LOCALLY OPERATED TRANSIT SYSTEM (LOTS)

TIER II GROUP TRANSIT ASSET MANAGEMENT PLAN (TAMP)

2018

MARYLAND DEPARTMENT OF TRANSPORTATION™

MARYLAND TRANSIT ADMINISTRATION

RELEASE DETAILS

Release Date		7/19/18
Filename		20180718_MD Tier 2 LOTS Group TAMP (FINAL v4.3)
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Version Control

Version	Date	Author	Comment
1	04/13/2018	M. A-Sowah E. Gensib	Initial draft of TAMP for MDOT MTA review
2	05/02/18	M. A-Sowah E. Gensib	Draft for LOTS review
3	06/13/18	M. A-Sowah E. Gensib	Final Draft for MDOT MTA Review
4	06/29/18	M. A-Sowah	Final for LOTS Approval
5	07/12/18	M. A-Sowah	Incorporating MTA Core feedback
6	07/18/18	M. A-Sowah	Minor updates from OLTS

DOCUMENT APPROVAL (LOTS ACCOUNTABLE EXECUTIVES)

This Asset Management Group Plan has been approved by the following Accountable Executives with receipt of a signed letter of approval.

Greyed out names indicate approval has not been received.

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EXECUTIVE SUMMARY

This group Transit Asset Management Plan (TAMP) lays out an approach to ensuring that capital transit assets used in the services provided by Maryland's Tier II Locally Operated Transit Systems (LOTS) are maintained above a minimum acceptable level of service over their lifecycle. Per federal regulations, Maryland Department of Transportation – Maryland Transit Administration (MDOT MTA) is required to sponsor this plan on behalf of the Tier II LOTS in the state and support their implementation of asset management practice and the federal requirements.

Federal Asset Management Requirements (49 CFR § 625)

- ✓ Develop a transit asset management plan that includes:
  - o Inventory of capital assets
  - o Condition assessment
  - o Description of decision support tools used to prioritize needs
  - o Project-based prioritization of investments
- ✓ Set annual performance targets
- ✓ Designate an Accountable Executive to approve the TAMP and annual targets.

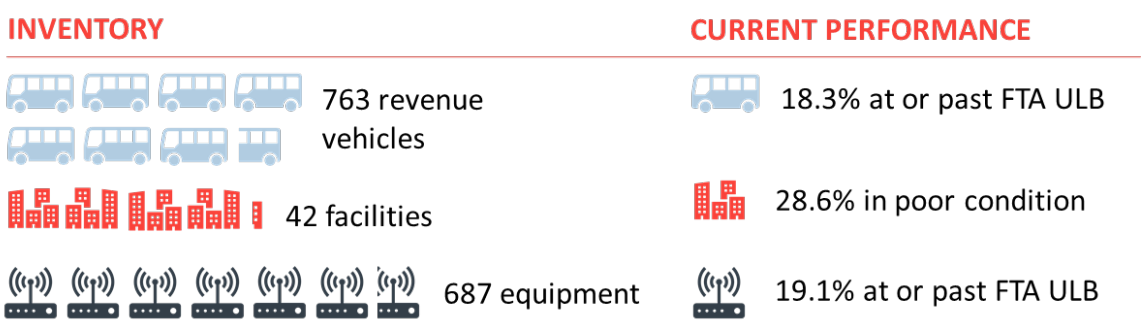
LOTS Included in the TAMP

Of the 23 LOTS in the state of Maryland, 22 are subject to the federal asset management regulations. Of those, 20 are Tier II agencies (smaller, non-rail agencies) who are participants in this group plan. The primary services offered by the Tier II LOTS are fixed route bus service and demand response service, typically used by commuters, the elderly, and the disabled to get to work centers, medical centers, shopping centers, and recreational centers.

Asset Portfolio

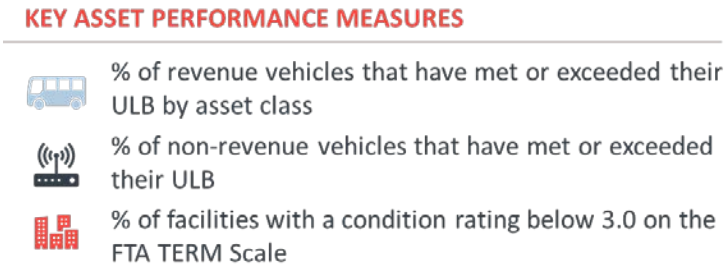
Collectively, Tier II LOTS manage an asset inventory of 763 revenue vehicles, most of which are cutaway buses or medium- and heavy-duty buses. In addition, there are 42 facilities mainly used for administrative and maintenance functions, with some passenger and parking facilities, and 687 equipment assets including non-revenue vehicles. The cumulative replacement value of the Tier II LOTS asset inventory is $330 million, which corresponds to an average asset portfolio of $16 million per LOTS.

In accordance with federal regulations, asset condition is evaluated based on the number of assets that have exceeded their Useful Life Benchmark (ULB) which is set based on asset class. Current performance for FY 2018 shows 18 percent of revenue vehicles, 19 percent of equipment (15 percent of non-revenue vehicles), and 29 percent of facilities are at or past ULB.



Performance Targets

Federal regulations require that agencies set annual performance targets for their assets, based on current asset performance and anticipated investments to meet the target. For MDOT MTA, the asset management and target-setting processes are intended to be aligned with the existing capital decision-making processes. As such, targets in this TAMP are set for FY 2019, based on the FY 2017 and anticipated FY 2018 asset performance.



NTD Vehicle Type	FY19 Target
Revenue Vehicles	
Bus	13.3%
Cutaway Bus	10.8%
Automobile	38.9%
Van	35.4%
Equipment	
Trucks and Other Rubber Tire Vehicles (Non-Revenue Vehicles)	14.6%
Facilities	
Administrative*	5.0%
Administrative/Maintenance	25.8%
Maintenance	35.0%
Passenger	25.0%

Asset and Safety Risk Management

While federal regulations do not require formalized risk management processes as part of a transit agency's asset management practice, guidance for prioritizing capital asset investments recommend the consideration of asset and safety risks. In addition, Federal safety regulations include safety risk management as a component of the safety management system. This TAMP identifies enterprise and project-level risks in six categories that can have repercussions on asset performance or on overall system safety.

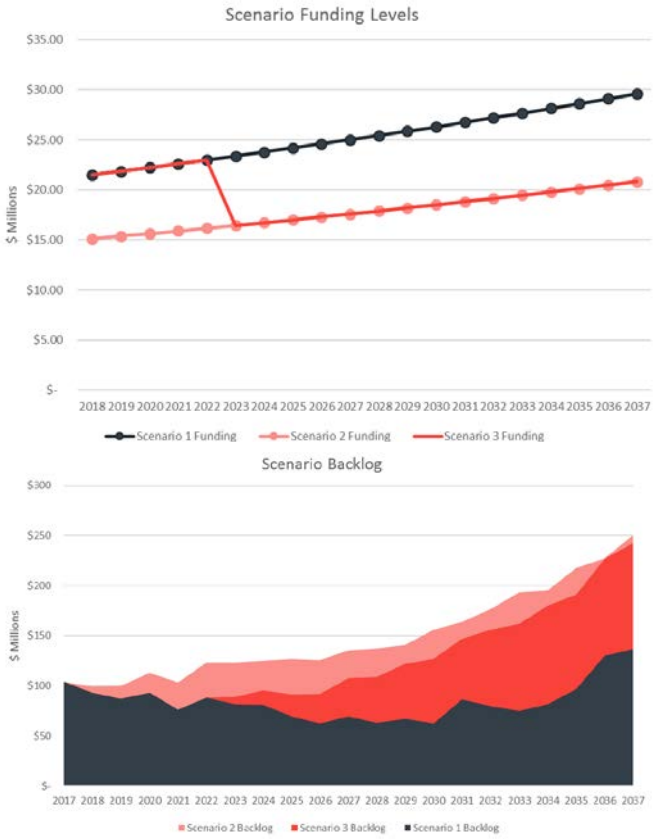
Project level risks were evaluated using a standard risk management process which scored risks based on likelihood and consequence to classify each one

in four types (unacceptable, undesirable, acceptable with review, and acceptable). Mitigation actions were also identified for each project-level risk to complete the risk register.

Funding Analysis and Scenarios

Out of the total asset value of $330 million, the current state of good repair backlog for all Tier II LOTS is $104 million as of the end of FY 2017. To eliminate the backlog and maintain it at zero, the total unconstrained need is projected to be $658 million over the next 20 years – an average of $32.9 million per year.

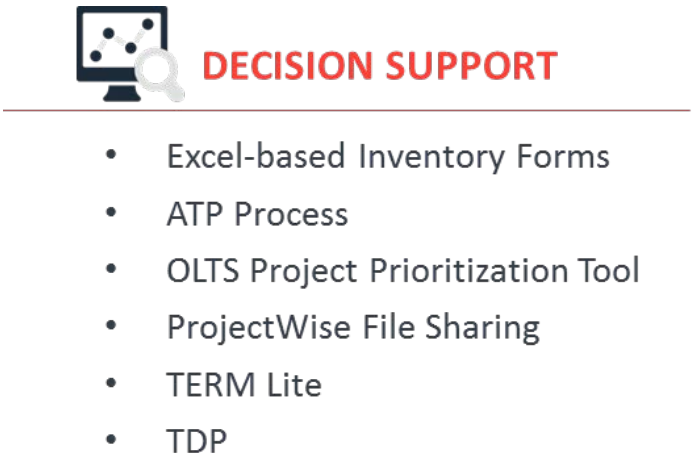
Based on historical funding levels, the average annual capital funding for LOTS is projected to be $28.5 million which is less than the need to eliminate the backlog. This TAMP evaluates three funding scenarios, finding that if funding is maintained at or around current levels, the state of good repair backlog is expected to grow to $150 - $300 million in the next 20 years.



Scenario	Total Funding over 20 Years	Total Funding Gap over 20 Years
1	$507 million	$151 million
2	$357 million	$302 million
3	$390 million	$269 million

Making Capital Investment Decisions

Given the current state of Tier II LOTS assets and the projected funding available, MDOT MTA must make strategic decisions about where to invest capital funding to maintain assets in the best possible condition. Capital projects are programmed into all the major transportation planning processes and submitted through the Annual Transportation Planning (ATP) process for funding to be granted. As the designated recipient of FTA funds in the state, MDOT MTA disburses funds for procurement of capital assets, preventive maintenance, and others, generally prioritizing vehicles over equipment and facilities. Funding decisions consider multiple factors including asset condition, risk management, safety, and asset lifecycle strategies, and the asset management and ATP processes are supported by several decision support tools.



Investment Prioritization

Investment prioritization occurs on an annual basis for MDOT MTA and the Tier II LOTS. Based on the information presented in this plan and the capital investment decision-making process, the following investments have been selected for funding for FY 2019. Total federal and state investment for these projects is $15.8 million.

LOTS	Project
Allegany County (Allegany County Transit)	Preventive Maintenance
	1 Small Bus Replacement
	1 Medium Bus Replacement
Annapolis (Annapolis Transit)	Preventive Maintenance
	2 Small Cutaway Bus Replacements
Anne Arundel County (Anne Arundel Transit)	2 Medium Bus Replacements
	Mobile Radios
Calvert County (Calvert County Transportation)	Preventive Maintenance
	1 Small Bus Replacement
Caroline/Kent/Talbot/Dorchester Counties (Delmarva Community Services)	Preventive Maintenance
	2 Gas Transmissions
	2 Gas Engines
	1 Medium Bus Replacement
Carroll County (Carroll Transit)	Preventive Maintenance
	3 Small Bus Replacements
Cecil County (Cecil Transit)	Preventive Maintenance
	1 Small Bus Replacement
	1 Medium Bus Replacement
Charles County (VanGo)	Preventive Maintenance
	5 Medium Bus Replacements
Frederick County (TransIT)	Preventive Maintenance
	3 Small Gas Cutaway Bus Replacements
Garrett County (Garrett Transit Services)	Preventive Maintenance
	2 Small Bus Replacements
Harford County (Harford Transit LINK)	Preventive Maintenance
	2 Medium Bus Replacements
Howard County (Regional Transportation Agency of Central Maryland)	2 Heavy Duty Bus Replacements
Queen Anne's County (County Ride)	Preventive Maintenance
	2 Small Cutaway Bus Replacements
St Mary's County (St. Mary's Transportation Services)	Preventive Maintenance
	3 Medium Bus Replacements
Somerset/Wicomico/Worcester Counties (Shore Transit)	Preventive Maintenance
	Mobility Management
	1 Small Bus Replacement
	2 Medium Bus Replacements

LOTS	Project
Town of Ocean City (The Beach Bus)	Preventive Maintenance
	Facility
Washington County (Washington County Transit)	Preventive Maintenance
	2 Medium Bus Replacements

Continuous Improvement

This TAMP has been developed to outline a strategy to best utilize the limited funding available for Tier II LOTS' capital asset needs. This document will be updated on an annual basis to reflect updated asset portfolio information. Following FTA regulations, the TAMP will also undergo a complete overhaul every four years to capture key improvements in the overall asset management process towards an increased state of good repair. MDOT MTA will explore the feasibility of the following initiatives and actions that could be taken over the four-year time horizon to continue to improve TAM for the LOTS.

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FIGURES

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Abbreviations

ADA – Americans with Disabilities Act

ARRA – American Recovery and Reinvestment Act

AT – Annapolis Transit

ATP – Annual Transportation Plan

CFR – Code of Federal Regulations

CMTMC – Central Maryland Transportation and Mobility Commission

CY – Calendar Year

DHS – Department of Health Services

DR – Demand Response

DT – Demand Response-Taxi

FTA – Federal Transit Administration

FY – Fiscal Year

ISO – International Organization for Standardization

ISO31000 – International Organization for Standardization Risk Management Standard

ITS – Intelligent Transportation Systems

JOBS – Job Opportunity Access Program

LOTS – Locally Operated Transit System

LRTP – Long-Range Improvement Program

MAP -21 - Moving Ahead for Progress in the 21st Century

MB – Motor Bus

MIS – Management Information System

MDOT – Maryland Department of Transportation

MDP – Maryland Department of Planning

MTA – Maryland Transit Administration

MUST – Maryland Upper Shore Transit

NTD – National Transit Database

O&M – Operations and Maintenance

OLTS – Office of Local Transit Support

PM – Preventive Maintenance

RP – Regional Planner

RTA – Regional Transportation Authority

SGR – State of Good Repair

STIP – Statewide Transportation Improvement Program

TAM – Transit Asset Management

TAMP – Transit Asset Management Plan

TDP – Transportation Development Plan

TERM – Transit Economic Requirements Model

TIP – Transportation Improvement Program

ULB – Useful Life Benchmark

US – United States

VOMS – Vehicles Operated at Maximum Service

WCT – Washington County Transit

YOE – Year of Expenditure

1 INTRODUCTION

This Plan sets forth MDOT MTA's approach to improving transit asset management (TAM) capabilities for the Tier II LOTS in the state, in compliance with requirements initially established by the Moving Ahead for Progress in the 21st Century (MAP-21) Act of 2012 and further defined by the Federal Transit Administration's (FTA) Final Rule on Transit Asset Management (49 Code of Federal Regulations (CFR) 625 and 630). Known as the LOTS Group Transit Asset Management Plan (Group TAMP), this master document sets objectives and strategies for delivering all commitments in LOTS TAM policy. In addition, this TAMP describes how the capital project selection process has been enhanced using TAM principles.

MDOT MTA's Office of Local Transit Support (OLTS) exists to provide a variety of technical assistance services to the LOTS operating in the State of Maryland. OLTS provides support regarding federal and state regulatory compliance, operations, management, planning, and training. A county's LOTS services vary depending on the jurisdiction's size, population density, and specific needs. Some jurisdictions have extensive fixed-route service, door-to-door demand response service, or a combination of the two. When executed properly with increasingly limited resources, asset management allows for more efficient and effective transit service.

1.1 LOTS SERVICE OVERVIEW

The state of Maryland has 23 LOTS, of which 22 are subject to the federal rules. While Somerset County provides closed-door service, which excludes them from federal regulations and from participation in this group plan, their assets are included in the performance and funding analyses to maintain consistency with other MDOT MTA analyses.

This group Plan applies only to LOTS that are recipients of 5311 funding, operate less than 100 vehicles, or serve an American Indian tribe. These providers are referred to as Tier II LOTS per the federal rule. The 20 LOTS subject to this TAMP are listed in Table 1, with a summary of the service they provide.

Of the 20 LOTS subject to this TAMP, 15 offer both demand response and fixed route, three (3) offer fixed route only, and two (2) offer demand response service only. All fixed route services provide complimentary Americans with Disabilities Act (ADA) services, which is different from the demand response service.

Table 1. Summary of Services Provided by LOTS

LOTS	Fixed Route	Demand Response
Allegany County Allegany County provides public transportation through a fixed-route system and complementary ADA demand response service. 15 buses run in peak service. FY 2017 ridership: 222,388	✓	✓
City of Annapolis Annapolis Transit provides fixed route transit and on-demand paratransit services to the City of Annapolis and the surrounding Anne Arundel County. The service is operated by the City of Annapolis although over 35% of the total service area is in Anne Arundel County. 13 buses run in peak service. FY 2017 ridership: 384,954	✓	✓
Anne Arundel County Anne Arundel County has contracts with Annapolis Transit (AT) and the Regional Transit Agency of Central Maryland (RTA) using contractual grant agreements to operate deviated and fixed route service. The Taxi Voucher Program provides coupons for discounted taxicab service within the county to persons 68 years and older (as of FY 2018) and people 18 or older with disabilities, who meet the income guidelines. 10 buses run in peak service. FY 2017 ridership: 166,802	✓	✓
Baltimore City – Charm City Circulator Charm City Circulator is a City operated, free, fixed-route bus system that services the Central Business District of Baltimore City. Together with the Harbor Connector, which is the water adjunct of the Charm City Circulator, the Charm City Circulator's route structure and robust operating schedule, has contributed greatly to the quality of life in Baltimore City. 23 buses run in peak service. FY 2017 ridership: 6,645,526	✓	
Baltimore County CountyRide is the Locally Operated Transit System in Baltimore County that provides demand-response service for senior adults, persons with disabilities ages 18 – 59 and residents in rural areas of the County. The service also operates to Baltimore City to partnership medical facilities. 20 buses run in peak service. FY 2017 ridership: 24,989		✓
Calvert County Calvert County Public Transportation provides coordinated public transportation services to its citizens with eight deviated-fixed routes and five daily specialized routes for demand response, medical assistance, and ADA transportation services. 14 buses run in peak service. FY 2017 ridership: 120,670	✓	✓

LOTS	Fixed Route	Demand Response
Carroll County The Carroll Transit System provides the following services; demand-response, known as door-to-door, and four deviated-fixed routes in more densely populated areas. Carroll County's demand-response service is a shared ride program that operates on a space and time available capacity. 29 buses run in peak service. FY 2017 ridership: 153,444	✓	✓
Cecil County Cecil Transit operates deviated fixed routes and demand-response transportation in Cecil County for the public, senior citizens and individuals with disabilities. Cecil Transit also offers a discount Taxi Voucher program for Cecil County seniors, persons with disabilities, and low-income individuals. 13 buses run in peak service. FY 2017 ridership: 97,043	✓	✓
Charles County The Department of Planning & Growth Management exercises a coordinated approach to providing public transit to the residents of Charles County, marketed as VanGO, by integrating fixed route services with specialized services, including demand response and Americans with Disabilities Act (ADA) transportation. 27 buses run in peak service. FY 2017 fixed route ridership: 839,900	✓	✓
Dorchester County (Delmarva Community Service) Delmarva Community Services (DCS) is a non-profit community service agency that has been designated by Dorchester County to provide public transit service. DCS provides these services through its transportation operator - Delmarva Community Transit (DCT). DCT provides fixed route and demand response transit service to the general public, the elderly, and to persons with disabilities. Also, DCT provides Americans with Disabilities Act (ADA) transportation services to people with disabilities who are unable to access a fixed route and are eligible for the service. Public transportation provides the citizens of Dorchester County access to shopping, medical, educational, and recreational facilities, as well as employment and social/human service centers throughout the mid-shore region. The program has thirty-nine (39) buses in peak service. FY2017 ridership: 117,371	✓	✓
Kent/Talbot/Caroline Counties (Delmarva Community Service) Delmarva Community Services (DCS) is a non-profit community service agency that has been designated by Talbot County to provide public transit service. DCS provides these services through its transportation operator - Delmarva Community Transit (DCT). DCT provides fixed route and demand response transit service to the public, the elderly, and to persons with disabilities. Also, DCT provides American with Disabilities Act (ADA) transportation services to people with disabilities who are unable to access a fixed route and are eligible for the service. The program has thirty-three (33) buses in peak service. FY 2017 ridership: 107,480	✓	✓

LOTS	Fixed Route	Demand Response
Frederick County Frederick County "TransIT" operates fixed routes in urbanized areas of Frederick County as well as commuter shuttle routes and countywide ADA paratransit and demand response service for seniors and people with disabilities, known as TransIT-plus. TransIT-plus also provides service for seniors and those with disabilities under the Statewide Specialized Transportation Assistance Program (SSTAP). 37 buses run in peak service. FY 2017 ridership: 642,316	✓	✓
Garrett County Garrett County Community Action Committee, Inc., a non-profit human services organization, operates Garrett Transit Service. It is the only public transportation provider in Garrett County covering all 640 square miles. GTS provides demand response and subscription services. 24 buses run in peak service. FY 2017 ridership: 91,995		✓
Harford County Harford Transit LINK provides fixed route service for the County's general population and demand response bus services throughout Harford County for people 60 years of age and older and for individuals with disabilities of any age. 27 buses run in peak service. FY 2017 ridership: 325,534	✓	✓
Howard County Howard County's transit services are branded, RTA. The services are managed and operated by the Regional Transit Agency of Central Maryland under a bus service management contract with First Transit. The County provides fixed route service as well as demand-response transportation services for the elderly and persons with disabilities, including ADA complementary paratransit. 39 buses run in peak service. FY 2017 ridership: 919,123	✓	✓
Ocean City The Town of Ocean City's Public Works Department operates a fixed route public transportation service that runs 365 days per year. Ocean City also provides complementary ADA paratransit service for those individuals who cannot access or use fixed route service. 52 buses run in peak service. FY 2017 ridership: 2,563,434	✓	
Queen Anne's County The Queen Anne's Department of Aging operates County Ride, which provides deviated-fixed route and demand response service to the public, elderly, and persons with disabilities. 16 buses run in peak service. FY 2017 ridership: 29,173	✓	✓

LOTS	Fixed Route	Demand Response
Shore Transit The Tri-County Council of the Lower Eastern Shore (TCC-LES) is a quasi-governmental entity designated by the State Legislature to serve as a regional economic development center for Somerset, Wicomico and Worcester counties. Through a planned consolidation process to streamline services, Shore Transit has become the transportation department of TCC-LES and is responsible for providing fixed route and demand response transit services to the public, elderly, and to persons with disabilities throughout the lower-shore region. 37 buses run in peak service. FY 2017 ridership: 365,556	✓	✓
St. Mary's County St. Mary's Transit System (STS) provides fixed route services and connects with Charles County's VanGO. Calvert County Transit ADA Complementary Paratransit service and Statewide Specialized Transportation Assistance Program Services (SSTAP) is provided countywide serving the elderly and disabled, and citizens unable to use the fixed route services. 18 buses run in peak service. FY 2017 ridership: 379,949	✓	✓
Washington County Washington County Transit operates all public transportation in Washington County. The system runs eight fixed urban routes in addition to multiple specialized services. WCT provides transportation for the elderly and persons with disabilities through a rider assist voucher program funded by SSTAP and ADA Complementary Paratransit service for individuals with disabilities who cannot access fixed route service. WCT also operates the Job Opportunity Access Program (JOBS) in cooperation with the Washington County Department of Social Services. 13 buses run in peak service. FY 2017 ridership: 463,546	✓	

1.2 FEDERAL TAM REQUIREMENTS

Federal regulations for transit asset management require transit service providers to establish transit asset management performance measures and targets, and develop a TAMP. The final TAM Rule was published on July 26, 2016 and went into effect on October 1, 2016. The rule itself amended the United States (U.S.) CFR Title 49 Parts 625 and 630, which relate to TAM and the National Transit Database (NTD) respectively.

The FTA Transit Asset Management Final Rule distinguishes requirements between large and small or rural transit agencies. Figure 1 summarizes the qualifications that determine whether a LOTS is classified as a Tier I or Tier II provider.

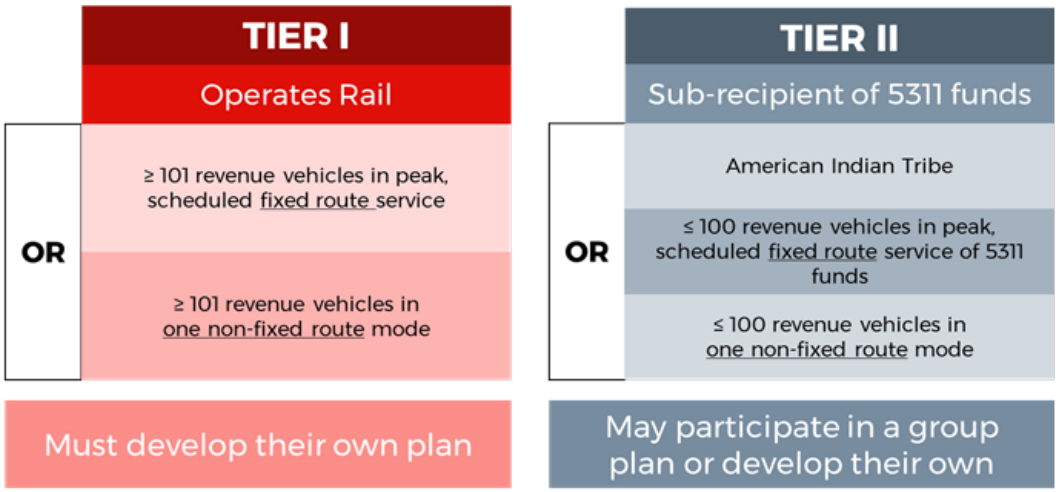


Figure 1. Comparison of Tier I and Tier II Qualifications

Due to the size and type of service provided, all LOTS covered in this TAMP are Tier II providers as identified in FTA TAM Final Rule. For these small transit providers (Tier II), MDOT MTA must sponsor a single Group TAMP which must be completed by October 1, 2018. The Group TAMP participants must collaborate with the MDOT MTA in developing the Plan.

Each LOTS must designate an Accountable Executive to approve the Transit Asset Management Plan. As required by the FTA, TAMPs must be updated at least every four years, cover a minimum four-year period, and coincide with the Statewide Transportation Improvement Plan (STIP).

TAMP Required Contents:

- Inventory of capital assets
- Condition assessment
- Description of decision support tools used to prioritize needs
- Project-based prioritization of investments

1.3 ORGANIZATION OF THE MDOT MTA GROUP TAMP

This Group TAMP is organized into eight chapters following asset management best practice and incorporating the elements required by 49 United States (US) CFR 625. Table 2 identifies the federal rule requirements for Tier II Group Plans with the corresponding section in this TAMP. In addition to the required sections for Tier II providers, this Group TAMP also includes a Transit Asset Management Policy (Section 2) and a risk management process (Section 5).

Table 2. Group TAMP Chapters and Content

U.S.49CFR625 Ref	Requirement	TAMP Section
A Tier II TAMP must include the following elements:		
49 CFR § 625.25 (b)(1)	Inventory of the number and type of all capital assets a provider owns, except equipment with an acquisition value under $50,000 that is not a service vehicle.	Sec 4: Capital Asset Portfolio
49 CFR § 625.25 (b)(1)	An inventory must also include third-party owned or jointly procured exclusive-use maintenance facilities,	Sec 4: Capital Asset Portfolio

U.S.49CFR625 Ref	Requirement	TAMP Section
	passenger station facilities, administrative facilities, rolling stock, and guideway infrastructure used by a provider in the provision of public transportation.	
49 CFR § 625.25 (b)(2)	Condition assessment of those inventoried assets for which a provider has direct capital responsibility and to level of detail to monitor, predict performance of assets, and inform investment prioritization.	Sec 3: Levels of Service Sec 4: Capital Asset Portfolio
49 CFR § 625.25 (b)(3)	Description of analytical processes or decision-support tools to estimate capital investment needs over time and develop its investment prioritization.	Sec 6: Capital Investment Strategies
49 CFR § 625.25 (b)(4)	Project-based prioritization of investments.	Sec 7: Work Plans & Budget Forecasts

When developing its investment prioritization, a provider must:		
49 CFR § 625.33 (a)	Identify a program of projects to improve or manage the SGR of capital assets for which the provider has direct capital responsibility over the TAMP horizon period;	Sec 7: Work Plans & Budget Forecasts
49 CFR § 625.33 (b)	Rank projects to improve or manage the SGR of capital assets in order of priority and anticipated project year;	Sec 7: Work Plans & Budget Forecasts
49 CFR § 625.33 (c)	Ensure project rankings are consistent with its TAM policy and strategies;	Sec 6: Capital Investment Strategies
49 CFR § 625.33 (d)	Give due consideration to state of good repair projects to improve those that pose an identified unacceptable safety risk;	Sec 5: Risk Management Sec 7: Work Plans & Budget Forecasts
49 CFR § 625.33 (e)	Take into consideration its estimation of funding levels from all available sources that it reasonably expects will be available in each fiscal year during the TAMP horizon period; and	Sec 7: Work Plans & Budget Forecasts
49 CFR § 625.33 (f)	Take into consideration requirements under 49 CFR 37.161 and 37.163 concerning maintenance of accessible features and the requirements under 49 CFR 37.43 concerning alteration of transportation facilities.	Sec 6: Capital Investment Strategies

2 LOTS ASSET MANAGEMENT POLICY

The following language represents the Policy Statements already signed by the Accountable Executives of each LOTS. The policy was developed based the main MDOT MTA TAM Policy, and identifies the priorities of OLTS, the Maryland Department of Transportation Maryland Transit Administration (MDOT MTA), and the LOTS. Whereas MDOT MTA is the designated recipient of federal transit funding in the State of Maryland, and provides technical assistance to the LOTS throughout the state, this policy provides guidelines for MDOT MTA and each LOTS' overall asset management approach in a manner consistent with current federal regulations (49 U.S.C. 5326).

The following LOTS are subject to this policy:

- Allegany County (Allegany County Transit)
- Anne Arundel County
- Baltimore City (Charm City Circulator)
- Baltimore County (CountyRide)
- Calvert County (Calvert County Transportation)
- Carroll County (Carroll Transit)
- Cecil County (Cecil Transit)
- Charles County (VanGo)
- City of Annapolis (Annapolis Transit)
- Dorchester County (Delmarva Community Transit)
- Frederick County (TransIT Services)
- Garrett County (Garrett Transit Services)
- Harford County (Harford Transit LINK)
- Howard County (Regional Transportation Agency)
- Queen Anne's County (County Ride)
- St. Mary's County (St. Mary's Transit System)
- Talbot, Caroline, and Kent Counties (Delmarva Community Transit)
- Town of Ocean City (The Bus)
- Tri County Council for Lower Eastern Shore (Somerset, Wicomico, and Worcester Counties Shore Transit)
- Washington County (Washington County Transit)

It is the policy of MDOT MTA and the aforementioned LOTS to effectively manage all capital assets and maintain each of their respective transit systems in a state of good repair. This policy sets the direction for establishing asset management strategies and plans that are achievable with available funds.

MDOT MTA and all LOTS commit to:

- ✓ Maintain an Asset Inventory that includes all vehicles, facilities, and equipment used in the delivery of transit service;
- ✓ Identify all Safety-Critical assets within the Asset Inventory and prioritize efforts to maintain those Safety-Critical assets in a SGR;
- ✓ Clearly define ownership, control, accountability, and reporting requirements for assets, including leased and third-party assets;
- ✓ Set annual asset performance targets and measure, monitor, and report on progress towards meeting those targets;
- ✓ Consider asset criticality, condition, performance, available funding, safety considerations, and the evaluation of alternatives that consider full lifecycle benefits, costs, and risks in capital project prioritization and other asset management decisions; and
- ✓ Maintain a group asset management plan, in coordination with MDOT MTA and LOTS safety policies and plans, as a means of delivering this policy.

Each LOTS' asset management program applies to all modes of service and will be monitored by the MDOT MTA OLTS. It is the responsibility of each MDOT MTA and LOTS employee to support the achievement of the goals and objectives established by this policy.

OLTS can be contacted to provide signed copies of the policy.

3 LEVELS OF SERVICE

Levels of service refers to the measurement of transit performance from two different perspectives: operating performance measurement and asset performance measurement. Operating performance measures involve costs to deliver service, passenger utilization of services, and operating assistance. These metrics indicate the degree to which the LOTS are efficiently providing service. Asset performance measures relate to technical characteristics of the assets in line with federal regulation and expectations; specifically, asset condition, age and useful life related to target performance.

3.1 OPERATING PERFORMANCE MEASUREMENT

The 20 LOTS included in this Group TAMP serve an average of 13 million riders each year. Table 3 provides total ridership (unlinked passenger trips) from FY 2015 to FY 2017, showing that ridership has increased over this period. The compounded annual growth of total ridership was 8.9 percent over this period.

In addition to ridership, OLTS and the LOTS use the following operating metrics to assess performance on an annual basis:

Table 3. Ridership Metrics (FY 2015 – FY 2017)

Total Ridership		
FY 2015	FY 2016	FY 2017
12,385,321	11,668,659	14,693,765
Average Ridership		12,915,915
Ridership Growth		8.9%

- **Operating Cost per Hour:** how much it costs an agency to provide an hour of revenue service on average. An agency's total operating costs divided by its total service hours equals operating cost per hour.
- **Operating Cost per Mile**: how much it costs an agency to provide one mile of service on average. An agency's total operating costs divided by its total revenue service miles equals operating cost per mile.
- **Operating Cost per Passenger Trip**: how much it costs an agency to provide a single trip for a single customer on average. An agency's total operating costs divided by total unlinked passenger trips equals operating cost per passenger trip.
- **Local Operating Revenue Ratio:** a measure of an agency's local operating revenues relative to its operating costs on average. This metric gives an indication of financial stability. An agency's local operating revenue is equal to the sum of its farebox receipts, advertising revenues, and other local operating revenues such as rebates and warranties. The local operating revenue ratio is calculated by dividing the agency's total local operating revenue by its total operating costs.
- **Farebox Recovery Ratio:** a measure of an agency's fare revenues relative to its operating costs on average. This metric provides insight regarding financial stability. An agency's farebox recovery ratio is calculated by dividing its total farebox receipts by its total operating costs.
- **Passenger Trips per Mile:** how many passengers utilize a service on a per mile basis. This metric gives an indication of service route efficiency. Passenger trips per mile is calculated by dividing total passenger trips by total revenue service miles.

- **Passenger Trips per Hour:** how many passengers utilize a service on an hourly basis. This metric gives an indication of service schedule efficiency. Passenger trips per hour is calculated by dividing total passenger trips by total revenue service hours.
- **Fatalities:** the total number of reportable deaths.
- **Injuries:** the total number of reportable injuries.
- **Safety Events:** the total number of reportable events (accidents and incidents).

Table 4 summarizes the operating performance for the LOTS in FY 2015, FY 2016, and FY 2017. The figures shown in the table represent the average performance measure for all LOTS included in this Group TAMP.

Table 4. Operating Levels of Service

Performance Measure	FY 2015 Average	FY 2016 Average	FY 2017 Average	National Average (FY 14-FY 16)[1]
Operating Cost per Hour ($/hour)	$59.7	$52.9	$53.5	$74.95
Operating Cost per Mile ($/mile)	$4.4	$3.8	$4.0	$5.61
Operating Cost per Passenger Trip ($/trip)	$13.0	$9.5	$11.6	$20.19
Local Operating Revenue Ratio (%)	46%	44%	42%	-
Farebox Recovery Ratio (%)	15%	14%	14%	19%
Passenger Trips per Mile (trips/mile)	0.78	0.77	1.05	0.71
Passenger Trips per Hour (trips/hour)	8.8	8.6	10.2	8.87
Fatalities (per billion trips)	0	0	0	43
Injuries (per million trips)	1	0	3	8
Reportable Incidents (per million trips)	2	0	1	7

As shown, the LOTS have observed fluctuations in operating costs per hour, per mile, and per trip; however, ultimately these operating performance measures have decreased since FY 2015. Unfortunately, local operating revenue ratio has seen a consistent two percent point reduction annually over the three-year period, but farebox recovery remained steady. Passenger trips per mile and per hour have seen a notable increase from FY 2016 to FY

[1] Includes only agencies comparable to the Tier II LOTS, i.e. that operate fewer than 100 vehicles at maximum service (VOMS). National average was calculated using the most recent NTD data.

2017 (37 percent and 18 percent respectively), indicating increased ridership and possibly that LOTS are delivering service more efficiently.

Safety operating measures show much fluctuation, which is typical of many agencies. Fortunately, none of the LOTS experienced any fatalities over the three-year period. Note that many LOTS experienced zero fatalities, injuries, or safety events over the three-year period, so a major incident or accident at just one LOTS can have a significant impact on the overall group safety performance.

As shown in Table 4, this operating performance is comparatively better than the national average (FY 2014 to FY 2016) for similar-sized agencies that operate less than 100 vehicles in peak service. From FY 2015 to FY 2017, Tier II LOTS had lower average operating costs per hour (26 percent below average), per mile (27 percent below average), and per passenger trip (44 percent below average), despite observing more passenger trips per mile (22 percent above average) and per hour (4 percent above average) than what was observed nationally. One area of improvement identified by this analysis is farebox recovery, the LOTS were 24 percent below the national average.

LOTS safety performance from FY 2015 – FY 2017 was very strong relative to the national average from FY 2014 – FY 2016. The LOTS observed fatalities per billion trips (100 percent below average), injuries per million trips (83 percent below average), and reportable incidents per million trips (88 percent below average) well below the national average.

These operating levels of service are important in the context of asset management for several reasons. The ability to maintain assets in good condition can support high levels of reliability in service provision. Furthermore, with cost-effective decision-making as a key principle in asset management, financial prudence is essential, as it effects a provider's financial capacity to maintain its assets. Good practice is to be diligent in ensuring financial stability, which includes analyzing operating costs and revenues to identify potential areas for improvement.

3.2 ASSET PERFORMANCE MEASUREMENT

The FTA requires tracking specific performance measures for each asset category to monitor whether the assets are in a SGR. Table 5 shows the required performance indicators and measures by asset category. Note that performance measures are applied by asset class and targets must be set for each asset class within the category.

For vehicles, "ULB is defined as the expected lifecycle or the acceptable period of use in service for a particular transit provider's operating environment. It takes into account a provider's unique operating environment (e.g., geography, service frequency, passenger loads, etc.)."[2] All participants share the same ULBs in a group plan. Vehicles that have aged beyond their ULB are considered to not be in a state of good repair.

[2] 2017 LOTS Manual definition

Table 5. Performance Measures and Targets by Asset Category

Asset Category	Performance Indicator	Performance Measure
Rolling Stock ***All revenue vehicles***	Age	% of revenue vehicles that have met or exceeded their ULB by asset class
Equipment ***Non-revenue vehicles***	Age	% of non-revenue vehicles that have met or exceeded their Useful Life ULB
Facilities ***All buildings or structures***	Condition	% of facilities with a condition rating below 3.0 on the FTA Transit Economic Requirements Model (TERM) Scale

It is important to distinguish between useful life and ULB. Generally, useful life determines the minimum age at which an asset becomes eligible to be replaced or disposed. In contrast, ULB is a projection for when an asset ought to be replaced once it has surpassed its useful life, but remains in use until replaced. Figure 2 illustrates the relationship between the two terms.

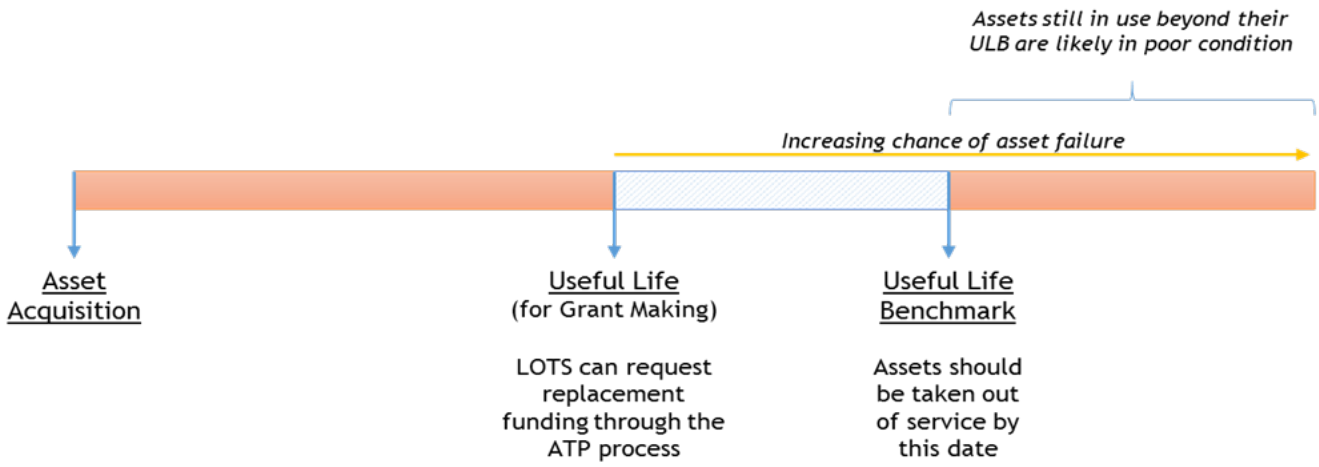


Figure 2. Useful Life versus Useful Life Benchmark Timeline

Facility condition is measured using the FTA's TERM condition scale (Figure 3). Facility condition is determined either by a physical condition assessment or by aged-based analysis in the TERM Lite tool. 3 While this Plan presents facility condition as determined by using the TERM Lite age-based model, all facilities will undergo a physical condition assessment over the next four years, in compliance with federal regulations.

[3]Transit Economic Requirements Model tool available through FTA at https://www.transit.dot.gov/TAM/TERMLite

Facility SGR

Rating	Condition	Description
5	Excellent	No visible defects, new or near new condition, may be under warranty if applicable
4	Good	Good condition, but no longer new, may have some slightly defective or deteriorated component(s), but overall is 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

Figure 3 TERM Condition Rating Scale for Facilities

Federal regulations require MDOT MTA to set asset management performance targets each fiscal year for the following fiscal year which are shared by all the participants of this group plan. The target-setting process involves:

1. Evaluating current performance for each asset class;
2. Assessing funding availability and performance scenarios based on available funding;
3. Selecting annual performance targets for each asset class for the next fiscal year.

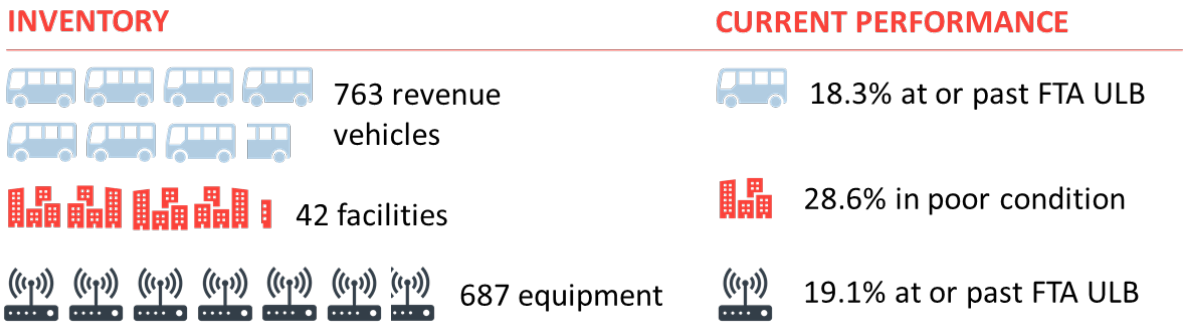
To integrate asset management processes with the existing Annual Transportation Plan (ATP) investment awards process, the targets reported in this Plan are FY 2019 performance targets, that is, performance that the LOTS aim to achieve or surpass by June 30, 2019 (see Section 4.4).

Performance targets should be:

- Set for every fiscal year (annually)
- Supported by data
- Approved by the agency's Accountable Executive every fiscal year
- Reported to the NTD on an annual basis
- Coordinated with State and MPOs to the extent practical

4 CAPITAL ASSET PORTFOLIO

By definition, Tier II LOTS' capital asset portfolio includes revenue vehicles, facilities, and equipment (including non-revenue vehicles). MDOT MTA's policy for Tier II LOTS is to include mission critical equipment regardless of value, and maintenance and other equipment valued over $15,000 or integral to the public transportation system or network.



4.1 CAPITAL ASSET INVENTORY

The following tables provide a summary of the capital asset inventory covered in this TAMP with a crosswalk between nomenclature for NTD asset types and MDOT MTA asset types. As shown in Table 6, most revenue vehicles are cutaway buses, representing 52% of the total vehicle inventory, with heavy- and medium-duty buses at 37%.

The Tier II LOTS have a total of 42 facilities including only four (4) passenger facilities (Table 7). FTA's Facility Performance Measure Reporting Guidebook defines a facility as a single building. For sites that have multiple buildings, each building is considered a facility. In addition, the FTA Guidebook's definition of a passenger facility, excludes bus shelters and canopies. Most the LOTS' passenger facilities are mainly bus shelters and canopies. As such, these assets are excluded from consideration in this Group TAMP.

Table 6. Revenue Vehicles Inventory

NTD Vehicle Type	MDOT MTA Vehicle Type	Quantity
Bus	Large Heavy-Duty Bus	284
	Medium Heavy-Duty Bus	
	Medium-Duty Bus	
Cutaway Bus	Light-Duty Bus	399
Automobile	Accessible Car	14
Van	Accessible Van	66
Totals		**763**

Table 7. Facilities Inventory

Facility Type	Quantity
Administrative*	10
Combined Administrative/Maintenance	13
Maintenance	15
Passenger/Parking	4
Totals	**42**

**Administrative also includes operational facilities*

Table 8 summarizes the Tier II LOTS current equipment inventory by NTD asset type and MDOT MTA asset type. Non-revenue vehicles (including trucks and support vans) make up 15% of the total equipment inventory, and 12% of the total vehicle inventory (i.e. revenue and non-revenue).

Table 8. Equipment Capital Inventory

NTD Equipment Type	MDOT MTA Equipment Type	Quantity
Communications	Phone System	27
	Radio	170
	Safety and Security	28
Revenue Collection	Revenue Collection	85
Intelligent Transportation Systems (ITS)	ITS	197
Non-Revenue Vehicles	Non-Revenue Vehicles	50
	Truck	40
	Support Van	13
Other Equipment	Maintenance Equipment	77
TOTAL		**687**

Collectively the Tier II LOTS manage an asset inventory of $330 million in replacement value (2017 dollars) with an average $15.7 million asset portfolio per each LOTS. Note that costs for facilities are adjusted for percent used for transit if shared with other non-transit services. Table 9 summarizes the value of the asset portfolio by asset category and class. Facilities represent the largest category by cost, an estimated replacement value of $182 million, which comprises 55.0 percent of the asset base. Revenue vehicles have an estimated replacement cost of $128 million, 38.9 percent of the overall asset base and equipment assets are $20.1 million (6.1%). The asset category which comprises the largest percent of the asset base by cost is facilities; buses (heavy- and medium-duty) are the most prevalent asset class by cost.

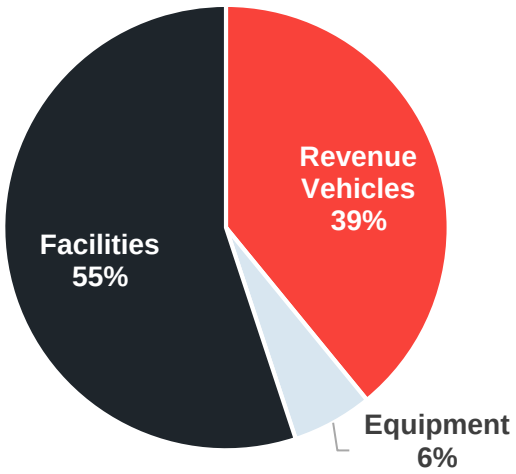


Figure 4. Asset Category Breakdown by Replacement Value (2017 dollars)

Table 9. Asset Replacement Value by Type/ Category (2017 dollars)

Asset Category/Class	Total Replacement Value (2017 dollars)	% of Asset Base (by Cost)
Revenue Vehicles	**$128,287,559**	**38.9%**
Bus	$95,424,542	28.9%
Cutaway Bus	$28,380,974	8.6%
Automobile	$349,517	0.1%
Van	$4,132,525	1.3%
Equipment	**$20,141,099**	**6.1%**
Non-Revenue Vehicles	$3,253,623	1.0%
Communications	$2,088,685	0.6%
Revenue Collection	$1,495,106	0.5%
ITS	$3,146,892	1.0%
Maintenance Equipment	$10,156,793	3.1%
Facilities	**$181,669,571**	**55.0%**
Administrative*	$40,966,384	12.4%
Administrative/Maintenance	$54,395,424	16.5%
Maintenance	$57,425,860	17.4%
Passenger/Parking	$28,881,903	8.7%
Total	**$330,098,229**	**100.0%**

**Administrative also includes operational facilities*

4.2 ASSET CONDITION

Condition assessments for LOTS' assets currently are based on age. For facilities assets, age-based assessments have historically been conducted using the FTA's TERM Lite tool. Over the next four years, physical condition assessments will be conducted for all LOTS facilities to replace the age-based scores obtained from TERM Lite. Details on TERM Lite (the tool, a quick start guide, and an inventory publisher) are available through FTA's website.

Table 10 provides information on current performance metrics for Tier II LOTS revenue vehicles, showing that 18% of all revenue vehicles are at or past their ULB (i.e. in poor condition). While automobiles are the smallest proportion of revenue vehicles (by number), they have the highest percentage in poor condition. Cutaway buses, the highest proportion of revenue vehicles, have the lowest percentage in poor condition.

Table 10. Revenue Vehicles Current Performance

Asset Class	ULB (Years)	Total Vehicle Quantity	Quantity at or past ULB	Percent at or past ULB
Bus	14	284	49	17.3%
Cutaway Bus	10	399	59	14.8%
Automobile	8	14	6	42.9%
Van	8	66	26	39.4%
Total	**N/A**	**763**	**140**	**18.3%**

Table 11 provides information on current performance metrics for Tier II LOTS equipment, which includes non-revenue vehicles. Like revenue vehicles, equipment performance is determined based on the percentage of assets at or past their ULB. As shown, the total category has 19 percent of assets at or past ULB. While this table shows condition for all equipment asset classes, condition assessments (and corresponding targets) are only required for non-revenue vehicles. Altogether, about 15% of non-revenue vehicles are at or past their ULB.

Table 11. Equipment Current Performance

Asset Class	MDOT MTA Equipment Type	ULB (Years)	Total Equipment Quantity	Quantity at or past ULB	Percent at or past ULB
Communications	**Phone System**	10	27	22	81.5%
	Radio	10	170	61	35.9%
	Safety and Security	20	28	1	3.6%
Revenue Collection	**All**	12	85	4	4.7%
ITS	**All**	12	197	19	9.6%
Other Equipment	**Maintenance Equipment**	Various	77	9	11.7%
Trucks and Other Rubber Tire Vehicles	**Non-Rev Vehicle, Support Car Truck, Support Van**	14	103	15	14.6%
Total	**N/A**	**N/A**	**687**	**131**	**19.1%**

Table 12 provides information on current performance for Tier II LOTS facilities. Facilities performance is determined based on the percentage of facilities with an overall condition rating less than three on the TERM scale. For this plan, facilities scores are based on the TERM Lite age-based analysis; over the next four years, these scores will be replaced with physical inspection assessment scores. As shown, the facilities asset category has 29% of assets in poor condition overall. Administrative buildings are in the best condition, with the lowest percentage of facilities scoring less than three (3). Maintenance facilities have the highest percentage below three on the TERM scale (40 percent).

Table 12. Facilities Current Performance

NTD Facility Type	Total Facility Quantity	Quantity Below 3 TERM Rating	Percent Below 3 TERM Rating
Administrative*	10	1	10.0%
Combined Administrative/Maintenance	13	4	30.8%
Maintenance	15	6	40.0%
Passenger/Parking	4	1	25.0%
Total	**42**	**12**	**28.6%**

**Administrative also includes operational facilities*

4.3 TERM LITE ANALYSIS OF TIER II LOTS ASSET CONDITION

MDOT MTA utilizes the FTA TERM Lite program as a key tool to support decisions throughout the asset management process. The primary use of the tool is to assess the asset portfolio's age-based condition and predict future condition and investment needs. This section provides a report of the total asset portfolio condition based on the TERM Lite analysis to establish the anticipated needs to maintain Tier II LOTS assets in a state of good repair.

In the previous section, asset condition reporting is directly tied to federal regulations, using federally-mandated asset categories and asset definitions. In this section, the analysis uses the asset category breakdown built into the TERM Lite tool. Figure 5 provides a crosswalk between the FTA asset categories and the TERM Lite categories that MDOT MTA has historically used.

Table 13 provides additional insight regarding the condition of the asset inventory (by cost), showing the percentage of assets at or past their ULB by asset type, category, and overall. Based on the TERM Lite analysis, the total replacement value of LOTS transit assets beyond their ULB is estimated to be $104 million in 2017 dollars. This SGR backlog is 31.5 percent of all Tier II LOTS assets by cost.

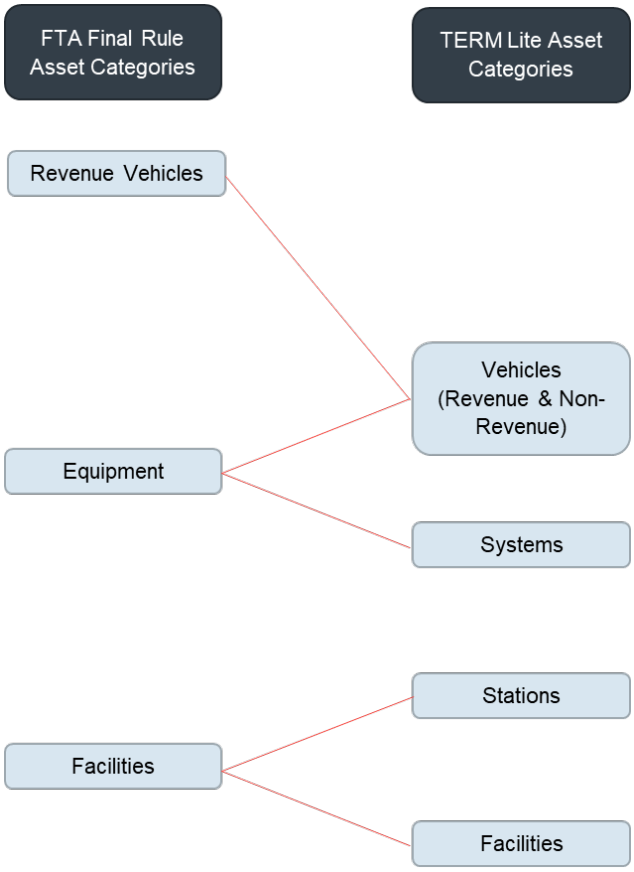


Figure 5. Crosswalk Between FTA and MDOT MTA Asset Categories

Table 13. Asset Condition by Cost (Backlog)

Asset Category/Type	Total Replacement Value/Cost (2017 $)	Value of Assets at or Past ULB (2017 $)	% of Assets at or Past ULB
Revenue Vehicles	$128,287,559	$55,944,627	43.6%
Bus	$95,424,542	$36,668,812	38.4%
Cutaway Bus	$28,380,974	$15,449,434	54.4%
Automobile	$349,517	$272,088	77.8%
Van	$4,132,525	$3,554,294	86.0%
Equipment	$20,141,099	$3,382,815	16.8%
Non-Revenue Vehicles	$3,253,623	$2,120,862	65.2%
Communications	$2,088,685	$329,465	15.8%
Revenue Collection	$1,495,106	$62,942	4.2%
ITS	$3,146,892	$137,722	4.4%
Maintenance Equipment	$10,156,793	$731,823	7.2%
Facilities	$181,669,571	$44,680,563	24.6%
Administrative*	$40,966,384	$27,007,679	65.9%
Administrative/Maintenance	$54,395,424	8,217,300	15.1%
Maintenance	$57,425,860	$6,558,260	11.4%
Passenger/Passenger	$28,881,903	$2,897,324	10.0%
Total	**$330,098,229**	**$104,008,006**	**31.5%**

**Administrative also includes operational facilities*

Figure 6 summarizes the distribution of SGR backlog across the three asset categories. Most of the backlog is made up of revenue vehicle assets at an estimated value of $55.9 million (54 percent) of the total SGR backlog and 43.6 percent of the revenue vehicle asset base by cost. Facilities comprise 43 percent of the total SGR backlog ($44.7 million), representing 24.6 percent of the facilities asset base by cost. Equipment (including non-revenue vehicles) assets have the lowest value of assets beyond their ULB by cost ($3.4 million), this represents 3 percent of the total SGR backlog and 16.8 percent of the total value of all equipment assets, including non-revenue vehicles.

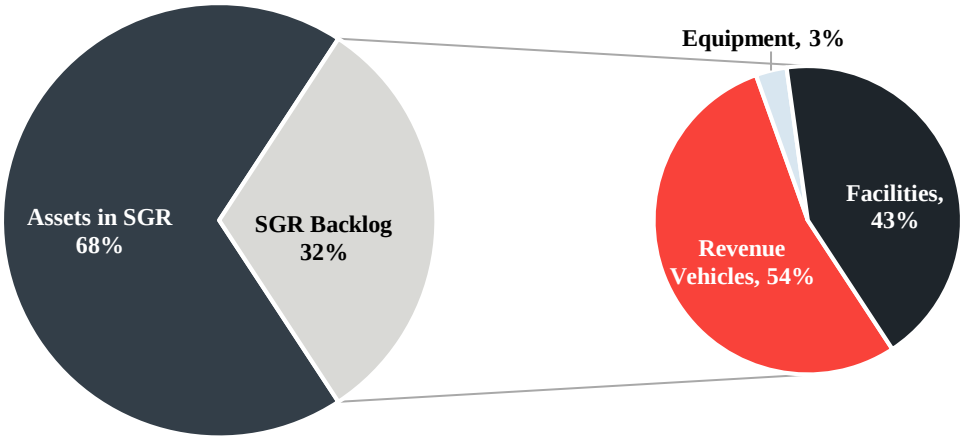


Figure 6. SGR Backlog Distribution by Asset Category (2017 dollars)

Figure 7 shows the amount of funding necessary to clear the current asset backlog for Tier II LOTS and maintain all assets in good condition for a 20-year period. This projection of unconstrained needs is shown by TERM Lite asset category (facilities, vehicles, systems and stations) with an initial investment need of $114.3 million in 2018 (which covers the current backlog and other replacements to prevent any additional backlog). While the 20-year average unconstrained investment need is $32.9 million, significant peaks are expected in 2030 ($66.1 million) and 2034 ($76.6 million). The peak years of unconstrained needs (2018, 2030, and 2034) correspond to years of high investment needs for vehicle assets.

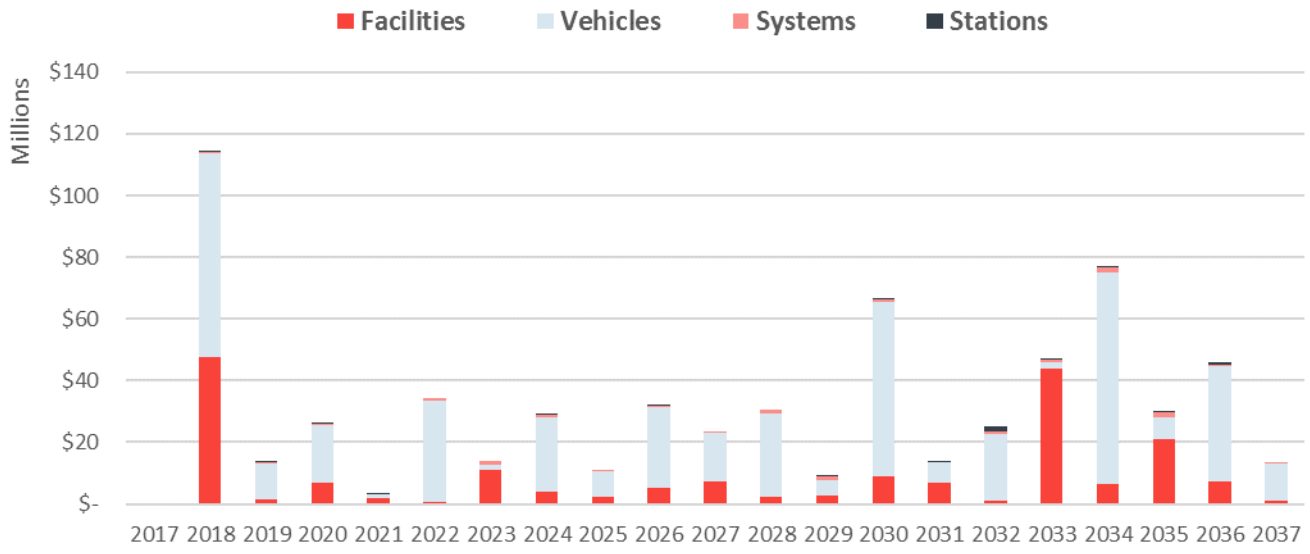


Figure 7. Unconstrained Needs by Category (Year of expenditure (YOE) dollars, Calendar Year (CY))

Note that facilities unconstrained needs peak in 2018 and 2033. Over the 20-year projection period, total unconstrained needs for vehicles, facilities, systems and stations are estimated to be $451 million, $189 million, $15 million and $3 million respectively.

4.4 FY 2019 PERFORMANCE TARGETS

Based on the reported asset condition, targets have been set for each asset class taking the projected funding levels into consideration. Table 14 summarizes the FY 2017 performance and FY 2019 targets for Tier II LOTS assets. Targets have been set based on the anticipated funding availability and the priorities of both the LOTS and MDOT MTA.

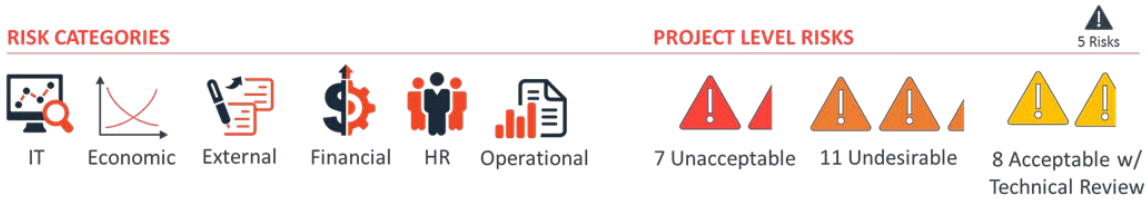
Table 14. FY 2019 Target Asset Performance for All Vehicles

NTD Vehicle Type	FY 2017 Performance	FY 2019 Target
Revenue Vehicles		
Bus	17.3%	13.3%
Cutaway Bus	14.8%	10.8%
Automobile	42.9%	38.9%
Van	39.4%	35.4%
Equipment		
Trucks and Other Rubber Tire Vehicles (Non-Revenue Vehicles)	14.6%	14.6%
Facilities		
Administrative*	10.0%	5.0%
Administrative/Maintenance	30.8%	25.8%
Maintenance	40.0%	35.0%
Passenger	25.0%	25.0%

**Administrative also includes operational facilities*

5 ASSET & SAFETY RISK MANAGEMENT

While federal regulations do not require formalized risk management processes as part of a transit agency's asset management practice, incorporating a risk management process into asset lifecycle management supports the goals of asset management. Identifying, evaluating, and managing asset and safety risks, and developing a risk management strategy that informs capital investment prioritization represents good practice for ensuring that assets are maintained in a state of good repair.



MDOT MTA has adopted a risk management framework following ISO risk management standard ISO31000, which defines a five-step risk management approach shown in Figure 8. For the LOTS, federal safety management regulations require a safety risk management methodology that focuses on identifying, evaluating, and mitigating safety risks. This Group TAMP defines a blended asset management and safety risk process which incorporates asset and safety risk management into the asset lifecycle management process.

The adopted risk management framework identifies two categories of risks: enterprise risks and project level risks. Enterprise risks are high-level, organization wide risks which may constrain the general asset management processes or the development of an effective asset management strategy. These risks may also have broad impacts on the entire Tier II LOTS group, or one or more agencies, potentially affecting areas aside from strictly asset management (e.g. reputation). In contrast, project level risks are risks associated with a specific asset or groups of assets represented in the form of a capital project or program (e.g. system wide elevators/escalators), whether at one or multiple LOTS. For this first iteration of the LOTS risk management framework, enterprise risks are identified to be monitored

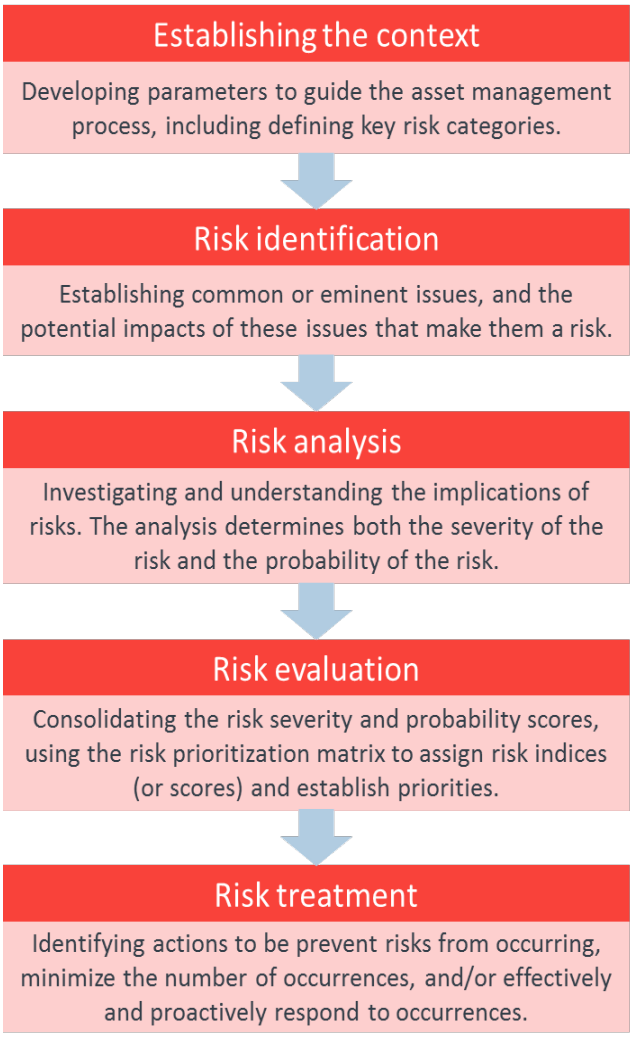


Figure 8. ISO 31000 Risk Management Process

while project level risks are identified and evaluated following the standard risk management process.

5.1 ENTERPRISE RISKS

Collectively, the LOTS identified several enterprise risks that can affect their operations organized into six categories (Table 15).

Table 15. Enterprise Risks

Category	Risk
Asset Information and Technology	**Implementation of new transportation technologies** LOTS struggle to prepare for/adapt to the influx of new transportation technologies (fare collection, apps, etc.), which impacts service reliability and performance and the management of related new assets.
Economic	**Changing demographic of riders and the developing population (medical services)** A growing senior population results in increased demand for ADA service. This demand increase may require additional inventory needs (more ADA compliant vehicles) or additional service needs (more frequent service to medical facilities and other services heavily utilized by seniors).
External	**Unexpected demand on existing transit system** Economic development (such as the opening of a new job center), political influences, and other unexpected factors may prevent LOTS from delivering the appropriate level of service for customer demand.
	Federal legislation uncertainty In the current political climate, there is little certainty as to whether transit funding is a federal priority. Federal legislation threatens overall federal transit funding.
Financial	**Insufficient county-level funds to match federal and state funding** Many federal funding programs are contingent on the local jurisdictions' ability to provide a local match. Some LOTS have difficulty coming up with the local match, which puts the LOTS in jeopardy of losing federal funding.
	Difficulties maintaining operational budget efficiency Rising operational costs such as fuel and overtime costs, may lead to reduced financial stability.
	Fare evasion When passengers utilize LOTS services without paying the fare, revenue available to properly maintain service is reduced.
Human Resources	**Resource capability and competence** Lack of qualified personnel to support new mandates, a shortage of commercial drivers, and an undisciplined workforce impact operating and asset performance.
	Department of Health Services (DHS) Contract Loss of the DHS contract would cause loss of staff, which may reduce service capacity.
	Leadership Turnover During leadership transitions (e.g. due to political appointments), lack of succession planning and leadership development result in loss of institutional knowledge and other complications related to efficient operations.
Operational	**Insufficient funding and procurement mechanisms** Insufficient funding and procurement mechanisms to maintain rolling stock and associated equipment in a SGR, threaten asset performance and service reliability.

5.2 PROJECT LEVEL RISKS

Asset management and safety project-level risks were identified and evaluated during a LOTS workshop using a risk management matrix (Figure 9) to prioritize risks based on their probability of occurrence and the severity of the consequences. In addition, risk mitigation strategies were identified for those risks that require action.

LEGEND

Unacceptable - Cannot be accepted as is, **must** be mitigated

Undesirable – Should be mitigated, or can be accepted with Executive Management concurrence

Acceptable – with Technical Review (must identify who signs off)

Acceptable without further review

RISK INDICES					
Probability	Severity Category				
	1 Catastrophic	2 Critical	3 Moderate	4 Minor	5 Insignificant
(A) Frequent	1A	2A	3A	4A	5A
(B) Probable	1B	2B	3B	4B	5B
(C) Occasional	1C	2C	3C	4C	5C
(D) Remote	1D	2D	3D	4D	5D
(E) Improbable	1E	2E	3E	4E	5E

Figure 9. Risk Prioritization Matrix

The risk register below (Table 16) identifies project level risks, impacts and potential mitigation strategies, arranged in order of risk priority. As the process continuously evolves, these risk scores will be incorporated into the investment prioritization process to help identify projects that alleviate or mitigate the consequences of any risks.

Table 16. Project-Level Risk Register

Risk	Category	Impact	Risk Score	Proposed Mitigation
MaxxForce International engine defects	Operational	– Mechanical failures – Lengthy delays	1A	– Improve vehicle specifications during the bid process to eliminate procurement of transit vehicles with MaxxForce International Engines – Continue to provide preventative maintenance (PM) funding for replacements – Improve turn-around of concurrent requests – Work with the manufacturer for more efficient repairs – Reduce repair time with better training for mechanics and by keeping parts on hand for frequent repairs

Risk	Category	Impact	Risk Score	Proposed Mitigation
Low procurement bids	Operational	– Low quality equipment and vehicles	2A	– Improve vehicle specifications during the bid process to emphasize technical merits of vendor proposals over cost – Use a scoring matrix that weights reliability and dependability higher than price
Ramp deployment failures	Operational	– Service delays – Injury to operators and/or passengers – Lawsuits	2B	– Update preventive maintenance practices to include complete evaluation of ramps, including immediately addressing rust and cycling lifts/ramps with sandbags to simulate real-world conditions – Train drivers to perform minor troubleshooting – Ensure pre-trip inspection of ramps and lifts
Current workforce is untrained and/or low on resources to conduct facility inspections	Human Resources	– Lacks bandwidth to perform mandated physical facilities condition assessment	2B	– MDOT MTA will provide trained consultants to assess facilities condition – Improve training for current staff – Hire the most qualified personnel for the job and provide continuous training
Small parking lots	Operational	– Insufficient capacity for the number of vehicles that are stored	2B	– Acquire/lease more property (adjacent or nearby), potentially for spares – Look for opportunities to share parking resources with other departments/agencies – Consider additional parking needs throughout service planning – Evaluate automated vehicle options
Vehicle breakdowns	Operational	– Service delays	3A	– Rely on spare vehicles to supplement service; – Ensure vehicles meet useful life standards – Fund vehicle replacements quickly to minimize funds lost for excessive maintenance procedures – Ensure compliance with manufacturer's maintenance standards – Modernize the fleet; – Complete regular preventative maintenance – Perform pre-trip inspections and empower drivers to report problems as soon as possible

Risk	Category	Impact	Risk Score	Proposed Mitigation
Major equipment malfunctions (e.g. bus wash)	Operational	– Causes corrosion – Public perception	**3A**	– Use a power washer for bus cleaning – Use anti-corrosive additive in soap – Adhere to scheduled maintenance of the bus wash system; hire a contractor for vehicle washing if needed – Acquire a commercial grade pressure washer as back-up, undercarriage spray equipment for cleaning during the winter, or other necessary equipment – Emphasize to mechanics that rust must be addressed immediately
Major accidents	Operational	– Significant damage to bus fleets	**1D**	– Regular defensive driving training – Monitor driver performance – Daily announcements over the radio dispatcher system to emphasize the importance of defensive driving
Vehicle theft	External	– Impacts performance	**1D**	– Ensure that drivers always secure/lock their vehicle when unattended – Store vehicles in a secure, well-lit location under video surveillance; shut-down vehicles and disconnect batteries – Reduce access to the public
Vehicle condition deterioration (due to age, mileage, and body damage)	Operational	– Performance – Public perception – Service reliability	**2C**	– Refurbish or dispose of vehicles based on the circumstances – Work with MDOT MTA to rotate vehicles when they reach their useful life – Develop a short-term financially-constrained vehicle replacement plan to ensure ULB standards are met; consider a mid-life overhaul – Ensure all vehicles get the same level of use
Bus collisions with fixed objects	Operational	– Vehicle damage – Transit facility damage – Reduction in spare ratios – Service impacts	**2C**	– Improved training for drivers and rewards for safe driving – Regular defensive drivers training; emphasize the importance to drivers – Design facilities to minimize the risk of collisions

Risk	Category	Impact	Risk Score	Proposed Mitigation
Minimal storage space	External	– Lack of storage for oil, transmission fluid, windshield wiper fluid – Third party contractor maintenance facilities will not provide access outside of their hours	**3B**	– Re-negotiate contracts to allow access to these materials or find a better maintenance contractor – Consider above-ground storage tanks (inexpensive and require minimal storage space) – Use fluids in smaller containers (e.g. 55 gal) and arrange with waste oil recycling companies for regular removal – Purchase storage tanks and place them for 24-hour access
Poor roadway conditions	Operational	– Vehicle damage – Reduced safety	**3C**	– Report conditions to officials/Public Works and reduce schedule for weather related issues – Invest in better quality vehicles to reduce risk – If road salts are causing damage, consider an accelerated vehicle wash schedule
Frequent turnover in contracted demand response workforce	Human Resources	– Service interruptions	**3C**	– Charge the contractor damages for service interruptions – Screen for behavior and competency before hiring a contractor – Provide opportunities for knowledge sharing through training, mentoring, presentations, etc. – Provide a competitive and comprehensive benefits package (life insurance, disability insurance, flexible hours, etc.) – Increase workforce to maintain back-up drivers; continuous recruiting
Scheduling software failure	Asset Information & Technology	– Operational inefficiencies – Service disruption	**3C**	– Move from local servers to the cloud – Replace current software with a more reliable product; work with IT to ensure software stability and manufacturer to address failures – Train staff to manually use readily available programs (e.g. Microsoft Excel) as back-up – Make the service contractor responsible for maintaining software; train staff

Risk	Category	Impact	Risk Score	Proposed Mitigation
Insufficient space for current staff in offices	Human Resources	– Operational efficiency	**4A**	– Consider relocating staff – Short-term: satellite offices, share space with other agencies, work from home – Consider facility expansion – Adjust schedules to have fewer staff in the facility at once; revolving schedules
Non-transit vehicle collisions with bus shelters	Operational	– Damage to shelters – Asset performance	**4B**	– Install protective bollards, barriers, signs, and lighting for visibility – Improve driver training – Review location factors for bus shelters; move shelters back from the road
Lack of system to track vehicle repairs and failures	Operational	– Operational and maintenance efficiency	**4B**	– Develop a system – Create or purchase spreadsheet programs such as Google Docs, Microsoft Excel, or Access to track vehicle history; ensure adequate training for all staff
Equipment failures	Operational	– Service interruptions – Performance	**3D**	– Examine preventative maintenance effectiveness – Develop a replacement plan to ensure on-time performance as equipment reaches ULB – Maintain equipment per manufacturer standards – Increase spare ratio
Computer hacks	Asset Information & Technology	– Property damage – Need to rebuild systems	**3D**	– Consider employee training to assist preventing hacks (e.g. identifying suspicious e-mails and eliminating personal use of work computers) – Work with IT to develop effective safeguards – Utilize antivirus, malware, etc. security programs and maintain them – Reduce access to systems to needed personnel only
GenFare computer system failures	Asset Information & Technology	– Inability to use fareboxes as intended – Operating efficiency	**3D**	– Ensure that preventive maintenance is being performed – Charge damages if the service is contracted – Train maintenance staff to detect and solve problems – Maintain adequate spare parts to replace non-functional parts – Consider installing a better system and work with IT

Risk	Category	Impact	Risk Score	Proposed Mitigation
Electric bus fires	Operational	– Service interruptions – Asset damage – Injuries – fatalities	**3E**	– Adherence to manufacturer's recommended maintenance schedule and component replacements – Regular preventive maintenance – Train staff and mechanics to look for signs of an issue – Report and repair issues as quickly as possible – If the overall fleet is at risk, work with the manufacturer for a long-term solution
Bus vandalism	External	– Asset condition – Public perception	**4C**	– Increase police presence in the area, specifically in areas with a history of bus vandalism – Store vehicles in secure, well-lit, fenced-in locations with video surveillance; shut-down vehicles and disconnect battery – Limit access to storage facilities – Install on-board cameras to identify and deter violators – Train drivers to report vandalism
Severe weather impacts on fixed route and paratransit services	External	– Service interruptions	**4C**	– Communicate with demand-response clients to adjust schedules as necessary – Procure small, 4x4 support vehicles that can be used in inclement weather to transport patients – Limit service reductions only when safety is a concern
Driver shortages and excessive overtime	Human Resources	– Service interruptions – Operational performance	**4C**	– Implement a program to train people to become qualified drivers – Recruit aggressively and offer a hiring bonus – Staff adequately so overtime is minimized – Purchase non-CDL vehicles – Change rates for drivers who work on Saturdays to attract better drivers – Increase part-time staff
Shared bays	Operational	– Service delays	**4D**	– Consider contracting for available space – Develop a plan to use limited bays efficiently – Schedule workload more efficiently; stagger mechanic shifts and use revolving preventive maintenance schedules

6 ASSET LIFECYCLE STRATEGIES

This section identifies key management practices across the asset lifecycle including procurement, maintenance, replacement, and disposal for each asset class. These strategies and policies are documented in detail in the LOTS Program Manual, developed to provide comprehensive guidance on federal and state rules for the LOTS.

6.1 CAPITAL INVESTMENT DECISIONS

New vehicles, equipment, and facilities capital expenses are programmed into all the major transportation planning processes, including the Transportation Improvement Program (TIP), STIP, Long-Range Transportation Plan (LRTP), and the Transportation Development Plan (TDP). Once programmed, these projects go through the ATP process to obtain funding for procurement, rehabilitation, preventive maintenance, and other investments that will require federal and/or State capital funding. MDOT MTA is the designated recipient of all FTA funds in the state of Maryland and disburses grant funds through sub-grant agreements to the LOTS.

Funding distribution is based on a grant-making process that allocates capital assistance based on need and the availability of state and federal funds. Generally, vehicles are prioritized over equipment and facilities. To support its asset management system, MDOT MTA has recently adopted a project prioritization tool which considers multiple factors including TERM Lite analysis, asset condition, environmental reliability, risk management, and safety.

In addition to capital funding, ATP applications also include operating budget requests. While use of the awarded funds are up to each LOTS, asset lifecycle strategies must adhere to the guidelines laid out in the LOTS Program Manual.

6.2 VEHICLE LIFECYCLE STRATEGIES

6.2.1 VEHICLE PROCUREMENT

Each LOTS develops individual written procedures, which comply with federal and state local requirements as necessary, related to purchasing, procurement, and contracting for all services that use federal or state funds. For vehicles, procurements are often done centrally through existing MDOT MTA contracts on behalf of the LOTS, for vans, small buses, medium buses, and sometimes large buses. LOTS often prefer to procure large buses on their own to avoid delivery time delays.

For future procurements, LOTS hope to rely on group procurements as much as possible. Additionally, MDOT MTA will take responsibility for and prioritize eliminating gaps in vehicle procurement contracts by beginning new procurements before current contracts expire. MDOT MTA will evaluate all procurement options, including maintaining a menu of contracts for all vehicle types, joint procurements, and utilizing grant funds (discretionary or competitive) for the group or for individual LOTS.

6.2.2 VEHICLE MAINTENANCE

To ensure federal and state-funded vehicles are adequately maintained, each LOTS develops a maintenance program and plan. The maintenance program involves two major components (preventive maintenance and repairs) and establishes goals and objectives to monitor maintenance performance, as well as strategies to achieve these goals. Goals and objectives can relate to vehicle life, major equipment failures, etc. Maintenance functions are performed by in-house staff, by a local government fleet maintenance office, or by a private contractor. The maintenance plan is included in the LOTS ATP submission to MDOT MTA, and is resubmitted as updates occur. In addition, LOTS are encouraged to establish a Management Information System (MIS) to track maintenance information and analyze vehicle performance as it relates to maintenance of vehicles.

Based on current performance of the LOTS fleet, LOTS hope to make strategic investments towards more efficient vehicle maintenance for the coming years. To reduce maintenance costs, LOTS plan to expedite replacement of vehicles with maintenance costs greater than the vehicle's remaining value; for example, for vehicles with defective Maxx Force Engines. Rehabilitation activities will be explored, such as evaluation of heavy duty fleets to determine if rehabilitation is beneficial and refurbishing vehicle components and body. Ramp maintenance will also be a priority, to include more frequent ramp certification, mandatory driver training, and required ramp maintenance schedules. LOTS plan for more frequent, required employee and equipment certification.

6.2.3 SPARE VEHICLES MANAGEMENT

Spare vehicles supplement service when vehicles are taken out of service due to preventive maintenance, repairs, breakdowns, accidents, etc. Factors such as fleet size, condition, and maintenance program capacity to respond to preventive maintenance and repair needs determine the appropriate spare ratio. MDOT MTA has established a maximum spare ratio of 20 percent for LOTS. LOTS that are unable to comply with MDOT MTA's spare ratio standards develop a fleet management plan to explain extenuating circumstances that justify their current spare ratio, and outline a strategy to reduce it in the future.

6.2.4 VEHICLE REPLACEMENT

Vehicles funded through specific federal and state programs are subject to minimum useful life standards (Table 17), established by MDOT MTA to ensure they are appropriately maintained to reach a normal useful life. These useful life standards are determined by vehicle classification; vehicles can be retired and replaced based on years in service or mileage, whichever surpasses useful life standards first. Under special circumstances, LOTS may retire a vehicle before it meets useful life standards. However, to justify the replacement, LOTS provide a detailed description of the vehicle condition, an explanation for the current condition, a list of repairs and associated costs necessary to keep the vehicle in service, and detailed maintenance records.

Based on current vehicle performance, LOTS are analyzing various replacement strategies to determine which is optimal for their needs. LOTS are analyzing and considering level set revenue vehicle replacements and comparing the benefits and drawbacks of different vehicle types. The LOTS will consider new technology related to fuel and propulsion options. Additionally, LOTS will consider the expensive upfront costs and repairs associated with

electric buses. LOTS want to identify trends of common vehicle issues and the point in the lifecycle that these issues typically occur, to share this information with other LOTS so they can address the issue in advance of failure.

Table 17. Vehicle Minimum Useful Life Standards

Vehicle Classification	Years	Miles
35'-40' Heavy Duty Large Size and Articulated Bus	12	500,000
30'-35' Heavy Duty Medium Size Bus	10	350,000
Under 30' Medium Duty Bus	8	250,000
25'-35' Light Duty Bus (body on truck chassis vehicles)	6	200,000
Small Specialized Vehicles (accessible minivans and accessible taxicabs)	4	150,000

6.2.5 VEHICLE DISPOSAL

LOTS dispose of vehicles at the end of their useful life, in accordance with federal and state requirements, after consultation with MDOT MTA (for federal or state-funded vehicles). LOTS make additional considerations prior to disposal of vehicles that are assessed by the insurance company as a total loss (usually due to a serious accident) before reaching useful life. In this situation, the LOTS will receive a payout from the insurance company to be reinvested in the service. If the insurance company does not dispose of the totaled vehicle, the LOTS might sell the vehicle, keep it for spare parts, or dispose of it themselves.

LOTS have considered implementing new processes for vehicle disposal to realize cost savings. LOTS will aim for level-set revenue vehicle disposals to match replacement costs. Additionally, LOTS will consider auctioning disposed vehicles as well as selling vehicles for scrap parts.

6.3 EQUIPMENT LIFECYCLE STRATEGIES

6.3.1 EQUIPMENT PROCUREMENT

As with vehicles, LOTS develop and follow their own written procedures, which adhere to federal and state requirements related to purchasing, procurement, and contracting for all services that use federal or state funds. Equipment procurement procedures vary based on the nature of the equipment. LOTS equipment that is not installed on a vehicle (such as maintenance equipment, computer hardware, software) is procured locally. Equipment that is purchased separately from the vehicle to be installed on the vehicle once delivered, is also procured locally. Optional, factory-installed equipment, such as wheelchair lifts, can be procured in multiple ways. Procurement rules are detailed in the LOTS Program Manual.

LOTS have evaluated current equipment procurement processes to identify areas of improvement. One potential improvement measure the LOTS have identified is to rely more on group procurements for equipment (both led my MDOT MTA and not led by MDOT MTA), including fare bus cameras, dispatch, and regional communications equipment.

6.3.2 EQUIPMENT MAINTENANCE

LOTS maintenance programs must include any equipment that supports rolling stock or daily operations. The equipment maintenance program must comply with manufacturers recommended standards. Examples of equipment to be included in the maintenance program include but are not limited to: revenue collection systems, communication systems, etc.

Based on current equipment performance, LOTS have reassessed existing equipment maintenance processes. In the future, LOTS want to establish a lifecycle and replacement schedule for equipment assets based on original equipment manufacturer specifications. An Additional focus is to provide better training for employees on how to use the equipment to prevent breaking, particularly for large pieces of equipment.

6.3.3 EQUIPMENT REPLACEMENT

Equipment replacement projects are also funded through the ATP capital investment prioritization process and are based on existing asset condition and funding availability.

LOTS have evaluated current equipment replacement strategies and have identified several areas of improvement. LOTS are working towards developing a forecast and implementing a replacement schedule for equipment assets per the ATP application form, which includes 5-year projections. Also, LOTS want to identify common equipment and the point in the lifecycle that these issues typically occur, to share this information with other LOTS so they can address the issue in advance of failure.

6.3.4 EQUIPMENT DISPOSAL

Each LOTS develops a written policy for equipment disposal practices which satisfies FTA, MDOT MTA, and local government disposal requirements as applicable. The equipment disposal policy is also included in the LOTS maintenance program. LOTS dispose of equipment assets near the end of their useful life, but LOTS will seek special approval by MDOT MTA to dispose of capital equipment assets that have not met minimum useful life standards. LOTS will consider alternative disposal methods for the coming years; for example, selling to other LOTS.

6.4 FACILITIES LIFECYCLE STRATEGIES

6.4.1 FACILITIES PROCUREMENT

Facilities development and procurement processes are more involved than vehicle or equipment procurement processes. The full facilities procurement process, with details on timing and specific requirements, is documented in the LOTS Program Manual.

LOTS have considered multiple strategies for more efficient facilities procurement. LOTS will look for opportunities to share resources and facilities within their counties or other entities outside their jurisdiction, to realize cost savings.

6.4.2 FACILITIES MAINTENANCE

LOTS maintain facilities in good condition, to remain eligible for federal and state assistance. To ensure that facilities are clean and functioning in good repair, each LOTS develops a facilities maintenance program accompanied by a written maintenance plan. The facilities maintenance program also accounts for facilities-owned equipment assets and includes an inspection program and a preventive maintenance program. LOTS conduct annual facilities inspections to ensure that maintenance needs can be adjusted over time.

LOTS plan special efforts to maintain passenger facilities (including bus shelters), as these facilities and respective assets are highly visible to the public. These efforts include but are not limited to regular garbage pick-up, graffiti-removal, and timely repair of shelter panels, whatever actions are necessary to ensure that facilities are clean and safe for customers.

Based on current facilities performance, LOTS have considered a variety of maintenance strategies to optimize facility conditions. LOTS will develop a list of facility maintenance companies for each component within their facilities to be prepared for any component issues. The goal is to shift the culture towards preventive maintenance (PM) and away from reactive maintenance, to include developing PM schedules by component, in accordance with maintenance plans developed during component purchase. Therefore, it will be important to update maintenance plans and require employees to follow them. LOTS will also prioritize PM and inspections for current components with low scores. Employee training will be an integral factor in improving facilities maintenance, so LOTS will strive for better training for maintenance workers. Additionally, LOTS aim to develop a 5-year plan to upgrade, change, and replace components and facilities to meet current and future needs.

6.4.3 FACILITY REPLACEMENT

LOTS plan for long-term replacement of any major facilities assets based on the typical life span for that asset. Planning for replacement of long term assets allows LOTS to anticipate large capital funding needs and prepare to apply for capital funding in advance of the replacement. This also includes planning for facility-related equipment such as fuel tanks, roofs, HVAC systems, etc.

After evaluating current facility performance and replacement strategies, the LOTS have identified areas of improvement. LOTS want to calibrate TERM Lite analysis, which may involve modifying and conducting more in-person inspections, prioritizing replacement based on the condition of resources, and modifying ULBs for some components. Additionally, LOTS want to identify common facilities and facilities component issues and the point in the life cycle that these issues typically occur, to share this information with other LOTS so they can address the issue in advance of failure.

6.4.4 FACILITIES DISPOSAL

Each LOTS maintains a policy for property disposal practices in compliance with FTA, MDOT MTA, and local government disposal requirements as applicable. The property disposal policy is also included in the LOTS maintenance program.

The LOTS have considered multiple facilities and facilities components disposal strategies to realize cost savings. One disposal strategy LOTS have identified is to sell facilities assets as-is.

7 WORK PLANS AND BUDGET FORECASTS

7.1 CAPITAL FUNDING LEVELS

MDOT MTA requests funding from the federal and state governments on behalf of the LOTS and is responsible for distributing the funds for LOTS capital projects through the ATP process. Table 18 shows historical total capital funding levels for Tier II providers from CY2015 – CY2017.

Table 18. Historical Capital Funding Levels (CY, YOE dollars)

Year	Capital Award Amount
2015	$11,054,698
2016	$11,329,089
2017	$15,650,039

Figure 10 provides the 20-year forecast for total capital funding collectively available to the LOTS. OLTS will provide the bulk of funding, but LOTS are also responsible for providing a 10 percent local match. Note that the amounts depicted in the forecast include the LOTS 10 percent local match and assume an annual inflation rate of 1.7 percent. As shown, based on historical funding, the projected average funding over the next 20 years is $28.5 million.

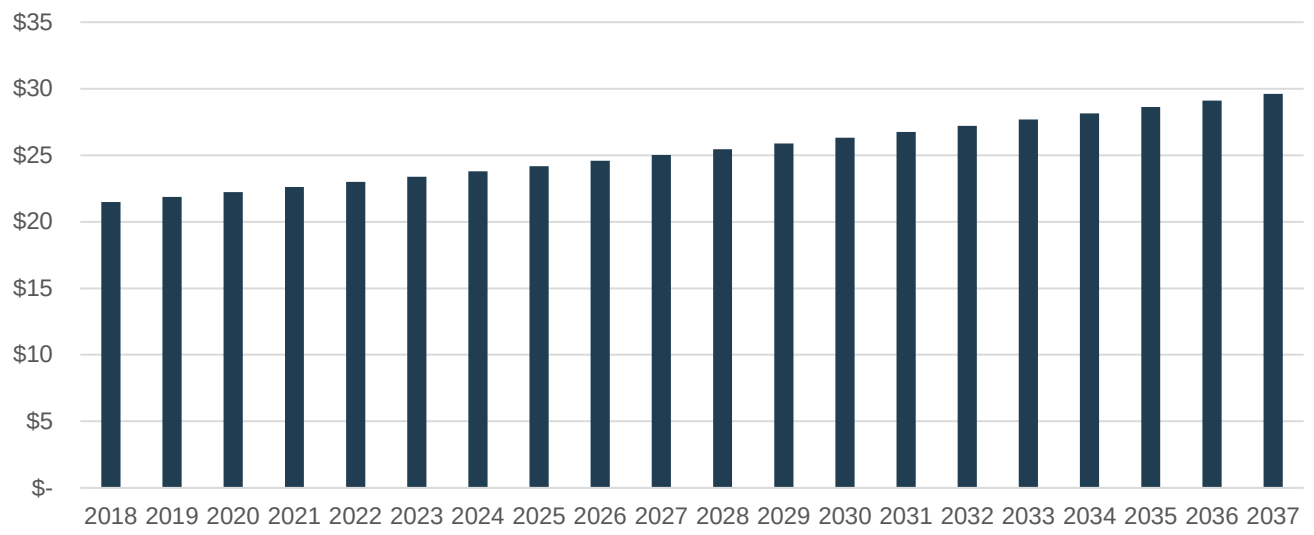


Figure 10. Projected Capital Funding Levels (CY, YOE dollars Millions)

7.2 FUNDING NEEDS AND SCENARIOS

In Chapter 4, asset condition indicated that the Tier II LOTS group has a backlog of $114.3 million of assets that are not in a state of good repair. The projected average investment need over the next 20 years to clear the backlog and maintain all assets in a state of good repair was determined to be $32.9 million. Figure 11 shows the unconstrained needs over the 20-year period with the projected funding based on historical funding levels. As shown, there are years where funding falls below the investment need and several years where projected funding

exceeds the need; however, the projected funding average of $28.5 million is less than the average need. Ultimately, in determining how to best manage the capital asset portfolio over the next twenty years, funding constraints must be considered.

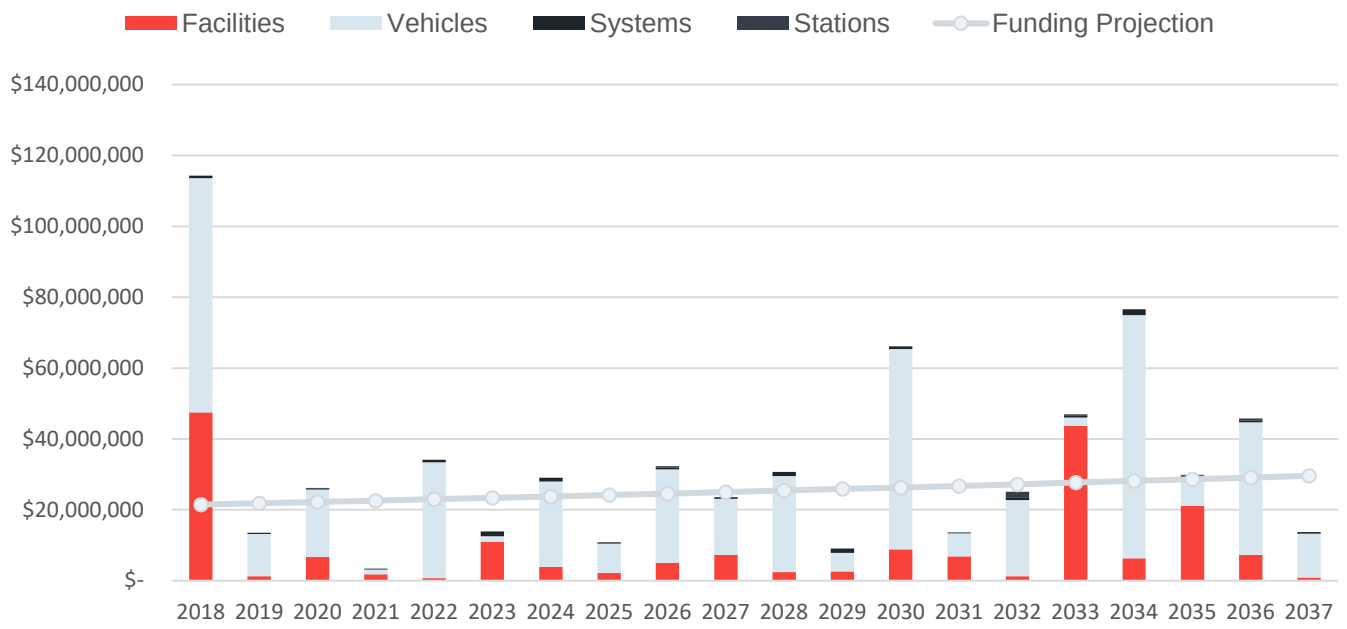


Figure 11. Twenty-Year Projected Needs and Funding

The funding projections presented here are based on historical funding levels, which in FY 2018 included an additional $5 million over the previous years as special purpose funding. MDOT MTA has considered three constrained funding scenarios to inform the capital asset management and investment prioritization process, which take the impact of the increased special purpose funding into consideration. The first scenario assumes that funding levels will be maintained at the increased level (i.e. historical norm plus $5 million); the second scenario assumes that funding levels return to the historical norm prior to the increased level; and the third scenario is a combination of both funding levels. Each scenario includes the 10 percent local match and an annual inflation rate of 1.7 percent in the annual funding levels.

Table 19 and Figure 12 summarize the scenarios. The purpose of this analysis is to understand the impacts of different funding assumptions on the SGR backlog for Tier II LOTS.

Table 19. Constrained Funding Scenarios Assumptions

Scenario	Funding Assumptions
Scenario 1	CY2018 Funding Level - $21.5 million
Scenario 2	CY2018 Funding Level - $15.1 million
Scenario 3	CY2018 – CY2022 Funding Level - $21.5 million (plus inflation) CY2023 Funding Level - $16.5 million

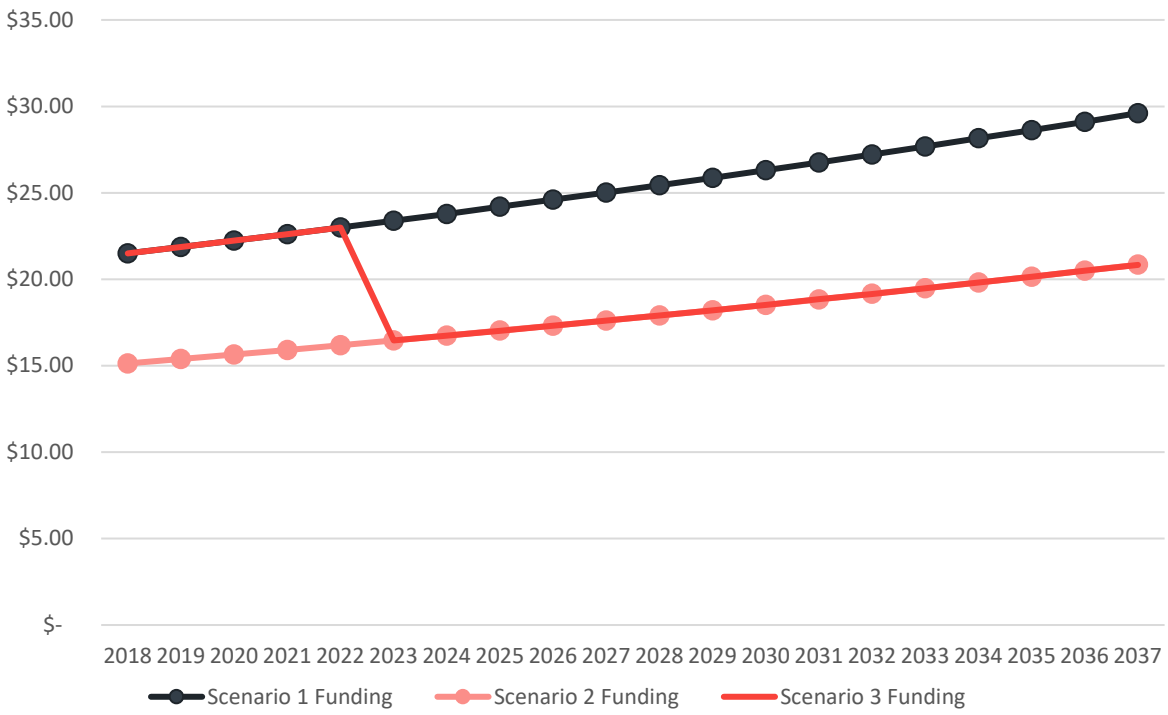


Figure 12. Scenario Analysis Funding Levels (CY, YOE dollars Millions)

The TERM Lite application was used to model the funding scenarios, incorporating a prioritization weighting system that determines how funding is allocated to each asset and asset category (Table 20).

Table 20. Investment Prioritization Weighting Assumptions

Factor	Weighting
Asset Condition	50%
Safety and Security	25%
Reliability	15%
Efficiency (O&M Cost Impact)	10%

7.2.1 SCENARIO 1

Scenario 1 assumes that the base funding level in CY2018 is $21.5 million, which is escalated 1.7 percent each year for an average annual funding of $25.3 million – this presents a $7.6 million gap from the average unconstrained need. In this case, the SGR backlog begins at $104.0 million in CY2017, reaches a minimum in 2030 ($62.4 million) and increases to $136.3 million by CY2037. Facilities' SGR backlog is responsible for most of the forecasted backlog, growing from $45.4 million in CY2017 to $110.0 million by the end of the forecast period. Vehicles is the only category whose backlog decreases over the forecast period. The vehicles SGR backlog is nearly eliminated in

CY2026 ($0.7 million), but grows to $20.3 million by CY2037 (from $58.1 million in CY2017). Figure 13 shows the forecasted SGR backlog by asset category for Scenario 1.

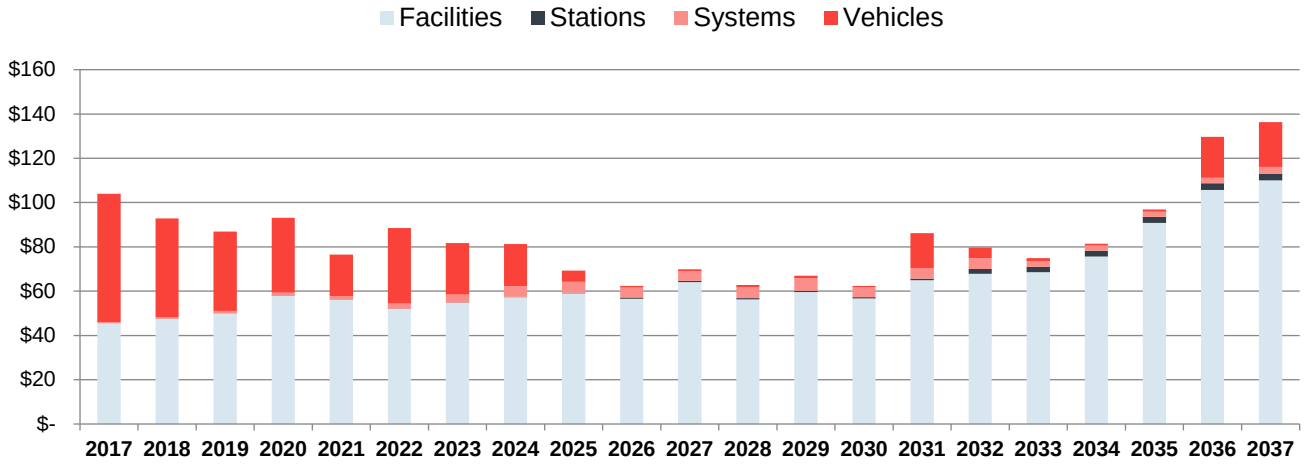


Figure 13. Backlog by Category, Scenario 1 (CY, YOE dollars Millions)

7.2.2 SCENARIO 2

The base funding level in CY2018 for Scenario 2 is $15.1 million, which is escalated 1.7 percent annually for an average annual funding of $17.8 million – this presents a $15.8 million gap from the average unconstrained need. The backlog grows more steadily in this scenario, from $104.0 million in CY2017 to $250.2 million in CY2037. Once again, the facilities category comprises most of the SGR backlog, growing from $45.4 million in CY2017 to $183.5 million in CY2037. The vehicles' SGR backlog decreases from $58.1 million to $53.0 million over the forecast period, with a minimum of $24.5 million in CY2029. Figure 14 shows the forecasted SGR backlog by asset category for Scenario 2.

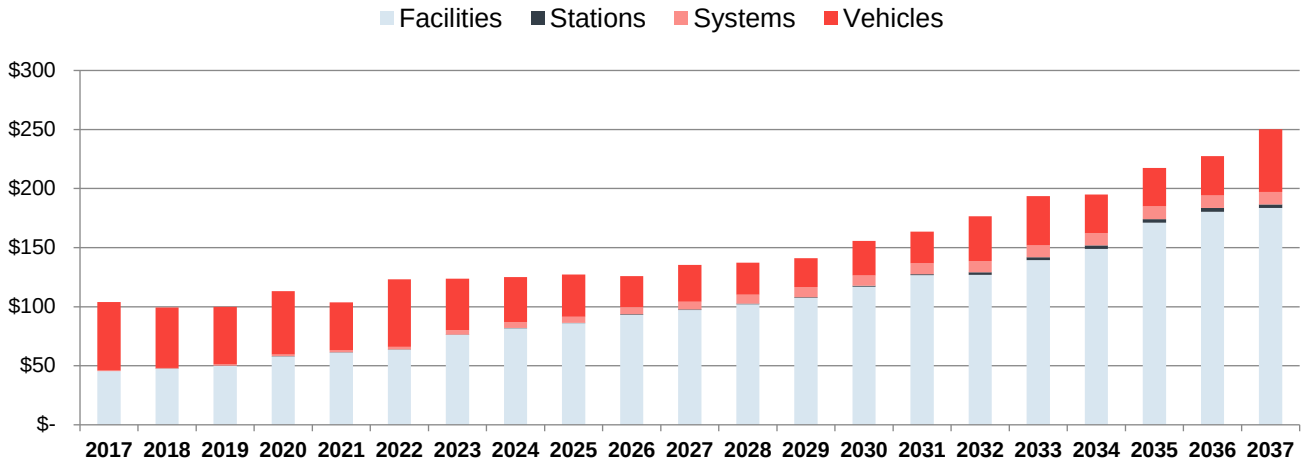


Figure 14. Backlog by Category, Scenario 2 (CY, YOE dollars Millions)

7.2.3 SCENARIO 3

In the third scenario, the initial funding level in CY2018 is $21.5 million (the same as Scenario 1), and is escalated by 1.7 percent until CY2022. In CY2023, the funding level is reduced to $16.5 million (equal to the funding level for this year in Scenario 2), and escalated by 1.7 percent through the end of the forecast period. For the 20-year period, the average annual funding is $19.5 million, which presents a $13.4 million gap from the average unconstrained need. In this case, the SGR backlog reaches its lowest point in CY2021 ($76.4 million) while still subject to Scenario 1 funding levels. By the end of the forecast period, the total SGR backlog is $242.2 million. Facilities SGR backlog grows from $45.4 million to $171.5 million and the vehicles SGR backlog reaches a minimum of $16.0 million in CY2026, but ultimately rises to $57.3 million by CY2037 (from $58.1 million in CY2017). Figure 15 provides the forecasted SGR backlog by asset category for Scenario 3.

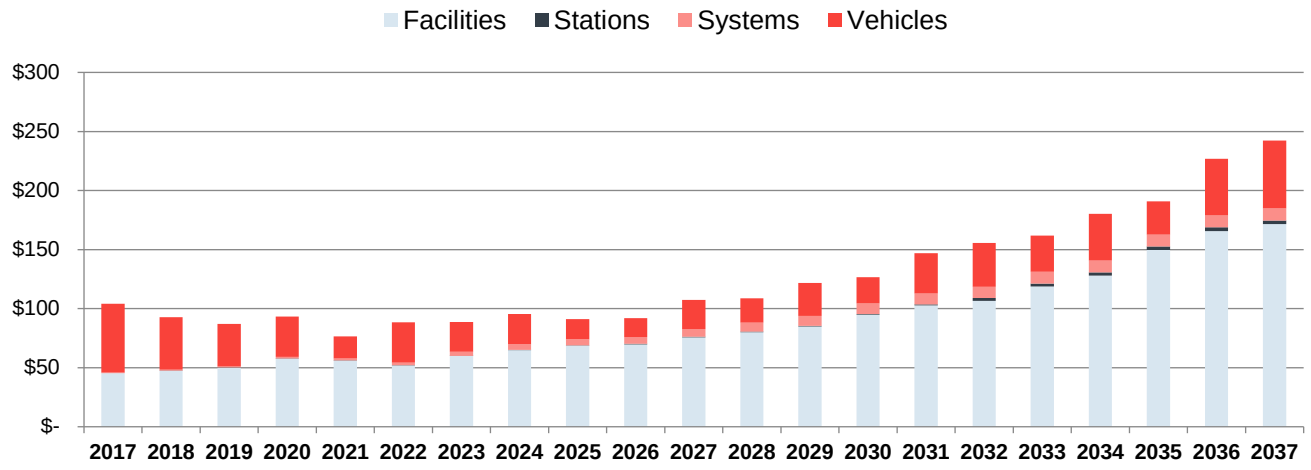


Figure 15. Backlog by Category, Scenario 3 (CY, YOE dollars Millions)

7.2.4 COMPARISON OF FUNDING SCENARIOS

Over the next 20 years, the total projected funding required to clear the Tier II LOTS SGR backlog is $658 million. The analysis has demonstrated that at current funding levels, it is impossible to completely clear the backlog. In fact, with funding maintained at current levels with inflation considered, the backlog is projected to grow from $104 million in 2017 to $136 million in Scenario 1, $250 million in Scenario 2, and $242 million in Scenario 3 over the twenty-year period (Figure 16).

Nonetheless, the results show that in the shorter-term (i.e. the next ten years), it is possible to control the backlog, slightly reducing it or maintaining it at a steady state with current funding levels. Table 21 provides a comparison of the total funding and resulting funding gap over the forecast period, for each scenario. Scenario 1 is the most favorable of the three scenarios with higher funding levels, which result in a lower funding gap relative to Scenarios

2 and 3. Ultimately, MDOT MTA has limited resources to put towards asset lifecycle management investments, and therefore must prioritize investments as is done through the ATP application and grantmaking process.

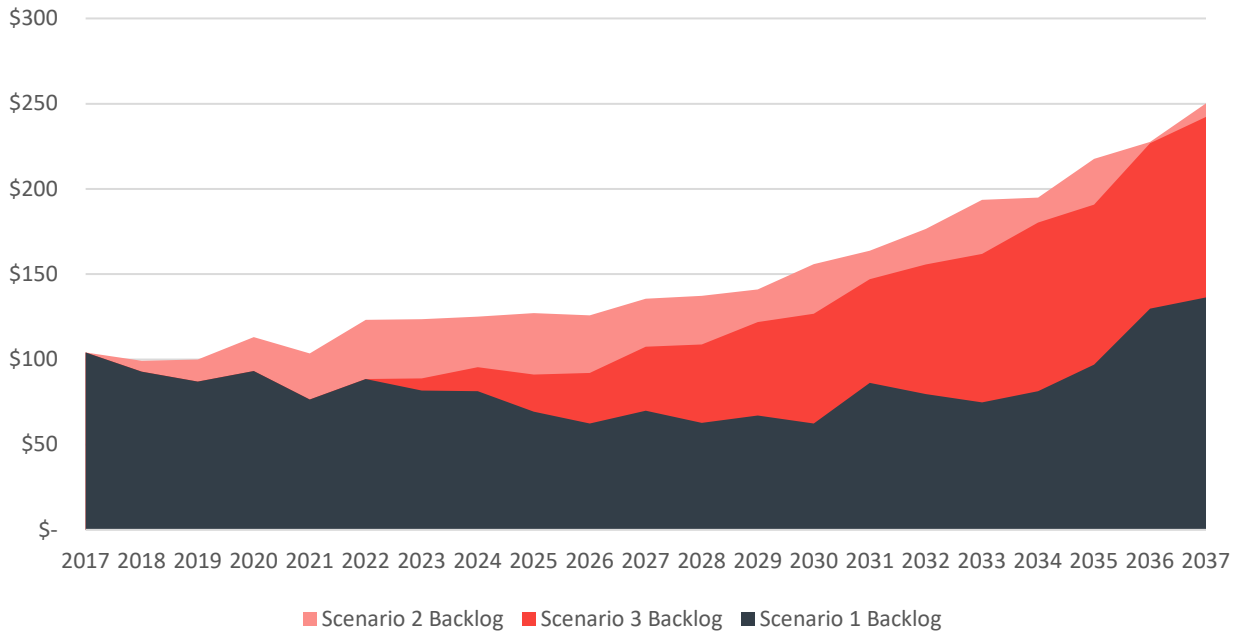


Figure 16. Scenario Analysis Backlog Growth (CY, YOE dollars Millions)

Table 21. Comparison of 20-Year Total Funding and Gaps (YOE dollars)

Scenario	Total Funding over 20 Years	Total Funding Gap over 20 Years
1	$507 million	$151 million
2	$357 million	$302 million
3	$390 million	$269 million

** Total 20-Year Need = $658 Million*

7.3 INVESTMENT PRIORITIZATION

Investment prioritization occurs on an annual basis for MDOT MTA and the Tier II LOTS through the ATP process. LOTS identify candidate projects for funding based on their knowledge of their asset base, and ideally, based on the performance data that is made available to them. As the agencies mature in their asset management, the output of the TERM Lite models will also be used to inform project identification.

Using the existing ATP process, MDOT MTA has selected to fund the following projects for FY0219. Total federal and state investment for these projects is $15.8 million.

Table 22. Selected Capital Investment Projects for FY 2019

LOTS	Project
Allegany County (Allegany County Transit)	Preventive Maintenance
	1 Small Bus Replacement
	1 Medium Bus Replacement
Annapolis (Annapolis Transit)	Preventive Maintenance
	2 Small Cutaway Bus Replacements
Anne Arundel County (Anne Arundel Transit)	2 Medium Bus Replacements
	Mobile Radios
Calvert County (Calvert County Transportation)	Preventive Maintenance
	1 Small Bus Replacement
Caroline/Kent/Talbot/Dorchester Counties (Delmarva Community Services)	Preventive Maintenance
	2 Gas Transmissions
	2 Gas Engines
	1 Medium Bus Replacement
Carroll County (Carroll Transit)	Preventive Maintenance
	3 Small Bus Replacements
Cecil County (Cecil Transit)	Preventive Maintenance
	1 Small Bus Replacement
	1 Medium Bus Replacement
Charles County (VanGo)	Preventive Maintenance
	5 Medium Bus Replacements
Frederick County (TransIT)	Preventive Maintenance
	3 Small Gas Cutaway Bus Replacements
Garrett County (Garrett Transit Services)	Preventive Maintenance
	2 Small Bus Replacements
Harford County (Harford Transit LINK)	Preventive Maintenance
	2 Medium Bus Replacements
Howard County (Regional Transportation Agency of Central Maryland)	2 Heavy Duty Bus Replacements
Queen Anne's County (County Ride)	Preventive Maintenance
	2 Small Cutaway Bus Replacements
St Mary's County (St. Mary's Transportation Services)	Preventive Maintenance
	3 Medium Bus Replacements
Somerset/Wicomico/Worcester Counties (Shore Transit)	Preventive Maintenance
	Mobility Management
	1 Small Bus Replacement
	2 Medium Bus Replacements

LOTS	Project
Town of Ocean City (The Beach Bus)	Preventive Maintenance
	Facility
Washington County (Washington County Transit)	Preventive Maintenance
	2 Medium Bus Replacements

8 ASSET MANAGEMENT ENABLERS

8.1 RESOURCE AND ACCESS PLAN

Generally, each of the Tier II LOTS included in this Group TAMP has a very small staff that supports their operations and all other functions. Selected staff (one or two per LOTS) represent each provider participating in the Group TAMP in asset management discussions which are centrally coordinated by OLTS at MDOT MTA. OLTS has an organizational structure that identifies Regional Planners (RP) responsible for coordinating with assigned LOTS throughout the year on all aspects of the planning process. Figure 17 shows the overall organizational structure at OLTS and Figure 18 shows the LOTS assigned to each RP. Within the group, one RP is appointed as the asset management lead and point of contact; however, almost all the OLTS staff are engaged in asset management activities from the asset inventory process through the ATP process.

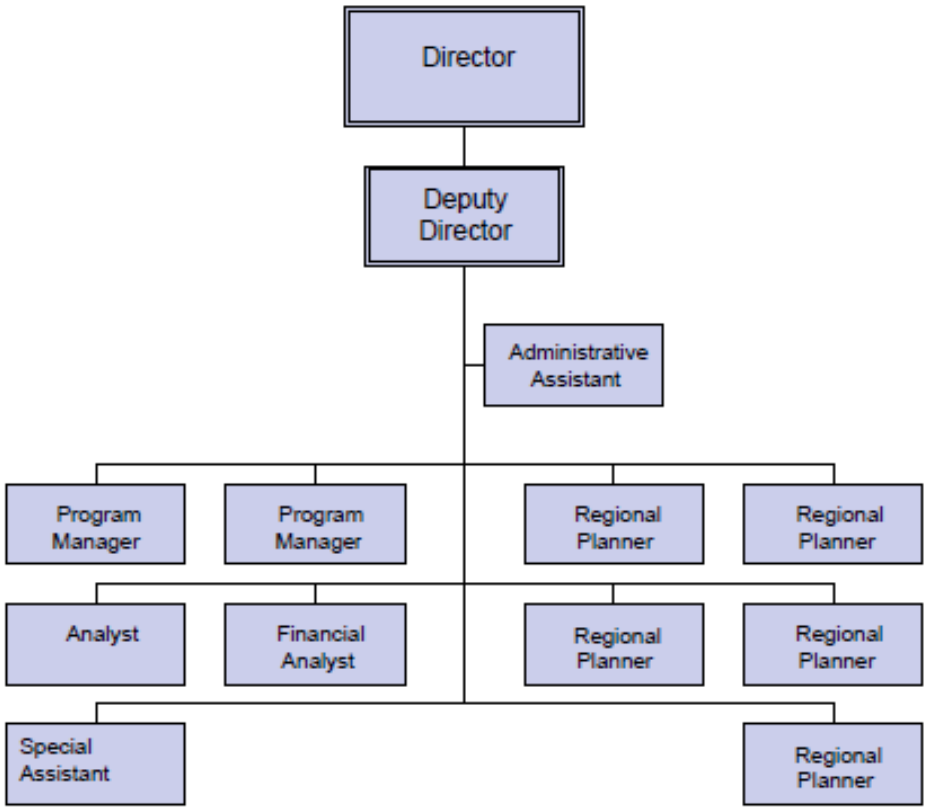


Figure 17. OLTS Organizational Structure

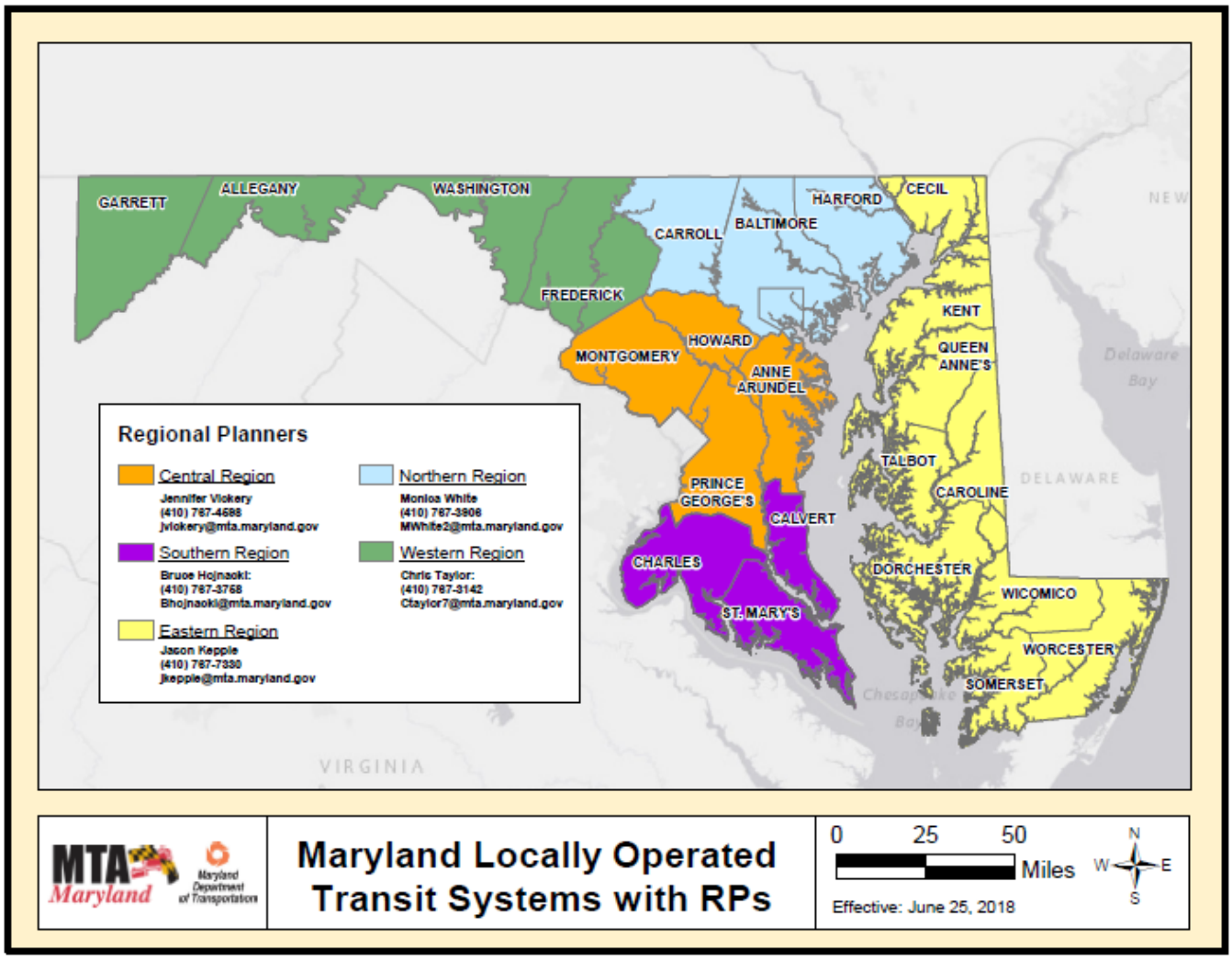


Figure 18. Regional Planner County (LOTS) Assignments

8.2 CORE BUSINESS PROCESSES

Federal regulations require the LOTS to collect and analyze asset inventory information to determine asset condition and establish performance measurement targets, inform capital investment prioritization strategies, and ultimately develop and update a plan (this TAMP) to meet asset performance targets. This asset management process provides strategies to plan for and coordinate all activities related to asset maintenance, rehabilitation, and replacement, from procurement through decommissioning, to ensure that the asset reaches its optimal useful life without sacrificing safety, reliability, or cost-efficiency. The asset management planning process must be implemented to feed into the existing core business processes that MDOT MTA and the LOTS use, improving processes as needed. This section describes those processes that inform or are informed by the asset management planning process.

8.2.1 ASSET INVENTORY AND CONDITION ASSESSMENT

Throughout the year, LOTS closely monitor their inventory to track the number of assets they own, asset replacement value, and asset condition. On an annual basis, LOTS are expected to submit their current inventory through Microsoft Excel based forms (referred to as Form 6, 6A, and 6B) which document all assets used in revenue service and the condition of those assets.

8.2.2 PERFORMANCE MEASUREMENT AND CONDITION ASSESSMENT

MDOT MTA monitors LOTS operational performance to ensure that resources are being used to efficiently deliver service, comply with federal and state requirements, assess service quality, and inform performance improvement initiatives. LOTS submit performance indicators to MDOT MTA using Form 2a, on a monthly, bimonthly, and/or quarterly basis. MDOT MTA has established operating performance standards based on service type which are updated as needed and based on a composite of peer agency performance nationwide.

Asset condition is primarily tracked based on the information provided by the LOTS in the inventory forms (Forms 6, 6A, and 6B) but projected using TERM Lite. For facilities, MDOT MTA is conducting the first round of physical facility condition assessments following the guidance provided in the FTA Facility Condition Assessment Guidebook, as well as MDOT MTA's Facility Condition Assessment Guidebook for LOTS.

8.2.3 TRANSPORTATION DEVELOPMENT PLAN

LOTS are required to develop and update TDP every five years to identify transportation needs of their service area, analyze the performance of their system, and recommend an implementation plan. The TDP is a critical document as it heavily influences the ATP each year and the budget produced in the TDP is used to comply with FTA requirements to maintain a financial plan. The TDP must be endorsed by local elected officials for the plan to be approved by MDOT MTA. Stakeholders in development of the TDP include: the LOTS, the local transportation advisory committee, the local planning department, and MDOT MTA. This group of stakeholders ensure that the TDP is well-coordinated with other local and state plans and feasible given current funding levels.

8.2.4 COUNTY MASTER PLAN

County Master Plans typically have a transportation component which includes transit. LOTS should engage in the development of their respective County Master Plans to ensure that transportation and transit are included and well-integrated with land use plans, that the transit component is compatible with the current TDP, and that the plan includes both local and regional opportunities. The Maryland Department of Planning (MDP) is the lead agency responsible for reviewing local plans such as the County Master Plan. Ultimately, MDOT is the lead agency responsible for reviewing the transportation element. Once MDOT's review is complete, the plan is forwarded to MDOT MTA through the RPs within OLTS for review of the transit element.

8.2.5 SAFETY PLAN

Federal legislation requires LOTS who receive federal funding through MDOT MTA to develop an agency safety plan that complies with federal requirements. The regulation implementing this legislative requirement is currently in proposed rule, or draft, form (49 CFR Part 673, Public Transportation Agency Safety Plan, published 2/5/2016). Until this rule is finalized, LOTS are subject to MDOT MTA requirements specified in the LOTS Manual Chapter 11, "Safety, Security, and Risk Management." The requirements follow the 2003 FTA Model Bus Safety and Security Program described under a Memorandum of Understanding among FTA, the American Public Transportation Association, the American Association of State Highway and Transportation Officials, and the Community Transportation Association of America. The core elements of a LOTS safety and security plan under the 2003 MOU Safety and Security Program include: a security program, driver/employee selection qualifications, driver/employee training requirements, vehicle maintenance plan and shop safety plan, drug and alcohol abuse program policies and procedures, and safety data acquisition and analysis. In preparation for publication of the FTA Agency Safety Plan final rule, LOTS agencies are developing draft safety plans that follow the Safety Management System framework and methodologies.

8.3 DECISION SUPPORT PROCESSES/TOOLS

To support the asset management process, MDOT MTA and the LOTS utilize several processes and tools to support decision making. Table 23 provides a summary of the tools and processes used to inform these critical decisions.

Table 23. Decision Support Processes and Tools Used in TAM Planning

Process/Tool	Description/Configuration	Owner
Inventory Forms	Forms in Microsoft Excel with VBA-enabled functionality. The LOTS use these forms to track asset inventory and condition.	MDOT MTA OLTS
Annual Transportation Plan Process	Forms in Microsoft Excel, not VBA-enabled. The LOTS use this form to make capital funding requests.	MDOT MTA OLTS
Project Prioritization Tool	Microsoft Excel tool that supports capital investment decision-making.	MDOT MTA OLTS
Transportation Development Plan (TDP) Process	A strategic plan to determine future needs. This plan is revised annually.	All LOTS
TERM Lite	Microsoft Access application used to forecast estimated capital funding needs for transit assets over an extended forecast period.	FTA-owned; made freely available to transit agencies
Facility Inspection Form & Process	This form documents repair items, and is completed by supervisors on a monthly to quarterly basis (depending on the LOTS).	Ocean City, Shore Transit
Local Transportation Committee	This committee has monthly meetings to gain input from elected officials on transportation priorities.	Ocean City

Process/Tool	Description/Configuration	Owner
Internal Budgeting Process	Budgeting process is used to determine what funds are available for transportation projects.	Harford County Calvert County Allegany County Baltimore City DOT
Transit Coordinating Council	Community Partners meet quarterly to discuss community transit needs.	Harford Transit LINK
First Vehicle Maintenance System Software	This software provides reports to track fleet maintenance costs.	Utilized by Howard County, owned by a third party
Vehicle Plan	This plan reports miles, condition, and use of fleet to inform adjustments to replacement cycles. These factors are updated annually, and the plan is reassessed every 5 years at a minimum.	Harford Transit LINK
Shore Transit Advisory Board	This committee includes members of the community who meet quarterly to provide input to the agency.	Shore Transit
Trapeze	Route configuration and reporting software.	Carroll County
Fleet Dynamics	This product is for PM scheduling and reporting, as well as tracking asset inventory.	Carroll County
Mileage and PM Spreadsheet	Microsoft Excel spreadsheet used to track mileage and PM intervals.	Cecil County
Repair and Condition Spreadsheet	Microsoft Excel spreadsheet used to track the cost of repairs and continually assess the condition of rolling stock.	Cecil County
Fleet Management Plan	An extensive spreadsheet that projects annual mileage, forecasts powertrain replacements, and eventual bus replacement. The plan covers a 10-year horizon.	Charles County Government
Farebox Replacement Plan	This plan tracks the replacement schedule for GFI Genfare equipment.	Charles County Government
Capital Improvement Program	Programming of capital items that need to be constructed and/or replaced. Departments submit programs or projects to one Capital Improvement Plan team, who will discuss and score based on approved criteria.	City of Annapolis Allegany County Baltimore MPO
Shah Transportation Software	This software is used to ensure efficient use of bus fleet.	DCS Inc.
Maintenance Inspection of Vehicle Disposal	An assessment to determine if any bus parts can be used in the spare parts inventory.	DCS Inc.
City Performance Measures	Performance measures used by the city to track system performance.	Baltimore City

9 CONTINUOUS IMPROVEMENT

MDOT MTA's existing process for LOTS' asset inventory and condition review and capital investment project prioritization follows an annual cycle (i.e. the ATP cycle). Accordingly, this Group TAMP will undergo minor revisions on an annual basis to reflect updates to the asset inventory and condition, and to reflect the next set of annual capital investments towards SGR. Following FTA regulations, the entire Plan will undergo a complete overhaul every four years to reflect the updated state of the assets, and to capture other key initiatives whose goal is to improve the overall asset management process towards an increased state of good repair.

9.1 KEY IMPROVEMENT INITIATIVES

MDOT MTA is exploring the feasibility of the following initiatives and actions to be taken over the four-year time horizon to continue to improve TAM for the LOTS.

Table 24. Key Initiatives to Improve LOTS Asset Management

Initiative	Description
Web-Based Asset Inventory Collection	Migrating the Excel-based data collection process to a web-based system.
Facility Asset Verification	Conducting an exercise to generate a more accurate inventory of LOTS facilities, ownership and capital responsibility, and equipment housed at each facility.
Refining Existing Asset Inventory	Reviewing the existing asset inventory data (except facilities) to remove duplicates and outdated assets, correct all errors, and improve the overall data quality.
Facility Physical Condition Assessment	Conducting physical condition assessments of all LOTS facilities to maintain compliance with FTA regulations.
Asset Inventory Standard Operating Procedures	Developing and documenting the asset inventory process to alleviate challenges related to knowledge transfer between old and new staff and maintain the integrity of the inventory process.
LOTS Asset Management Dashboard Improvements	Refining the LOTS Asset Management Dashboard and migrating the tool to a web-based platform that provides stakeholders with a view of asset inventory, condition, and performance on-demand.
Web-Based ATP Process	Migrating the Excel-based ATP application forms, and the project prioritization tool to a web-based platform that will allow automatic linking between forms to reduce the man-hours required to review ATP applications.

Initiative	Description
LOTS Risk Management Process Improvements	Phase 1: Updating the ATP forms to include risk management and safety questions that will allow the incorporation of these factors in ATP grant award decisions. Phase 2: Developing a full risk management information system and training LOTS and MDOT MTA staff to use it to continuously identify, manage, and monitor both asset management and safety risks.
Multi-Year Budgeting	Developing a process to allow MDOT MTA to budget for capital investment projects multiple years in advance.
OLTS Asset Management Manual	Developing a manual for MDOT MTA OLTS that documents all the steps involved in the annual asset management planning process, including the necessary processes to produce this asset management plan.
LOTS Asset Management Training Manual	Producing a manual that memorializes the training workshops and material provided to LOTS during the development of this Group TAMP to alleviate challenges related to LOTS staff turnover. This will include training videos.
Asset Management Resource and Competency Improvements	Exploring potential methods of providing additional resources at the MDOT MTA level, to improve asset management capabilities and competencies. Continue to provide training and technical assistance for the LOTS to expand their asset management capabilities and competencies.
Asset Management Knowledge Transfer	Establishing a platform to facilitate knowledge-sharing between the LOTS. The purpose of this platform is to enable LOTS to easily alert the communal group when faced with a common situation, to share challenges/issues or successes/solutions.

APPENDIX A: KEY DEFINITIONS

Accountable Executive

Defined by 49 U.S.C. Chapter 53 as a "single, identifiable person who has ultimate responsibility for carrying out the safety management systems of a public transportation agency; responsibility for carrying out transit asset management practices; and control or direction over the human and capital resources needed to develop and maintain both the agency's public transportation agency safety plan, in accordance with 49 U.S.C. 5329(d), and the agency's transit asset management plan in accordance with 49 U.S.C. 5326.

Asset (Definition Used by MDOT MTA Office of Finance: 2015)

Land, land improvements, buildings, building improvements, and capital equipment typically greater than $250 in value. Any high theft item or easily concealable item having a value under $250 may also be capitalized for their sensitive nature or issues. The term does not include materials, supplies, and non-capital equipment. *See definitions of Land Asset, Transit Asset, Safety-Critical Asset, and Systems Asset below for disambiguation.*

Transit Asset or Transit Capital Asset

A subset of the term "Asset." A depreciable physical Asset required to support transit service either directly or indirectly, including vehicles, stations, facilities, guideway and systems Assets, whether mobile or fixed. MDOT MTA's definition of Transit Asset can be aligned to the asset categories defined by 49 U.S.C. Chapter 53 for a Capital Asset as "a unit of rolling stock, a facility, a unit of equipment [that is nonexpendable, tangible property with a useful life of at least one year], or an element of infrastructure used for providing public transportation." Transit Assets do not include land, spare parts, or office furniture. *See definitions of Asset, Land Asset, and Safety-Critical Asset for disambiguation.*

Lifecycle

The time interval that begins with the acquisition of a Transit Asset or Land Asset, and ends with the disposal of the Transit Asset or Land Asset. Lifecycle phases may include planning, design, procurement, construction, operations, maintenance, rehabilitation, and asset replacement/disposal.

State of Good Repair (SGR)

Defined by 49 U.S.C. Chapter 53 as the "condition in which a [transit asset or] capital asset is able to [safely] operate at a full level of performance." The State of Good Repair is further defined by an asset's Useful Life Benchmark (for rolling stock and equipment) or physical condition (for facilities). Assets are considered in a State of Good Repair when they do not meet or exceed their ULB or physical condition threshold. Vehicle and equipment assets, for example, are considered in a State of Good Repair, when rated as a 2.5 or above on FTA's TERM Lite scale, where 2.5 is equivalent to the ULB set for an asset class. Additionally, facilities, are considered in a State of Good Repair when rated as a 3 or above on FTA's TERM scale. *Also, see definition for Useful Life Benchmark.*

State of Good Repair (SGR) Backlog

The cumulative dollar value of deferred capital maintenance and replacement needs.

TERM Scale

The five-category rating system used in the FTA's Transit Economic Requirement Model (TERM) to describe the condition of an asset, where 5 is excellent condition and 1 is poor condition.

TERM Lite

An MS Access-based decision tool provided by the FTA for estimating SGR Backlog, annual capital investment needs, current and future asset conditions, and capital investment priorities over a 20 to 30-year time horizon. TERM Lite produces these analyses for MDOT MTA based on the most complete and comprehensive Transit Asset inventory to-date.

Tier I Transit Provider

An entity that receives federal financial assistance under 49 U.S.C. Chapter 53, either directly from FTA or as a subrecipient, that owns, operates, or manages either (1) one hundred and one (101) or more vehicles in revenue service during peak regular service across all fixed route modes or in any one non-fixed route mode, or (2) rail transit.

Tier II Transit Provider

An entity that receives federal financial assistance under 49 U.S.C. Chapter 53, either directly from FTA or as a subrecipient that owns, operates, or manages (1) one hundred (100) or fewer vehicles in revenue service during peak regular service across all non-rail fixed route modes or in any one non-fixed route mode, (2) a subrecipient under the 5311 Rural Area Formula Program, (3) or any American Indian tribe.

Transit Asset Management (TAM)

Defined by 49 U.S.C. Chapter 53 as "the strategic and systematic practice of procuring, operating, inspecting, maintaining, rehabilitating, and replacing transit capital assets to manage their performance, risks, and costs over their lifecycles, for the purpose of providing safe, cost-effective, and reliable public transportation."

Transit Asset Management Plan (TAMP)

This document, which describes: the capital asset inventory; condition of inventoried assets; TAM performance measures, targets, and prioritization of investments aligned with the agency's TAM and SGR policy, strategic goals and objectives; as well as the strategies, activities, and resources required for delivering this plan (including decision support tools and processes); and other agency-wide approaches to continually improve TAM practices. While this TAMP exists as a standalone document, LMPs may be considered an extension of the TAMP by reference.

Useful Life

Defined by 49 U.S.C. Chapter 53 as "either the expected lifecycle of a capital asset or the acceptable period of use in service determined by FTA." It generally defines the minimum eligibility for retirement, replacement, or disposal of an asset.

Useful Life Benchmark (ULB)

Defined by 49 U.S.C. Chapter 53 as "the expected lifecycle or the acceptable period of use in service for a capital asset, as determined by a transit provider, or the default benchmark provided by FTA." The ULB is the realistic expectation for when an asset would be disposed or replaced based on operating environment and procurement timelines. It is not the same as "Useful Life" in FTA grant programs, is reported by age (in years), and usually only pertains to rolling stock or equipment. It is a single number shared for or within specified asset classes, although may vary across different asset classes and providers.