

This section outlines the capital budget for RTA, budget breakdown and descriptions, and also the outcomes of the capital investment prioritization. Section 6.1 describes the capital plan for Fiscal Years 2019 and 2020 that was adopted by RTA's Board of Directors (BoD) at their August 2018 meeting. The numbers presented for Fiscal Years 2021 and 2022 are conceptual numbers and have not been adopted by the BoD. However, these numbers are used to develop the investment prioritization for the 4-year horizon of this TAM Plan. RTA will revise the plan once the next capital budget is adopted by the board in the coming years.

6.1. RTA Capital Budget

The Board of Directors of the Regional Transportation Authority of Middle Tennessee (RTA) recognizes the need to develop a broad funding policy for the annual Capital Budget to:

1) maintain assets in a state of good repair;
2) provide improvements to existing service for current riders; and
3) reflect and advance the initiatives adopted under the ***nMotion Strategic Plan*** for Middle Tennessee to expand the use of mass transit in Middle Tennessee.

This capital plan generally identifies sources and amounts of projected capital funding available to RTA as well as a framework for categorizing and prioritizing projects for funding decisions. It goes on to provide descriptions of proposed capital projects and to project available resources for those projects.

The capital plan provides projected projects for a 4-year horizon – FY2019 through FY2022. It should be noted that only FY2019 and FY2020 projects have been adopted by the BoD and FY 2021 and FY2022 projects are conceptual, and to be presented to and adopted by the BoD in coming years. Projects listed for FY2019 and prior years generally (1) have been thoroughly scoped, and (2) have identified funding sources associated with them. Once approved in the Capital Plan, RTA Board Members can next expect to see them reported out in a "project delivery" phase, such as design or procurement. Projects listed for FY2020 are more conceptual in nature, and most will likely require more detailed scoping and the identification of specific funding sources. They are listed to facilitate discussion of RTA priorities among members and will likely be presented in next year's capital plan.

6.1.1. RTA Capital Funding Sources and Amounts

RTA receives capital funding from Federal, State, and Local sources as identified below.

6.1.1.1. Federal 5307 – Urbanized Area Formula Grant

The 5307 Federal formula funding is provided to the Region based on reported and audited ridership data. Through annual agreements with regional partners at the MPO level, funding is split between RTA, WeGo, and Franklin Transit. These funds can also be "flexed" over to the operational budget to be used for preventative maintenance to some extent, as allowed by FTA regulation. These are typically "80%" funds, meaning that 80% of the funding shown is federal money while 10% of the money comes from the state and 10% comes from local sources. Funding under this program may be allocated to either bus or rail projects, at the RTA's discretion.

At this time, RTA can reasonably predict that annually it will receive approximately $6M total for Capital needs in 5307 funds including state/local match annually. RTA typically transfers approximately $2.5M to the operations budget for Rail Capital Costs of Contracting, though the specific amount for this transfer is included as part of the annual operating budget process.

FTA provides 5307 funding to public transit systems in Urbanized Areas (UZA) for public transportation capital projects, planning, job access and reverse commute projects, as well as operating expenses in certain circumstances. Eligible activities include:

- Planning, engineering, design and evaluation of transit projects and other technical transportation-related studies;
- Capital investments in bus and bus-related activities such as replacement of buses, overhaul of buses, rebuilding of buses, crime prevention and security equipment and construction of maintenance and passenger facilities; and
- Capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software.

All preventive maintenance and some Americans with Disabilities Act complementary paratransit service costs are considered capital costs.

6.1.1.2. Federal 5337 – Rail and Rail Facilities Grant

The 5337 Federal formula funding is provided to the Region based on reported and audited rail ridership data. RTA is the only regional provider eligible for 5337 funds. As with 5307 funding, these are typically "80%" funds, meaning that 80% of the funding shown is federal money while 10% of the money comes from the state and 10% comes from local sources. Funding under this program may only be allocated to projects for the Music City Star. Bus projects are not eligible.

At this time, the region can reasonably predict that annually it will receive approximately $3.3m total for Capital needs in 5337 funds and state/local match annually. FTA provides 5339 funding to states and transit agencies through a statutory formula for capital projects to maintain a fixed guideway or a high intensity motorbus system in a state of good repair, including projects to replace and rehabilitate:

- Rolling stock
- Tracks
- Line equipment and structures
- Signals and communications
- Power equipment and substations
- Passenger stations and terminals
- Security equipment and systems
- Maintenance facilities and equipment
- Operational support equipment, including computer hardware and software

5337 Federal formula funding can also be used for the development of Transit Asset Management Plans (TAM plan).

6.1.1.3. Federal 5339 – Bus and Bus Facilities Grant

The 5339 Federal formula funding is provided to the Region based on reported and audited bus ridership data. Through annual agreements with regional partners, funding can be split between WeGo, RTA, and Franklin Transit. As with 5307 funding, these are typically "80%" funds, meaning that 80% of the funding shown is federal money while 10% of the money comes from the state and 10% comes from local sources. Funding under this program may only be allocated to projects for the commuter bus program. Music City Star projects are not eligible.

At this time, the region can reasonably predict that annually it will receive approximately $2.0M total for Capital needs in 5339 funds and state/local match annually. As WeGo provides the greatest share of bus service in Middle Tennessee, the portion of these funds that would be fairly shared with RTA and Franklin Transit requires significant paperwork for limited revenue to those agencies. By mutual agreement, WeGo receives the full allocation of regional 5339 funding.

FTA provides 5339 funding to states and transit agencies through a statutory formula for capital projects to replace, rehabilitate and purchase buses, vans, and related equipment, and to construct bus-related

facilities, including technological changes or innovations to modify low or no emission vehicles or facilities.

6.1.1.4. Federal Congestion Mitigation and Air Quality (CMAQ)

These are federal funds that are allocated by TDOT through a competitive grant process. These funds typically are 80% federal and require a state or local match. RTA can apply to TDOT for capital funding for Bus Replacements, Park and Rides, and other projects that would result in a reduction of vehicle congestion and an associated improvement of local or regional air quality.

With the exception of funding to support the operation of commuter bus service, RTA does not have a current strategy for requesting these funds and cannot reasonably include this as an ongoing and stable funding source. However, RTA does review “shovel ready” projects in its capital budget to submit CMAQ applications each year. Current requests focus on bus replacements.

6.1.1.5. Federal Surface Transportation Program (STBG)

These are funds that are managed and allocated by the MPO. RTA can apply for these funds for use on capital projects, engineering, planning studies, and similar activities. These funds are also typically are 80% federal and require a state or local match.

RTA does not have a current strategy for requesting these funds and cannot reasonably include this as an ongoing and stable funding source.

6.1.1.6. State IMPROVE ACT Program

These are state funds that are allocated by TDOT through a competitive grant process. These funds require a local match. RTA can apply to TDOT for funding for a broad range of transit capital projects.

RTA does not have a current strategy for requesting these funds and cannot reasonably include this as an ongoing and stable funding source. However, RTA does review “shovel ready” projects in its capital budget to submit IMPROVE ACT applications each year. Current requests focus on bus replacements and rail vehicle rehab. RTA was successful in receiving an award for IMPROVE acts funding to these items.

6.1.1.7. State Grant Match

RTA relies on state funding to provide matches to federal funds.

6.1.1.8. Local Capital Funding and Grant Match

RTA relies on local funds to provide matches to federal funds.

6.1.1.9. Other

When projects deemed to be an RTA priority cannot be funded through traditional formula sources, a dialogue is initiated with potential outside funding partners (ie: TDOT, NAMPO, etc.) to identify other potential sources of funds. Other sources include grants from other federal, state, or local entities. RTA continuously reviews opportunities to apply for grants to support capital projects.

6.1.2. RTA Capital Funding Strategy

This section describes the prioritization strategy for RTA's capital projects. Projects are categorized in the following order of priority.

6.1.2.1. Safety / Regulatory Projects

Completing projects required for safety or by law/regulation is at the top of RTA's priority list. Capital Safety projects for FY19 include annual audit of rail operations and implementation of enhanced security systems for Park and Rides and Rail Stations.

6.1.2.2. Committed Projects

Some key agency investments are funded with the commitment that full funding will be obligated using multi-year funding. These committed, underway projects are high priority projects. For FY19, the MPO-led South Corridor Study is a committed multi-year project that requires additional funding to completely cover committed cost sharing.

6.1.2.3. Transfer of Federal Capital Funds to Operation for Rail Capital Cost of Contracting

RTA transfers Federal 5307 capital dollars for operational preventative maintenance and ADA needs. The amount transferred annually is reviewed to balance the needs of system maintenance and system capital projects. This has historically been funded at $2.5M in prior years and is projected to stay at this level for FY19 and FY20.

6.1.2.4. State of Good Repair (SGR)

Maintaining the existing transit system in a State of Good Repair (SGR) is also one of RTA's highest priorities. Having well maintained, reliable transit infrastructure will help ensure safe, dependable, efficient, and accessible services. Capital SGR projects include Overhaul of Rail Locomotives, Replacement of Passenger Railcars, Rail Infrastructure Repairs, Rail Station SGR, Bus Vehicle Replacement, and non-revenue vehicle purchases.

6.1.2.5. Business Improvements

In order to provide increase staff efficiency and improve business processes, RTA will review and upgrade and implement strategic process improvements to streamline business efforts and increase effective use of existing resources. No projects have been identified in this category in the proposed plan.

6.1.2.6. nMotion Service Improvements

In order to provide increasingly meaningful service to Middle Tennessee residents, RTA will improve its existing service making it easier to use, more convenient, more comfortable, and more efficient, and more accessible. ***nMotion*** Recommendations for Service Improvements include:

- Make Service Easier to Use
- Improve Existing Commuter Services

Capital ***nMotion*** Service Improvement projects encompassed in this plan include Mt Juliet Park and Ride Expansion, Fare Collection Technology Improvements, Bus Service Improvements (CAD/AVL Installation), and Bus Park and Ride Study for existing routes.

6.1.2.7. nMotion System Expansion and High Capacity Transit Development

As Middle Tennessee continues at its high rate of population and job growth, RTA will begin laying the foundation for larger infrastructure and network expansion and improvements. These projects tend to be strategic studies or multi-year, multi-disciplinary exercises that can require inter-agency planning, engineering, construction, and financing. ***nMotion*** Recommendations for Service Expansion include:

- Expand Service to New Areas
- Build Frequent Transit Network
- Build High Capacity Network

For RTA, this includes a strategic assessment of the infrastructure and capital needs required to expand service on the Music City Star. It also completes funding of the RTA's share of the South Corridor Study, described under "committed projects."

6.1.3. RTA Capital Funding Look Ahead

Figure 16 illustrates the sources and amounts of funds available to the RTA for capital projects in FY2019. You will note a large balance of prior year funding. RTA had set aside capital funds over the past several years with the expectation that these funds would be required to implement Positive Train Control (PTC) on the Music City Star. The majority of these funds are 5337 dollars that must be used on Rail capital projects and would not have been sufficient to fully fund PTC. With the Federal Railroad Administration granting the RTA a limited service exception to defer installation of PTC, this capital plan repurposes these funds to more pressing rail infrastructure priorities.

RTA Staff will initiate studies in 2019 to define and prioritize the needs for strategic improvement of RTA Bus and Rail service including expansion of Commuter Bus Park and Rides and Rail investments necessary for service expansion. Once these studies are completed, a broader strategy will be developed for RTA Board approval to reallocate and prioritize prior year funds. Figure 17 illustrates the FY2019 RTA proposed project breakdown.

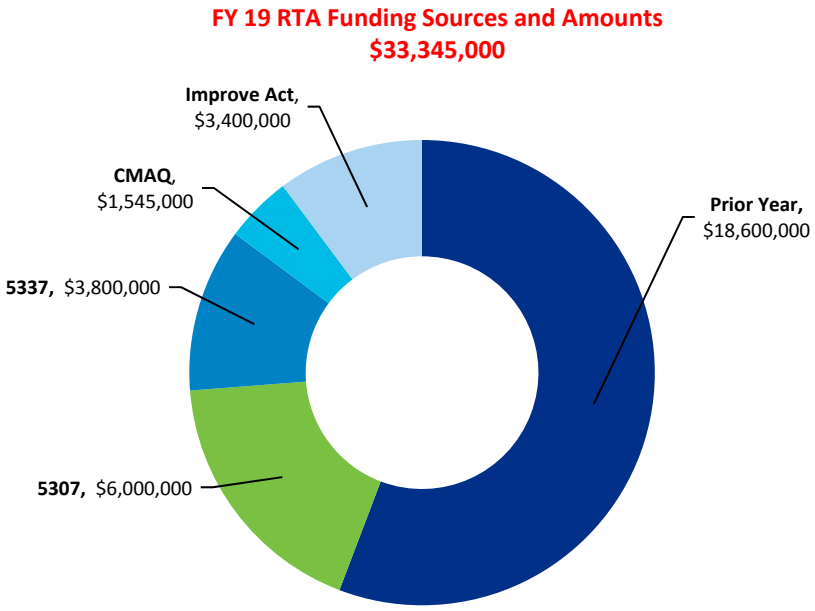

Figure 16. Fiscal Year 2019 RTA Funding Sources

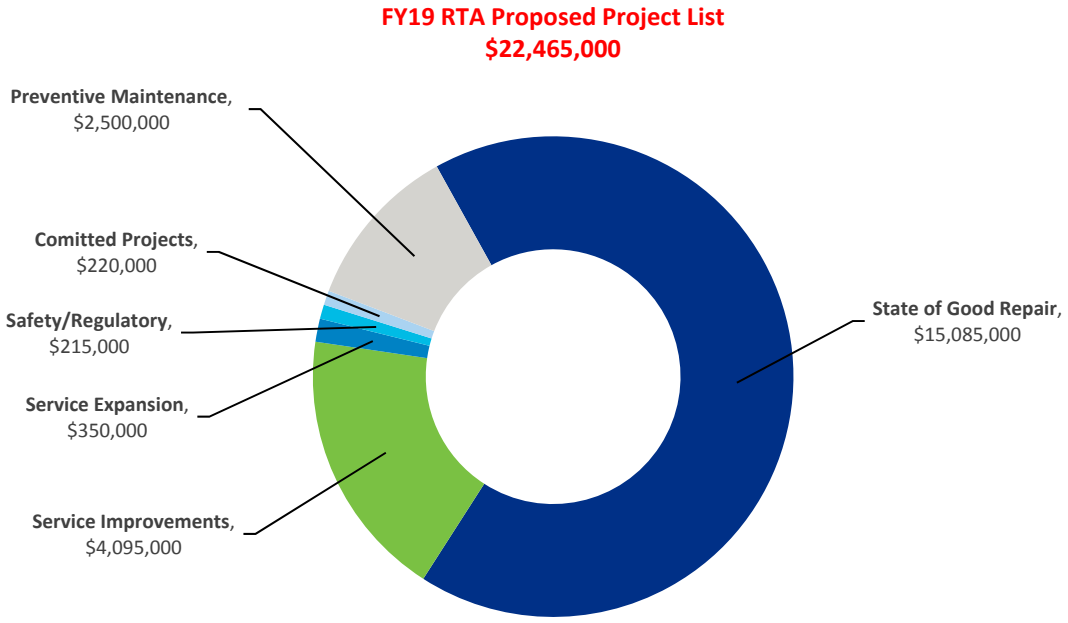

Figure 17. Fiscal Year 2019 RTA Proposed Project Breakdown

6.1.4. Project Plan Budget

Table 19 outlines the details of RTA's 4-year capital budget plan. Fiscal Year 2018 through 2020 budget was adopted by the Board of Directors (BoD) in August 2018. FY 2021 and 2022 budget are conceptual and have not yet been adopted by the BoD. These will be presented to the board in the coming years.

The following are brief descriptions of each project contained in the Project Plan Budget.

Security Camera Purchase and Installation – Park and Ride Lots may be susceptible to vandalism and auto break ins due to the relatively low levels of activity in mid-day periods. With the expansion of the Ticket Vending Machine Program on the Music City Star, there is also an increased risk of vandalism of these units. This project would install digital video surveillance cameras at RTA Music City Star Park and Ride Lots/Stations.
The $95, 000 will allow us to install 5 cameras at Riverfront, 7 cameras at Hamilton Springs, and 2 cameras each at Donelson, Hermitage, Lebanon, Martha, and Mt. Juliet stations. This amount is a little less than the FY20 project costs because most of the necessary power source already exists.
$100,000 in FY20 would cover an additional 4 cameras at each station (Donelson, Hermitage, Lebanon, Martha, and Mt. Juliet) including the installation of an extra power source.

Annual FRA Track Audit - Audit services serve as a 3rd party oversight function to ensure the service provider, Transit Solutions Group (TSG), is in compliance with Federal Railroad Administration's rules & regulations and RTA's Operations & Maintenance contract. Beyond FRA compliance, this level of oversight is necessary as a condition of our Federal Transit Administration funding to assure continuing control over Federally funded assets.

South Corridor Study - Conduct a transit alternatives analysis for the south corridor of the region (roughly paralleling I-65) connecting Nashville and communities along the corridor into Maury County. The study will provide short, mid and long-term recommendations for major investments and will be consistent with the MPO's Regional Transportation Plan: Middle Tennessee Connected and with the ***nMotion*** strategic plan. The Nashville Area MPO and the RTA are providing federal funding with TDOT and communities along the corridor providing the match.

Table 19. RTA 4-Year Capital Budget Breakdown

	CAPITAL PROJECT NEEDS	Board Adopted in August 2018				Forecast	
		Proposed Funding Sources for 2019	Prior Years	2019	2020	2021	2022
Safety/Regulatory Projects			**-**	**$ 215,000**	**$ 220,000**	**$ 100,000**	**$ 100,000**
1	Security Camera Purchase and Installation	5307		$ 95,000	$ 100,000		
2	Annual FRA Track Audit	5337		$ 120,000	$ 120,000	$ 100,000	$ 100,000
Committed Projects			**$ 230,000**	**$ 220,000**	**-**	**-**	**-**
3	South Corridor Study	5307	$ 230,000	$ 220,000	-	-	-
Preventive Maintenance Transfer			**-**	**$ 2,500,000**	**$ 2,500,000**	**$ 2,500,000**	**$ 2,500,000**
4	Annual Rail Capital Cost of Contracting	5307		$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 2,500,000
State of Good Repair			**-**	**$ 15,085,000**	**$ 4,480,000**	**$ 550,000**	**$ 550,000**
Rail Rolling Stock							
5	Locomotive Overhaul	IMPROVE Act/5337/5307		$ 6,580,000	$ 2,080,000		
6	Passenger Car Replacement	5337/5307		$ 4,100,000	-	-	-
Track Infrastructure							
7	Rail State of Good Repair	5337		$ 2,550,000	$ 650,000	$ 500,000	$ 500,000
Rail Stations							
8	Station State of Good Repair	5337/5307		$ 80,000	$ 50,000	$ 50,000	$ 50,000
Bus Vehicles							
9	Acquire New Buses	IMPROVE Act		$ 1,700,000	$ 1,700,000		
Non Revenue Vehicles - Rail Operations							
10	Acquire Two Service Vehicles	5337		$ 75,000	-	-	-
Business Improvements			**-**	**-**	**-**	**-**	**-**
11	No Projects Programmed in this Category			-	-	-	-
nMotion Service Improvements			**$ 150,000**	**$ 4,095,000**	**-**	**-**	**-**
Park and Ride Facilities							
12	Mt Juliet Parking Lot Improvement/Expansion - Design	5307	$ 150,000	-	-	-	-
13	Mt Juliet Parking Lot Improvement/Expansion - Construction	CMAQ / 5307		$ 1,545,000	-	-	-
Fare Collection							
14	Fare Collection System Installation	5307		$ 1,750,000	-	-	-
Computer Aided Dispatch / Automated Vehicle Location (CAD/AVL)							
15	CAD/AVL System Installation	5307		$ 550,000	-	-	-
Bus Park and Rides							
16	Park & Ride Location Study	5307		$ 250,000	-	-	-
nMotion Service Enhancements			**-**	**$ 350,000**	**-**	**-**	**-**
Track Infrastructure							
17	Music City Star Improvement Study	5307		$ 350,000	-	-	-
Total Project Budget Requirements			**$ 380,000**	**$ 22,465,000**	**$ 7,200,000**	**$ 3,150,000**	**$ 3,150,000**

Annual Rail Capital Cost of Contracting - Annual transfer of capital funds to operational budget for Cost of Contracting expenses. This is the maximum amount allowable as currently calculated by Finance.

Locomotive Overhaul - The (4) locomotives, 120, 121, 122, and 381 are in need of overhaul. This equipment was originally built in 1985 and purchased used by the RTA when the Music City Star entered service. Lubricant consumption has increased radically over the past year and, without overhaul, the reliability of the units will degrade, and revenue service will be compromised. This project encompasses a life extending overhaul of the 4 locomotives, as well as project engineering and oversight and the lease of substitute locomotive(s) during the rehabilitation process.

Passenger Railcar Replacement - 8 passenger cars are in need of replacement, having well exceeded their useful lives. Funds programmed would support the acquisition of used passenger cars, as was done for the start of service.

Rail State of Good Repair - This project covers planned NERR track maintenance performed by NERR. Primary expense relates to the replacement of approximately three miles of rail and plates along track. Within these areas NERR will also replace ties and resurface track where required. Additional work includes converting the bridge over Barton's Creek to ballast deck for ease of maintenance and smoother ride. This FY19 project completes the jointed rail replacement.

Station State of Good Repair - Provides for capital repairs to all RR stops & Park and Ride facilities as needed. This can include power and lighting, shelters, glass, parking lot/asphalt sealing, irrigation, storm sewer, plumbing, sidewalks, fencing, vandalism repair, painting, locksmith, hazardous waste services, etc. This line item also contemplates the replacement of an outdated HVAC system at Riverfront Station in FY19 for $30,000.

Acquire New Buses - Procure new, RTA-owned buses to replace buses leased from Gray Line. The advantage being, (1) a reduction in long-term operating cost due to the elimination of the bus leasing portion of the Gray Line contract and (2) the ability to acquire vehicles in the RTA "brand" paint scheme for enhanced visibility and marketing opportunities.

Acquire Two Service Vehicles - This project would acquire two (2) non-revenue vehicles (trucks) to be used for rail supervisory, on-call and emergency response purposes for the Music City Star. Vehicles are to be used by the third-party operator of the Music City Star (TSG). These are replacement vehicles for trucks originally supplied under the startup contract for the Music City Star that have exceeded their useful life.

Business Improvement Projects – There are not projects programmed in this category.

Mt. Juliet Parking Lot Improvement/Expansion - Construction of parking lot expansion at Mt. Juliet Station. Parking lot expansion will occur on adjacent lots to the east and west of the current facility, already owned by the RTA. Concurrent with City requirements, construction will also include stormwater infrastructure improvements, new lighting, and bike racks. Adjacent RTA properties to the west of the lot expansion are identified for stormwater retention. This project is for design, using prior year funds.

Mt. Juliet Parking Lot Improvement/Expansion – This project would apply FY2019 funds to construction of the Mt. Juliet Parking Lot expansion project described under item 12.

Fare Collection System Installation - Fare collection equipment for Music City Star and Express Bus Service, including Ticket Vending Machines, onboard fareboxes and readers, and handheld scanners. This includes additional provisions for installation and unknown contingences after equipment purchase. Upon completion, it will allow for mobile payment through smartphone devices, smart card payment through a regional smartcard, and enhanced accounting and audit capabilities. This project is being done as a regional collaboration with WeGo (Formerly MTA), Murfreesboro Rover and Franklin Transit.

Computer Aided Dispatch/Automatic Vehicle Location (CAD/AVL) System Installation - Purchase and installation of CAD/AVL equipment on vehicles used for RTA commuter bus operations will allow supervisors to monitor RTA Gray Line buses in real time within the Transit Master CAD/AVL platform. In addition, this will allow for the display of real-time ETAs and vehicle locations to RTA customers via existing smartphone applications that are already used to display WeGo services in real time. Equipment can also be integrated with new fare collection equipment, resulting in greater data accuracy. Historical AVL data can be used to identify missed service for service monitoring and billing purposes (assessing penalties per 3rd party service contract with Gray Line or other vendor), a process that is currently extremely labor-intensive. Finally, AVL data can be used to monitor on-time performance and make informed schedule adjustments. Currently, available on-time performance information is limited to spot-checks and self-reporting from Gray Line.

Park and Ride Location Study - Preliminary study to help RTA identify priority corridors and potential locations for development of dedicated park-and-ride facilities for commuter bus services across the Middle Tennessee region. The study will help identify priority locations for expansion in strategic areas that will allow quick, easy and convenient access and egress for buses and commuters and with the potential for future growth.

Music City Star Improvement Study - This study would allow for the RTA to develop a strategic plan for improvements along the MCS line to allow for increased service. The study will include a review of needs for and phasing of Rail Infrastructure Improvements including straightening of curves and road crossings, identification of areas in need of passing sidings or double tracking, Wilson County Expo Center extension, timing for the purchase of additional rail vehicles, the consideration of an RTA controlled rail operations, maintenance, and storage facility.

6.2. Prioritization of Capital Projects

This section describes the outcomes of the replacement prioritization process (Outlined in Section 5), based on the detailed capital budget (Section 6.1) and the SGR targets (Section 4).

6.2.1. Commuter Rail Locomotive Overhaul Prioritization

RTA is planning to overhaul its commuter rail locomotives. These locomotives were built in 1985 and are currently 33 years old. Asset number 120 was rebuilt back in 2011 and is in better shape comparing to the others. Asset ID 122 is also out of service due to a mechanical problem, and thus is prioritized for FY2019, so that it can be added back to the fleet. Given the capital budget and the cost of each overhaul (in excess of $2.1m, on average), three of the locomotives (Asset IDs 121, 122, and 381) are prioritized for FY2019 (given their higher mileages), and asset ID 120 is prioritized for FY2020.

It should be noted that locomotive overhaul will improve mechanical performance and reliability of these assets but will not improve SGR performance. This plan is summarized in Table 20. RTA currently does not have a plan to replace its locomotives in the near future and will update its SGR targets accordingly during the next round of TAM Plan updates in 2022.

Table 20. Summary of Commuter Rail Locomotive Overhaul Prioritization

2019				2020			
Asset ID	Year Built	Mileage (June 2018)	Notes	Asset ID	Year Built	Mileage (June 2018)	Notes
121	1985	385,023		**120**	1985	43,451	Rebuilt in 2011
122	1985	391,285	Out of service				
381	1985	211,217					

6.2.2. Commuter Rail Car Replacement Prioritization

All of RTA's commuter rail cars have exceeded their ULB of 39 years. RTA is planning to purchase overhauled rail cars (built in 1985) in FY2019 and has initiated the procurement negotiations. This will improve the SGR performance of RTA's rail cars from 100% exceeding ULB to 0%. This plan is summarized in Table 21. However, given the age of the planned purchases (33 years old), this SGR performance will go back to 100% in 2024. RTA will update its SGR targets in the next round of TAM Plan updates in 2022.

Table 21. Summary of Commuter Rail Car Replacement Plan

FY2019		
Asset ID	Year Built	Mileage (June 2018)
400	1968	376,419
401	1968	342,782
402	1968	308,184
500	1961	258,916
501	1961	259,184
502	1961	259,419
503	1961	258,916
504	1961	20,434

6.2.3. VanPool Fleet Retirement and Replacement Prioritization

RTA currently retires and replaces its VanPool fleet based on the 100,000 miles threshold. RTA is revising its fleet maintenance plan, which will be done by 2020. In the meantime, RTA is planning the fleet exceeding the mileage threshold in FY2019, and then do not replace or retire any van until the fleet management plan is fully developed and communicated with the VanStar (VanPool operating company). Accordingly, the assets listed in Table 22 will be retired this year. Figure 18 and Figure 19 illustrate the performance of the fleet based on this retirement plan. RTA will update its fleet inventory and SGR targets in the next years.

Table 22. Summary of VanPool Fleet Retirement in FY2019

FY2019		
Asset ID	**Year**	**Mileage (June 2018)**
A511	2011	145,536
A513	2011	126,350
A602	2010	116,149
A606	2011	104,789
R303	2013	112,775
R311	2015	105,000
T159	2010	106,245

Figure 18. Performance Forecast for VanPool Fleet Retirement Plan

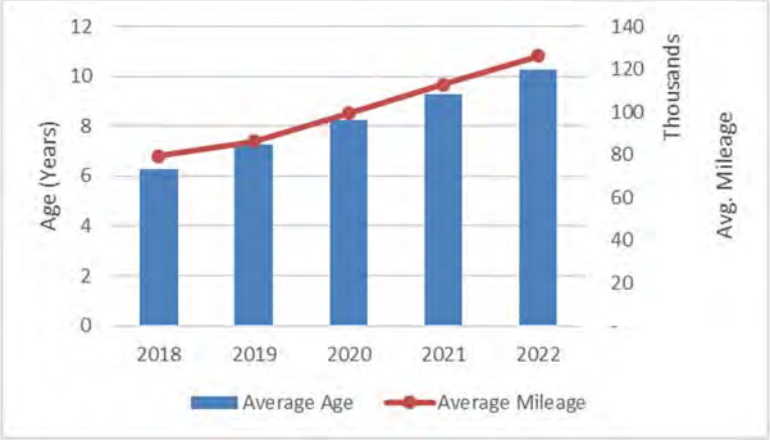

Figure 19. Average Age and Mileage for VanPool Fleet through 2022

6.2.4. Bus and Service Vehicle Acquisitions

RTA is planning to acquire multiple buses in the coming years. These buses will be operated by Gray Line but will be owned by RTA and will carry RTA's brand for more visibility and marketing. In addition, RTA will acquire two (2) non-revenue vehicles (trucks) to be used for rail supervisory, on-call and emergency

response purposes for the Music City Star. Vehicles are to be used by the third-party operator of the Music City Star (TSG). These are replacement vehicles for trucks originally supplied under the startup contract for the Music City Star that have exceeded their useful life. RTA will revise the fleet inventory and targets in the next years, once these acquisitions occur.

6.2.5. Rail Track State of Good Repair

The budget for this item covers planned project for track maintenance performed by NERR (the owner of the tracks). Primary expense relates to the replacement of approximately three miles of rail and plates along track. Within these areas NERR will also replace ties and resurface track where required. Additional work includes converting the bridge over Barton's Creek to ballast deck for ease of maintenance and smoother ride. FY19 project completes the jointed rail replacement project. It should be noted that the speed restrictions are not due to condition, but the geometry of the tracks, and thus will not be improved by these planned projects. Accordingly, RTA is setting the targets to maintain the same performance of speed restriction on 13.5% of the track segments.

6.2.6. Station State of Good Repair

For the analysis of SGR investment for passenger stations, TAPT's condition-based models were utilized. Two scenarios were analyzed. The first scenario "Do Nothing" is an unrealistic scenario in which RTA would not invest in its SGR of its stations. The reason for analyzing this scenario is to illustrate the impact of lack of investment, and also to use the results as benchmark for comparison with the capital budget scenario, and to find out if the capital budget will be effective in maintaining a SGR for stations.

Figure 20 shows the impacts of no investment on the performance of the stations, and Figure 21 illustrates the results of the prioritized SGR investment on the performance. Table 23 summarizes the prioritized investments through 2022. The peak in SGR costs for FY2019 is largely due to the scheduled repairs on the HVAC system at the Riverfront Station.

Figure 20. Performance of RTA Stations in "Do Nothing" Scenario

Figure 21. Performance of RTA Stations in the Prioritized Capital Budget Scenario

Table 23. Prioritized List of SGR Projects for RTA Stations

Program Year	Project Rank	Project Description
2019	1	Riverfront-HVAC Replacement ($30,000)
	2	Riverfront-Interior
	3	Riverfront-Substructure
	4	Riverfront-Site
	4	Martha-Site
	4	Lebanon-Site
2020	1	Riverfront-Shell
	2	Donelson-Site
	2	Mt. Juliet-Site
	3	Hermitage-Site
	4	Riverfront-Substructure
2021	1	Riverfront-Interior
	2	Greensboro P&R
	3	Riverfront-Sub-3
	4	Riverfront-Site
	5	Martha-Site
	5	Lebanon-Site
	6	Riverfront-HVAC
2022	1	Riverfront-Shell
	2	Riverfront-Substructure
	3	Donelson-Site
	3	Hermitage-Site
	3	Mt. Juliet-Site
	4	Riverfront-Plumbing

Section 7

7. TAM IMPLEMENTATION ROADMAP AND ACTIVITIES

TAM is a series of processes and an organizational stewardship culture tailored to preserving the public transit assets through their lifecycle at an optimized cost. A successful, mature TAM practice continuously improves itself through documentation of its gaps and reevaluation of its progress toward the desired maturity level on an ongoing basis. RTA has developed an implementation roadmap that is aligned with its TAM vision and policies and aims at closing the maturity gaps over the course of next four years. The roadmap includes certain activities for each policy focus, as well as timeline and the level of resources for each activity.

The roadmap was developed through a collaborative effort with the Steering Committee and reflects the current gaps in TAM practices at RTA, and their plan for advancing the TAM practice at the agency. For the detailed description of the TAM vision, policies and goals, refer to Section 1 of this TAM Plan.

Table 24 summarizes the TAM implementation roadmap, its activities, timeline, priorities, and resources needed over the TAM Plan horizon. The following serve as the legend for the table:

!	High Priority Activity	$ $	High Resources Needed (more than $300k, or more than 1 Full Time Equivalent (FTE))
!	Medium Priority Activity	$ $	Medium Resources Needed (between $50k and $300k, or 1 Full Time Equivalent (FTE))
!	Low Priority Activity	$	Low Resources Needed (Less than $50k, or less than 1 Full Time Equivalent (FTE))
	Activity Period		Activity Ongoing Beyond Timeline Period

Table 24. Implementation Roadmap, Activities, Timeline, Priorities, and Resources

TAM Goals	Activities	Timeline					
		Year 0	Year 1	Year 2	Year 3	Year 4	Beyond
1. Policy: Provide agency-wide direction and leadership to increase the RTA's asset management practice maturity.							
■ Ensuring the agency has well-defined vision, policies and goals, and these are reviewed as part of the continuous improvement plan. ■ Identify the factors that drive the TAM objectives (TAM enablers). ■ Integrate TAM with the agency's business processes and link TAM Plan to other internal and external plans.	a) Develop and promote TAM vision, policies, and goals at all levels of the agency.						
	b) Self-certify the agency by the Accountable Executive and adopt the plan as an official agency plan as part of the business processes and the capital investment decision-making process.						
2. Organizational Efficiency and Effectiveness: Improve organizational efficiency by employing effective asset management processes							
■ Build understanding and support for asset management at all levels of RTA, including executive level. ■ Improve and expand communications with RTA's departments and contractors regarding well-documented SGR needs and priorities. ■ Document and manage organizational knowledge and lessons-learned.	a) Promote the importance of TAM practices for the agency, and the role of staff in successful implementation of the TAM plan, using internal campaigns.						
	b) Establish and institutionalize a systematic communication protocol across RTA's departments and with contractors, as part of an enterprise-level management system (see 7. Tools).						
	c) Document organizational knowledge and processes through development of Standard Operating Procedures (SOP) and maintaining them up-to-date.						
	d) Promote coordination between the TAMP, the Transit Agency Safety Plan, the CIP, and the MPO's TIP and MTP to build synergy and reduce duplication of efforts.						

TAM Goals	Activities	Timeline					
		Year 0	Year 1	Year 2	Year 3	Year 4	Beyond
3. Fiscal Sustainability: Foster financial sustainability by implementing asset management and promoting the TAM culture at the agency							
■ Adopt TAM processes and SGR needs as part of RTA's annual budgeting process and Capital Improvement Program (CIP). ■ Promote preservation of existing assets while planning for addition of new assets and replacement of existing assets. ■ Utilize objective methods to prioritize capital projects.	a) Establish objective models to consider effects of budgeting scenarios on future performance of assets. (see 7. Tools).	See 7. Tools					
	b) Utilize enterprise-level asset management system to make asset maintenance, especially for facilities, more proactive by leveraging preventive maintenance (PM) programs for facilities. (see 7. Tools).	See 7. Tools					
	c) Expand the existing PM plan for vehicles with greater support from data systems so that the life cycle cost benefits of proposed maintenance and overhaul strategies can be documented.						
	d) Establish more objective prioritization approach for capital projects as part of an enterprise-level asset management system (see 7. Tools).	See 7. Tools					
4. Human Capital: Promote asset management culture at RTA and develop the human capital necessary for TAM implementation							
■ Promote TAM across all levels at RTA. ■ Promote knowledge sharing within the agency, and with contractors. ■ Recruit, develop and retain well-trained TAM workforce. ■ Develop succession plan for key roles at the agency.	a) Establish a practice to document institutional knowledge of the senior staff, and their knowledge of the agency's assets, tools, and processes.						
	b) Develop a plan for TAM education, which should include tracking FTA publications, webinars, and conferences, to provide RTA staff with ongoing training in TAM procedures.						
	c) Train workforce for TAM procedures and tools.						
	d) Develop succession plan for the key, senior staff, including job descriptions, required experience and training, and leverage the mentorship and training programs to prepare more junior staff for taking on new responsibilities.						

TAM Goals	Activities	Timeline					
		Year 0	Year 1	Year 2	Year 3	Year 4	Beyond
5. Safety: Maintain RTA assets in State of Good Repair (SGR) to support a safe operating environment							
■ Maintain vehicles, equipment, infrastructure systems and facilities in SGR. ■ Promote a safety culture at the agency and align asset and safety management practices. ■ Proactively review and communicate safety-related issues with the staff. ■ Use asset data and subject matter expertise to identify and avoid or minimize road calls and failures and move toward a proactive management of assets. ■ Identify recurring asset issues and failures and provide a plan to address the root of the issue.	a) Establish SGR policies and targets that support safe operating environment by linking the agency's Safety Plan and TAM Plan (in compliance with 49 CFR Part 673, Public Transportation Agency Safety Plan).	! $	!! $	!! $			
	b) Through establishing an objective, proactive approach and by utilizing an enterprise-level asset mgmt. system (see 7. Tools and 8. Data), use asset performance data and subject matter expertise to identify recurring issues or failures (e.g. road calls) that can be avoided.	See 7. Tools and 8. Data					
6. State of Good Repair (SGR) Investments: Invest in RTA assets and SGR and promote the culture of "Asset Stewardship" at all levels of the agency							
■ Maintain vehicles, equipment, infrastructure systems and facilities in SGR. ■ Develop TAM Plan and policies in compliance FTA TAM Rule (49 CFR § 625). ■ Develop and implement preventive and proactive capital asset maintenance, replacement and rehabilitation plans.	a) Develop and adopt a TAM Plan in compliance with FTA TAM Rule (see 1. Policy).	!! $ $					
	b) Establish SGR policies and targets that support capital investment decisions.	!! $ $					
	c) Update the target on an annual basis and submit them to NTD along with a narrative report (see 10. Annual Submissions).	!! $					
	d) Establish proactive, preventive maintenance for assets, especially facilities. Maintain and update the preventive maintenance plan for vehicles.	!! $ $					
	e) Establish a Fleet Management Plan for prioritizing replacement or retiring of VanPool fleet based on SGR targets	!! $ $					

TAM Goals	Activities	Timeline					
		Year 0	Year 1	Year 2	Year 3	Year 4	Beyond
7. Tools: Provide infrastructure and tools to support data-driven decision-making for asset management							
■ Assess and implement tools to support data driven asset management decisions across stakeholder agencies. ■ Utilize historical data and trends to inform future decisions. ■ Ensure investment decisions are based on the assessment of business benefits, are transparent, and are clearly communicated.	a) Explore solutions for the enterprise-level management system and inform (b), through Request for Information (RFI), or invite the vendors to "Vendor Day" to present their products.	!! $	! $				
	b) Implement an enterprise-level transit asset management system that supports multiple departments at RTA, by processing historic and current data and trends to inform the decision-making process. **Note:** This enterprise system to encompass tools to support life-cycle cost (LCC) analysis and planning for all asset classes, preventive maintenance planning for facilities and vehicles, capital investment prioritization and optimization based on SGR targets and capital budgets, forecasting asset performance for different capital investment scenarios, among other features.		! $	!! $ $	! $ $	! $ $	
8. Data: Collect relevant, timely, and accurate data that can support the decision-making process and TAM processes							
■ Highlight the need for collecting the right data, one time, at the right time, in the right format. ■ Develop data management protocols to ensure the data collection supports multiple agency needs. ■ Improve data sharing across stakeholder agencies so multiple departments benefit from data collection (data collected once, used by many).	a) Develop and adopt a universal data management plan, to support the enterprise transit asset management systems (See 7. Tools), and to promote collection of data at the right time, and in the right format. Leverage the data management plan to ensure the same data is not collected by multiple departments in different formats for different purposes. This plan should ensure the data can be collected once and used many times by multiple departments, to the extent possible. This may be done concurrently with enterprise TAM system implementation, and the data management plan requirements can be incorporated in the requirements for the TAM system implementation.		! $	! $ $			
	b) Establish a program to collect accurate, timely data about the performance of Vanpool fleet (including mileage, age, condition, and maintenance records)	! $					

TAM Goals	Activities	Timeline					
		Year 0	Year 1	Year 2	Year 3	Year 4	Beyond
9. Continuous Improvement: Meet all FTA requirements at each deadline, and continue to develop the processes, tools, and data for an optimum return on investment							
■ Continue meetings of the TAM Steering Committee to identify issues and coordinate solutions. ■ Evaluate the ongoing TAM processes, implementation costs, and benefits. ■ Monitor TAM programs at other agencies to evaluate best practices.	a) The steering committee to continue meeting regularly to evaluate ongoing TAM processes, implementation costs, and benefits.						
	b) Develop contacts with a set of peer agencies known for best practices for their TAM programs. The steering committee to monitor TAM programs at other peer agencies to inform TAM practices at RTA and evaluate best practices.						
	c) The steering committee to conduct agency TAM self-assessment on an annual basis by engaging appropriate staff, monitor progress toward TAM policies and goals, and SGR targets, and revise the implementation roadmap or policies, if necessary.						
10. Annual Submissions: Comply with annual submissions to FTA and MPO							
■ Comply with required activities of 49 CFR § 625.	**a) Complete NTD asset inventory module (AIM) report annually.** Develop an inventory of assets and report the data and other information required to the NTD asset inventory module report. Additional data required by NTD includes information used to calculate the TAM metrics.						
	b) Conduct and report facility condition assessments. Assess the condition of all the capital assets in TAM plan and report the condition assessments for facility category assets to the NTD (Every year a portion of the facility capital assets can be submitted until all facility capital assets have been reported to the NTD in a four-year cycle).						
	c) Set Performance Targets. Set SGR targets annually for the performance of assets and submit those targets to the NTD as part of annual data submission.						
	d) Submit narrative report to the NTD that provides a description of any change in the condition of the transit system from the previous year and describes the progress made during the year to meet the performance targets set in the previous reporting year.						

TAM Goals	Activities	Timeline					
		Year 0	Year 1	Year 2	Year 3	Year 4	Beyond
	e) Update the TAM Plan in its entirety every four years.						
	f) Share the updated TAM Plan with planning partners and coordinate with the MPO's development of their TIP and MTP**.**						

Section 8

8. MONITORING AND CONTINUOUS IMPROVEMENT PLAN

RTA is planning to monitor the TAM activities through the Steering Committee and ensure the TAM Plan implementation is being done as planned and the agency is making progress toward its TAM goals and SGR targets.

As outlined in Section 1 of this TAM Plan, RTA set the policy to continuously monitor and improve its TAM practices, and for that set certain goals. In addition, Section 7 of this TAM Plan, listed three activities that RTA is planning to undertake to ensure progress toward a mature agency for TAM practices. These activities are described further below:

a) The Steering Committee to continue meeting on a quarterly basis to evaluate ongoing TAM processes, implementation costs, and benefits.

The Committee will discuss the progress of the implementation plan, and any potential barriers in achieving the planned timelines and goals. In addition, the Committee, in collaboration with the different units at RTA, will ensure that sufficient resources are assigned to each activity. Monitoring the outcomes and benefits of each activity will be evaluated and will be compared with the cost of resources assigned to that goal or activity. The Committee may decide to revise the implementation roadmap to put more resources into certain activities or re-prioritize or reallocate resources among a number of activities based on the feedback from the agency staff, or the units represented at the Committee.

b) Peer Exchange for Best Practices

The Steering Committee will develop contacts with a set of peer agencies known for their TAM best practices. RTA has communications with other similar size agencies through different organizations, which can be utilized for this purpose. In addition, the Committee will monitor TAM programs at other peer agencies to inform TAM practices at RTA and evaluate best practices. FTA provides technical support by publishing guidelines and case studies on their website, and also by holding peer exchange conferences and roundtable events for transit providers. RTA will continue to explore participating at these events to share their experiences and learn from other agencies.

c) Annual Self-Assessment

The steering committee will conduct agency TAM self-assessment on an annual basis by engaging appropriate staff, monitor progress toward TAM policies and goals, and SGR targets, and revise the implementation roadmap or policies, if necessary. The results of these annual assessments can provide invaluable insight into the effectiveness of the TAM plan implementation on the maturity of the agency and can inform the decisions at the Committee with regard to priorities and resource allocation of activities.

Section 9

9. COMPLIANCE WITH FTA FINAL RULE (49 CFR 625)

The following provides a checklist to determine overall compliance with the TAM rulemaking. This FTA document was updated in December 2017, and posted on January 4, 2018 at this address:

https://www.transit.dot.gov/TAM/gettingstarted/RuleCompliance_workflow

This document was accessed on FTA's website on August 27, 2018. This checklist shows full compliance of RTA's 2018 TAM Plan with the FTA Final Rule.

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Am I in Compliance with the TAM Final Rule?

The following checklist is for recipients and subrecipients of Federal financial assistance that own, operate, or manage capital assets in the provision of public transportation. To determine which of these provisions apply to your agency, use the Am I a Tier I or Tier II agency?, Group Plan Sponsor, and Group Plan Participant checklists. For questions about applicability and requirements of the TAM rule not addressed in this checklist, please see the TAM FAQs.

Tier I and Tier II recipients and Group Plan Sponsors

Complete?

1. Do I have a TAM plan that covers a four year period? ☒
2. Was the TAM plan updated within the last four years? ☒
3. Do I have a TAM plan that includes all of the required elements? (Tier I providers and group plan sponsors, see applicable sections.) ☒
   a. An asset inventory for all assets used in the provision of public transportation, including those owned by third parties? ☒
   b. A condition assessment of all assets in my asset inventory for which I have direct capital responsibility? ☒
   c. An investment prioritization that: ☒
      - Ranks projects to improve or manage the state of good repair over the horizon period,
      - Includes all capital assets for which I have direct capital responsibility, and
      - Is at the asset class level ☒
   d. Did I document the analytical processes and decision support tools used in developing my TAM plan? ☒
4. Do I have documentation that I calculated performance for:

   Equipment (non-revenue service vehicles, support-service and maintenance vehicles equipment): the percentage of those vehicles that have either met or exceeded their ULB for all assets for which I have direct capital responsibility. ☒

   Rolling Stock: the percentage of revenue vehicles by vehicle type that have either met or exceeded their ULB for all assets for which I have direct capital responsibility. ☒

   Infrastructure (rail fixed-guideway, track, signals, and systems): the percentage of track segments with performance restrictions for all assets for which I have direct capital responsibility. ☒

   Facilities: the percentage of facilities within an asset group rated below condition 3 on the TERM scale for all assets for which I have direct capital responsibility. ☒

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Complete?

5. Do I have documentation that I set performance targets annually to project the following fiscal year for:
   - Equipment ☒
   - Rolling Stock ☒
   - Infrastructure ☒
   - Facilities ☒

6. Did I make my TAM plan, any supporting records or documents, performance targets, investment strategies, and the annual condition assessment report available to the State and/or MPO that provides my funding? ☒

Group Plan Sponsors

The below questions relate to all assets in a group plan inventory which include all participants' assets.

7. Did I create a group plan for participants that meets the associated requirements? ☐

   a. Does the group plan include a list of participants? ☐
   b. Have I ensured that each participant is included in only one group plan? ☐
   c. Have I received and maintained documentation of opt-outs? ☐
   d. Have I received all necessary and relevant information from participants? ☐
   e. Have I coordinated the TAM plan development process with all participants' Accountable Executives? ☐
   f. Have I made the plan available in an easily accessible format to participants? ☐
   g. Do I have documentation that I set unified performance targets annually to project the following fiscal year that covers all assets in the group plan inventory? ☐
   h. Did I make my sponsored Group TAM documents available to the State and/or MPO that provides funding to any of my group plan participants? ☐

Not Applicable to RTA TAM Plan

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Tier I Recipients

Complete?

For questions related to group plan sponsors see the previous section, even if you are a tier I sponsor. The below questions apply to the individual tier I plan assets. ☒

8. Does your tier I TAM plan include all of the required elements? ☒

   a. Documentation of a TAM and SGR policy? ☒

   b. An implementation strategy that outlines a plan to achieve its asset management goals? ☒

   c. A written description of the key TAM activities that you intend to engage in over the TAM plan horizon period? ☒

   d. A summary or list of the resources, including personnel, that the recipient needs to develop and carry out the TAM plan? ☒

   e. An outline of how I will monitor, update, and evaluate, as needed, its TAM plan and related business practices, to ensure the continuous improvement of its TAM practices? ☒

Once you can answer yes to the above questions, your agency should be in compliance with the transit asset management final rule.

Resources

Checklists:	Am I Tier I or a Tier II agency? Am I required to be a Group TAM Plan sponsor? Am I going to be a participant in a Group TAM Plan?
Performance measures:	TAM Infrastructure Performance Measure Reporting Guidebook TAM Facility Performance Measure Reporting Guidebook Transit Asset Management Guide TAM Performance Measures Fact Sheet
Reporting to NTD:	TAM NPRM and NTD Guidance Crosswalk NTD Asset Inventory Module Reporting Manual NTD User Manual

Definitions:

Public Transportation is defined by law as "regular, continuing shared-ride surface transportation services that are open to the general public or open to a segment of the general public defined by age, disability, or low income." 49 U.S.C. § 5302(14).

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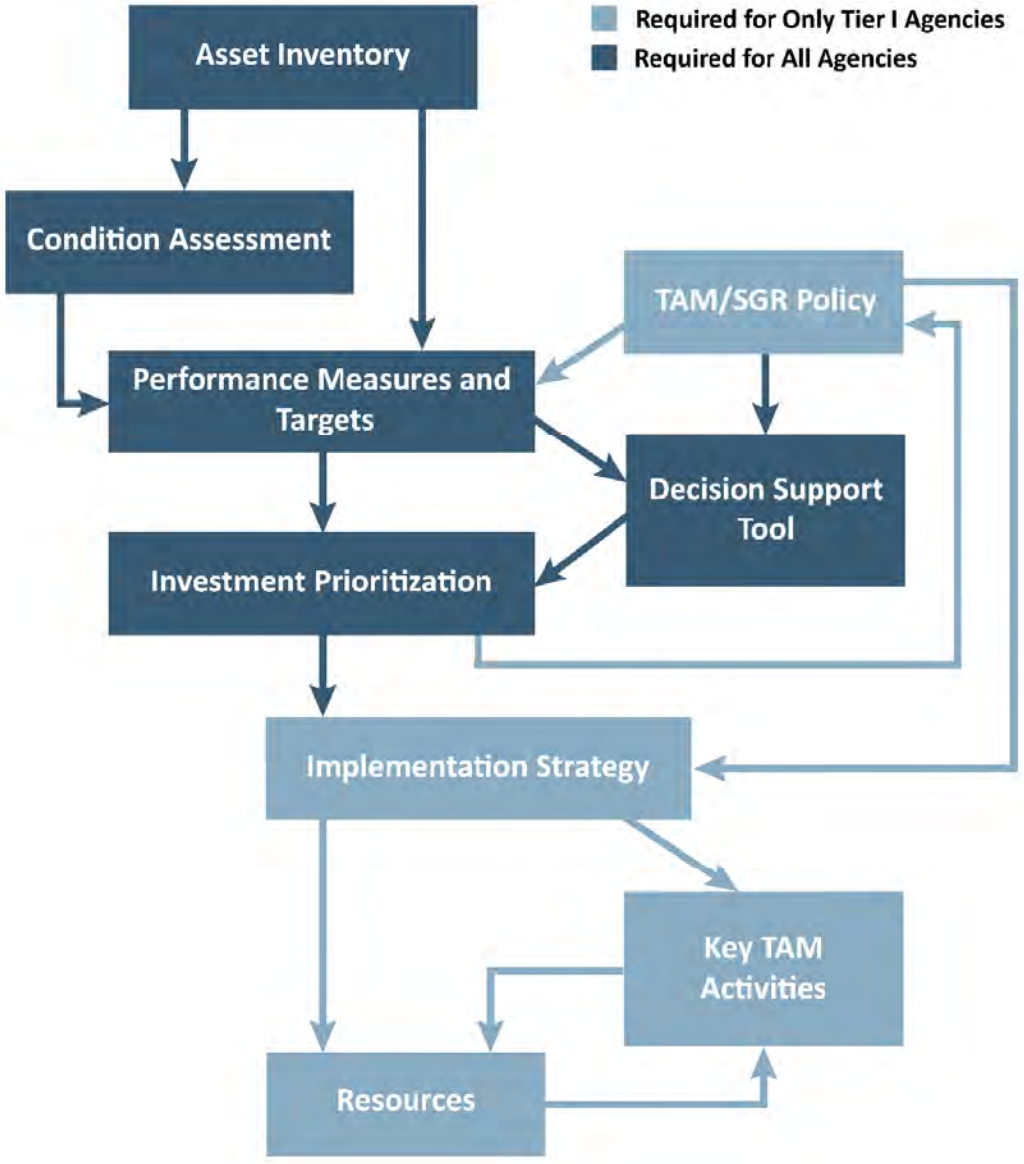
Relation between TAM Plan Elements

The graphic below shows the logical relationship between TAM plan elements for tier I and tier II agencies. While this graphic does not indicate relationships required by the rule, following the flow of the graphic will encourage consistency between plan elements and plan that meets all requirements.



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Applicable TAM Rule Language:

§ 625.25 Transit Asset Management Plan Requirements.

(a) General.

(1) Each tier I provider must develop and carry out a TAM plan that includes each element under subsection (b) of this section.

(2) Each tier II provider must develop its own TAM plan or participate in a group TAM plan. A tier II provider's TAM plan and a group TAM plan only must include elements (1)-(4) under subsection (b) of this section.

(3) A provider's Accountable Executive is ultimately responsible for ensuring that a TAM plan is developed and carried out in accordance with this part.

(b) Transit asset management plan elements. Except as provided in subsection (a)(3) of this section, a TAM plan must include the following elements:

(1) An inventory of the number and type of capital assets. The inventory must include all capital assets that a provider owns, except equipment with an acquisition value under $50,000 that is not a service vehicle. An inventory also must include third-party owned or jointly procured exclusive-use maintenance facilities, passenger station facilities, administrative facilities, rolling stock, and guideway infrastructure used by a provider in the provision of public transportation. The asset inventory must be organized at a level of detail commensurate with the level of detail in the provider's program of capital projects;

(2) A condition assessment of those inventoried assets for which a provider has direct capital responsibility. A condition assessment must generate information in a level of detail sufficient to monitor and predict the performance of the assets and to inform the investment prioritization;

(3) A description of analytical processes or decision-support tools that a provider uses to estimate capital investment needs over time and develop its investment prioritization;

(4) A provider's project-based prioritization of investments, developed in accordance with section 625.33 of this part;

(5) A provider's TAM and SGR policy;

(6) A provider's TAM plan implementation strategy;

(7) A description of key TAM activities that a provider intends to engage in over the TAM plan horizon period;

(8) A summary or list of the resources, including personnel, that a provider needs to develop and carry out the TAM plan; and

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(9) An outline of how a provider will monitor, update, and evaluate, as needed, its TAM plan and related business practices, to ensure the continuous improvement of its TAM practices.

§ 625.29 Transit asset management plan: horizon period, amendments, and updates.
(a) Horizon period. A TAM plan must cover a horizon period of at least four (4) years.

(b) Amendments. A provider may update its TAM plan at any time during the TAM plan horizon period. A provider should amend its TAM plan whenever there is a significant change to the asset inventory, condition assessments, or investment prioritization that the provider did not reasonably anticipate during the development of the TAM plan.

(c) Updates. A provider must update its entire TAM plan at least once every four (4) years. A provider's TAM plan update should coincide with the planning cycle for the relevant Transportation Improvement Program or Statewide Transportation Improvement Program.

§ 625.31 Implementation deadline.

(a) A provider's initial TAM plan must be completed no later than two years after the effective date of this part.

(b) A provider may submit in writing to FTA a request to extend the implementation deadline. FTA must receive an extension request before the implementation deadline and will consider all requests on a case-by-case basis.

§ 625.45 Setting performance targets for capital assets.

(a) General.

(1) A provider must set one or more performance targets for each applicable performance measure.

(2) A provider must set a performance target based on realistic expectations, and both the most recent data available and the financial resources from all sources that the provider reasonably expects will be available during the TAM plan horizon period.

(b) Timeline for target setting.

(1) Within three months after the effective date of this part, a provider must set performance targets for the following fiscal year for each asset class included in its TAM plan.

(2) At least once every fiscal year after initial targets are set, a provider must set performance targets for the following fiscal year.

(c) Role of the accountable executive. A provider's Accountable Executive must approve each annual performance target.

(d) Setting performance targets for group plan participants.

(1) A Sponsor must set one or more unified performance targets for each asset class reflected in the group TAM plan in accordance with subsections (a)(2) and (b) of this section.

(2) To the extent practicable, a Sponsor must coordinate its unified performance targets with each participant's Accountable Executive.

(e) Coordination with metropolitan, statewide and non-metropolitan planning processes. To the maximum extent practicable, a provider and Sponsor must coordinate with States and Metropolitan Planning Organizations in the selection of State and Metropolitan Planning Organization performance targets.

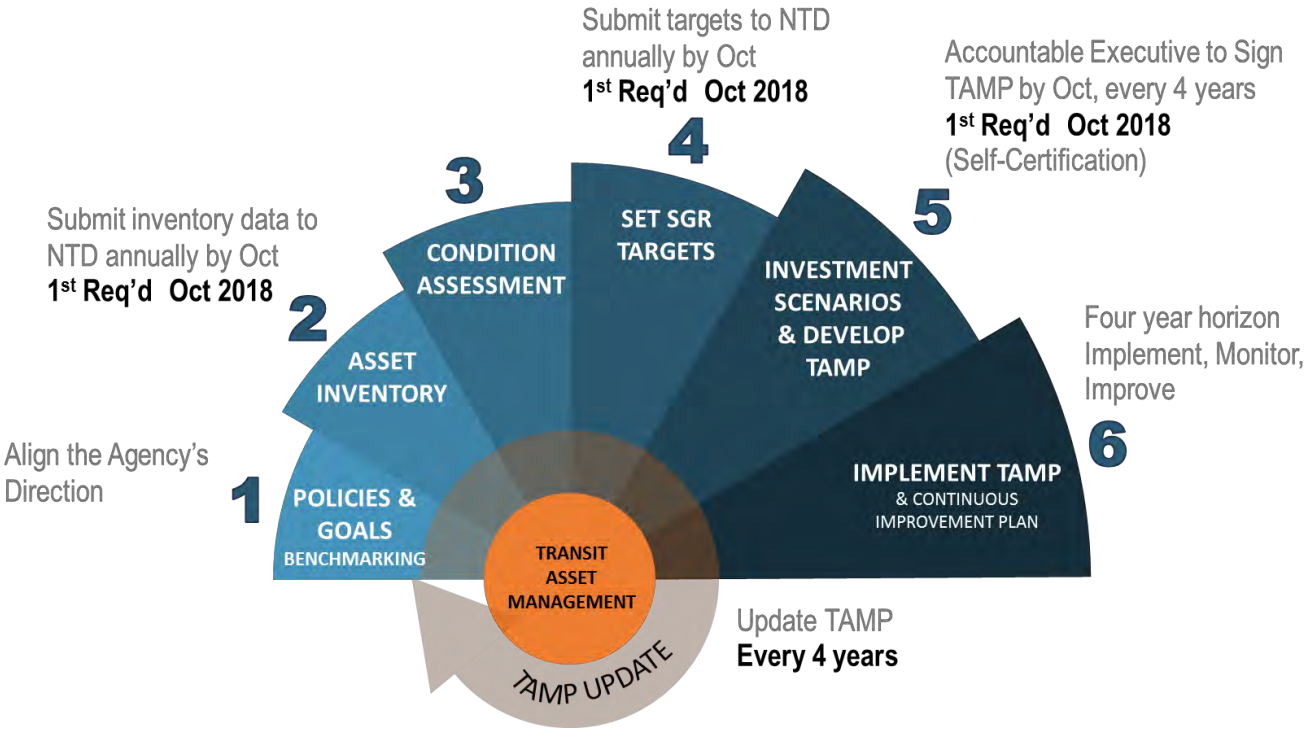
Appendix A

RTA Transit Asset Management Plan (TAM Plan) Agency TAM Maturity Assessment Interviews

What is a TAM Plan and Why Is It Required?

The Moving Ahead for Progress in the 21st Century Act (MAP-21) required the federal Secretary of Transportation to develop rules to establish a system to monitor and manage public transportation assets to improve safety and increase reliability and performance, and to establish performance measures, and the Fixing America's Surface Transportation (FAST) Act reaffirmed this requirement. On July 26, 2016, Federal Transit Administration (FTA) published the Transit Asset Management (TAM) Final Rule that requires all transit agencies to develop performance-based TAM Plans by October of 2018, and update their plans every four years.

RTA has retained CDM Smith to assist them in develop their plans. There will be two separate plans, one for each agency, as required by the Final Rule. The figure below illustrates the steps in developing the TAM Plan, and these interviews will be part of Step 1, Benchmarking (or agency self-assessment).



Confidentiality

Anything you tell us through this questionnaire and at the interviews will be kept anonymous and no personal identifying information will be reported at anytime to anyone. Any information from this interview that is made public in any way will be either anonymous or in the form of group data where no individual can be identified. In particular, any specific comments that might be used as examples in any report to anyone will be either paraphrased or used in such a way that no individual can be identified. Finally, these notes and other records will only be seen and reviewed by authorized staff at CDM Smith.

Purpose of the Questionnaire and Interviews

This questionnaire and the following interviews were designed to identify, describe, and document the state-of-the-practice of transit asset management at RTA, to thus determine the level of maturity of such practices at these agencies. The questionnaire that will be used as part of the interview is designed based on

FTA TAM Maturity Agency Self-Assessment Tool as part of FTA's Transit Asset Management Guide. The outcomes of these interviews will assist the CDM Smith team find possible ways to improve upon the management, maintenance and capital planning of the agency's transit assets.

Format of the Interview

The format involves us asking you a series of questions about the current set up of how things work in various parts of the agency, including phases of management, policy, inventory, maintenance, operations, and support services for the agency's assets. One goal is to understand how things operate now so that we can identify ways to improve such operations, thereby moving the agency's maturity closer to what is desired by the agency and required by the Final Rule. Furthermore, your expert guidance and knowledge of the agency is necessary to create suggestions for the TAM Plan Implementation roadmap (as required by FTA). These components are addressed in the following sets of questions.

- Demographic and Interviewee Background
- Policy
- Strategy
- Inventory
- Condition Assessment and Performance Monitoring
- Lifecycle Management Planning
- Capital Planning and Programming
- Operations and Maintenance Budgeting
- Performance Modeling
- Asset Management Information Systems
- Enablers of TAM – Organization and Leadership
- Enablers of TAM – Skills and Training
- Enablers of TAM – Continuous Improvement
- Enablers of TAM – Communications
- Enablers of TAM – Values and Culture
- Enablers of TAM – Project Management

Answering the Questions

These questions address all aspects of the agency's operation, and thus, it is expected that some individuals may not know answers to all the questions. However, we are asking that you answer these questions to the best of your knowledge, and be as accurate as you can. Your responses will be invaluable and instrumental in developing the agency's maturity benchmark and also in developing a TAM Plan Implementation roadmap (as required by FTA).

You may consult your team to prepare the answers as a group whenever you feel it would be helpful.

Each question can be answered using a scoring system of 1 to 5, as follows:

1: Totally Disagree
2: Mostly Disagree
3: Neutral
4: Somewhat Agree
5: Totally Agree

Note: Please provide a response for each question, to the best of your knowledge.

Scoring Guide:

1: Totally Disagree 2: Mostly Disagree 3: Neutral 4: Somewhat Agree 5: Totally Agree

Notes:

- The purpose of this questionnaire is to capture the transit asset management status quo at your agency. This will be used to monitor progress in the next years as you develop and implement your agency's Transit Asset Management Plan.
- This questionnaire is designed to be done in less than 30 minutes by the agency's staff familiar with transit operations.
- These questions represent best practices in Transit Asset Management, and thus, not every agency may score 5 on all questions. It is important that you provide a response to every question, to the best of your knowledge.

Name of Responder(s):

Position(s):

Date:

Fiscal Year Runs: The agency is a recipient of Chapter 53 funds ☐

1. Policy	Score
1.1. An agency-wide asset management policy is in place to support the establishment of asset management vision and goals and implementation of an asset management strategy.	
1.2. The agency-wide asset management policy is reviewed and adopted by the executive team or senior management. The asset management policy is regularly evaluated, evolved, and communicated.	
1.3. The asset management policy is clearly linked to / explicitly supported by the agency's overall strategy and planning and to key business processes.	

2. Strategy	Score
2.1. An asset management strategy is in place and provides sufficient information, direction, and accountabilities to support the implementation of the asset management policy.	
2.2. The asset management strategy is in place and outlines asset-specific outcomes and provides high-level direction and expectations for asset management by asset class and functional managers.	
2.3. The asset management strategy is clearly linked to / explicitly supported by the organization's business processes.	
2.4. Agency-wide asset management strategy and goals are reviewed and adopted by the executive team or senior management.	

Note: Please provide a response for each question, to the best of your knowledge.

Scoring Guide:

1: Totally Disagree 2: Mostly Disagree 3: Neutral 4: Somewhat Agree 5: Totally Agree

3. Inventory	Score
3.1. Assets are classified into maintainable units, which are organized into an asset hierarchy that best supports the agency's business process requirements.	
3.2. The agency has a centralized inventory for storing asset data or multiple inventories with a unique identifier for each asset. The inventory includes data (with clear data definitions) to support key asset management business processes.	
3.3. The inventory is mostly complete and accurate (with minimal assumptions for non-critical assets).	
3.4. Data maintenance and upkeep practices are well-documented and followed. There is a high-level of confidence in critical asset data.	

4. Condition Assessment and Performance Monitoring	Score
4.1. Condition is measured consistently across all asset classes and in a way that supports all appropriate business processes.	
4.2. A condition inspection/monitoring program is in place for all asset classes.	
4.3. The level of resources expended to gather condition data is commensurate with the level of risk or uncertainty associated with the asset class.	
4.4. Condition and performance benchmarks and targets are established and monitored to ensure an acceptable level of service for assets and to provide a basis for performance improvement.	

5. Lifecycle Management Planning	Score
5.1. Lifecycle management plans are in place for key assets and include asset condition and performance information that can be used to evaluate performance against agency asset management goals.	
5.2. Lifecycle management plans for the agency's most critical assets (based on risk and financial commitment) are updated regularly to document the lifecycle costs, performance, and risks associated with each asset class.	
5.3. Lifecycle management plans reflect input from staff throughout the agency.	
5.4. Lifecycle management plans outline the investment approach for minimizing the total cost of ownership of the asset throughout its lifecycle, including considerations for design/procurement, development of the preventive maintenance and capital rehabilitation strategy, and disposal.	

Note: Please provide a response for each question, to the best of your knowledge.

Scoring Guide:

1: Totally Disagree 2: Mostly Disagree 3: Neutral 4: Somewhat Agree 5: Totally Agree

6. Capital Planning and Programming	Score
6.1. The capital programming process incorporates "top-down" direction from the leadership team regarding high- level priorities.	
6.2. The capital programming process incorporates "bottom-up" direction from asset owners and department leads regarding capital needs.	
6.3. The capital program adheres to the greatest extent possible to the capital needs identified in assets' lifecycle management plans, which are intended to minimize each asset class' total cost of ownership and maximize its performance.	
6.4. The capital program is prioritized based on simple, quantifiable, agreed-upon prioritization criteria that demonstrate the link between capital investments and agency outcomes.	
6.5. Capital programming is informed by quantitative decision-making techniques, including predictive modeling, scenario evaluation, and benefit-cost analyses based on past condition and performance data.	
6.6. Capital programming is fully-integrated with O&M budgeting.	

7. Operations and Maintenance Budgeting	Score
7.1. Maintenance practices from the agency's lifecycle management plans are used to develop the O&M budget.	
7.2. The maintenance budgeting process relies in part on collaboration and coordination with the capital programming team, operations, and other departments as needed to ensure agency and system goals are met.	

8. Performance Modeling	Score
8.1. Performance modeling is used to optimize assets' maintenance and investments based on risk levels, performance goals, and overall lifecycle needs.	
8.2. Performance modeling is used to determine optimal investment approaches and timing within an asset class.	
8.3. For each asset class, reliability modeling is used to support assets' lifecycle planning.	

Note: Please provide a response for each question, to the best of your knowledge.

Scoring Guide:

1: Totally Disagree 2: Mostly Disagree 3: Neutral 4: Somewhat Agree 5: Totally Agree

9. Asset Management Information Systems	Score
9.1. Asset management information systems, comprised of an asset inventory, maintenance management system, condition monitoring and detection systems, and other functions, provide appropriate support to asset management business process and capture key data to support reporting, performance monitoring, and planning and decision making.	
9.2. Integrated data and access to historical data enable the agency to coordinate and collaborate horizontally across the organization and support agency-wide goals and performance.	
9.3. A team of qualified system users or subject matter experts are involved in the development, installation, and evaluation of information systems.	
9.4. There is an information system planning process to guide the development, integration, and update of information systems, including asset management functions.	

10. Enablers - Organization and Leadership	Score
10.1. Roles and responsibilities are defined for all asset management stakeholders, including the Board, Executive Team, Asset Management Program Manager, and line staff, to ensure appropriate accountabilities.	
10.2. Job descriptions are clearly defined, documented, and communicated.	
10.3. The agency has a transparent and focused change management process in place, supported by senior management, to implement organizational changes in support of improved asset management and the agency's asset management goals and vision.	

11. Enablers - Skills and Training	Score
11.1. General training is available to educate staff on the asset management initiative's scope, benefits, and processes.	
11.2. More advanced training, as well as high quality documentation and supportive business processes, is provided to support staff development and continuous improvement agency-wide.	
11.3. The agency maintains the appropriate expertise and human resources needed to support asset management business processes and activities.	

12. Enablers - Continuous Improvement	Score
12.1. Detailed asset performance and maintenance data are used to identify performance issues and opportunities for all assets.	
12.2. Performance improvement programs and processes exist to diagnose performance issues and develop and implement performance improvement measures.	
12.3. Staff members at all levels are empowered and motivated to be innovative and feel ownership over their asset management responsibilities.	

Note: Please provide a response for each question, to the best of your knowledge.

Scoring Guide:

1: Totally Disagree 2: Mostly Disagree 3: Neutral 4: Somewhat Agree 5: Totally Agree

13. Enablers - Communications	Score
13.1. There are effective business processes in place for coordination and collaboration in asset management across teams and departments.	
13.2. Asset management decision making, including capital programming and O&M budgeting, is conducted transparently at all levels.	
13.3. Senior management regularly communicates progress against asset management goals and changes to the policy, vision, and strategy.	
13.4 Staff has the opportunity to provide input and share lessons learned regarding asset management.	

14. Enablers - Values and Culture	Score
14.1. The agency, especially capital programming and maintenance departments, has developed an awareness and understanding of asset management.	
14.2. Actions and behaviors supportive of asset management are encouraged and incentivized, including collaboration and coordination with other departments and teams.	
14.3. The agency's management and staff embrace the Asset Management Plan, and employees at all levels take personal responsibility for its implementation.	

15. Enablers - Project Management	Score
15.1. The agency's project and program management capabilities are commensurate with the scale and challenges of the capital program and the Asset Management Plan.	
15.2. Effective project management standards and procedures exist and are followed to ensure successful delivery of the capital program and the Asset Management Plan.	
15.3. There are ongoing opportunities for project management training and improvement to support the quality of the capital program and the Asset Management Plan implementation.	

Appendix B

Default Useful Life Benchmark (ULB) Cheat Sheet

Source: 2017 Asset Inventory Module Reporting Manual, Page 53

Transit Agencies will report the age of all vehicles to the National Transit Database. FTA will track the performance of revenue vehicles (Rolling Stock) and service vehicles (Equipment), by asset class, by calculating the percentage of vehicles that have met or exceeded the useful life benchmark (ULB).

FTA has set a default ULB as the expected service years for each vehicle class in the table below. ULB is the average age-based equivalent of a 2.5 rating on the FTA Transit Economic Requirements Model (TERM) scale. Transit agencies can adjust their Useful Life Benchmarks with approval from FTA.

Vehicle Type		Default ULB (in years)
AB	Articulated bus	14
AG	Automated guideway vehicle	31
AO	Automobile	8
BR	Over-the-road bus	14
BU	Bus	14
CC	Cable car	112
CU	Cutaway bus	10
DB	Double decked bus	14
FB	Ferryboat	42
HR	Heavy rail passenger car	31
IP	Inclined plane vehicle	56
LR	Light rail vehicle	31
MB	Minibus	10
MO	Monorail vehicle	31
MV	Minivan	8
	Other rubber tire vehicles	14
RL	Commuter rail locomotive	39
RP	Commuter rail passenger coach	39
RS	Commuter rail self-propelled passenger car	39
RT	Rubber-tired vintage trolley	14
SB	School bus	14
	Steel wheel vehicles	25
SR	Streetcar	31
SV	Sport utility vehicle	8
TB	Trolleybus	13
TR	Aerial tramway	12
VN	Van	8
VT	Vintage trolley	58

Appendix C

Substructure	Fire Protection	Shell Appurtenances
Foundations Walls Columns Pilings Exposed Foundation Elements Basement Insulation Slab	Sprinklers Standpipes Fire Extinguishers Hydrants and other fire protection specialties Fire Detection System Fire Suppression Systems	Stairs Walkways/Sidewalk Fire Escapes Means of Egress Vertical Openings Cat Walk Inspection Pit
Shell and Stationary Equipment	**Interiors**	**Facility Equipment**
Superstructure Structural Frame: columns, pillars, walls Fire Resistive Construction Integrity Roof Roof Structural Systems Deck Waterproofing Roof Penetration Flashing Systems Gutters Chimney, Skylights, Eaves Surroundings Roof Drainage Systems Inspection Features Roof Hatches Roof Ladders Exterior Building Envelope - Masonry/Concrete Walls Building Envelope – Cladding Building Envelope - Windows and Glazing Building Envelope - Doors, Glazing, Door Hardware Building Envelope - Garage Doors Bird Proofing System Exterior Finishes	Partitions Interior Walls Interior Windows and Glazing Interior Doors, Glazing, Door Hardware Stairs Seating Finishes Flooring System Flooring Spaces Ceiling System Wall Finishes Fittings Interior Amenities Signage Built-In Furnishings Appliances Adequate Office Space Break Area Provided Male/Female Lockers and Showers ADA Compliance	Service Vehicles Fork Lifts Loaders Scissor Lifts Boom Lifts Man Lifts Snowplow

Platforms	Plumbing	Site
Structure Slab Joints Railing Bridge Plate Base Substructure Under-Platform Fence Track Access Steps Platform Drain Utility Pole Communication Device Signage Seating Recycling / Trash Canopy Roof (gutters and leaders) Frame Water Proofing Bird Proofing System Lighting Shelter Ramp Stairs	Domestic Water Distribution Water Heaters Water Treatment Systems Backflow Prevention Sanitary System Pumps (sump, well, domestic) Bathroom Fixtures Other Plumbing Items (Piping, Insulation, etc.) Other Plumbing Fixtures	Roads Parking Lots Curbs Access Road Parking Lots Sidewalk Walkway Pavement Marking Security Fences Gates Barrier Arm Site Security Lighting Camera/Surveillance System Guard Shack
Utilities	**Fare Collection Equipment**	
Water Back Flow Preventer Murdock Metering Cabinets Exterior Fire Protection Landscape Irrigation System	Turnstiles Ticket Machines Other fare collection items	

Heating Ventilation & Air Conditioning	Electrical & Communications	Conveyance
Energy Recovery Units Heat Pumps Heat & Ventilation Units Make-Up Units Air Handling Unit Boilers Burners Furnaces Unit Heaters Radiant Heaters Finned Tube Radiation and Convertors Air Conditioning Unit Splits and Mini-Splits Cooling Towers Condensers (Air-Cooled, Evaporative) Chillers HVAC Air Terminals Fans (Centrifugal, Axial, Roof-Mounted, Propeller) Coils Heat Exchangers Reciprocating Compressors Air Curtains Water Treatment System Pumps Other HVAC Components	Electrical Service/Distribution Power Distribution/Switchgear Service Panel Generator and Transfer Switch Transformer(s) (non-utility owned only Disconnect Switch DC Power Substation/Traction Power Substation AC Power Substation Backup Power Uninterruptible Power Supply (UPS) Lighting Automatic Transfer Switch Interior Lighting Exterior Lighting (Building and Site) Communications (Data) System Phone System Emergency Lighting/Exit Signs Other Electrical Components (Conduits, etc.)	Elevators Brakes Car Door Equipment Hydraulic System Cable System Jack Assembly Motor Car Sling/Platform Controller/Power Supply Pits Safety Equipment / Signage Fire Service Elevator Recall Escalators Brakes Carriage Step and Guide Assemblies (Comb Plate, etc.) Handrails Drive Train & Motor Controller/Power Supply Safety Equipment Lifts Cranes and Monorails Vehicle Lifts Hoists Davits

Appendix D

Asset Description	Acquisition Cost	Acquisition Date
GILLIG 40 FT HYBRID BUS #604	$ 561,477.95	12/8/2009 : AM
GILLIG 40 FT HYBRID BUS #605	$ 561,477.95	12/8/2009 : AM
[4] RAIL CARS #400, #401, #402, #500	$ 144,181.80	9/18/2006 : AM
[4] RAIL CARS (#501, #502, #503, #504)	$ 144,181.80	9/18/2006 : AM
GM LOCOMOTIVE #122	$ 535,849.45	9/18/2006 : AM
GM LOCOMOTIVE #121	$ 535,849.45	9/18/2006 : AM
LOCOMOTIVE #120	$ 400,849.45	9/18/2006 : AM
[1] RAIL CAR (IN REHAB) #V445	$ 7,039.90	6/30/2008 : AM
[1] RAIL CAR (IN REHAB) #V458	$ 7,039.90	6/30/2008 : AM
[1] RAIL CAR (IN REHAB) #V451 (parked at Nestor)	$ 7,039.90	6/30/2008 : AM
[1] RAIL CAR (IN REHAB) #V457 (parked at Nestor)	$ 7,039.90	6/30/2008 : AM
REHAB OF LOCOMOTIVE #120	$ 943,568.72	11/1/2011 : AM
LOCOMOTIVE #381	$ 285,222.00	11/1/2012 : AM
2010 15-PASSENGER FORD WSD VAN - A502	$ 25,954.00	10/21/2009 : AM
2010 15-PASSENGER FORD WSD VAN - A503	$ 25,954.00	10/21/2009 : AM
2010 FORD 15-PASSENGER VAN W/LIFT	$ 29,945.00	5/14/2010 : AM
2011 FORD 15-PASS LIFT-EQUIPPED VAN	$ 31,828.00	10/18/2010 : AM
2011 FORD 15-PASS VAN	$ 26,244.00	4/14/2011 : AM
2011 FORD 15-PASS VAN	$ 26,244.00	4/14/2011 : AM
2011 FORD 15-PASS VAN	$ 26,244.00	6/1/2011 : AM
2010 15-PASSENGER WSD FORD VAN	$ 25,996.50	2/23/2010 : AM
2010 15-PASSENGER WSD FORD VAN	$ 25,996.50	2/23/2010 : AM
2010 15-PASSENGER WSD FORD VAN	$ 25,996.50	2/23/2010 : AM
2010 15-PASSENGER WSD FORD VAN	$ 25,996.50	2/23/2010 : AM
2010 FORD 15-PASSENGER VAN W/LIFT	$ 29,945.00	5/14/2010 : AM
2010 FORD 15-PASS VAN	$ 25,979.00	8/31/2010 : AM
2010 FORD 15-PASS VAN	$ 25,979.00	8/31/2010 : AM
2011 FORD 15-PASS VAN	$ 26,244.00	6/1/2011 : AM
2011 FORD 15-PASS VAN	$ 26,244.00	6/1/2011 : AM
2011 FORD 15-PASS VAN	$ 26,244.00	6/24/2011 : AM
2011 FORD 15-PASS VAN	$ 26,244.00	6/24/2011 : AM
2011 FORD 12-PASS VAN	$ 24,849.00	9/1/2011 : AM
2011 FORD 12-PASS VAN	$ 24,849.00	9/1/2011 : AM
2011 FORD 12-PASS VAN	$ 24,849.00	9/1/2011 : AM
2006 FORD ECONOLINE LIFT E250 (J705)	$ 25,756.00	10/16/2006 : AM
2006 FORD ECONOLINE 12-PASS VAN (J706)	$ 19,989.00	7/24/2006 : AM
2009 FORD 12 PASS VAN (J707)	$ 23,922.25	10/31/2008 : AM
2009 FORD 12 PASS VAN (J708)	$ 23,922.25	10/31/2008 : AM
2009 FORD 12 PASS VAN (J709)	$ 23,922.25	10/31/2008 : AM
2009 FORD 12 PASS VAN (J710)	$ 23,922.25	10/31/2008 : AM
2009 FORD 12 PASS VAN (J711)	$ 23,922.25	10/31/2008 : AM
2010 15-PASSENGER WSD FORD VAN	$ 25,979.00	2/23/2010 : AM
2010 15-PASSENGER WSD FORD VAN	$ 25,979.00	6/24/2010 : AM
2010 15-PASSENGER WSD FORD VAN	$ 25,979.00	6/24/2010 : AM
2013 FORD 15-PASS VAN (R301)	$ 24,408.00	4/25/2013 : AM
2013 FORD 15-PASS VAN (R302)	$ 24,408.00	4/25/2013 : AM
2013 FORD 15-PASS VAN (R303)	$ 24,408.00	4/25/2013 : AM
2013 FORD 15-PASS VAN (R304)	$ 24,408.00	4/25/2013 : AM
2013 FORD 15-PASS VAN (R305)	$ 24,408.00	4/25/2013 : AM
2015 FORD TST	$ 29,859.40	2/26/2015 : AM
2015 FORD TST	$ 29,859.40	2/26/2015 : AM

2015 FORD TST	$	29,859.40	3/10/2015 : AM
2015 FORD TST	$	29,859.40	3/10/2015 : AM
2015 FORD TST	$	29,859.40	3/10/2015 : AM
2015 FORD TST	$	29,859.40	3/10/2015 : AM
2015 FORD TST	$	29,859.40	3/20/2015 : AM
2015 FORD TST	$	27,009.40	3/20/2015 : AM
2015 FORD TST	$	27,009.40	3/20/2015 : AM
2015 FORD TST	$	27,009.40	3/20/2015 : AM
2016 FORD TRANSIT 15-PASS VAN	$	29,673.42	8/8/2016 : AM
2016 FORD TRANSIT 15-PASS VAN	$	29,673.42	8/8/2016 : AM
2016 FORD TRANSIT 15-PASS VAN	$	29,673.42	8/8/2016 : AM
2016 FORD TRANSIT 15-PASS VAN	$	29,673.42	8/8/2016 : AM
2005 FORD ECONOLINE VAN (R401)	$	17,968.00	4/11/2005 : AM
2008 FORD 12-PASS VAN (T132)	$	23,922.00	6/20/2008 : AM
2008 FORD 12-PASS VAN (T134)	$	23,922.00	6/20/2008 : AM
2008 FORD 15-PASS VAN (T137)	$	26,349.00	6/20/2008 : AM
2008 FORD 12-PASS VAN (T141)	$	23,922.00	6/20/2008 : AM
2008 FORD 15-PASS VAN (T142)	$	26,349.00	6/20/2008 : AM
2009 FORD 12 PASS VAN (T144)	$	22,943.25	10/31/2008 : AM
2009 FORD 15-PASS VAN (T148)	$	25,452.10	10/31/2008 : AM
2009 FORD 15-PASS VAN (T149)	$	25,452.10	10/31/2008 : AM
2009 FORD 15-PASS VAN (T151)	$	25,452.10	10/31/2008 : AM
2009 FORD 15-PASS VAN (T152)	$	25,452.10	10/31/2008 : AM
2009 FORD 15-PASS VAN (T154)	$	25,042.30	10/31/2008 : AM
2009 FORD 12 PASS VAN (T156)	$	22,943.25	10/31/2008 : AM
2010 FORD 15-PASS VAN	$	25,996.50	8/3/2010 : AM

Asset Description	Acquisition Cost	Acquisition Date
LAND ACQUIRED FOR COMMUTER RAIL STATION	$ 2,695,149.49	9/18/2006 : AM
ADD'L LAND IN MT JULIET	$ 108,580.00	6/30/2008 : AM
GREENSBORO NORTH PARK & RIDE (GALLATIN RD.)	$ 978,429.24	9/30/2015 : AM
RIVERFRONT COMMUTER RAIL STATION	$ 2,960,788.51	9/18/2006 : AM
DONELSON COMMUTER RAIL STATION	$ 1,645,994.29	9/18/2006 : AM
HERMITAGE COMMUTER RAIL STATION	$ 1,897,896.65	9/18/2006 : AM
MT. JULIET COMMUTER RAIL STATION	$ 1,337,827.50	9/18/2006 : AM
MARTHA COMMUTER RAIL STATION	$ 211,822.84	9/18/2006 : AM
LEBANON COMMUTER RAIL STATION	$ 1,604,003.58	9/18/2006 : AM
MARTHA STATION PERMANENT PLATFORM	$ 1,610,925.21	4/30/2011 : AM

Appendix E

Segment ID	Description	From	To	Length (Miles)	Direction	DRM	Design Speed (MPH)	Start	End	Cause of Performance Restriction	Speed Restriction (MPH)
1	Riverfront	0	0.2	0.13	2	0.26	20				
2	Main Line - Bluff	0.2	1.1	0.63	2	1.26	50	0.90	1.00		40
3	West Turnout - Southern Junction	1.1	1.22	0.12	2	0.24	30				
4	West Southern Junction By-Pass	1.22	1.5	0.28	2	0.56	35				
5	Southern Junction By-Pass	1.5	2.08	0.58	2	1.16	50				
6	East Turnout Southern Junction	2.08	2.15	0.07	2	0.14	20				
7	Main Line - Water Plan	2.15	3.9	1.75	2	3.5	50	2.20 3.20	2.50 3.30	Curvature Waterworks Crossing	40 40
8	Main Line - Mill Creek West	3.9	4.3	0.4	2	0.8	40				
9	Main Line Mill Creek East	4.3	4.5	0.2	2	0.4	30				
10	Main Line - Briley West	4.5	4.9	0.4	2	0.8	55				
11	Main Line - Briley	4.9	5.9	0.98	2	1.96	59				
12	Main Line - Briley East	5.9	6.2	0.29	2	0.58	50				
13	Main Line - McGavock	6.2	7.5	1.29	2	2.58	59				
14	Main Line - Donelson	7.5	9.4	1.91	2	3.82	45				
15	Main Line - Stones River	9.4	10	0.6	2	1.2	50				
16	Main Line - Brandau Curve	10	10.4	0.4	2	0.8	45	10.00	10.40	Reverse curve	40
17	Main Line - Central Pike	10.4	11.4	1	2	2	45				
18	Main Line - Andrew Jackson	11.4	11.6	0.2	2	0.4	40				
19	Main Line - Hermitage East	11.6	13.7	2.12	2	4.24	59	12.40	13.70	Curve through Tulip Rd crossing	45
20	Main Line - Chandler West	13.7	14	0.28	2	0.56	40				
21	Main Line - Chandler East	14	14.4	0.4	2	0.8	50				
22	Main Line - Mt. Juliet West	14.4	16.95	2.55	2	5.1	59	14.90 15.50	15.00 16.20	S. Green Hills Crossing Curvature	45 55
23	Main Line - Mt. Juliet	16.95	18.2	1.25	2	2.5	45				
24	Main Line - Mt. Juliet East	18.2	19.75	1.57	2	3.14	55				
25	Main Line - Division Curve	19.75	19.95	0.2	2	0.4	45				
26	Main Line - Beckwith West	19.95	20.8	0.85	2	1.7	59				
27	Main Line - Farmstead	20.8	22	1.22	2	2.44	45				
28	Main Line - Martha	22	25.5	3.54	2	7.08	59	23.20	23.95	Martha Station & Frieght Siding	45
29	Main Line - Prowell Lake	25.5	26.2	0.7	2	1.4	45				
30	Main Line - Five Oaks	26.2	26.5	0.3	2	0.6	40				
31	Main Line - Horn Springs	26.5	27.9	1.4	2	2.8	45				
32	Main Line - Maple Hill West	27.9	28.6	0.7	2	1.4	55				
33	Main Line - Maple Hill East	28.6	28.9	0.3	2	0.6	59	28.60	28.90	Curvature	40
34	Main Line - Baddour	28.9	29.7	0.8	2	1.6	55				
35	Main Line - Hartman	29.7	31.2	1.44	2	2.88	50	30.20	30.40	Curvature	45
36	Main Line - West Lebanon	31.2	31.67	0.43	2	0.86	20				
37	Donelson Passing Siding	7.8	8.1	0.3	1	0.3	20				


CDM
Smith
RTA