METRO

Transit Asset Management Plan

FY 2018

Policy Statement

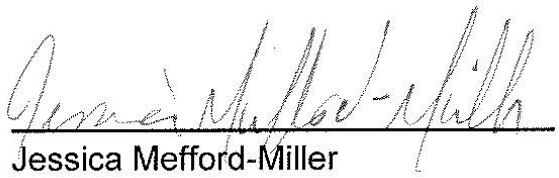
To communicate Metro's commitment to improve asset management, senior leadership policy statement makes the link between asset management and the agency's core mission, and outlines the approach and expected outcomes. The Leadership Team developed the following **asset management policy statement**.

Metro is committed to implementing a strategic process for acquiring, operating, maintaining, upgrading, and replacing its transit assets to directly support the organization's mission of providing safe and reliable public transportation services to the St. Louis Metropolitan region.

Our policy is to continue a culture that supports asset management at all levels of the organization and the elimination of information silos within the agency. It is also our policy to employ effective asset management business practices and tools, to ensure optimum asset performance through its useful life.

Metro's goal is to provide timely, quality data that is necessary to support a transparent and cost-effective decision-making model to obtain an optimal return on investment needed for resource allocation and asset preservation in order to operate in a maximum state of good repair.

Metro is committed to enhancing the capabilities of our exceptional personnel by providing coaching, training, innovative state-of-the-art technology and improved business processes. Metro will ensure our workforce's ability to identify and meet Metro's asset management needs, incorporate sustainability and accessibility into our business practices. In addition, Metro will deliver to its customers a safe, valuable and reliable service for all communities for tax dollars and funding sources.



Jessica Mefford-Miller
Executive Director Metro Transit
October, 2018

Approval

Transit Asset Management Plans are mandatory for all Federal Transit Administration (FTA) grantees per Moving Ahead for Progress in the 21st Century (MAP-21) legislation in 2012. Asset Management was also supported in the Fixing America's Surface Transportation (FAST) Act of 2015. Section 20019 of MAP-21 amended Federal transit law by adding a new section codified under 49 USC 5326. 49 Code of Federal Registers (CFR), Part 625 and 630 are final rule of the "Transit Asset Management". This rule implements the statutory requirements of 49 USC 5326 (b) and (c).

Furthermore, development of this Transit Asset Management Plan (TAM Plan) supports Metro's strategic objectives, ensuring Metro's and the St. Louis Regional Long-Range Transit Plan goals are met. The benefits from enhanced asset management practice include improved system safety and reliability, reduced costs, better customer service and optimized resource allocation. With aging infrastructure, limited funding and a growing demand for service, Metro desires to find ways to better manage and extend the life of existing critical assets, while optimizing its investment in new capital projects. This TAM Plan outlines Metro's strategic approach and specific actions to improve its asset management practices going forward.

The following signatories agree to support the TAM Plan.

Transit Asset Management Plan Revision 5 October 2018

Concurrence (By Executive Sponsors):

Jessica Mefford-Miller — Date
Executive Director Metro Transit

Darren Curry — 10-1-18 — Date
Chief Mechanical Officer
TAM Accountable Executive

Charles A. Stewart — 10/2/18 — Date
Vice President Pension & Insurance

Larry B. Jackson — 10/1/18 — Date
Executive Vice President

Scott Grott — 10/2/18 — Date
General Manager MetroLink

Mark Vago — 10/2/18 — Date
Senior Vice President
Chief Financial Officer

Tammy Fulbright — 10/1/18 — Date
Sr. Director of Financial
Planning & Treasury

Kathy Brittin — 10/1/18 — Date
Director of Risk Management

James Cali — 10/8/2018 — Date
Director Internal Audit

10/8/2018 — Date

I, John Nations, Metro President & Chief Executive Officer

Do fully authorize and endorse Metro's Transit Asset Management Plan, dated October 2018

1 Summary

The summary is a high level view of asset status. Details for the TAM program are in the following sections. Assets are grouped in the following manner and discussed in that order in the executive summary.

ROLLING STOCK		INFRASTRUCTURE	FACILITIES
Passenger Vehicles • *Bus* • *Van* • *LRV*	**Non-Revenue Service Vehicles** • *< 1 ton trucks* • *>1 ton trucks,* • *Trailers* • *Snow removal* • *Tugs & mules* • *Forklift* • *Off Road Vehicles*	**System Communication** • *LRT Communication (SCADA, PA, CCTV)* • RF Radio • Core IT Systems	**Maintenance** • *Ewing Y&S* • *29th St Y&S* • *Central* • *BW garage* • *II garage* • *DeB garage* • *DeB power house* • *Swansea* • *Sarah*
		Structures • Bridges • Tunnels • Ancillary Bridges • Ancillary Tunnels • Ancillary Culverts • Ancillary Retaining walls • Radio Towers	**Parking** • *Parking lots* • *Parking garages*
		Systems Guideway • *Traction power* • *Signal* • *Track*	**Passenger** • *Rail Stations* • *Transit Centers*
		Systems • *Fare collection* • *Security*	

A medium level view of the asset and asset class breakdown is found in the assets and conditions assessments sections. A list of all assets are listed in the referenced appendices. The appendix sections within each sub-asset group, are ordered by evaluation score and highlighted for sub-assets with a transit economic requirements models (TERM) score < 2.5. This graphical representation of sub-assets <2.5 provides

a deeper view of backlog that is missed when asset group performance scores are averaged.

Assets are evaluated against one of three systems:

- FTA's TAM Useful Life Benchmark (ULB) is vehicle age in years;
- The TERM scale ranges from 5 excellent or new to 1 poor.
- American Association of State Highway and Transportation Officials (ASSHTO) system. The condition ratings for these structures are reported on a scale of 0 to 9, with 0 defined as "Failed Condition" and 9 defined as "Excellent Condition", in accordance with the MetroLink Standard for Structures Inspection and Maintenance.

The scales are indicated on the summary tables. Scale systems are discussed later, in more detail.

All assets are included in the FY18 TAM Plan. However, not all asset groups have been evaluated to the same level of detail. The more detailed evaluation for the radio frequency, core IT systems, parking facilities including lots and garages, rail stations and transit centers will be completed by FY19-FY20.

The compilation of data for the TAM Plan generated the following observations.

1. In some cases, broader project scope is necessary due to obsolesce of parts and/or equipment. Asset repair, replacement, or refurbishment was not possible because the parts or equipment are no longer available in production or for purchase, or are cost prohibitive to specialty manufacture.
2. Metro's capital budget and financial view is a solid three year documented view. TAM Plan needs are of a 4 year financial horizon. As Metro develops their TAM Program by conducting TAM Plan revision, regular assessment of asset scores, and rolling out the Enterprise Asset Management (EAM) program, these actions will facilitate the development of a longer financial view. Ultimately, the goal view will be 25 years look ahead.
3. The TAM Plan could be organized and assets evaluated in a number of ways. There were many conversations as to how to present the required information. 49 CFR § 625 recognizes this also. TAM Plan reviews and revisions will make for the most useful TAM Program. Idea discussion and recommendation of change is encouraged.
4. This is a living document. TAM Plan and State of Good Repair conditions will be evaluated yearly starting the second week in July of each year. Updates will be

due to the TAM Department by the second week of August of each year. Updates will be tracked yearly.

5. The TAM Plan will be revised at a minimum, every 4 years with an option of as needed.

1.1 Rolling Stock-Passenger Vehicles

1.1.1 Bus

Metro has incorporated a long-range strategic replacement plan for its city transit buses. The plan calls for buses to be replaced at a 15 year interval. With current schedules, Metro should achieve that goal and replace 1/15 each year of the fleet by the year 2024. This will establish a consistent fleet age of 7.5 years and stabilize procurement costs. By increasing bus replacement interval to 15 years instead of the FTA required 12 years, Metro reduces bus replacement capital costs by 20%. Articulated Buses are 2001-04 model year however, they were refurbished and delivered in July 2014.

Bus	Performance Measures	2015	2016	2017	2018	2019 Goal	Trend
	LTD Cost Per Mile	$ 1.67	$ 1.50	$ 1.29	$ 1.31	$ 1.31	
	Avereage LTD Cost Per Vehicle	$ 32,854.42	$ 30,978.26	$ 31,760.76	$ 32,636.38	$ 32,636.38	
	Average Vehicle Availability	81.28%	80.30%	81.01%	100.00%	100.00%	
	On Time Performance	99.10%	99.02%	99.91%	99.09%	99.09%	
	Mean Distance for Failure	20,747	23,619	22,957	23,755	23,755	
	Average MPG	4.68	4.87	4.88	4.77	4.77	
	Road calls	1,010	898	935	910	910	
	Maintenance Hours Per Vehicle	374	347	339	327	327	
	Spare Ratio (Average)	18.71%	18.68%	18.73%	18.62%	18.62%	

Series	Number of Vehicles	Mileage	$ per mile	Years in Service	Cost = (LTD P&L /purchase price)	Cost per Mile (lifetime)	Performance	Safety (ABS & ATC, E stroke)	Reliability (Section Total)	Miles	AGE	Section Score	Condition Section 3	FTA Score
Bus														
2003-2055	26	819278.07	$ 0.81	18.0	$ 1.00	2.3	2.7	3.0	2.3	1.0	1.0	1.0	1.3	1.7
2070-2079	10	158973.60	$ 1.13	4.0	$ 2.10	1.1	2.1	3.0	2.1	3.0	3.0	3.0	2.8	2.5
2080-2086	7	69175.29	$ 1.15	3.0	$ 4.86	2.7	2.0	3.0	3.1	5.0	5.0	5.0	4.5	4.0
3137-3192	11	771374.18	$ 0.72	17.0	$ 1.00	3.0	3.1	3.0	2.5	1.0	1.0	1.0	1.4	1.8
3221-3279	13	764668.38	$ 0.78	15.0	$ 1.00	2.8	3.1	3.0	2.5	1.0	1.0	1.0	1.4	1.8
3401-3412	8	641885.13	$ 0.85	14.0	$ 1.00	2.3	2.1	3.0	2.1	1.0	1.0	1.0	1.3	1.6
3501-3526	26	475926.42	$ 0.81	10.0	$ 1.00	2.3	3.1	5.0	2.9	1.7	2.0	1.9	2.1	2.4
3601-3604	4	486590.00	$ 0.76	9.0	$ 1.00	2.5	3.1	5.0	2.8	1.8	3.0	2.4	2.5	2.6
3801-3859	50	342880.20	$ 0.72	7.0	$ 2.82	3.0	4.0	5.0	3.7	2.7	3.0	2.8	3.0	3.3
6601-6658	43	263641.28	$ 0.61	6.0	$ 4.02	3.8	4.0	5.0	4.2	3.3	4.0	3.6	3.8	3.9
6701-6757	51	250768.69	$ 0.57	5.0	$ 4.10	3.9	4.8	5.0	4.4	3.4	4.0	3.7	3.9	4.1
6801-6854	51	198730.76	$ 0.49	4.0	$ 4.75	4.3	3.8	5.0	4.5	4.0	4.0	4.0	4.1	4.3
6901-6954	47	134228.51	$ 0.43	3.0	$ 5.00	4.7	4.4	5.0	4.8	4.2	5.0	5.0	4.7	4.8
7001-7054	30	53266.00	$ 0.33	1.0	$ 5.00	4.7	4.4	5.0	4.8	4.2	5.0	5.0	4.7	4.8
7001-7054	30	2211.00	$ 0.00	0.0	$ 5.00	4.9	4.4	5.0	4.8	4.7	5.0	5.0	4.9	4.9
													Total	3.23
Artic Bus														
2201-2215	15	97809.07	$ 1.87	4.0	$ 3.47	1.0	1.0	5.0	2.6	4.0	3.0	3.5	3.3	3.01
													Total	3.01

1.1.2 Van

Metro had a 5 year contract to replace the paratransit vans. Orders have been delayed by the manufacturer and the van fleet has far exceeded its life expectancy on 70 of the 124 revenue vehicles. Metro is currently working to procure replacement vehicles and stabilize the replacement schedule for the paratransit vans.

Performance measures from 2015 to 2018 for vans are shown in the table below.

Paratransit Vans	Performance Measures	2015	2016	2017	2018	2019 Goal	Trend
	LTD Cost Per Mile	$ 0.89	$ 0.76	$ 0.68	$ 0.76	$ 0.76	
	On Time Performance	99.67%	99.27%	100.00%	99.83%	99.83%	
	Mean Distance for Failure	35,404	38,497	47,433	41,431	41,431	
	Average MPG	8.45	8.29	9.53	8.53	8.53	
	Road calls	170	138	121	143	143	
	Maintenance Hours Per Vehicle	453	400	358	444	444	

SERIES	Number of Vefiicles	MILEAGE	$ per mile	Years in Service	Cost = (LTD P&L /purchase price)	Cost per Mile (lifetime)	Performance	Safety (ABS & ATC, E stroke)	Reliability (Section Total)	Miles	AGE	Section Score	Condition Section 3
4330-4384	21	450311.03	$ 0.37	8.8	$ 1.00	$ 2.74	3.4	5.0	3.0	1.0	1.0	1.0	1.5
4401-4425	25	424590.40	$ 0.41	7.6	$ 1.00	$ 2.48	2.7	5.0	2.8	1.0	1.4	1.2	1.6
4430-4453	24	376307.52	$ 0.43	7.0	$ 1.00	$ 2.16	2.8	5.0	2.7	2.0	2.0	2.0	2.2
4501-4537	37	142,681.30	$ 0.31	4.0	$ 4.65	$ 3.32	1.5	5.0	3.6	4.0	5.0	4.5	4.3
4601-4617	17	47763.94	$ 0.19	2.0	$ 5.00	$ 4.65	1.3	5.0	4.0	5.0	4.0	4.5	4.3
Totals and Averages	124	252800.89	$ 0.34	5.29	$ 2.93	$ 3.06	2.1	5.0	3.3	2.9	3.2	3.1	3.1

1.1.3 LRV

Metro is developing a long range strategic replacement plan to replace one-third of its fleet every ten years which will meet the useful life of 31 years and establish an average fleet age of not more than 19 years. LRVs 1006, 1010, 1015,1018,1019,1023 will be retired August 1, 2018 into a contingency fleet. 16 of the LRV 1's 31 fleet will be end-of-life-rebuilt. The rebuild will add an additional 10 years of life.

LRV	Performance Measures	2015	2016	2017	2018	2019 Goal	Trend
	LTD Cost Per Mile	$ 0.92	$ 0.92	$ 0.74	$ 0.92	$ 0.92	
	Average Vehicle Availability	57.47%	62.06%	75.86%	75.86%	75.86%	
	On Time Performance	99.70%	99.78%	99.92%	99.92%	99.92%	
	Mean Distance for Failure	45,191	30,672	26,769	29,641	29,641	
	Road calls	171	192	215	213	213	
	Spare Ratio	11.49%	12.64%	16.09%	16.09%	16.09%	

The condition calculation is the number of remaining number of LRV useful life years times the FTA rating 5 (excellent) to 1 (scrap). The Useful life number is from FTA circular 5010.1E.

Performance measures from 2015 to 2018 for LRV are shown in the table below.

LRV Rollup								
LRV Series	Quantity	Year	Make	Model	FTA ULB Years	Age In Years	HOW MANY YEARS LEFT IN USEFUL LIFE FTA	Calculated Remaining Life Cycle Percentage Remaining
LRV 1	31	1992	Siemens	SD 400	31	26.08	4.9	16%
LRV 2	10	1999	Siemens	SD 400	31	19.08	11.9	38%
LRV 3	24	2000	Siemens	SD 400	31	18.50	12.5	40%
LRV 4	22	2004	Siemens	SD 400	31	24.08	6.9	22%
Total LRV - 87						21.93	9.1	29%

50% of the Mean Distance for Failure is due to 1000 series LRVs. DC propulsion and obsolesce of parts are the contributing failure factors. By moving the 1000 series fleet into the contingency fleet and refurbishing the LRVs, Mean Distance for Failure will improve.

1.2 Rolling Stock Non-Revenue Service Vehicles

Non-revenue service vehicles includes the following.

Sub Class	Factored ULB	Quantity FY 2018	Quantity Past ULB FY 2018	Replacement Backlog Cost FY 2018	FY 2016 Remaining life Cycle (Years)	FY 2017 Remaining life Cycle (Years)	FY 2018 Remaining life Cycle (Years)	FY 2019 Target
Over 1Ton	14 years	82	33	$2,224,719	No Data	1.9	2.2	3
Under 1 Ton	8 Years	216	122	$4,709,023	No Data	-2	-1.7	-0.6
Trailers	14 years	38	17	$153,514	No Data	2.4	2.2	3.2
Off-Road Equipment	14 years	57	23	$459,375	No Data	1.1	1.1	1.8
Forklifts	14 years	26	13	$126,812	No Data	1.8	2	2.4
TUG/Mule Vehicles	14 years	6	5	$296,199	No Data	-0.8	-0.8	-1.8
Snow Removal Equipment	14 years	45	3	$21,925	No Data	2.7	3.6	3.1

The target is to replace 1/15 of each heavy duty bus fleet yearly with a goal of $12,566,400 each year every year split between rolling stock and specialty equipment. Current funding is nearly three years behind. 210 light duty trucks and sedans will be sold. The 210 vehicles will be replaced with leased vehicles. Leased vehicles will not tracked in the TAM Program.

1.3 Infrastructure-System Communication

The communication group includes Light Rail Train (LRT) communication supervisory control and data acquisition (SCADA), public address (PA) and close circuit television (CCTV); radio frequency (RF) radio, and core information technology (IT) systems.

1.3.1 LRT Communication

LRT communication performance targets are listed below. The performance targets are TERM scale. As asset information was gathered, further delineation of sub-asset groups was made, thus some sub-assets did not have performance targets in FY17, but do in FY18. As the TAM Program develops, data history development will be collected and trend analysis will be collected. This will apply to all assets.

Performance Target	FY17 Achieved*	FY18 Achieved*	2 Year Average
SCADA/RTU	2.54	1.53	2.04
Public Address System PACIS	2.00	1.00	1.50
PAT - ET	2.95	3.05	3.00
TVM (Network only to TVM Bank)	3.00	3.05	3.03
CCTV	2.28	2.61	2.45
Fire Intrusion System	2.00	2.08	2.04
Cable Plant	3.00	2.59	2.80
Clock	No Data	3	3.00
CTS	No Data	2.54	2.54
IVS	No Data	2.00	2.00
Tunnel ventilation control system	No Data	3.00	3.00
UPS	No Data	1.30	1.30
Average	**2.53**	**2.31**	**2.56**
	FY19 Goal		**2.39**

The LRT communication FY18 performance target goal was 2.56, 2.31 was achieved. The performance target was not achieved due to the following:

1. The PA system wide performance rating was changed from a 2 to a 1 (in 2018) due to obsolescence of sound card use (SCU) sound card used is no longer available for purchase and is not repairable,
2. PA SCU operating system (Windows XP) is no longer supported by manufacturer.
3. Other systems not improved during the year due to lack of project money and/or project execution.
4. As the TERM scale evaluation process was applied, a better understanding as to correct use of TERM scores was gained. Scores became more accurate from FY17 to FY18.

The FY19 LRT communication performance target is 2.39 (average of all sub-assets). To reach the new performance goal, the Union Station Tunnel Rehab project will include the communication building relocation project which should improve many of the communication systems equipment located at Union Station including CCTV, CTS, emergency telephone/passenger assist telephone (ET/PAT), fire intrusion (FI), outside cable plant (OSP), SCADA, ticket vending machine (TVM), and uninterrupted power source (UPS).

Other projects include ET upgrade, PA system upgrade and emergency notification system addition at all rail stations. CCTV projects at all MetroLink stations and MetroBus facilities.

LRT communication backlog includes the following asset groups that average 2.5 or lower. Assets are discussed as an observation when the sub-asset is an average TERM score calculation >2.5 and there is a large group of assets <2.5 within the sub-asset. The LRT Communication-Rail System backlog is in order of priority. Sub-asset detail is presented in Appendix K.

LRT Communication-Rail Systems Backlog				
Unit		**Cost Estimation**	**TERM 1-5 SCALE**	**NOTES**
1	Public Address / Audio and Text	$ 2,950,000	1.00	See Appendix K
2	SCADA	$ 2,190,000	1.53	See Appendix K
3	UPS	$ 120,000	1.30	See Appendix K
4	IVS - Intelligent Video System (AGENT VI)	$ 300,000	2.00	See Appendix K
5	CTS (Channel Bank, SONET, XTRAN)	$ 1,875,000	2.54	See Appendix K
6	Fire Intrusion System	$ 347,000	2.08	See Appendix K
	TOTALS	$ 7,782,000		
	Sub-Asset Average > 2.5 - Observation			
7	CCTV Closed Circuit Television	$ 2,930,000	2.61	The sub-asset CCTV average is 2.61. 18 of the 41 CCTV have a rating of 2.0. See Appendix K. Funding for this is identified in a capital budget.
8	Outside Cable Plant	$ 18,520,000	2.59	The sub-asset outside cable plant average is 2.59. 19 of the 41 outside cable plant is a rating of 2.0. See Appendix K. This is not identified in a capital budget.

1.3.2 RF Radio & Core Information Technology (IT) Systems

The RF communication facilities, vehicle maintenance department (VMD) communication maintenance system and core IT systems asset evaluation was conducted in FY17. Findings were as follows.

RF Communication Facilities		
Location	**FY17 Achieved**	**FY17 Goal**
Antire	5.00	5.00
Ballas	5.00	5.00
DeBaliviere	3.00	3.00
Emerson Park	3.50	3.50
Florissant	4.00	4.00
Gray Summit	2.50	3.50
Harvester	5.00	5.00
High Ridge	2.50	3.50
Kirkwood	5.00	5.00
Manchester	5.00	5.00
Meramec	2.00	3.50
Shiloh-Scott	3.50	3.50
Shrewsbury	3.00	3.50
St Charles Co Highway	5.00	5.00
Stratman	5.00	5.00
RF Communications Facilities Totals		
Current Condition FY 17 Average		**3.90**
	Target	**4.20**

RF communication facilities Gray Summit, High Ridge and Meramec all have a TERM score of <2.5. At all three facilities, there is an agreement with Ameren for BSD to maintain the building and use the tower with the ability to upgrade the system asset. Upgrades have been conducted since FY17. All RF communication facilities assets will be evaluated with the TERM scale by FY20.

(VMD) Communications Maintenance Systems		
System	**FY17 Achieved**	**FY17 Goal**
RF Communications System (Voice)	4.62	4.00
RF/Network Communications System (Data)	4.09	4.00
RF/Network Communications System (Microwave)	4.00	4.00

(VMD) Communications Maintenance Systems		
System	**FY17 Achieved**	**FY17 Goal**
RF/Network Communications System Bus and CAR	1.00	0 (Pending Disposal)
(VMD) Communications Maintenance Systems Totals		
Current Condition FY17 Average		**3.4**
	Target	**4.00**

The RF/Network Communications System for Bus and CAR have been disposed of as of FY18. The RF communication facilities, VMD communication maintenance system and core IT systems assets will be evaluated to reflect the level of detail of the other assets. This will be completed by FY21.

1.4 Infrastructure-Structures

Infrastructure structures includes bridges, tunnels, ancillary bridges, ancillary tunnels, ancillary culverts, ancillary retaining walls and radio towers. These structures are evaluated in accordance with the MetroLink Standards for Structures Inspection and Maintenance. The condition rating scale of 0 to 9 is based on AASHTO's Manual for Bridge Evaluation.

1.4.1 Bridges

62 bridges with a total length of 27,542-ft are included in the asset inventory. The shortest bridge span length is 33.58-ft and the longest bridge is 4,514.75-ft. Due to the large variation in lengths across the bridge inventory, an average condition rating, or Performance Target Achieved, was calculated by using a weighted average by bridge length. Therefore, the average Deck, Superstructure, Substructure, and Channel/Banks ratings provided take into account the relative size of the bridge. The condition ratings for MetroLink bridges are reported on a scale of 0 to 9, with 0 defined as "Failed Condition" and 9 defined as "Excellent Condition", in accordance with the MetroLink Standard for Structures Inspection and Maintenance. These values are:

Infrastructures Bridges					
Total Number of Bridges =	62	Weighted Average Deck Rating =	7.0	FY19 Target Performance Rating (based on Inventory Age) =	5.8
Total Length of Bridges (ft.) =	27,542	Weighted Average Superstructure Rating =	6.7	Minimum Target Performance Rating =	6.0
Total Replacement Cost =	$1,176,983,000	Weighted Average Substructure Rating =	6.8		

Infrastructures Bridges					
		Weighted Average Channel/Banks Rating =	6.7		
		Weighted Average Inventory Age (yrs.) =	40		

The FY18 Performance Target for Bridges was calculated to take into account the current average age of the bridge inventory and the expected condition rating based on a 75-year service life. When a structure is new, it is expected to have a condition rating of 9, or “Excellent Condition”. At the end of a structure’s service life of 75-yrs, it is assumed the structure is still in use, but is in need of immediate rehabilitation or replacement, which equates to a condition rating of 3 (Serious Condition). In 2018, the average age of the 62-bridge inventory, weighted by bridge length, is 40 years. At 40 years into a bridge’s service life, this results in a target condition rating of 5.8 on a straight rating scale from 9 to 3. However, as the overall age of the bridge inventory increases, this target condition rating decreases. Therefore, in order to regulate capital expenditures and avoid replacement of all same-aged structures at the same time in the future, a minimum target condition rating of 6, or “Satisfactory Condition”, should be established. This overall minimum target rating, at any point in time, should ensure that the entire system is maintained to a safe level.

While 95% of the MetroLink bridges are ≤ 37.5 years old, which equates to the minimum target rating of 6, it should be noted that 2 bridges included in the inventory have already exceeded their useful service life of 75 years. Skinker Boulevard Bridge is still in service at 78 years, and is planned to be rehabilitated by 2021 to extend its useful service life an additional 20 years. The historic Eads Bridge over the Mississippi River, at 4,514.75-ft, is still in service at 144 years, and will continue to be maintained to preserve its condition.

The weighted average rating of deck, superstructure, substructure, and channel/banks in comparison to either the FY19 Target Performance Rating or the minimum target performance rating, indicate a rating in a positive state of good repair. The condition ratings for two of the Cross County tunnels and associated stations are tracking lower than expected based on their current age, due to water infiltration and premature aging. Metro plans to address the water infiltration issues with capital projects to be completed over the next 5 to 10 years.

The bridge information is presented in the structure’s Appendix N.

1.4.2 Tunnels

The condition ratings for MetroLink tunnels are reported on a scale of 0 to 9, with 0 defined as “Failed Condition” and 9 defined as “Excellent Condition”. The FY19 Performance Target for Tunnels was calculated to take into account the current average age of the tunnel inventory and the expected condition rating based on a 75-year service life. When a structure is new, it is expected to have a condition rating of 9, or “Excellent Condition”. At the end of a structure’s service life of 75 years, it is assumed the structure is still in use, but is in need of immediate rehabilitation or replacement, which equates to a condition rating of 3 (Serious Condition). In 2018, the average age of the 7-tunnel inventory, weighted by length, is 65 years. At 65 years into its service life, this results in a target condition rating of 3.8 on a straight rating scale from 9 to 3. However, as the overall age of the tunnel inventory increases, this target condition rating decreases. Therefore, in order to regulate capital expenditures and avoid replacement of all same-aged structures at the same time in the future, a minimum target condition rating of 6, or “Satisfactory Condition”, should be established. This overall minimum target rating, at any point in time, should ensure that the entire system is maintained to a safe level. Summary of tunnels is listed below.

Tunnels			
Total Number of Tunnels =	7	Weighted Average Tunnel Rating =	5.6
Total Length of Tunnels (ft.) =	12,568	Weighted Average Inventory Age (yrs.) =	65
Total Replacement Cost =	$304,288,000	FY19 Target Performance Rating (based on Inventory Age) =	3.8
		Minimum Target Performance Rating =	6.0

While 5 of the 7 MetroLink tunnels are ≤ 37.5 years old, which equates to the minimum target rating of 6, it should be noted that 2 tunnels have already exceeded their useful service life of 75 years. Union Station Tunnel is still in service at 116 years. With an overall condition rating of 3, this tunnel is planned to be replaced by 2020. The historic Downtown Tunnel, still in service at 142 years, is planned to be rehabilitated by 2022 in order to extend its service life. When these 2 projects are complete, it is expected that the current weighted average tunnel inventory rating of 5.6 will increase to meet the minimum target performance rating of 6 to indicate a rating in a positive state of good repair.

1.4.3 Ancillary Structures

Metro’s Ancillary Structures include 9 pedestrian and off-system bridges, 1 pedestrian tunnel, 81 culverts, and 378 retaining walls. The condition ratings for these structures

are reported on a scale of 0 to 9, with 0 defined as “Failed Condition” and 9 defined as “Excellent Condition”, in accordance with the MetroLink Standard for Structures Inspection and Maintenance. Bridges are rated using four separate categories, as applicable to each bridge, including Deck, Superstructure, Substructure, and Channel/Banks. Culverts are rated using 3 separate categories, including Culvert, Channel, and Banks. All other structures have a single condition rating.

Due to the large variation in lengths across this ancillary structure inventory, an average condition rating, or Performance Target Achieved, was calculated by using a weighted average by length. Similarly, a weighted average inventory age was calculated for each structure type to account for relative length.

The FY19 Performance Target was calculated to take into account the current average age of the Ancillary Structure inventory and the expected condition rating based on a 50-year service life. When a structure is new, it is expected to have a condition rating of 9, or “Excellent Condition”. At the end of a structure’s service life of 50-yrs, it is assumed the structure is still in use, but is in need of immediate rehabilitation or replacement, which equates to a condition rating of 3 (Serious Condition).

However, as the overall age of the bridge inventory increases, this target condition rating decreases. Therefore, in order to regulate capital expenditures and avoid replacement of all same-aged structures at the same time in the future, a minimum target condition rating of 6, or “Satisfactory Condition”, should be established. This overall minimum target rating, at any point in time, should ensure that the entire system is maintained to a safe level.

To summarize each structure type within the Ancillary Structure group:

Ancillary Structure Bridges, Tunnels, Culverts and Retaining Walls				
	Bridges	**Pedestrian Tunnels**	**Culverts**	**Retaining Walls**
Total Number	9	1	81	378
Total Length (ft.)	1,233	47	7,082	117,551
Weighted Average Inventory Age (yrs.)	33	18	20	16
Weighted Average Bridge Deck /Tunnel/ Culvert/ Retaining Wall Rating	6.4	8.0	6.9	6.6
Weighted Average Bridge Superstructure Rating	6.6	N/A	N/A	N/A
Weighted Average Bridge Substructure Rating	6.8	N/A	N/A	N/A
Weighted Average Bridge Channel/Banks Rating	6.8	N/A	N/A	N/A
Weighted Average Culvert Channel Rating	N/A	N/A	7.1	N/A
Weighted Average Culvert Banks Rating	N/A	N/A	7.3	N/A
FY19 Target Performance Rating (based on Inventory Age)	5.0	6.8	6.6	7.1
Minimum Target Performance Rating	6.0	6.0	6.0	6.0

The weighted average condition ratings for ancillary bridges, tunnels, and culverts all exceed the FY19 Target Performance Rating and Minimum Target Performance Rating. However, the weighted average retaining wall ratings are tracking below the FY19 Target Performance Rating based on the weighted age of this inventory, but still above the Minimum Target Performance Rating. Therefore, repairs or replacement of the lower-rated walls will be necessary to maintain an overall condition rating above the minimum target rating of 6.0. In addition, 166 walls have recently been added to the overall inventory, but only 48 walls remain to be inspected and rated. This remaining inventory, or 13% of the total, makes up the current FY19 inspection backlog. This backlog is expected to be eliminated over the next year.

1.4.4 Radio Towers

6 Radio Towers have recently been added to the MetroLink Structures Inspection Program, with a defined routine inspection frequency and schedule. The towers had been previously inspected, but not formally documented. Therefore, an inspection backlog exists in FY19, but is expected to be eliminated over the course of 4 years.

In FY17, radio towers TERM score were as follows:

Radio Towers (Estimated)		
Location	**FY 17 TERM**	**FY17 TERM Target Goal**
Belleville-Memorial	4	4
Emerson Park	4	4
DeBaliviere	3	3
Shiloh-Scott	3	3
Shrewsbury	4	4
Meramec Tower on Ameren property	NA	NA
Radio Tower Facilities Totals		
Current Condition Average		**3.6**
	Target	**3.6**

The Meramec Tower has been recently added to the tower list. There is no data at this time. Condition is estimated based on current available documentation initial assessment is ongoing. Asset evaluation will be included in the inspection backlog work.

1.5 Infrastructure-System Guideway

System guideway includes traction power, signal and track.

1.5.1 Traction Power

The FY18 Traction Power performance TERM scale target achieved was 3.53. There was no FY18 performance target goal because this was the first year of Traction Power asset evaluation. The FY19 performance target goal is 3.84.

Traction Power Performance Targets				
Parent Unit Name	**FY17 TERM Score Achieved***	**FY18 TERM Score Achieved***	**FY18 TERM Goal**	**FY19 TERM Goal**
TP-MO1SUBSTATION	No Data	3.36	No Data	3.91
TP-MO2SUBSTATION	No Data	3.09	No Data	3.91
TP-MO4SUBSTATION	No Data	3.09	No Data	3.91
TP-MO5SUBSTATION	No Data	3.09	No Data	3.91
TP-MO6SUBSTATION	No Data	3.09	No Data	3.91
TP-MO7SUBSTATION	No Data	3.09	No Data	3.91
TP-MO8SUBSTATION	No Data	3.09	No Data	3.91
TP-MO9SUBSTATION	No Data	3.09	No Data	3.91
TP-MO10SUBSTATION	No Data	3.09	No Data	3.91
TP-MO11SUBSTATION	No Data	3.09	No Data	3.91
TP-MO12SUBSTATION	No Data	3.09	No Data	3.91
TP-IL1SUBSTATION	No Data	3.09	No Data	3.91
TP-IL2SUBSTATION	No Data	3.65	No Data	3.65
TP-IL3SUBSTATION	No Data	3.70	No Data	3.70
TP-IL4SUBSTATION	No Data	3.70	No Data	3.70
TP-IL5SUBSTATION	No Data	3.70	No Data	3.70
TP-IL6SUBSTATION	No Data	3.70	No Data	3.70
TP-IL7SUBSTATION	No Data	3.70	No Data	3.70
TP-IL8SUBSTATION	No Data	3.70	No Data	3.70
TP-IL9SUBSTATION	No Data	3.70	No Data	3.70
TP-IL10SUBSTATION	No Data	3.70	No Data	3.70
TP-IL11SUBSTATION	No Data	3.70	No Data	3.70
TP-IL12SUBSTATION	No Data	3.70	No Data	3.70
TP-IL13SUBSTATION	No Data	3.70	No Data	3.70
TP-IL14SUBSTATION	No Data	3.70	No Data	3.70
TP-MO21SUBSTATION	No Data	4.00	No Data	4.00
TP-MO22SUBSTATION	No Data	4.00	No Data	4.00
TP-MO23SUBSTATION	No Data	4.00	No Data	4.00
TP-MO24SUBSTATION	No Data	4.00	No Data	4.00
TP-MO25SUBSTATION	No Data	4.00	No Data	4.00
TP-MO3SUBSTATION	No Data	4.00	No Data	4.00
Total / Averages		**3.53**	No Data	**3.84**

* Achieved is the average of all sub-class assets.

The traction power backlog includes the following asset groups that average <2.5 or lower. No assets are discussed as an observation because all other assets are above a TERM scale 3.0. Sub-asset detail is presented in Appendix U. The linear overhead catenary system (OCS) asset is not included in the FY18 TAM Plan. The traction power systems backlog is in order of priority. The traction power backlog is as follows:

Traction Power Systems Backlog				
Unit		Cost Estimation	TERM 1-5 SCALE	Notes
1	TP-MO1ACBreaker	$19,283.00	2	See Appendix U
2	TP-MO2ACBreaker	$19,283.00	2	See Appendix U
3	TP-MO4ACBreaker	$19,283.00	2	See Appendix U
4	TP-MO5ACBreaker	$19,283.00	2	See Appendix U
5	TP-MO6ACBreaker	$19,283.00	2	See Appendix U
6	TP-MO7ACBreaker	$19,283.00	2	See Appendix U
7	TP-MO8ACBreaker	$19,283.00	2	See Appendix U
8	TP-MO9ACBreaker	$19,283.00	2	See Appendix U
9	TP-MO10ACBreaker	$19,283.00	2	See Appendix U
10	TP-MO11ACBreaker	$19,283.00	2	See Appendix U
11	TP-MO12ACBreaker	$19,283.00	2	See Appendix U
12	TP-IL1ACBreaker	$19,283.00	2	See Appendix U
13	TP-MO1BatteryBKCHGR	$20,000.00	2	See Appendix U
14	TP-MO2BatteryBKCHGR	$20,000.00	2	See Appendix U
15	TP-MO4BatteryBKCHGR	$20,000.00	2	See Appendix U
16	TP-MO5BatteryBKCHGR	$20,000.00	2	See Appendix U
17	TP-MO6BatteryBKCHGR	$20,000.00	2	See Appendix U
18	TP-MO7BatteryBKCHGR	$20,000.00	2	See Appendix U
19	TP-MO8BatteryBKCHGR	$20,000.00	2	See Appendix U
20	TP-MO9BatteryBKCHGR	$20,000.00	2	See Appendix U
21	TP-M10BatteryBKCHGR	$20,000.00	2	See Appendix U
22	TP-M11BatteryBKCHGR	$20,000.00	2	See Appendix U
23	TP-M12BatteryBKCHGR	$20,000.00	2	See Appendix U
24	TP-IL1BatteryBKCHGR	$20,000.00	2	See Appendix U
25	TP-MO1138KVSCswitch	$8,345.00	2	See Appendix U
26	TP-MO2138KVSCswitch	$8,345.00	2	See Appendix U
27	TP-MO4138KVSCswitch	$8,345.00	2	See Appendix U
28	TP-MO5345KVSCswitch	$8,345.00	2	See Appendix U
29	TP-MO6345KVSCswitch	$8,345.00	2	See Appendix U

Traction Power Systems Backlog				
Unit		Cost Estimation	TERM 1-5 SCALE	Notes
30	TP-MO7345KVSCswitch	$8,345.00	2	See Appendix U
31	TP-MO8345KVSCswitch	$8,345.00	2	See Appendix U
32	TP-MO9345KVSCswitch	$8,345.00	2	See Appendix U
33	TP-MO10345KVSCswitch	$8,345.00	2	See Appendix U
34	TP-MO11345KVSCswitch	$8,345.00	2	See Appendix U
35	TP-MO12345KVSCswitch	$8,345.00	2	See Appendix U
36	TP-IL1345KVSCswitch	$8,345.00	2	See Appendix U
Totals		**$ 451,396.00**	**2.00**	

Battery banks have funding secured in a grant. The first order of batteries has been placed. Estimated completion is FY2020. The battery life span of 15 years has been exceeded by 10 years.

AC breaker replacement project funding has been requested and is awaiting funding. Replacement is ongoing and challenging. The AC breaker is moving into a part-of-obsolesces. If the current AC breaker part cannot be located, a new AC breaker part will be need to be selected. Project completion is targeted for FY19.

The first S&C switch is being installed at MO5 and was added into the feeder wire replacement project. The S&C switch has exceeded its life span is 20 years.

1.5.2 Signal

The FY18 signal performance TERM scale target achieved was 3.49. There was no FY18 performance target goal because this was the first year of signal asset evaluation. The FY19 performance target goal is 4.52.

To understand the signal naming convention, please refer to the Appendix V. Hierarchy of asset is developed to support tracking in the EAM system.

Performance Target	FY17 TERM Score Achieved*	FY17 TERM Goal	FY18 TERM Score Achieved*
SIG-I70	No Data	No Data	2
SIG-RH3	No Data	No Data	2
SIG-RH4	No Data	No Data	2
SIG-RH6	No Data	No Data	2
SIG-RH5	No Data	No Data	2.07
SIG-RH2	No Data	No Data	2.09
SIG-RH7	No Data	No Data	2.09
SIG-RH1	No Data	No Data	2.14
SIG-AM	No Data	No Data	2.65
SIG-RY	No Data	No Data	2.73
SIG-CL	No Data	No Data	2.89
SIG-BV	No Data	No Data	2.9
SIG- SC	No Data	No Data	2.93
SIG-FI	No Data	No Data	3.09
SIG-SB	No Data	No Data	3.09
SIG-FM	No Data	No Data	3.12
SIG-HLB	No Data	No Data	3.12
SIG-EPA	No Data	No Data	3.2
SIG-EPB	No Data	No Data	3.46
SIG-HLA	No Data	No Data	3.54
SIG-RF	No Data	No Data	4
SIG-YD	No Data	No Data	4.1
SIG-BB	No Data	No Data	4.12
SIG-DB	No Data	No Data	4.14
SIG-BW	No Data	No Data	4.15
SIG-ET	No Data	No Data	4.16
SIG-FPB	No Data	No Data	4.18
SIG-SUNNEN	No Data	No Data	4.2
SIG-TU	No Data	No Data	4.21

Performance Target	FY17 TERM Score Achieved*	FY17 TERM Goal	FY18 TERM Score Achieved*
SIG-LL	No Data	No Data	4.22
SIG-FPA	No Data	No Data	4.24
SIG-WM	No Data	No Data	4.24
SIG-PK	No Data	No Data	4.25
SIG-UNION	No Data	No Data	4.25
SIG-GR	No Data	No Data	4.46
SIG-NH	No Data	No Data	4.63
SIG-PA	No Data	No Data	4.64
SIG-CWE	No Data	No Data	4.65
SIG-UM	No Data	No Data	4.75
SIG-RR	No Data	No Data	4.75
Signal Performance FY18			3.49
	Target FY19		**4.52**

* Achieved is the average of all sub-class assets.

The signal backlog includes the following asset groups that average 2.5 or lower. Assets are discussed as an observation when the sub-asset is an average TERM score calculation >2.5 and there is a large group of assets <2.5 within the sub-asset. Sub-asset detail is presented in Appendix V. The signal backlog is in order of priority. The signal backlog is as follows:

Signal-Rail Systems Backlog				
Unit		**Cost Estimation**	**TERM 1-5 SCALE**	**Notes**
1	SIG-I70	$ 91,722.00	2.00	See Appendix V
2	SIG-RH3	$ 82,170.00	2.00	See Appendix V
3	SIG-RH4	$ 164,904.00	2.00	See Appendix V
4	SIG-RH6	$ 131,472.00	2.00	See Appendix V
5	SIG-RH5	$ 367,574.00	2.07	See Appendix V
6	SIG-RH2	$ 332,036.00	2.09	See Appendix V
7	SIG-RH7	$ 360,128.00	2.09	See Appendix V
8	SIG-RH1	$ 977,690.00	2.14	See Appendix V
	Totals	**$ 2,507,696.00**		

	Sub-Asset Average > 2.5 – Observation			
9	SIG-AM	$ 381,274.00	2.65	The sub-asset SIG-AM condition average is 2.65. 18 of the 26 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
10	SI-FM	$ 132,036.00	3.12	The sub-asset SIG-FM condition average is 3.12. 19 of the 39 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
11	SIG-EPA	$ 96,498.00	3.20	The sub-asset SIG-EPA condition average is 3.2. 13 of 28 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
12	SIG-EPB	$ 89,615.00	3.46	The sub-asset SIG-EPB condition average is 3.46. 13 of 32 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
13	SIG-HLA	$ 84,840.00	3.32	The sub-asset SIG-HLA condition average is 3.32. 12 of 28 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
14	SIG-HLB	$ 120,378.00	3.12	The sub-asset SIG-HLB condition average is 3.12. 18 of 37 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
15	SIG-FI	$ 191,661.00	3.09	The sub-asset SIG-FI condition average is 3.09. 25 of 53 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
16	SIG-RY	$ 160,692.00	2.73	The sub-asset SIG-RY condition average is 2.73. 25 of 37 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
17	SIG-BV	$ 134,142.00	2.90	The sub-asset SIG-BV condition average is 2.90. 18 of 30 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
18	SIG-CL	$ 138,918.00	2.89	The sub-asset SIG-CL condition average is 2.89. 19 of 33 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.
19	SIG-SC	$ 129,366.00	2.93	The sub-asset SIG-SC condition average is 2.93. 17 of 30 units have a rating of 2.0. See Appendix V. This is funded for replacement in 2019.

Signals has a funded project to replace the Phase 1 AF track circuits. With the addition of the Cortex Station, Metro was able to replace the AF track circuit equipment at the Central West End and Grand signal houses.

All Phase 1 tuning boards have been replaced in the AF track circuit impedance bonds, but the Amplifier/Coupler boards and the Receiver Boards in the houses have yet to be replaced.

Funding is in place for finishing the AF Track Circuit upgrades, and we may be considering contracting out the replacement work. In addition, we have the funding to equip interlocking on Phase II with backup generators to improve reliability, and Royal Interlocking now has an automatic start on the generator.

1.5.3 Track

The FY18 track performance TERM scale target achieved was 3.49. There was no FY18 performance target goal because this was the first year of signal asset evaluation. The FY19 performance target goal is 3.00.

Parent Asset Name	FY17 TERM Score Achieved	FY18 TERM Score Achieved*
Rail	No Data	3.75
Switches	No Data	3.23
Crossings	No Data	3.73
Restraining Rail	No Data	2.00
Expansion Joint	No Data	4.00
Bumping Post	No Data	4.00
Lubricators	No Data	3.17
Spur Track	No Data	3.50
Pocket Track	No Data	4.00
Average	No Data	**3.49**

At this time, Metro is replacing wood and concrete ties. 36,000 wood ties have been replaced to date. Future wood ties replacement will be on an as needed basis. Concrete ties under warranty, are being replaced at the cost of the manufacture. Replacement is approximately 2/3rds complete. The concrete tie project is estimated at be completed by 2021.

The linear track is not included in the FY18 TAM Plan. The linear track will be added by FY20. As we have a better understanding of the MMS and EAM systems, the data organization will adjust to fit needs.

The track backlog includes the following asset groups that average 2.5 or lower. Assets are discussed as an observation when there is a trend that should be made aware. Sub-asset detail is presented in Appendix W. The track backlog is in order of priority. The track backlog is as follows:

Track Department Backlog				
Unit		**Cost Estimation**	**TERM 1-5 SCALE**	**Notes**
1	TR-SwitchEW1A	$75,000.00	2.00	See Appendix W
2	TR-SwitchEW1B	$75,000.00	2.00	See Appendix W
3	TR-SwitchEW5	$75,000.00	2.00	See Appendix W
4	TR-XingEwing	$225,000.00	2.00	See Appendix W
5	TR-RSTRNGRL13.8-14.1	$155,000.00	2.00	See Appendix W
6	TR-RSTRNGRL16.7	$155,000.00	2.00	See Appendix W
7	TR-XingPlymouth	$125,000.00	2.00	See Appendix W
8	TR-XingMain	$125,000.00	2.00	See Appendix W
9	TR-Xing4th	$125,000.00	2.00	See Appendix W
10	TR-SwitchGrandDMDTR1	$50,000.00	2.00	See Appendix W
11	TR-SwitchGrandDMDTR2	$50,000.00	2.00	See Appendix W
Totals		**$1,235,000.00**		

Track-switch Grand Diamond track1 and track switch Grand Diamond track 2 project is unfunded. This project is a future project request, but not targeted in FY19. The track department will keep the switch items safe for service until replacement is accomplished. This has not been submitted to capital budgets.

Track crossing at Plymouth is a funded active project and will be completed in 2019. The track department will keep item safe for service until replacement is accomplished.

Track crossing at Ewing - Performance Target for FY19 included only Ewing Grade Crossing. Funding for this project was reallocated to accomplish a higher priority

project (Elevator Rehabilitation). Track-switchEW1A, track-switchEW1B, track-switchEW5 - Performance Target for FY19 included only Ewing Grade Crossing. However, 30% design work was accomplished and the project may advance pending reprioritization and available Metro Operating Budget (Prop M) local funding. The Track department will keep the item safe for service until replacement is accomplished.

The track crossing at Main project is an unfunded future project request (Not Targeted in FY19). This has not been submitted to capital budgets. The Track department will keep the item safe for service until replacement is accomplished.

The track crossing at 4th project is an unfunded future project request (Not Targeted in FY19). This has not been submitted to capital budgets. The Track department will keep the item safe for service until replacement is accomplished.

The track restraining rail mile post 12.8-14.1 is an unfunded future project request (Not Targeted in FY19). The Track department will keep the item safe for service until replacement is accomplished.

The track restraining rail mile post 16.7 is an unfunded future project request (Not Targeted in FY19). The track department will keep the item safe for service until replacement is accomplished.

1.6 Infrastructure-Systems

Infrastructure systems includes fare collection and security. Only the fare collection assets are presented in the FY18 TAM Plan. The infrastructure system, security assets include CCTV, access control, intrusion detection and emergency operations center. CCTV assets exist in **three departments**. MetroLink system CCTVs are reported under LRT communication. Vehicle digital recording devices and other Metro CCTVs will be reported in the infrastructure system security asset group by FY21.

1.6.1 Fare Collection

The Missouri ticket vending machines (TVM) and Stand Alone Validators (SAV) expected lifecycle is different from the St. Clair equipment. Missouri is 12.08 years and St. Clair is 5.91 years.

TVM	2006 TVM	Total TVM	Remaining lifecycle	2013 TVM	Total TVM	Remaining lifecycle	TVM Average
Manufactures Expected Lifecycle Years	Total Units	95	-0.70%	Total Units	124	57.90%	
	Estimated 2018 Cost Each	$ 97,354.00		Estimated 2025 Cost Each	$ 116,246.00		
12 Years	Total Replacement	$ 9,248,630.00		Total Replacement	$ 14,414,504.00		
	Condition		4.00	Condition		5.00	4.56

SAV	2006 SAV	Total SAV	Remaining lifecycle	2013 SAV	Total SAV	Remaining lifecycle	SAV Average
Manufactures Expected Lifecycle Years	Total Units	123	-0.70%	Total Units	161	57.90%	
	Estimated 2018 Cost Each	$ 17,109.00		Estimated 2025 Cost Each	$ 17,109.00		
12 Years	Total Replacement	$ 2,104,407.00		Total 2025 Replacement	$ 2,121,516.00		
	Condition		4.00	Condition		5.00	4.56
	Total FY 18 Backlog		$ 11,353,037.00	Total FY18 Backlog		None	

As such, the Missouri TVMs and SAVs have reached their expected lifecycle of 12 years of service. The plan moving forward is to continue to operate the Missouri equipment until the St. Clair equipment has reached their full 12 years of service. Then the fare collection equipment will be replaced with the same make and model of equipment.

No funding has been established for the replacement of the new fare collection equipment as of this date per Director Passenger Revenue. The only pending equipment purchase currently is for 50 new Indra Validator heads and posts, which was a part of the original fare collection project of 2010. Metro has not taken possession of this equipment. The new validator specifications are being revised to add internal ticket printers. There is no delivery date from Indra as to when this equipment will be delivered and installed.

1.7 Guideway Performance Restriction Calculation

In an effort to evaluate how guideway restrictions impact the overall performance of the guideway system, a snap shot of restriction and work track length is add together on the first Wednesday at 9:00 AM of every month. A performance restriction is defined to exist on a segment of rail fixed guideway when the design speed of transit vehicles is set to a value that is below the guideway's full service speed. Metro's FY18 annual value for length of track miles under performance restrictions is 1.6. The monthly data is presented below.

GUIDEWAY PERFORMANCE RESTRICTION CALCULATION

FY 2018	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	YTD (sum)	YTD (average)
COMMUNICATIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	3.0	0.0	3.2	0.3
RAIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROW	0.0	1.5	0.0	1.0	0.4	0.0	0.0	0.0	0.0	0.4	2.0	0.0	5.3	0.4
SIGNALS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.0	0.0	0.0	2.3	0.2
STRUCTURES	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
TRACTION POWER	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.9	0.1
CONSTRUCTION	2.6	1.2	0.0	0.7	0.6	0.0	0.0	0.0	0.5	0.0	0.0	0.0	5.6	0.5
OTHER	0.0	0.0	0.6	1.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.1
TOTAL	2.6	2.7	0.6	2.7	1.8	None	None	0.1	2.1	1.5	5.0	0.0	19.1	1.6
Design speed of all segments listed in the Alignment Schematic														
Any speed restriction requiring a flag person is a maximum of 15 mph														

This is the first year for the guideway performance restriction calculation.

1.8 Facilities-Maintenance

Facilities are divided into maintenance support facilities, parking facilities, passenger facilities (MetroLink stations and transit centers). For the FY18 TAM Plan, parking facilities, passenger facilities (MetroLink stations and transit centers), and other facilities, elevators/escalators asset data is from FY17. These assets will be evaluated in more detail by FY19. The following is detailed reporting on maintenance support facilities.

Facility	FY17 Achieved	FY18 Goal	FY18 Achieved	2 Year Average	FY19 Goal
29th Street Rail Maintenance Facility	3.90	4.00	3.71	3.80	3.75
Ewing Rail Maintenance Facility	3.82	4.00	3.24	3.53	3.50
Brentwood Bus Maintenance Facility	3.49	3.75	3.56	3.52	3.75
Central Bus Maintenance Facility	3.29	3.50	3.68	3.48	3.80
DeBaliviere Bus Maintenance Facility	2.87	3.50	2.96	2.91	3.20

Facility	FY17 Achieved	FY18 Goal	FY18 Achieved	2 Year Average	FY19 Goal
Illinois Bus Maintenance Facility	3.14	3.30	3.28	3.21	3.30
Sarah Yard	No Data	3.00	3.06	3.06	3.00
Swansea Maintenance Facility	2.83	3.00	3.06	2.95	3.00

The maintenance facilities are evaluated with the TERM scale.

The FY17 evaluation process was not as detailed as the FY18 TERM scale evaluation process. The FY18 achieved TERM score reflects more accurate score.

1.8.1 Ewing Yard & Shops

The FY18 TERM scale score achieved for the Ewing Yard & Shops was 3.24. The FY18 TERM scale goal was 4.0. The following table presents components that make up the total Ewing Yard & Shops performance score.

Ewing Rail Maintenance Facility				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Substructure	$ 7,760,819.23	20%	3.93	**0.79**
Shell	$ 7,760,819.23	20%	3.25	**0.65**
Interior	$ 3,880,409.61	10%	3.22	**0.32**
Site	$ 3,880,409.61	10%	3.12	**0.31**
Total	**$ 23,282,457.68**	**60%**		
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Conveyance	$ 150,000.00	2%	3.00	**0.07**
Plumbing	$ 56,616.00	1%	3.00	**0.02**
HVAC	$ 726,950.00	11%	3.00	**0.32**
Fire Protection	$ 724,100.00	11%	3.00	**0.32**
Electrical	$ 165,395.00	2%	3.00	**0.07**
Equipment	$ 907,800.00	13%	2.78	**0.37**
	$ 2,730,861.00	**40%**		
Grand Total	**$ 26,013,318.68**	**100%**		
FY18 TERM Scale Achieved				**3.24**

The FY18 TERM Scale achieved was 3.24. The FY18 goal of 4.0 was not met. The FY18 TERM scale goal was not reached due to the following:

1. Lack of a Metro wide Pavement Maintenance and Management Plan (PMMP). As a part of the PMMP, all Metro owned pavement, including that at Ewing Y & S, will be: inspected, condition rated, and prioritized for work. Pavement work be performed based on the prioritization and funding.
2. Lack of funding to replace two mobile lifts. Funding request has not been submitted to capital budgets.

If funding is secured in FY19, the lifts will be purchased, and the TERM Scale goal achieved.

The Ewing Yard & Shops backlog is in order of priority. Ewing Yard & Shops backlog is as follows:

Ewing Yard & Shops Backlog			
Unit		**Cost**	**TERM 1-5 SCALE**
1	EW MOBILE LIFTS JOYCE	$ 100,000.00	2.00
2	EW MOBILE LIFTS SEFAC	$ 100,000.00	2.00
3	29 PARKING LOT STRIPING	$ 15,000.00	2.00
Total Backlog		**$ 215,000.00**	

The details of all components are found in Appendix AA.

1.8.2 29th Street Yard & Shops

The FY18 TERM scale score achieved for the 29th Street Yard & Shops was 3.71. The FY18 TERM scale goal was 4.0. The following table presents components that make up the total Ewing Yard & Shops performance score.

29th Street Rail Maintenance Facility				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Substructure	$ 10,820,078.50	20%	4.00	0.80
Shell	$ 10,820,078.50	20%	4.00	0.80

29th Street Rail Maintenance Facility				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Interior	$ 5,410,039.25	10%	3.92	0.39
Site	$ 5,410,039.25	10%	3.45	0.35
Total	**$ 32,460,235.49**	**60%**		
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Conveyance	$ 110,000.00	2%	4.00	0.06
Plumbing	$ 229,785.00	3%	3.89	0.12
HVAC	$ 359,500.00	5%	4.68	0.23
Fire Protection	$ 1,010,021.00	14%	3.10	0.43
Electrical	$ 154,140.00	2%	4.41	0.09
Equipment	$ 1,064,500.00	15%	3.00	0.44
Total	**$ 2,927,946.00**	**40%**		
Grand Total	**$ 35,388,181.49**	**100%**		
FY18 Achieved				**3.71**

The FY18 TERM Scale achieved was 3.71. The FY18 goal of 4.0 was not met. The FY18 TERM scale goal was not reached in part due to the following reasons. In addition the following will be conducted to meet the FY19 TERM goal.

1. The lack of a Metro wide Pavement Maintenance and Management Plan (PMMP). Metro is developing a PMMP. As a part of the PMMP, all Metro owned pavement, including that at 29th Street Y & S, will be: inspected, condition rated, and prioritized for work. Pavement work be performed based on the prioritization and funding.
2. Roofing repairs are scheduled in FY19, which will improve the overall rating.
3. If the PMMP is completed and funds are available, parking lot work will be performed.

The 29th Street Yard & Shops backlog is in order of priority. The 29th Street Yard & Shops backlog is as follows:

29th Street Yard & Shops Backlog			
Unit		**Cost**	**TERM 1-5 SCALE**
1	29 PARKING LOT STRIPING	**$15,000.0**	**2.00**
Totals		**$ 15,000.00**	

The details of all components are found in Appendix BB.

1.8.3 Central Bus Maintenance Facility

The FY18 TERM scale goal was 3.5 exceeded with a score of 3.68. The following table presents components that make up the total Central Maintenance Facility performance score.

Central Maintenance Facility Performance Target				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Substructure	$ 14,303,404.80	20%	4.00	**0.80**
Shell	$ 14,303,404.80	20%	3.05	**0.61**
Interior	$ 7,151,702.40	10%	3.94	**0.39**
Site	$ 7,151,702.40	10%	3.46	**0.35**
Total	**$ 55,608,074.82**	**60%**		
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Conveyance	$ 1,652,000.00	7%	3.10	**0.21**
Plumbing	$ 30,000.00	0%	3.00	**0.00**
HVAC	$ 2,617,381.00	11%	3.16	**0.34**
Fire Protection	$ 4,502,515.00	18%	4.64	**0.86**

Central Maintenance Facility Performance Target					
Component			**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Electrical	$	804,220.00	3%	3.00	**0.10**
Equipment	$	159,880.00	1%	3.51	**0.02**
	$	**9,765,996.00**	**40%**		
Grand Total	**$**	**65,374,070.82**	**100%**		
				FY18 TERM Scale Achieved	**3.68**

The FY18 goal was met by partnering with Ameren on their incentive program to replace all the lighting at the Central facility with LED lighting. Funding has been procured to replace three overhead doors, a partial area of the tank farm, and 1 HVAC unit. There are several items in discretionary funding which include the roof, interior of the parking lot, and 6 heaters. If the funding is secured, these projects will be completed during FY19. The requests have been submitted to the grants department to apply for funding for 2 heating units in the Body Shop and air conditioning for the locker rooms. The TERM FY19 goal is 3.8. Central backlog is in order of priority. Central backlog is as follows:

Central Bus Maintenance Facility Backlog			
Unit		**Cost Estimation**	**TERM 1-5 SCALE**
1	CF FACILITY ROOF STORE ROOM	$ 200,000.00	2.40
2	CF FACILITY ROOF TRACK MAINTENANCE	$ 200,000.00	2.30
3	CF FACILITY ROOF TRUCK SHOP	$ 200,000.00	2.40
4	CF FACILITY ROOF CAR	$ 200,000.00	2.40
5	CF FACILITY FRONT CANOPY	$ 200,000.00	3.00
6	CF FACILITY ROOF PAINT SHOP	$ 200,000.00	2.40
7	CF FACILITY ROOF BODY SHOP	$ 200,000.00	2.30

Central Bus Maintenance Facility Backlog			
Unit		Cost Estimation	TERM 1-5 SCALE
8	CF FACILITY ROOF SHIPPING AND RECEIVING	$ 200,000.00	2.30
9	CF FACILITY ROOF CAR OFFICES	$ 200,000.00	2.40
10	CF FACILITY ROOF MAIN OFFICES	$ 200,000.00	2.40
11	CF FACILITY SECURITY	$ 200,000.00	2.40
12	CF ROOF METAL SHOP	$ 200,000.00	2.40
13	CF ROOF TRANSMISSION /SMAL UNITS	$ 200,000.00	2.30
14	CF ROOF WASH RACK	$ 200,000.00	2.40
16	CF LARGE PARKING LOT GATE	$ 85,000.00	2.00
18	CF HRCU 02	$ 150,000.00	1.00
19	CF HRCU 03	$ 150,000.00	1.00
15	CF CAR BUS PARKING	$ 650,000.00	2.50
17	CF HVTV 03	$ 85,000.00	2.00
Totals		**$ 3,920,000.00**	

The Illinois Bus Maintenance Facility outside dry fire loop was found to be deteriorated and was replaced. Therefore, the Central outside dry fire loop will be evaluated. The details of all components are found in Appendix CC.

1.8.4 Brentwood Bus Maintenance Facility

The FY18 TERM scale achieved was 3.56 and did not meet the FY18 TERM scale goal of 3.63. The following table presents components that make up the total Brentwood Bus Maintenance Facility performance score.

Brentwood Bus Maintenance Facility				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Substructure	$ 10,914,613.90	20%	3.95	**0.79**
Shell	$ 10,914,613.90	20%	3.82	**0.76**
Interior	$ 5,457,306.95	10%	3.58	**0.36**
Site	$ 5,457,306.95	10%	3.65	**0.37**
Total	**$ 32,743,841.70**	**60%**		
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Conveyance	$ 330,000.00	3%	3.00	**0.08**
Plumbing	$ 330,906.20	3%	3.25	**0.08**
HVAC	$ 1,182,130.00	9%	3.00	**0.27**
Fire Protection	$ 951,280.00	7%	3.15	**0.23**
Electrical	$ 379,500.00	3%	3.00	**0.09**
Equipment	$ 2,090,200.00	16%	3.41	**0.54**
	$ 5,264,016.20	**40%**		
Grand Total	**$ 38,007,857.90**	**100%**		
FY18 TERM Scale Achieved				**3.56**

The FY18 TERM scale goal of 3.63 was not achieved for the following reasons. In addition the following will be conducted to meet the FY19 TERM goal of 3.75.

1. Lift 13 project was aborted after contractor reported that the cylinder needed was no longer being produced by the manufacturer. This project will be addressed in FY19 by replacing entire lift as opposed to replacing cylinder.
2. Boiler 04 is currently out for bid to be replaced in FY19.
3. BW Tank Farm Lid Access Area project will be addressed in FY19 along with the BW Tamper switch Deluge and BW Dry system.

The Brentwood backlog is in order of priority. The Brentwood backlog is as follows:

Brentwood Bus Maintenance Facility Backlog			
Unit		**Cost**	**TERM 1-5 SCALE**
1	BWFIRSUP01	$ 100,000.00	2.00
2	BW DRYSYSTEM	$ 250,000.00	2.00
3	BW TANK FARM LID ACESS AREA	$ 100,000.00	1.00
4	BW TANK FARM LID ACESS AREA	$ 10,000.00	1.00
5	BW TAMPERSWITCH DELUGE	$ 10,000.00	2.00
6	BWDYNO01	$ 100,000.00	2.00
7	BW BOILER 04	$ 15,000.00	1.00
8	BWLIFT13	$ 40,000.00	1.00
9	BW VAU SE	$ 20,000.00	1.00
10	BW VAU SW	$ 20,000.00	1.00
11	BW VAU NE	$ 20,000.00	1.00
12	BW VAU NW	$ 20,000.00	1.00
13	BWDYNO01	$ 100,000.00	2.00
14	BW MAU 10	$ 50,000.00	1.00
15	BW MAU 11	$ 30,000.00	1.00
15	BW MAU 12	$ 30,000.00	1.00
Totals		**$ 915,000.00**	

The Illinois Bus Maintenance Facility outside dry fire loop was found to be deteriorated and was replaced. Therefore, the Brentwood outside dry fire loop will be evaluated. The details of all components are found in Appendix DD.

1.8.5 Illinois Bus Maintenance Facility

The FY18 TERM scale achieved was 3.28 and did not meet the FY18 TERM scale goal of 3.30. The following table presents components that make up the total Illinois Bus Maintenance Facility performance score.

Illinois Bus Maintenance facility				
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Substructure	$ 11,385,198.35	20%	3.43	**0.69**
Shell	$ 11,385,198.35	20%	3.07	**0.61**
Interior	$ 5,692,599.18	10%	3.80	**0.38**
Site	$ 5,692,599.18	10%	2.88	**0.29**
Total	**$ 34,155,595.06**	**60%**		
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Conveyance	$ 277,000.00	2%	2.93	**0.06**
Plumbing	$ 287,325.70	2%	2.95	**0.07**
HVAC	$ 1,270,436.50	10%	2.67	**0.26**
Fire Protection	$ 1,199,741.00	9%	3.75	**0.35**
Electrical	$ 300,652.61	2%	2.79	**0.06**
Equipment	$ 1,853,638.60	14%	3.57	**0.51**
	$ 5,188,794.41	**40%**		
Grand Total	**$ 39,344,389.47**	**100%**		
FY18 TERM Scale Achieved				**3.28**

The Illinois Bus Maintenance did not achieve the FY18 performance target of 3.30 for the following reasons. In addition the following will be conducted to meet the FY19 TERM goal.

1. The final inspection of the Fire System (Wet) upgrade project uncovered a badly deteriorated Fire system (Dry). The original funds had not been exhausted, so the Fire System (Dry) replacement was immediately put out for bid. The Fire System (Dry) Upgrade was completed. Replacement of the jockey pump and its pressure monitor was added to the scope of work. This finalized the initial Fire System upgrade.

2. An ongoing three year project on the Diesel Fuel System was given high priority when the Illinois State Fire Marshal wrote a Notice Of Violation (NOV). To address the NOV, immediate upgrade to the Fuel System was needed. The NOV had a 45 day deadline to avoid the Diesel System being Red Tagged (taken out-of-service). This upgrade was required in order to prevent the closure of a 20,000 gallon UST that had been out-of-service for almost one year. Emergency funding was granted and the Diesel Fuel System was upgraded to include the Veeder Root, the submersible fuel pumps (3), new conduit & wiring including electrical panels, new spill buckets & lids, three containment sumps per new IL state statute requirements, gate valve manifold piping & tank elimination, elimination of the interceptor tank, and two additional monitors were added for waste oil.

3. The three fuel management systems (FMS) were upgraded. New electronic modules were installed.

4. The second phase of interior concrete replacement was completed.

5. The exterior perimeter fence was painted.

6. The Trane Roof Top Unit was completely refurbished.

All of these projects were high dollar upgrades to the Illinois Bus Facility that helped improve our overall asset score. FY18 was ended with a 3.28.

The FY19 target of 3.30 is within reach with the success of several upcoming projects. The following projects are needed to achieve the target:

1. Upgrading the emergency fire pump as well as the emergency generator to ensure reliable function.
2. Replacing one sewer lift station motor/pump assembly.
3. Replacing the submersible pump in the unleaded fuel tank as well as the above ground dispensing unit for unleaded gas.
4. Replacing an inoperative interior fire door at the exit from the bus maintenance shop.
5. Repairing four inoperative mass air units (MAU's).
6. Replacing existing inoperative fiberglass exit garage door with a speed door.
7. Resurfacing the asphalt training lot.
8. Replacing 400W metal halide lights in garage bus parking area with LED's.
9. Replacing the electric service to the main control center (MCC) on the west wall that powers the roll-a-matic exhaust system with the assistance of Ameren.
10. Relighting the training lot with LED stadium lighting.

The Illinois Bus Maintenance Facility backlog is in order of priority. The Illinois Bus Maintenance Facility backlog is as follows:

Illinois Bus Maintenance Facility Backlog			
Unit		Cost	TERM 1-5 SCALE
1	SEWER LIFT STATION PUMP	$ 15,000.00	1.00
2	ILRM144BUSPRKGWESTMCC	$ 28,000.00	1.00
3	DOME HATCHES BUS MAINT	$ 20,000.00	2.00
4	ILRFEXHFAN80 (FUEL ISLAND)	$ 2,520.00	2.00
5	ILRFEXHFAN81 (FUEL ISLAND)	$ 2,520.00	1.00
6	ILRFEXHFAN79 CHASS WASH	$ 2,520.00	1.00
7	ILRFEXHFAN67 COMP RM	$ 1,200.00	1.00
8	ASPHALT TRAINING LOT	$ 200,000.00	2.00
9	IL NE SHOP FIRE DOOR	$ 20,000.00	1.00
10	IL SIGNS EXTERIOR	$ 2,500.00	2.00
11	IL EXT WALL WHITE BLOCK	$ 150,000.00	2.00
12	SPEED DOOR EXIT	$ 40,000.00	1.00
13	BUSWASH	$ 125,000.00	2.00
14	4 MAU'S RESTORATION	$ 16,000.00	1.00
15	ILRFEXHFAN77 MAU	$ 2,520.00	1.00
16	ILRFEXHFAN78 MAU	$ 2,520.00	1.00
17	CHASSIS WASH DOME	$ 60,000.00	2.00

Illinois Bus Maintenance Facility Backlog			
Unit		Cost	TERM 1-5 SCALE
18	ILRM117MENSLKRRM/SHWR	$ 90,000.00	2.00
19	ILRM116WMLKRRM/SHWR	$ 90,000.00	2.00
20	2ND FLR MEN/WOM RESTRM	$ 120,000.00	2.00
21	TANK FARM CANOPY	$ 100,000.00	NA
22	IL TRAINING LOT LIGHTING	$ 125,000.00	2.00
23	REAR PARKING GATE	$ 8,000.00	1.00
24	CRANE BULB ROOM	$ 10,000.00	1.00
25	CRANE 2ND FLR PARTS	$ 10,000.00	1.00
Totals		$ 1,243,300.00	

The details of all components are found in Appendix EE.

1.8.6 DeBaliviere Bus Maintenance Facility

The FY18 TERM scale goal was 3.5. The TERM score achieved was 2.96. The following table presents components that make up the total DeBaliviere Bus Maintenance Facility performance score.

DeBaliviere Bus Maintenance Facility				
Component		Weight of Section	TERM 1-5 SCALE	Weighted Score
Substructure	$ 7,530,148.77	20%	3.00	**0.60**
Shell	$ 7,530,148.77	20%	2.80	**0.56**
Interior	$ 3,765,074.39	10%	3.24	**0.32**
Site	$ 3,765,074.39	10%	2.82	**0.28**
Total	**$ 37,650,743.87**	**60%**		

Component	Cost	Weight of Section	TERM 1-5 SCALE	Weighted Score
Conveyance	$ 180,000.00	1.1%	3.00	**0.03**
Plumbing	$ 1,755,301.00	10.6%	3.18	**0.34**
HVAC	$ 2,059,750.00	12.4%	2.95	**0.37**
Fire Protection	$ 1,280,600.00	7.7%	2.43	**0.19**
Electrical	$ 810,660.00	4.9%	3.08	**0.15**
Equipment	$ 551,300.00	3.3%	3.52	**0.12**
Total	**$ 6,637,611.00**	**40%**		
Grand Total	**$ 44,288,354.87**	**100%**		
FY18 TERM Scale Achieved				**2.96**

The DeBaliviere Bus Maintenance Facility did not achieve the TERM scale goal of 3.5 mainly due to funding and issues with planning. In addition the following will be conducted to meet the FY19 TERM goal of 3.2.

1. Funding is anticipated to become available for heating, ventilating, and air conditioning (HVAC) equipment MAUs, roof top unit (RTU)01, large primary return ventilation (PRV's)) replacement, along with upgrading and replacing smaller PRV's.
2. The replacement of two overhead doors (OHD) (4 & 11) has been approved and is ready to be let for bid. Exterior brick work funding has been mostly secured, has been approved, and is ready to be let for bid. The locker room rehabilitation should be completed by the end of FY19.
3. The cyclone cleaner has been refurbished. Inspection pit rehabilitation work is continuing and hope to complete in FY19.
4. All facility lighting is being converted to LED.
5. Full funding is anticipated to become available for the skylight project.
6. The remainder of the parking lot replacement, fire suppression replacement, fire hatch, floor trench drains are awaiting capital funding for FY20 and FY21.

The DeBaliviere Bus Maintenance Facility backlog is in order of priority. DeBaliviere Bus Maintenance Facility backlog includes the following.

DeBaliviere Bus Facility Backlog			
Unit		Cost	TERM 1-5 SCALE
1	DB WESTMAINTENANCE OF WAY (MOW) BRICK FENCE WALL	$ 425,000.00	1.0
2	DB SALT BIN	$ 60,000.00	1.0
3	DB FAC CLOCK TOWER GLASS BLOCK	$ 30,000.00	2.00
4	DB FACILITY CLOCK TOWER WINDOWS	$ 30,000.00	2.00
5	DB EXTERIOR WALL SOUTH	$ 60,000.00	2.00
6	DB EXTERIOR WALL EAST	$ 60,000.00	2.00
7	DB EXTERIOR WALL WEST	$ 60,000.00	2.00
8	DB FACILITY GARAGE DOOR 11	$ 30,000.00	2.00
9	DB FACILITY GARAGE DOOR 4	$ 30,000.00	2.00
10	DB MAU 03	$ 40,000.00	1.00
11	DB RTU 01	$ 200,000.00	2.00
12	DB MAU 01	$ 40,000.00	2.00
13	DB MAU 02	$ 40,000.00	2.00
15	DB MAU 04	$ 40,000.00	2.00
16	DB MAU 05	$ 25,000.00	2.00
17	DB MAU 06	$ 70,000.00	2.00
18	DB MAU 07	$ 55,000.00	2.00
19	DB MAU 08	$ 55,000.00	2.00
20	DB MAU 09	$ 55,000.00	2.00
21	DB MAU 10	$ 55,000.00	2.00
22	DB MAU 11	$ 55,000.00	2.00
23	DB MAU 12	$ 55,000.00	2.00
24	DB MAU 13	$ 55,000.00	2.00
25	DB MAU 14	$ 55,000.00	2.00
26	DB MAU 15	$ 40,000.00	2.00
28	DB MAU 16	$ 40,000.00	2.00
29	DB NE PARKING LOT	$ 100,000.00	2.00
30	DB SE PARKING LOT	$ 100,000.00	2.00
31	DB SOUTH PARKING LOT	$ 100,000.00	2.00
32	DB MAIN PARKING LOT	$ 150,000.00	2.00
33	DB WEST(MOW) PARKING LOT	$ 125,000.00	2.00

DeBaliviere Bus Facility Backlog			
Unit		Cost	TERM 1-5 SCALE
34	DB MOTORCYCLE PARKING	$ 50,000.00	2.00
35	DB SOUTH ALLEY DRIVE	$ 125,000.00	2.00
36	DB NORTH BRICK FENCE WALL	$ 87,500.00	2.00
37	DB EAST BRICK FENCE WALL	$ 87,500.00	2.00
38	DB PIPING ZONE 01	$ 75,000.00	2.00
39	DB PIPING ZONE 02	$ 75,000.00	2.00
40	DB PIPING ZONE 03	$ 75,000.00	2.00
41	DB PIPING ZONE 04	$ 75,000.00	2.00
42	DB PIPING ZONE 05	$ 75,000.00	2.00
43	DB PIPING ZONE 06	$ 75,000.00	2.00
44	DB PIPING ZONE 07	$ 75,000.00	2.00
45	DB PIPING ZONE 08	$ 75,000.00	2.00
46	DB PIPING ZONE 09	$ 75,000.00	2.00
47	DB PIPING ZONE 10	$ 75,000.00	2.00
48	DB PIPING ZONE 11	$ 75,000.00	2.00
49	DB PIPING ZONE 12	$ 75,000.00	2.00
50	DB PIPING ZONE 13	$ 75,000.00	2.00
51	DB PRESSURE SWITCH 01	$ 135.00	2.00
52	DB PRESSURE SWITCH 02	$ 135.00	2.00
53	DB PRESSURE SWITCH 03	$ 135.00	2.00
54	DB PRESSURE SWITCH 04	$ 135.00	2.00
55	DB PRESSURE SWITCH 05	$ 135.00	2.00
56	DB TAMPER SWITCH	$ 1,120.00	2.00
57	DB FLOW SWITCH	$ 4,200.00	2.00
58	DB FAC FIRE HATCH BUS SHOP	$ 63,450.00	2.00
59	DB FAC FIRE HATCH BUS PK	$ 63,450.00	2.00
60	DB FAC DOME SKYLIGHT BUS PARK	$ 30,000.00	2.00
61	DB FAC SKYLIGHT STEAM R00M	$ 10,000.00	2.00
79	DB FAC SKYLIGHT READY ROOM	$ 20,000.00	2.00
80	DB FACILITY GLASS BLOCK WINDOWS S	$ 50,000.00	2.00
81	DB TRENCH DRAIN 8	$ 40,000.00	2.00

DeBaliviere Bus Facility Backlog			
Unit		Cost	TERM 1-5 SCALE
82	DB TRENCH DRAIN 32	$ 40,000.00	2.00
83	DB TRENCH DRAIN 1	$ 40,000.00	2.50
84	DB TRENCH DRAIN 2	$ 40,000.00	2.50
85	DB TRENCH DRAIN 3	$ 40,000.00	2.50
86	DB TRENCH DRAIN 4	$ 40,000.00	2.50
87	DB TRENCH DRAIN 5	$ 40,000.00	2.50
88	DB TRENCH DRAIN 6	$ 40,000.00	2.50
89	DB TRENCH DRAIN 7	$ 40,000.00	2.50
90	DB TRENCH DRAIN 9	$ 40,000.00	2.50
91	DB TRENCH DRAIN 10	$ 40,000.00	2.50
92	DB TRENCH DRAIN 11	$ 40,000.00	2.50
93	DB TRENCH DRAIN 12	$ 40,000.00	2.50
94	DB TRENCH DRAIN 13	$ 40,000.00	2.50
95	DB TRENCH DRAIN 14	$ 40,000.00	2.50
96	DB TRENCH DRAIN 15	$ 40,000.00	2.50
97	DB TRENCH DRAIN 16	$ 40,000.00	2.50
98	DB TRENCH DRAIN 17	$ 40,000.00	2.50
99	DB TRENCH DRAIN 18	$ 40,000.00	2.50
100	DB TRENCH DRAIN 19	$ 40,000.00	2.50
101	DB TRENCH DRAIN 20	$ 40,000.00	2.50
102	DB TRENCH DRAIN 21	$ 40,000.00	2.50
103	DB TRENCH DRAIN 22	$ 40,000.00	2.50
104	DB TRENCH DRAIN 23	$ 40,000.00	2.50
105	DB TRENCH DRAIN 24	$ 40,000.00	2.50
106	DB TRENCH DRAIN 25	$ 40,000.00	2.50
107	DB TRENCH DRAIN 26	$ 40,000.00	2.50
108	DB TRENCH DRAIN 27	$ 40,000.00	2.50
109	DB TRENCH DRAIN 28	$ 40,000.00	2.50
110	DB TRENCH DRAIN 33	$ 40,000.00	2.50
111	DB TRENCH DRAIN 34	$ 40,000.00	2.50
112	DB TRENCH DRAIN 35	$ 40,000.00	2.50
113	DB TRENCH DRAIN 36	$ 40,001.00	2.50
114	DB WEST(MOW)POWER ENTRANCE GATE	$ 60,000.00	2.00
170	DB SPEED BUMPS	$ 1,000.00	2.00
171	DB EXTERIOR CURBING	$ 20,000.00	2.00

DeBaliviere Bus Facility Backlog			
Unit		**Cost**	**TERM 1-5 SCALE**
172	DB EXTERIOR PAINTING	$ 10,000.00	2.00
173	DB HOT WATER HEATER 2	$ 10,000.00	2.00
174	DB HOT WATER HEATER 3	$ 10,000.00	2.00
175	DB HOT WATER HEATER 8	$ 600.00	2.00
176	DB BATT ROOM EYEWASH AND SHOWER	$ 1,000.00	2.00
177	DB LIFT 5 EYEWASH STATION	$ 600.00	2.00
178	DB LIFT 7 EYEWASH STATION	$ 600.00	2.00
179	DB TRENCH DRAIN 29	$ 40,000.00	1.00
180	DB MAINT OFFICE SHOWER	$ 1,500.00	2.00
181	DB MOW MENS SHOWER 1	$ 2,500.00	2.00
182	DB MOW MENS SHOWER 2	$ 1,500.00	2.00
183	DB MOW LADIES SHOWER 1	$ 2,500.00	2.00
184	DB MOW LADIES SHOWER 2	$ 1,500.00	2.00
	Total Backlog	**$ 5,282,896.00**	

The DeBaliviere facility forecast includes the following:

Basic foundation and structure is sound.

Capital unfunded requests are:

1. Replace all Make Up Air Units- $ 720,000 applied for in FY 2017
2. If staying with 16, recommend replacing 2 per year starting at year 12 and at a 20 year cycle thereafter
3. Replace 12 Large Powered Roof Vents- $205,000 applied for in FY2017
4. Replace 4 per year starting at year 12 and at a 20 year cycle thereafter, offset with MAUs
5. Replace 75 ton Roof Top HVAC unit- $201,600 applied for in FY2017
6. Skylight repairs(skin over)- $50,000 applied for in FY2017

Current active capital projects are:

1. Expansion joint, brick repair and tuck-pointing. The RFQ submitted, solicitations due 27 SEPT 18.
2. When complete, break facility down into zones or sections with tuck-pointing and expansion joints being done in 15 year cycles.
3. Restroom and Locker room renovation are being funded out of operating budget, currently in progress.
4. Replacement of Glass Blocks is partially complete, more funding is needed.

5. Replace Powered Roof Vents 29-33(not enough money, may reallocate) plus also need to replace PRV #27 along with these. $41,663 has been allocated, needs about another $80,000. This project may be reallocate from other capital projects to fund.
6. Replace roll up doors with high speed doors. An Intent to Award letter has been sent to the vendor. This project will be complete in the next 60-90 days.

Projections include the following:

1. The current roof was installed in 1998 and the life expectancy is 25 years. A capital project will be requested for FY2021-2023.
2. RTU 5 is a 1997 model and will be applied for in the next capital cycle
3. RTU 2, RTU 3, and RTU 4 are all 2011 models and should be replaced at years 15, 16 and 17 and every 15 years after that.
4. Trench Drains should be replaced at the mid-life of the building starting with FY19. Currently approved to replace the south drain on row 32 at a cost of approximately $40,000. Recommend replacement of 2 drains per FY with anticipated increase in price of 20% by end of cycle. Funding applied for in FY 21.
5. Driveway replacement is a priority as the current driveway is original to the facility. Currently, replacing entry and exit driveways from the facility to the street and the south portions of the west parking area. The rest needs to be replaced at a cost of approximately $750,000 to $900,000. Funding applied for in FY 20.
6. Interceptors (oil/water separators) are in very good condition and needs regular maintenance at this time. Do not anticipate replacement for several years.
7. USTs are in very good condition and don’t anticipate replacement for many years unless government regulations change.
8. Electrical system is in good shape and needing only routine maintenance at this time. Panels can be upgraded to smart panels in the future to make facility more efficient and save on utilities. Planned on starting this in the next two years or so.
9. The generator/switchgear is original to the facility and replacement should be considered within the next 7-10 years. Cost is unknown but estimated to be $150,000-$200,000.
10. If Metro is to make an investment in electric coaches in the future, the facility would likely need to be upgraded with a second generator switchgear, expand the electrical room and entrance capacity at an unknown but significant cost.
11. The HVAC system is being upgraded now and as we replace or repair components plan to make them BAC/NET compatible with VFD motors for energy savings and component life, bringing everything online.
12. Fire suppression system life expectancy is 25-30 years. Need to schedule MIC testing soon and develop a plan for zone by zone replacement following NFPA recommendations. Also update system to be able to monitor from BAC/NET like the HVAC and electrical. Funding applied for in FY 20.

13. The fire/smoke hatches life expectancy are about the same as the suppression system. There are 54 hatches at a cost of about $1,800 each to purchase and approximately $200 to install, unless we install ourselves. For liability purposes, recommendation would be to have a licensed fire suppression company do any work on the fire suppression systems including these hatches and the fire doors. Recommend replacing 13 one year, 14 the next, 13 the next, 14 the next. Replace again starting year 16 and in 20 year cycles thereafter. Funding applied for in FY 21.
14. Bulk DEF dispensing system project funding is applied for FY 19.
15. Maintenance pit rehabilitation is underway, funded out of operating at this time. Due to the anticipated high cost of some materials we may try to reallocate some capital money from Capital Project.
16. We expect to be completely LED lighting by the end of FY 19. This has been funded with a combination of capital funds and operating funds

The Illinois Bus Maintenance Facility outside dry fire loop was found to be deteriorated and was replaced. Therefore, the DeBaliviere outside dry fire loop will be evaluated. The details of all components are found in Appendix FF.

1.8.7 DeBaliviere Power House

The FY18 TERM scale achieved was 2.93. There was not a FY18 TERM scale goal. The FY19 performance goal is 2.93. The following table presents components that make up the total DeBaliviere Power House performance score.

DeBaliviere Power House				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Substructure	$ 11,000.80	20%	3.00	**0.60**
Shell	$ 11,000.80	20%	3.00	**0.60**
Interior	$ 5,500.40	10%	3.00	**0.30**
Site	$ 5,500.40	10%	3.00	**0.30**
	$ 55,004.00	**60%**		
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Conveyance	$ 10,000.00	14.5%	3.00	**0.44**
Plumbing	$ -	0.0%	0.00	**0.00**
HVAC	$ 5,000.00	7.3%	3.00	**0.22**

DeBaliviere Power House				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Fire Protection	$ 2,500.00	3.6%	1.00	**0.04**
Electrical	$ 10,000.00	14.5%	3.00	**0.44**
Revenue	$ -	0.0%	0.00	**0.00**
	$ 27,500.00	**40%**		
	$ 82,504.00	**100%**		
FY18 TERM Scale Achieved				**2.93**

The DeBaliviere Power House backlog is in order of priority. The DeBaliviere Power House backlog is as follows:

DeBaliviere Power House Backlog				
Unit		**Cost**	**TERM 1-5 SCALE**	**Notes**
1	PH FCI ANNUNCIATOR PANEL	$ 10,000.00	1.00	See Appendix GG
2	PH SMOKE SENSORS ALL	$ 1,000.00	1.00	See Appendix GG
3	PH HEAT SENSORS ALL	$ 1,000.00	1.00	See Appendix GG
4	PH CUTTING TORCH RIG	$ 800.00	2.00	See Appendix GG
5	PH BASEMENT	$ -	2.00	See Appendix GG
6	PH EXTERIOR WALL NORTH	$ 50,000.00	3.00	See Appendix GG
7	PH EXTERIOR WALL SOUTH	$ 50,000.00	3.00	See Appendix GG
8	PH EXTERIOR WALL EAST	$ 50,000.00	3.00	See Appendix GG
9	PH EXTERIOR WALL WEST	$ 50,000.00	2.00	See Appendix GG
10	PH OVERHEAD DOOR WEST	$ 1,000.00	2.00	See Appendix GG
11	PH STEEL ENTRY DOOR SOUTH	$ 1,000.00	2.00	See Appendix GG
12	PH ROOF STRUCTURE	$ 300,000.00	2.00	See Appendix GG
13	PH ROOF SKYLIGHTS	$ 20,000.00	1.00	See Appendix GG

DeBaliviere Power House Backlog				
Unit		Cost	TERM 1-5 SCALE	Notes
14	PH GUTTERS & DOWNSPOUTS	$ 20,000.00	1.00	See Appendix GG
15	PH WINDOWS ALL	$ 50,000.00	1.00	See Appendix GG
16	PH ROOF TRUSSES	$ -	3.00	See Appendix GG
17	PH EXTERIOR FINISH PAINT/MASONRY	$ -	2.00	See Appendix GG
Totals		**$ 803.00**	**1.88**	

The details of all components are found in Appendix GG.

1.8.8 Swansea Maintenance Facility

The FY18 TERM scale goal was 3.00. The TERM score achieved was 3.06. The following table presents components that make up the total Swansea Maintenance Facility performance score.

Swansea Maintenance Facility				
Component		Weight of Section	TERM 1-5 SCALE	Weighted Score
Substructure	$ 100,000.00	20%	4.00	**0.80**
Shell	$ 100,000.00	20%	2.30	**0.46**
Interior	$ 50,000.00	10%	3.13	**0.31**
Site	$ 50,000.00	10%	3.33	**0.33**
Building Total	**$ 500,000.00**	**60%**		
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Conveyance	$ -	0%	0.00	**0.00**
Plumbing	$ 6,800.00	7%	3.00	**0.22**
HVAC	$ 24,000.00	26%	2.83	**0.74**
Fire Protection		0%	0.00	**0.00**
Electrical	$ 4,400.00	5%	3.00	**0.14**
Equipment	$ 1,500.00	2%	3.00	**0.05**
	$ 36,700.00	**40%**		
Grand Total	**$ 536,700.00**	**100%**		
FY18 TERM Scale Achieved				**3.06**

The FY18 goal of 3.0 was met with a TERM scale achieved of 3.06.

The roof and HVAC projects were delayed in FY18 due to workload issues. The work cannot be delayed any further. The roof and HVAC units will be replaced in FY19 of 3.0. The funds to do so will come from the operating budget. Completing this work will meet the performance target.

The Swansea backlog is in order of priority. The Swansea backlog is as follows:

Swansea Facility Backlog				
Unit		**Cost**	**TERM 1-5 SCALE**	**NOTES**
1	SWA ROOF NORTH 2210	$40,000.00	1.00	See Appendix HH
2	SWA 2208B FURNACE	$5,000.00	2.00	See Appendix HH
3	SWA 2208B A/C	$5,000.00	2.00	See Appendix HH
4	SWA PARKING LOT UPPER	$30,000.00	2.00	See Appendix HH
5	SWA OFFICE 2208A	$5,000.00	2.00	See Appendix HH
6	SWA WINDOWS/DOORS ALL	$10,000.00	2.00	See Appendix HH
7	SWA EXTERIOR WALL SOUTH	$5,000.00	2.00	See Appendix HH
8	SWA EXTERIOR WALL NORTH	$5,000.00	2.00	See Appendix HH
9	SWA EXTERIOR WALL WEST	$5,000.00	2.00	See Appendix HH
Totals		**$ 110,000.00**		

The details of all components are found in Appendix HH.

1.8.9 Sarah Maintenance Facility

The FY18 TERM scale goal was 3.00. The TERM score achieved was 3.06. The following table presents components that make up the total Sarah Maintenance Facility performance score.

Sarah Yard				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Substructure	$ 20,000.00	15%	3.00	**0.45**
Shell	$ 74,000.00	65%	3.00	**1.95**
Interior	$ 0.00	0%	0.00	**0.00**

Sarah Yard				
Component		**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Site	$ 14,000.00	10%	3.00	**0.30**
	$ 108,000.00	**90%**		
Component	**Cost**	**Weight of Section**	**TERM 1-5 SCALE**	**Weighted Score**
Conveyance	$ -	0%	0.00	**0.00**
Plumbing	$ -	0%	0.00	**0.00**
HVAC	$ -	0%	0.00	**0.00**
Fire Protection	$ -	0%	0.00	**0.00**
Electrical	$ 10,000.00	10%	3.00	**0.30**
Equipment	$ -	0%	3.00	**0.00**
	$ 10,000.00	**10%**		
Grand Total	**$ 128,000.00**	**100%**		
FY18 TERM Scale Achieved				**3.06**

FY18 goal was achieved. The only asset with a condition lower than 2 is the gate operator. The operator will be replaced in FY19 as part of the restoration work of the Sarah yard. The yard, in FY18 and into FY19, is being used as laydown area for construction of the Cortex MetroLink station. When that work is fully complete, the yard will be restored to its original purpose. Restoration will also include the addition of a utility building.

The Sarah backlog is in order of priority. The Sarah backlog is as follows:

Sarah Yard Backlog				
Unit		**Cost**	**TERM 1-5 SCALE**	**NOTES**
1	Gate Operator	$ 4,000.00	2.00	See Appendix II
Totals		**$ 4,000.00**		

The details of all components are found in Appendix II.

1.9 Facilities-Parking

Parking facilities include parking lots and parking garages. Parking lot asset evaluation will be completed by FY20. The North Hanley Garage and Meridian Garage are owned by Metro. Garage asset evaluation will be completed in more detail by FY20. The FY17 asset TERM scale achieved was as follows.

Parking Facilities		
Location	**FY17 Achieved**	**TERM 1-5 Scale Target**
North Hanley Garage	3.75	4.00
Meridian Garage (Maintained by DCM)	3.90	4.00
Average	**3.83**	**4.00**

1.10 Facilities-Passenger Stations

The passenger facilities (MetroLink station) evaluations were estimated in FY17. A more detailed MetroLink rail passenger facilities evaluation will be conducted by FY19. The TERM scale achieved was as follows. Facilities-Passenger Transit Centers
The passenger facilities (transit centers) were estimated in FY17. A more detailed passenger facilities (transit centers) facilities evaluation will be conducted by FY19.

Rail Passenger Facilities		
Location	**FY17 Achieved**	**FY18 Goal**
5th and Missouri	3.50	3.75
8th and Pine	3.47	4.00
Belleville	3.85	4.00
Brentwood	4.35	4.35
Central West End	3.05	3.75
Clayton	4.12	4.12
Civic Center	3.84	4.00
College SWIC	3.67	4.00
Convention Center	3.35	3.75
Delmar	3.50	3.75
East River Front	3.08	3.50
Emerson Park	4.07	4.25
Fairview Heights	4.07	4.25
Forsyth	4.47	4.47
Forest Park	4.09	4.25
Grand	4.43	4.50

Rail Passenger Facilities		
Location	**FY17 Achieved**	**FY18 Goal**
Jackie Joyner Kersey	4.07	4.25
Lambert Airport East	3.55	3.75
Lambert Airport Main	3.46	3.55
Laclede's Landing	3.02	3.50
Memorial	4.05	4.25
Maplewood	4.43	4.43
North Hanley	3.07	3.50
Richmond Heights	4.43	4.43
Rock Road	3.06	3.25
Shiloh Scott	4.07	4.25
Shrewsbury	4.42	4.42
Skinker	4.49	4.49
Stadium	3.45	3.65
Sunnen	4.43	4.43
Swansea	4.07	4.25
Union Station	3.04	3.5
University City / Big Bend	4.19	4.25
UMSL North	3.07	3.25
UMSL South	3.07	3.25
Washington Park	4.07	4.25
Wellston	3.07	3.25
Average	3.77	3.97

The TERM scale achieved were as follows.

Bus Transit Facilities		
Location	**FY17 Achieved**	**FY18 Goal**
Ballas TC	4.30	4.25
Catalan Loop TC	3.63	3.63
Civic Center TC	N/A Under Construction	N/A Under Construction
Hampton Gravois TC	3.12	3.50
North Broadway	3.80	3.75
North County TC	4.86	4.86
Riverview TC	3.93	3.93
Rock Hill TC	3.25	3.50
Average	**3.84**	**3.91**

1.10.1 Elevator and Escalators

The elevator and escalator report from FY17 4th quarter CEO report's reported the following.

	Elevators (17)			Escalator (8)			Combined		
Period FY18	**Down Time (hours)**	**Operating Time (hours)**	**Availability**	**Down Time (hours)**	**Operating Time (hours)**	**Availability**	**FY18 Combined Availability**	**FY18 Goal**	**FY17 Combined Availability**
1st Qtr	273:49	3,7582:00	99.27%	1,679:52	15,824:00	89.38%	94.33%	97.40%	97.81%
2nd Qtr	149:55	3,7582:00	99.60%	1,539:13	15,824:00	90.27%	94.94%	97.40%	97.20%
3rd Qtr	212:03	32,895:00*	99.36%	449:23	15,480:00	97.10%	98.23%	97.40%	98.35%
4th Qtr	447:54	33,260:30*	98.65%	925:55	15,652:00	94.08%	96.37%		94.86%
YTD Total	1,083:41	141,319:30	99.23%	4,594:23	62,780:00	92.68%	95.96%	97.00%	97.79%

*For 4th QTR, operating hours excludes the elevators at Union Station and Laclede's Landing which have been removed from service for planned rehabilitation.

As the TAM program becomes more defined and developed, the Metro key performance indicators (KPI) will be integrated in the TAM program as directed by leadership. A more detailed elevator and escalator facilities evaluation will be conducted by FY19.

1.11 Challenge Unlimited

Metro had reported on the four 2015 Dodge Caravans in the Metro Memorandum dated May 17, 2017. The vehicles were purchased with grant funding obtained through BSD for Challenge Unlimited of Alton, IL. As of September 4, 2018, Challenge Unlimited reported their TAM reporting will be through the Illinois Department of Transportation.

2 INTRODUCTION

The Bi-State Development Agency (BSD), doing business as Metro, was created through an interstate compact between the states of Missouri and Illinois, ratified by the United States Congress in 1949. Metro is the largest provider of public transportation services in the St. Louis Metropolitan area. The agency oversees the operations of MetroLink, MetroBus and Metro Call-a-Ride services. Consequently, Metro is responsible for operating and maintaining a large and diverse array of valuable transportation assets in the greater St. Louis region and more importantly, for moving people safely and efficiently throughout Metropolitan area.

The Federal Transit Administration in its role as a provider of financial and technical assistance to local transit agencies is promoting asset management as a core business process to help transit agencies manage their valuable transportation assets.

In 2012, MAP-21 mandated FTA to develop a rule establishing a strategic and systematic process of operating, maintaining, and improving public capital assets effectively through their entire life cycle. In accordance with 49 USC § 5335, agencies are required to calculate and report new data elements to the National Transit Database (NTD). The TAM Final Rule 49 USC §625 became effective Oct. 1, 2016 and established four performance measures. The performance management requirements outlined in 49 USC 625 Subpart D are a minimum standard for transit operators. The purpose of this plan is to document how the NTD and TAM requirements are met.

49 CFR § 625.25 (b) Transit asset management plan elements include the following and are addressed in the listed sections.

49 CFR § 625.25	As per 49 CFR § 625.25, TAM Plan requirements include:	See TAM Plan Sections
(b)(1)	An inventory of the number and type of capital assets. The inventory must include all capital assets that a provider owns, except equipment with an acquisition value under $50,000 that is not a service vehicle. An inventory also must include third-party owned or jointly procured exclusive-use main	Appendices are found in TAM Plan Volume II
(b)(2)	A condition assessment of those inventoried assets for which a provider has direct capital responsibility. A condition assessment must generate information in a level of detail sufficient	Appendices are found in TAM Plan Volume II

49 CFR § 625.25	As per 49 CFR § 625.25, TAM Plan requirements include:	See TAM Plan Sections
	to monitor and predict the performance of the assets and to inform the investment prioritization.	
(b)(3)	A description of analytical processes or decision-support tools that a provider uses to estimate capital investment needs over time and develop its investment prioritization.	Lifecycle Management Decision Support Tools
(b)(4)	A provider's project-based prioritization of investments, developed in accordance with §625.33* of this part.	Lifecycle Management Asset Investment Prioritization
(b)(5)	A provider's TAM and SGR policy.	Policy Statement Introduction
(b)(6)	A provider's TAM Plan implementation strategy.	Introduction TAM Plan Implementation Strategy table
(b)(7)	A description of key TAM activities that a provider intends to engage in over the TAM Plan horizon period. (Horizon period is 4 years as per §625.29(a).)	Introduction TAM Plan Implementation Strategy table
(b)(8)	A summary or list of the resources, including personnel that a provider needs to develop and carry out the TAM Plan.	Introduction
(b)(9)	An outline of how a provider will monitor, update and evaluate, as needed, its TAM Plan and related business practices, to ensure the continuous improvement of its TAM practices.	Introduction

*49 CFR § 625.33	As per 49 CFR §625.33, investment prioritization requirements include:	See TAM Plan Sections
(a)	A TAM Plan must include an investment prioritization that identifies a provider's programs and projects to improve or manage over the TAM Plan horizon period the state of good repair of capital assets for which the provider has direct capital responsibility.	Introduction Lifecycle Management Asset Investment Prioritization
(b)	A provider must rank projects to improve or manage the state of good repair of capital assets in order of priority and anticipated project year.	Appendices are found in TAM Plan Volume II
(c)	A provider's project rankings must be consistent with its TAM policy and strategies.	Appendices are found in TAM Plan Volume II
(d)	When developing an investment prioritization, a provider must give due consideration to those state of good repair projects to improve that pose an identified unacceptable safety risk when developing its investment prioritization.	Introduction, Nexus between SGR and Safety
(e)	When developing an investment prioritization, a provider must 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 TAM Plan horizon period.	Introduction Lifecycle Management Asset Investment Prioritization
(f)	When developing its investment prioritization, a provider must 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.	Asset Investment Prioritization

**49 CFR §49 Transportation Services for Individuals with Disabilities (ADA)

.161 Maintenance of accessible features

.163 Keeping vehicle lifts in operative condition

.43 Alteration of transportation facilities by public entities

Transit Asset Management (TAM) is the foundation by which Metro, proposes to meet and continually improve system safety, reliability and availability. It is also a means to, reduce life-cycle costs, improve investment decisions, and provide excellent service to our customers. With an aging infrastructure, limited funding and an increasing demand for service, Metro must find ways of managing and extending the life of existing critical assets, while optimizing its investment in new capital projects. The TAM Plan outlines Metro's policy, approach and specific actions to improve its asset management practices.

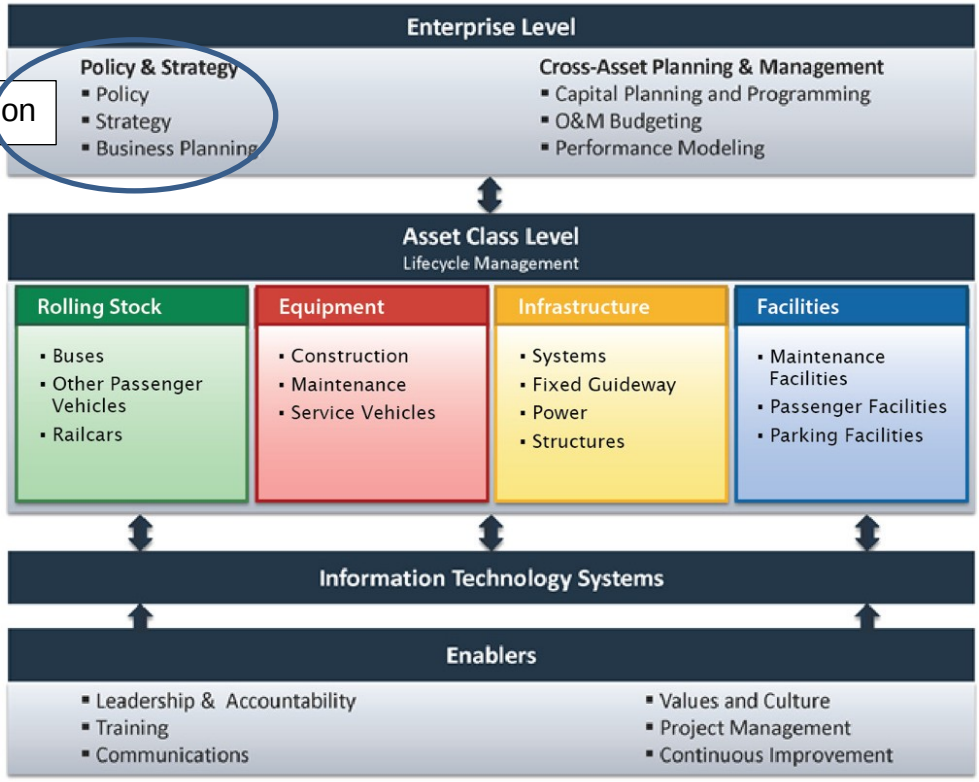
The state of good repair (SGR) means the condition in which a capital asset is able to operate at a full level of performance. Metro is committed to implementing a strategic process for acquiring, operating, maintaining, upgrading, and replacing its transit assets to directly support the organization's mission of providing safe and reliable public transportation services to the St. Louis Metropolitan region.

The SGR policy is to continue a culture that supports asset management at all levels of the organization, to employ effective asset management business practices and tools to ensure optimum asset performance and useful life, and to use timely, quality data to support transparent and cost-effective decision-making for resource allocation and asset preservation.

The TAM Plan is organized to reflect the TAM framework illustrated in FTA report No. 0098. The framework provides this massive undertaking a map to understand location in process. Figure 1 is the TAM framework.

Figure 1 TAM Framework

TAM Plan Introduction



From FTA Report No 0098.

In support of asset management and SGR policies, the TAM plan includes specific goals, objectives, and implementing actions. Metro has identified four agency-wide asset management goals:

1**. Policy**: Provide agency-wide direction and leadership to ensure the implementation of asset management across the entire agency. In addition, policy is critical to establishing a vision and support for an asset management culture.

2**. People**: Metro leadership must establish managerial positions to support asset management and support culture change throughout the organization.

Improving staff asset management leadership skills and knowledge sharing within the agency enhances employees' lifecycle management competencies.

3. **Tools:** Provide infrastructure and tools to support data-driven decision-making for asset management.

This ensures that investment decisions are based on the assessment of organizational benefits, transparent and clearly communicated.

4. **Business Practices** Manage whole life cycle cost, risk and performance to achieve cost savings, improve service and reliability.

Metro is committed to enhancing our outstanding personnel by providing coaching, training, innovative state-of-the-art technology, and improved processes. Metro will ensure our workforce's ability to identify and meet Metro's asset management needs, incorporate sustainability and accessibility into our business practices, and deliver to our customers the best service and value for our community's tax dollars expended.

This TAM Plan focuses specifically on Metro Transit related assets. Assets that do not assist Metro with providing transit services (such as the Gateway Arch, St. Louis Downtown Airport and other downtown attractions) are not included in this plan. Furthermore, this plan does not include financial assets or intangible assets commonly used in financial statements.

In support of the 49 CFR §625 and the agency-wide asset management goals, the following objectives were established to implement the Metro TAM Program and to promote TAM activities. Each goal has been assigned key objectives that are intended to have positive business outcomes that will advance TAM goals. The objectives will be evaluated on a four year cycle to ensure TAM program implementation is being accomplished.

TAM Program Implementation Strategy		
Area	**BSD & Metro TAM Goals**	**Objective**
Policy	Top down commitment to TAM program and SGR.	• Report on TAM program to all levels of Metro.
People and TAM culture	Promote asset management culture.	• Advance awareness for TAM across all groups. • Report changes of major assets. • Develop and retain well trained TAM workforce.

TAM Program Implementation Strategy		
Area	**BSD & Metro TAM Goals**	**Objective**
Safety	Maintain all assets in SGR to support a safe operating environment.	• All BSD to maintain equipment in SGR. • Measure and manage TAM related risks. • Cross pollinate Safety Management System (SMS) with SGR and TAM program. • Safety evaluates identified backlog assets (<2.5 ratings) and if the asset is safety or mission critical. • Document root cause analysis for asset failures. Investigated by Safety Department.
Fiscal Sustainability	Build and promote financial sustainability through implementation of asset management best practices.	• Establish linkage between multi-year SGR needs, annual budget process and Capital Improvement Program. • Develop objectives method to prioritize capital projects and assess trade-offs between competing investments. • Implement minimum life cycle cost policy.
Investing in assets/ SGR	Invest in assets and SGR	• Develop plan and policy consistent with MAP-21 requirements. • Establish clear capital replacement and rehabilitation plans, and monitor adherence. • Develop asset management system approach. • Develop TAM and maintenance quality assurance/quality control process.
Organizational efficiency	Demonstrate organizational efficiency for asset management processes and outreach to member agencies.	• Build understanding and support for asset management at the executive level. • Assess and implement tools to support data driven asset management decisions. • Improve and expand communications with member agencies regarding well-documented SGR needs and priorities.
People and TAM culture	Promote asset management culture.	• Advance awareness for TAM across all groups. • Develop and retain well trained TAM workforce.

The objectives will be met through the TAM program. The TAM Plan is documentation of the program as it is developed to date. The TAM program is a dynamic process with continuous evaluation, revision and development.

The TAM program and TAM Plan components will be reviewed and updated annually. The TAM Plan will be reviewed and submitted every 4 years to the FTA. The appendices and narratives will be reviewed and updated annually to establish new target goals.

2.1 Plan Development

Implementation of the policy and goals are a responsibility shared by all divisions within BSD and Metro. Identification of Metro personnel's roles and responsibilities in the plan development was the first step.

The Accountable Executive has overall responsibility for overseeing the development of asset management policies and procedures, in cooperation with the executive leadership team, and reporting to the Board on the status of the asset management program. In MAP-21 language the General Manager is the "Accountable Executive."

The lead responsibility for asset management function rests with the TAM Program Manager serving directly under the Accountable Executive. All Divisions will support TAM policy by participating in technical working group discussions and strategy; providing asset management data and assumptions; developing and maintaining processes and procedures; developing asset management criteria; implementing TAM Plan actions; and other asset management related activities in cooperation with the TAM Team. The TAM Team is made up of the following divisions:

- Maintenance Divisions – The Maintenance Divisions will continue to accomplish condition assessments, maintenance, rehabilitation, and replacement planning currently undertaken; and communicate data pertinent to asset management and state of good repair to the TAM Team.
- Engineering Division –The Engineering Division will continue to develop construction activities, condition assessments in cooperation with Operations; document project and asset costs; and communicate pertinent asset management related information to the TAM Team.
- Finance, Budget, and Accounting – Finance, Budget, and Accounting Division will provide the TAM Team access to necessary records; add detail to financial accounting data to facilitate a linkage of asset management to the budgeting process; project prioritization process; and collaborate on other asset management related activities.
- Business Services – The Business Services Division (Information Technology and Procurement/Contracts) will support and facilitate the implementation of asset management/decision-making support tools; develop life cycle cost procedures; implement life cycle cost into procurement procedures; and other asset management related activities.
- Safety Management Systems (SMS) – The executive team supports the formal implementation of SMS through all divisions. BSD and Metro have supported a robust safety program throughout all modes of transportation. The system safety

program plan (SSPP) will be carried out by the Risk Management, Claims and Safety Department.

- Support & Compliance – Support & compliance of the policy will be the day to day responsibility of the TAM Team. Because the TAM Team does not control day-to-day divisional operations, nor does the TAM Team have direct supervision of the divisional personnel, the superintendent is responsible for meeting required timelines, ensuring correct system data, and requesting updates to data and forms.

The TAM Team is made up of the following personnel.

Executive Team

John M Nations - President and CEO
Jessica Mefford-Miller - Executive Director of Metro Transit
Darren Curry - TAM Accountable Executive and Chief Mechanical Officer
Scott Grott - General Manager MetroLink
Larry Jackson - Executive VP Administration
Mark Vago - Chief Financial Officer
Charles Stewart - VP Pension & Insurance (Risk/Safety)
Tammy Fulbright - Sr. Director of Financial Planning & Treasurer
Kathy Brittin - Director of Risk Management, Claims and Safety

Asset Management Plan Development Team

Donald Chausse - Program Manager of Transit Asset Management
Chuck Clemens - Sr. Director of Maintenance of Way
Dale Schaefer - Director of Product Development and Training
Kristina Owen - Facilities Computer System Administrator
Amanda Winters - Vehicles Computer System Administrator
Kendra Wilkins - TAM Vehicles and Equipment Analysis
Sheila Hockel - TAM Facilities Analyst

Rolling Stock

Rolling Stock Bus & Paratransit - Enzo Stefano
Non-Revenue Vehicles - Enzo Stefano, Derrick Whitmire
LRV - Marc Cruz
Vehicle Mechanic Training - Geoff Kehr
Other Equipment (Wheeled) - Derrick Whitmire

Facilities

Rail Maintenance Facilities - Steve Brasfield, Chris Primas
Bus Maintenance Facilities - Enzo Stefano
Illinois Bus Facility - Tom Spurgeon, Mike Little
DeBaliviere Bus Facility - Mike Royal, Brian O’Hara

Central Maintenance Facility - Enzo Stefano, Marvin Dixon
Brentwood Bus Facility - Jeff Lowe, Ron Peters
Passenger Facilities
Rail Stations - Steve Brasfield
Bus Transit Centers
Rail Systems
Rail Systems - Jerry Bochantin
Track - Brian Sellers
Traction Power - Les Pinion
Signals - Geoff Bullock
LRT Communications - Rick Chausse
Engineering - Joni Korte
Radio Communication - Forrest Farthing
Revenue - Richard Clark
Communications
Communications - Rick Farthing
Administration/Finance
Accounting – Vicki Potter
Capital Budget – Budget Director (to be hired)
Risk Management
Risk Management - Kathy Brittin
Insurance & Analysis - Kevin Kloever
Safety - Andrew Ghiassi
Corporate Compliance - Kent Swagler

2.2 TAM Program Development Approach

The process of determining best practices evolves as the TAM program is developed and utilized. Metro has had a long term vehicles preventative maintenance program supported with M5. New guidelines, as directed by the FTA and NTD reporting, require reorganization of data and/or established new procedures. The addition of the TAM program is a driving force to many changes in the reporting functions, departmental requirements, and procedures. The TAM program is being built in phases with the end goal of a quality functioning asset and maintenance management system. Changes in process and procedures are being implemented in order to fine tune process and produce quality data and reporting platforms with effective forecasting of repair and replacement of assets.

The TAM Plan is developed through a shared process that includes the structured involvement of key stakeholders who provides input throughout the plan's development. These stakeholders were involved in each of the three major steps of the TAM Plan development process, as summarized below:

1. Baseline Assessment: Where Metro is Now- All of the stakeholder team members participated in a baseline assessment of existing asset management practices and the maturity level in key areas. Initially consultant staff reviewed documentation and interviewed stakeholder team members. The assessment evaluated the gap between the asset management baseline (i.e., what we do today) and best practices as outlined in FTA's Transit Asset Management Manual.

2. Definition of Asset Management Goals and Objectives: Where Metro Wants to Be- Through a series of briefings, workshops and breakout sessions, the Leadership Team and the TAM Team established an asset management policy and a series of goals and objectives for asset management improvement.

3. **Development of Asset Management Implementing Actions and Priorities: How Does Metro Get There-** Through guidance from the Leadership Team and the TAM Team, TAM program actions and priorities were developed. As the implementation and data development process moves forward some of the TAM Plan elements will be implemented simultaneously. It is unrealistic to push all data development, inspection schedule, inspection forms, inventories, and training at the same time. Currently, Metro utilizes M5 as the maintenance management system. Metro is in the process of implementation a new asset and maintenance management software, Trapeze EAM. The TAM program and EAM will grow concurrently as M5 work is moved to EAM, the TAM program will reflect the change.

The role of the Metro stakeholder team throughout the TAM Plan development process is illustrated in Figure 2.

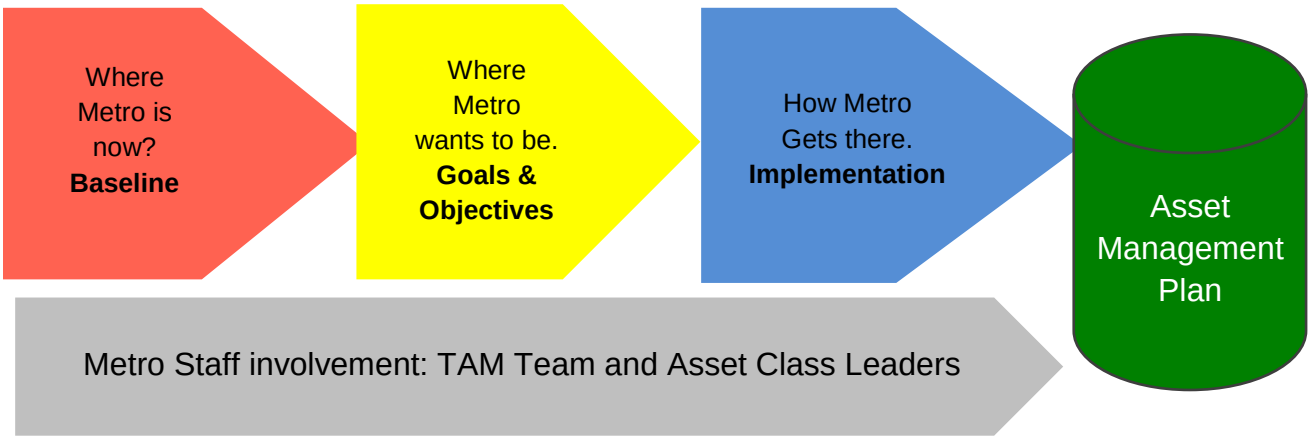


Figure 2 TAM Plan Development Process

2.2.1 Nexus between State Of Good Repair and Safety Programs

Metro recognizes the nexus between transit asset management and safety. While asset condition is not always a contributing factor in safety events, Metro believes that there is a relationship between the condition of an asset and safety performance. The FTA acknowledges that a transit asset that is in a state of good repair may be operated unsafely; conversely, a transit asset that is not in a state of good repair may be operated safely through appropriate safety risk mitigation strategies.

2.2.2 Safety Program Objectives

The Department of Risk Management, Claims & Safety strives to accomplish objectives and implement activities to attain safety goals in accordance with the requirements of the SSPP/Transit Safety Plan. This includes conformance to applicable laws and meeting the needs of the affected transit mode by utilizing available resources. The following objectives are established for attaining the program goals:

- Publish, revise and implement the SSPP as well as any applicable policies and procedures and ensure its implementation on an annual basis.
- Develop a safety conscious culture by implanting Safety Management System (SMS) through employees, customers, and contractors.
- Identify, analyze, and resolve hazards in a timely and appropriate manner; including reporting to the State Safety Oversight Agency (SSOA) officials. Communicate the hazards to the TAM program.
- Determine the appropriate practices and processes to eliminate, control, or minimize hazards.
- Provide the actions and measures necessary to obtain safety-related agreements, permits and approvals from departments, agencies, or organizations having jurisdiction.
- Develop and maintain documentation of all activities related to the goals of the SSPP/Transit Safety Plan and its implementation.
- Share facilities and equipment inspection reports with TAM Program.
- Safety evaluates backlog assets as to hazard rating and if safety critical, and provides a written report 90 days after the TAM Plan is completed. The evaluation will be part of the SMS program for all assets. Metro may collaborate

with the State Safety Oversight (SSO) Agencies to develop a Corrective Action Plan (CAP) to resolve or mitigate the hazard for fixed guideway assets.
- Safety Department provides appropriate notification to TAM Executive Officer for any assets where the hazard is deemed to be an unacceptable or high risk in accordance with the Hazard Classification Matrix within Metro's SSPP,
- Reporting any structures defects or damage discovered during audits or accident investigations to the TAM Executive Officer.

2.3 Data Collection, Uniformity and Relation to Data Capability

Data components are throughout the asset management framework. This section will address data on a broad concept. Data will vary between performance measure groups, however the data uniformity and requirements are the same throughout the TAM program.

Quality data produces a quality product and the ability to manipulate data filters to gain the desired results for reports and other information. Maintaining uniformity is the most challenging aspect of the TAM building process. The development of a naming convention must be universal and consistent. Different locations often use different terminology or names. Uniformity includes naming of units/items, standardization of processes and procedures, and standardized forms. Quality data drives everything.

Metro utilizes the M5 system to track planned (preventative) and unplanned rolling stock work. M5 is an integral part of vehicle maintenance of bus, van and LRV. Other asset groups have been moving toward M5 use. Asset listing has also been via Excel spreadsheets.

Metro's TAM program is a phased approach, transitioning from manual tracking of assets in Excel, to M5 implementation, ultimately moving all M5 tracking to the Enterprise Asset Management (EAM) system.

Regardless of the data system (M5, Excel spreadsheet or EAM), the same information will be necessary. Metro has worked diligently to ensure data is uniform and that the same baseline information is used in order to ensure the ability to pull data as needed. Everything starts in large groups then narrows down to become more and more specific. The hierarchy is extremely important. Provided the system is built and developed correctly it gives us the ability to pinpoint any information and pull data as needed.

2.3.1 Data Requirements

The following list is the information needed for each item entered in the TAM databases to properly build and track from the purchase to retirement and eventually disposal or sale. Items or equipment are tracked as required by FTA and NTD regulations. This

includes anything over $50,000 purchased with capital funds, critical or safety related. The inventory, at minimum, includes items to a level that maintenance or work is assigned. The data needs for rolling stock is slightly different than facilities or guideway equipment however, the data collected includes the following:

- Category
- Class
- Sub-Class
- Department
- Location Address
- Series
- Asset/Maintenance Item Name
- Manufacture, Make, Model
- Serial Number/VIN
- Condition Code
- Date of Last Condition Assessment
- Maintenance Schedule
- Cost Center
- Owning Department
- In-service Date
- Purchase Price
- Expected Life
- Funding source

2.3.2 Data Collection Schedule by Department

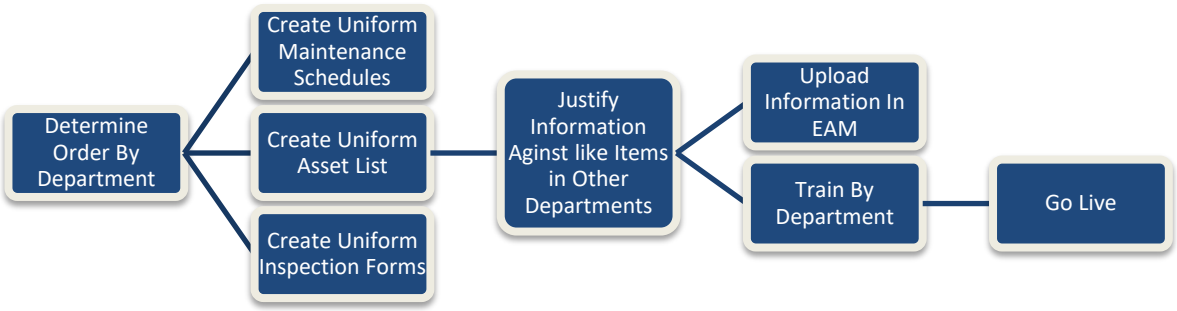
The initial inventory started in 2014 with the bus and van rolling stock. All other asset groups non-revenue vehicles; facilities and stations; guideway and systems have been tallied. Data collection schedule is as follows.

- Rolling Stock – FY19 – Complete
- Equipment (non-revenue service vehicles) – FY19 Complete
- LRT Communications - FY19 – Complete
- RF Radio - FY20
- Core IT – FY21
- Structures - FY19
- Traction Power - FY19 – Complete
- Linear OCS – FY20
- Signals - FY19 - Complete (excluding linear asset)
- Track (fixed asset) – FY19 – Complete
- Linear Track – FY20
- Fair Collection – FY19 – Complete
- Security (other CCTV, access control) – FY21
- Maintenance Facilities – FY19-Complete
- Parking Facilities/Lots – FY20
- Rail Stations – FY19
- Transit Centers – FY19
- Other “Clean Up” – FY20-21

The FY18 TAM Plan reports more than the required 1/3 of assets for the first TAM Plan submitall.

Data development is illistrated in Figure 3.

Figure 3 Data Development & Implementation Plan



2.3.3 Continual Improvement

An inventory that can be used to successfully support asset management relies upon established processes for maintaining inventory data. The individual lifecycle management requirements that define data requirements and include or reference the procedures that provide quality assurance for inventory data are included in the asset data. The TAM Program Manager will have sound data administration processes in place so that the data is of good quality and appropriately supports the asset management business processes. Additionally, the TAM Program Manager and the asset owners will be looking for opportunities to cost-effectively collect more data as the TAM program is utilized. To ensure this continual improvement, these processes have clear roles and responsibilities, schedules with milestones, a feedback loop, and quality assurance processes.

The inventory process organizes Metro assets into asset classes. Asset classes are then classified into maintainable units, which are organized into an asset hierarchy. This is because it is the maintainable unit to which the lifecycle management procedures (for example, inspections, predictive and preventive maintenance procedures, and rehabilitation investments) are applied.

2.4 Lifecycle Management

Metro is in the process of integrating a new asset and maintenance management software system. Because this system will have broad implications on Metro's business processes and the interconnection between the TAM program and other departments, it will be necessary to change and adapt processes in order to find the most effective procedures. This will include evaluation of all assets and identification of assets scored

<2.5. The assets will be reviewed by the TAM Team for prioritization and funding source identification. Annual update of the asset lists will capture asset changes. Inclusion to the procurement contract review will provide asset information for the TAM Program. The process will be documented as the TAM Program is implemented.

The lifecycle management of individual assets involves a common set of activities. M5, Excel spreadsheets and EAM systems track the planned and unplanned work, lifecycle cost, condition, and performance of each class of assets and link lifecycle management expenditures, such as rehabilitation, preventative maintenance and unplanned maintenance to asset performance. The process is data-driven with the end goal of maximizing asset performance, minimizing the total cost of ownership, and managing risks. Lifecycle management adheres to the following principals:

- Consistent asset inventory with a hierarchical structure that represents management structure, departmental structure, FTA reporting structure. It will provide accessible, consistent, and comprehensive information about that asset class. It is also intended to provide consistent information across all asset classes to support enterprise-level business processes, including capital programming and operations and maintenance budgeting.

- Each asset class has different requirements for condition, inspection, and monitoring that depend on performance characteristics, risks, and impacts of failure.

- Performance Monitoring will be used to improve reliability through an agency's ability to predict failure and address the root causes and proactively plan for the investments required to maintain good performance on the most critical assets. We will manage risk and determine needs and priorities.

- Lifecycle management takes into account the costs, performance, and risks associated with an asset class throughout its life. Lifecycle management will be used to ensure that the performance expectations will fit within the agency's broader goals and performance objectives. This will ensure all investment decisions are transparent, well-communicated, and support the agency's goals.

- Applying reliable centered maintenance (RCM) to the rolling stock fleet has maximized capital investment and maintenance. RCM philosophy will be applied to the TAM assets to better evaluate the assets and select an appropriate preventative maintenance program for that asset. This will increase transparency and accountability through an applied systematic process.

Maintenance will be more data-driving and reduce the impacts from unplanned break downs. Less safety hazards through RCM supports SMS.

Figure 4 illustrates the lifecycle management model.

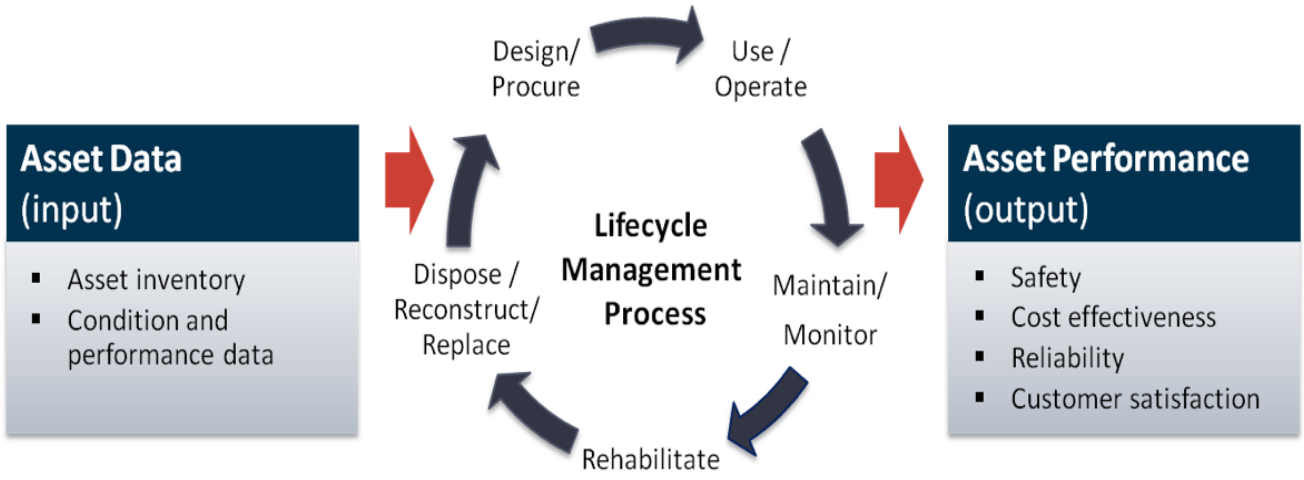


Figure 4 Lifecycle Management Model

Metro's vehicle maintenance department practice of reliable centered maintenance is also a circular process.

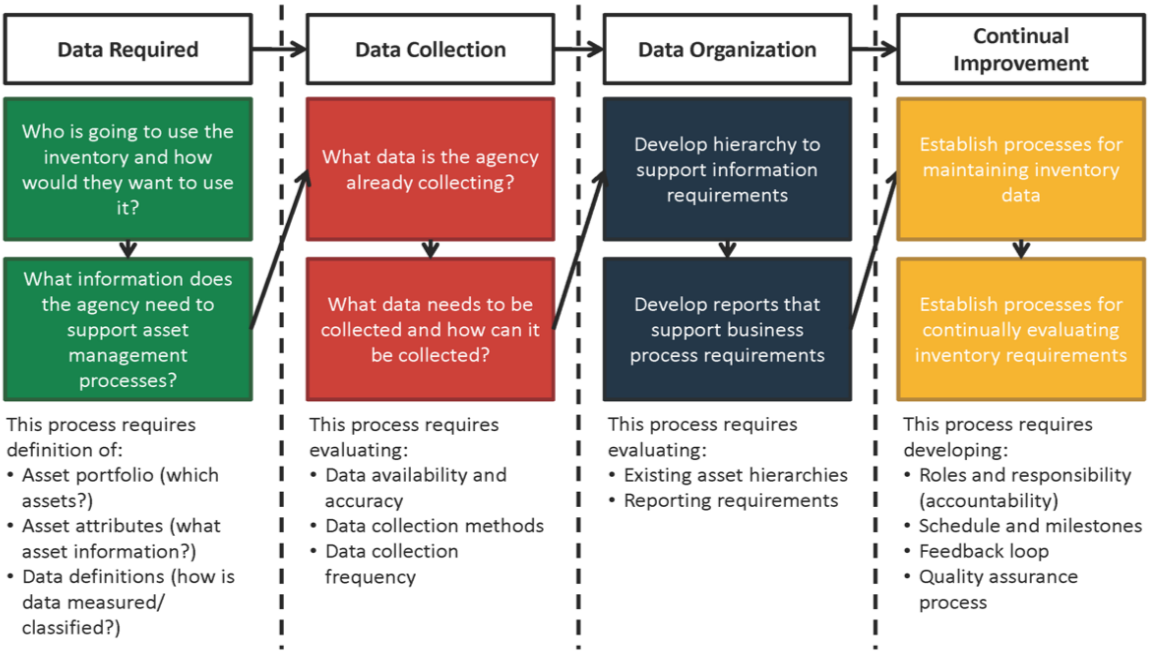
2.4.1 Lifecycle Forecasting

The end state goal is to be able to have lifecycle forecasting data available for 50 years for all assets. The maintenance management systems (MMSs) will support Metro's decision making process to predict failures and replace aged assets on a predictive schedule.

2.4.2 Asset Inventory

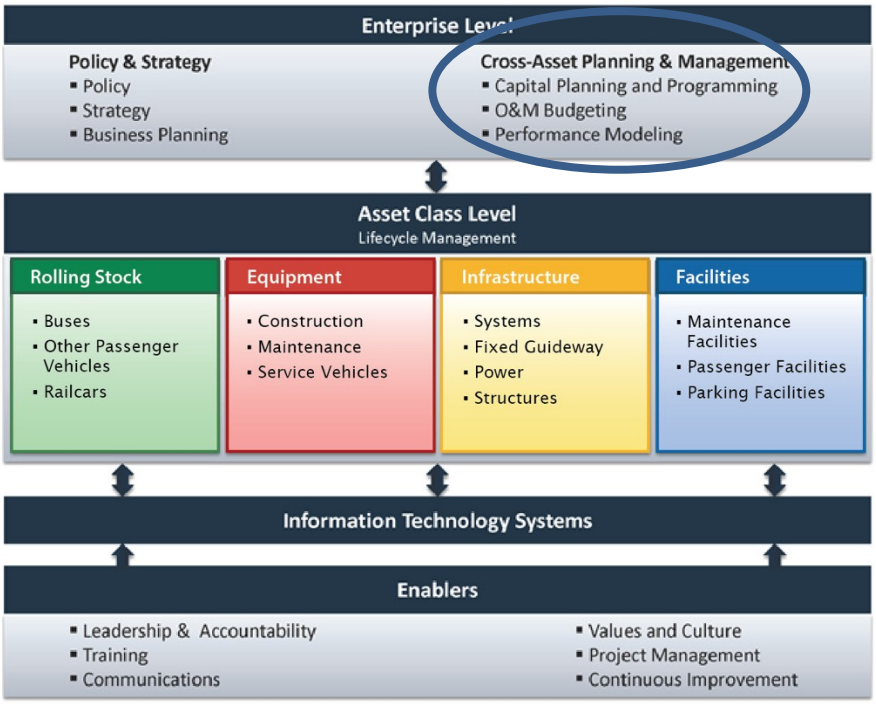
The asset inventory provides the basis for the asset management business planning, data collection, and performance reporting. This hierarchy provides the organization for the asset inventory and is the baseline for the data development. Figure 5 illustrates the data development process.

Figure 5 Data Development Process



2.5 Performance Measures

Under the TAM Final Rule, FTA established four performance measures to approximate the SGR for four categories of capital assets. Data is collected on all the capital assets. In the TAM framework, performance measures addresses asset class level, as illustrated in figure below of the framework.



Calculating performance measures supports Metro's effort to quantify the condition of assets. This facilitates setting targets that support local funding prioritization. Performance measure information is necessary in order to give key leadership a clear view of the organizations needs and to assess future financial needs and trends. The asset and performance measures are conducted in the following manner.

- **Rolling Stock***:* This is passenger vehicles, e.g. buses, LRVs and vans. The performance measurement is by ULB. This is predetermined by FTA.

- **Equipment:** This is maintenance and service vehicles, e.g. non-revenue 1-ton trucks, fork lifts and trailers. The performance measurement is by non-revenue service vehicles (by type) that exceed the ULB.

- **Infrastructure:** This is fixed guideway (rail track), systems of the fixed guideway and structures (bridges). Track measurement is the percentage of track segments (by mode) that have performance restrictions. Bridges, tunnels; and ancillary bridges, tunnels, culverts, and retaining walls performance target are evaluated using ASSHTO manual.

- **Facilities:** This is maintenance, passenger and parking facilities. The condition measure is a five-point scale called the TERM scale.

Rolling stock, revenue and non-revenue vehicles use the performance measure of ULB. ULB is the expected lifecycle of a capital asset as per FTA, as listed below. Due to Metro's vehicle maintenance's preventative maintenance program, the TAM Plan tracks the Metro ULB age.

Vehicle Type	FTA ULB Age	Metro ULB Age
Articulated Bus	14 Years	15 years
Automobile	8 Years	
Bus	14 Years	14 years
Cutaway Bus	10 Years	8 years
LRV	31 Years	31 years
Minivan	10 Years	
Vehicles Steel Wheeled	25 Years	
SUV	8 Years	
Van	8 Years	

Source: NTD 2017-2018 Asset Inventory Module Reporting Guide.

***Note from Metro May 17, 2017 2018 TAM Target memo:** Metro has incorporated a long-range strategic replacement plan for its city transit buses. The plan calls for buses to be replaced at a 15 year interval. With current schedules, we should achieve that goal and replace 1/15 of the fleet by the year 2024. This will establish a consistent fleet age of 7.5 years and stabilize procurement costs. By increasing our bus replacement interval to 15 years instead of the FTA required 12 years, Metro reduces bus replacement capital costs by 20%. Metro has a 5 year contract to replace the paratransit vans. Orders have been delayed by the manufacturer and the van fleet has far exceeded its life expectancy on 68 of the 122 revenue vehicles. Metro is currently working to procure replacement vehicles and stabilize the replacement schedule for the paratransit vans. Articulated Buses are 2001-04 model year however, they were refurbished and delivered in July 2014.

Metro is developing a long range strategic replacement plan to replace one-third of its LRV fleet every ten years which will meet the useful life of 31 years and establish an average fleet age of not more than 19 years.

Fixed guideway performance measured as performance restriction is defined to exist on a segment of rail fixed guideway when the maximum permissible speed of transit vehicles is set to a value that is below the guideway's full service speed. The performance restriction can be communicated through operating instructions, route signage, flaggers, or an agency's dispatch system. Performance restrictions may result from a variety of causes, including defects, signaling issues, construction zones, maintenance work, or other causes. Track segments are measured to the nearest 0.01 of a mile.

Facilities, facility systems and fixed guideway equipment performance measurement is by the TERM scale. TERM scale assigns numerical ratings based on condition, as listed below.

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

FTA, "TAM Facility Performance Measure Reporting Guidebook: Condition Assessment Calculation", Version 1.2 March 2018, update Appendix B.

It is important to note that some performance measures are limited to specific classes within that category. For each asset category the performance measure is a characterization of the percentage of the number of assets that are not in SGR. All of the performance measures have been designed with the goal of having low values as the age increases or condition of assets deteriorates, the value of the performance measures will increase.

State of good repair is defined as the condition in which a capital asset is able to operate at a full level of performance. TAM measures performance toward SGR in three ways:

- Age - Rolling Stock, Equipment
- Performance Restriction - Infrastructure
- TERM scale – Facilities, Infrastructure

2.6 Performance Target Setting

A target is a goal associated with performance that is used to track the progress of capital assets towards achieving a state of good repair. Targets connect strategic goals to the actions that Metro will take to reach those goals. Performance target is a quantifiable level of performance or condition, expressed as a value for the measure, to be achieved within a time period.

The TAM Final Rule does not require a specific process in setting performance targets. Metro's performance targets are set according to realistic expectations, available data, and expected financial resources from all sources over the upcoming year. Target setting will become more Metro-asset-specific as the TAM program is used. During target setting, Metro considers its ability to improve or maintain the state of its capital

assets, as well as the perception of the intended audience when determining how high or low to set the target. Asset performance targets are presented in the asset performance target tables of each asset section and asset appendix. The TAM Final Rule does not lay out penalties for missing a target, nor are rewards issued for attainment.

2.7 Reporting

Metro will report annually to FTA's NTD. The submission will include: asset inventory data; condition assessments and performance results; projected targets for the next fiscal year; and a narrative report on changes in transit system conditions and the progress toward achieving previous performance targets.

Metro fiscal year begins-ends July-June. Therefore, Metro will conduct NTD reporting in October each year going forward. The elements reported in NTD are also reported in the TAM Plan. The TAM Plan will be submitted to the FTA every 4 years starting in FY18. Initially, Metro will review and revise assets and the TAM Plan every year. This will facilitate a better internal understanding of the TAM process and how the performance measurements will help Metro manage assets. Internal review schedule will be also evaluated and revised with time.

2.8 TAM QA/QC

The TAM Plan quality assurance (QA)/quality control (QC) will be developed as a program. At a minimum it will include the following:

- TAM Team will randomly pull various inspections and work orders to ensure proper usage of EAM.
- Internal peer reviews, as EAM comes on line, of inspections and work orders to ensure inspection and maintenance are completed as designated.

3 DECISION SUPPORT TOOLS

Metro utilizes several tools in support of asset management.

3.1 Oracle Financial System

Metro has been using the Oracle Financial System since 2005. Both the fixed assets and materials management (inventory) data are stored in the Oracle system. At Metro, all capital purchases with an asset life of more than one year and a cost greater than $5,000 are considered depreciable capital assets. Major improvements to existing facilities and equipment that extend the lives of related assets are also capitalized. The fixed assets data is stored in the Oracle system and managed by the fixed assets accountant. Metro conducts a physical inventory of all fixed assets every two years, as required by state and local regulations. The most recent physical inventory was completed in FY18.

3.2 M5 Fleet Focus Vehicle

The M5 Fleet Focus strategic plan vehicle maintenance system was implemented at Metro in 1999 as M4 and upgraded to the Web-based M5 version in 2005. The system tracks Passenger vehicles which includes 487 buses, 138 vans, 87 LRVs, 9 facilities and approximately 300 other vehicles that support equipment. Since 2002, the agency's maintenance productivity has increased 100 percent. Without M5, Metro would have had great difficulty improving the agency vehicle reliability and reducing overall life cycle costs of its rail car and bus fleets. For buses, the agency has gone from an average breakdown after 6,000 miles to 20,000 miles between delays. In addition, Metro has been very successful in improving the reliability and integrating all of the preventive maintenance scheduling, predictive maintenance forecasting, parts data, and other maintenance performance metrics. In 2002, the agency established a preventive maintenance program for all vehicles. Key elements of this program include:

- Establishment of a set of standard operating procedures for maintaining vehicles, with schedules for key inspection and maintenance activities based on a combination of time and mileage interval.
- Development of maintenance plans describing Metro's schedules for maintaining existing assets consistent with its standards and a capital acquisition plan for the purchase of new assets
- Implementation of the M5 program to manage the fleet; the system is currently being implemented for managing facilities, ordering parts, and supporting other maintenance-related activities

Metro keeps track of maintenance requirements and needs for 30, 60, or 90 days into the future. It is one of the few transit agencies to implement an 18-month maintenance work outlook program.

M5 has added a fully integrated, automated fueling system option called Fuel Focus. This hardware and software system is unique because it manages fuel and fluid dispensing in the same database as the maintenance management application, rather than in two different programs.

M5 Fleet Focus software provides an intuitive, familiar Web-based user interface that Metro's senior management and bus and rail maintenance users find extremely helpful in reducing overall maintenance costs, while improving the reliability of both the rail and bus fleets. The software has assisted with Metro's reliability centered maintenance strategy that focuses on preventive maintenance, rather than the run-to-fail philosophy practiced in the past.

At a practical level, having detailed predictive maintenance data made possible by M5 is key to running a cost-effective maintenance operation. The improved fleet condition, original equipment maintenance recommendations and years of seamless operational effectiveness have enabled Metro to implement predictable component replacement instead of "time of failure" replacement. This enables Metro to combine some positions and eliminate others in the maintenance department. Better data, analysis, and control allow Metro to change inspection schedules to be more cost effective and efficient.

Metro has a planned maintenance schedule for its railcars, bus and van fleets from acquisition to retirement. This was designed to ensure that the highest maintenance dollars were spent at midlife, resulting in the greatest return on maintenance dollars invested. Metro also made another critical change, which was to schedule parts replacement before a part failure actually occurred. This strict predictive maintenance program and the planned preventive maintenance program were both enabled by the use of M5.

3.3 Type of Data

M5 Fleet Focus is focused on equipment classification, utilization, availability, assignment, accounting, life-cycle tracking and basic equipment information. Life cycle management of equipment is a desired goal for users and Metro. It provides Metro with the ability to manage each stage in the life of critical assets from when the organization plans, procures, rehabilitates and disposes.

The basic steps of life cycle management are:

- Classification
- Acquisition activities
- In-service activities
- Maintenance of equipment information
- Disposal/retirement activities

There are numerous pieces of information that impact whether an organization can successfully manage equipment throughout its known life. Cost, condition, usefulness, and classifications, as well as the need for the equipment, are all part of the picture. This pertinent information is needed in order to know that Metro has the right equipment in the right place at the right time to deliver revenue service to the public.

M5 also provides Metro with the ability to attach files, images, and links to a work order, unit record, parts records, etc. All of Metro's inspections consist of electronic documents that are attached to standard jobs that a mechanic fills out electronically. The mechanic then attaches the inspection form file to the work order, thus eliminating all paper files. Additionally, Metro attaches all title information, licensing information, sale/disposal information, recalls and any other pertinent information to units within the M5 application.

3.4 Facilities Data

The M5 system has already been used to keep track of some Metro facility maintenance information. These facilities include bus and rail maintenance facilities. These facilities are mainly for Metro internal use and not for Metro customers/riders.

In the M5 system, each facility is broken down into critical components, such as Heating, Ventilation, and Air Conditioning (HVAC). These major components are inspected on a regular basis (e.g., monthly or weekly). Some of the inspection results are scanned and attached to the M5 asset management system; the rest are in paper file format due to the shortage of staff. However, given enough resources, these paper files can be scanned and attached to the M5 system. Based on the inspection requirements (e.g., weekly or monthly) specified in the M5 system, the system automatically generates scheduled inspection requests or work requests. In addition to the scheduled inspection requests, there are other unscheduled repair work requests. These requests are also input into M5 and a work order is generated for each of them.

In the M5 system, cyclical maintenance schedules have been set up for maintenance of way, right of way and facility maintenance. However, the inspection forms for these facilities has not been input into M5. Similar to the practice of the bus maintenance department, the M5 system is used to keep track of the time Metro employees spend on each facility work order. The M5 system can automatically record the time each

employee clocks in and out for a particular facility work order. This is very helpful for increasing labor accountability.

3.5 Structure Assets – Inspection and Inventory

Metro has established a detailed asset inspection and maintenance policy that covers all MetroLink structure assets. The scope of this standard includes all fixed structures that support or carry loads, including bridges, tunnels and associated ancillary structures, retaining walls, culverts, and other special structures such as parking garages, communication towers, and elevated station platforms.

Metro's structure condition rating procedures are documented in the MetroLink Standard for Structures Inspection and Maintenance. Metro structure condition ratings are based on the existing condition of the structure as compared to its as-built condition. The determination of which ratings apply to each of the structure components are based on the evaluation of all relevant factors and information available. Condition rating values used are on a scale of 0 to 9, with 0 defined as "Failed Condition" and 9 defined as "Excellent Condition". This rating scale is based on AASHTO's Manual for Bridge Evaluation, which is referenced in the National Bridge Inspection Standards established for highway bridges in 23 CFR 650, Subpart C, and is in accordance with American Public Transportation Association (APTA)'s "Standard for Rail Transit Structure Inspection and Maintenance" (APTA RT-FS-S-001-02 Rev1) document. Metro's structures are routinely inspected on frequencies ranging from two to five years. Inspection reports provide condition ratings, noted deficiencies, recommended repairs, and photos for each inspected structure.

Metro has developed an electronic-based asset inventory and inspection database for MetroLink structures that utilizes ArcGIS. ArcGIS is a commercial software developed by ESRI, with features that have been customized to fit Metro's needs. This database tool was first developed for Metro over 13 years ago and has been expanded and upgraded continually.

The ArcGIS database combines the power of GIS location capability with a detailed information database. The database provides Metro the ability to quickly access, identify, and track the condition of critical structure assets required for safe and reliable operations. Additionally, all available information including inspection reports, plans, design calculations, photographs, operational agreements (easements, snow removal, limits of responsibility), emergency operational risks (seismic, flood/scour, vehicle impact, barge impact), utility crossings, and repairs for any structures asset is compiled in one accessible location. This system allows for all of the information for a particular asset to be assembled and viewed across departments needing access to the information.

This type of total asset visibility allows different departments to gather current information without going through a gatekeeper or other departments that could delay a time-sensitive response. This is particularly important in the cases of an emergency that occurs along the alignment. With complete access to all pertinent records of a particular asset, quick and competent decisions can be made. This system is particularly useful for identifying assets that are not in a state of good repair, documenting the deficiencies and justifying rehabilitation/ replacement decisions.

3.6 Asset Investment Prioritization

Metro has a thorough Capital Budget Request process for construction/rehabilitation, new equipment/replacement and major computer software procurement/development. The prioritization of a request is a two-tiered process, based on the project's priority and its impact on the agency's strategic planning goals and objectives for the three-year budget cycle that is being developed. The primary tier is the priority assigned to the project. The second tier is the project's anticipated impact on the daily operation. The project ranking is a static rating, based on the project type. The impact of the project is presented in a composite score of several independent criteria that will allow points based on the project's impact toward meeting the agency's strategic planning and objectives. The Capital Budget Request process is documented in the BSD Capital Budget Manual. The Capital Budget Manual is revised annually to reflect the current grant program requirements.

After the initial scoring by the Program Development and Grants Department, senior management conducts a separate project scoring for each project. The combined scores from staff and senior management determine the project's prioritization within the capital budget process.

Capital projects must be approved by the Commissioners of the Bi-State Development Agency (Metro) as a part of the annual Operating and Capital Budget approval process. The projects are then submitted to the East West Gateway Council of Governments (EWGCOG) for inclusion in the Transportation Improvement Program (TIP). The TIP is a schedule of transportation improvements planned by various agencies in the Bi-State area. The TIP is approved by the Board of Directors of the East-West Gateway Council of Governments. EWGCOC is the metropolitan planning organization (MPO) for the Bi-State area which includes the City of St. Louis; Franklin, Jefferson, St. Charles, and St. Louis counties in Missouri; Madison, Monroe, and St. Clair counties in Illinois. The Board of Directors is made up of the locally elected officials of those areas. Following the approval of the TIP, the Statewide Transportation Improvement Program (STIP) must be approved. The STIP is a federally required document that provides the Federal Highway Administration (FHWA)

and the FTA a listing of all projects that are candidates for federal-aid or regionally significant projects that are not using federal-aid. For the Bi-State area, the STIP is submitted to both the State of Missouri and the State of Illinois for approval by the respective governors of each state.

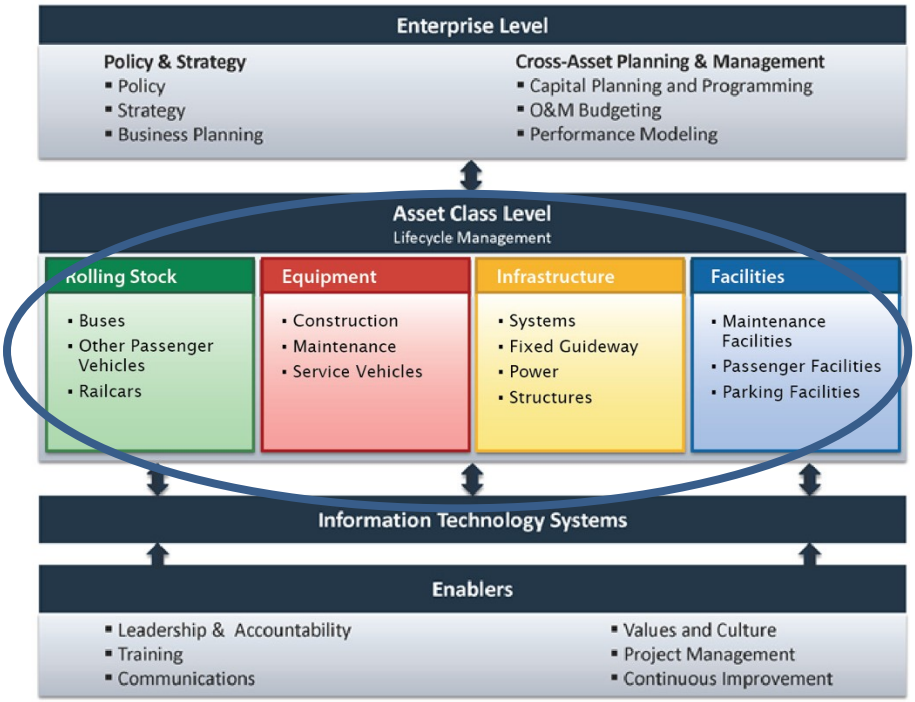
In addition, Metro's sustainable asset life cycle for the bus fleet provides critical data for analyzing costs of operating a safe and reliable transit service, which benefits the customers at significant cost savings. This TAM program forms the basis for long-term financial planning (a projection of future expenditures) that reconciles both the objectives of operations and maintenance and capital budgeting, thus collectively contributing to extension of the useful life of all assets. It is essential that capital asset investments are systematic and data driven as well as it is necessary to conduct scheduled asset condition assessments and monitor performance metrics, so that Metro can continue to be good a steward of public funds.

The capital budget process includes input from the following departments to ensure inclusion and appropriate notification of scope of work during new, refurbished and retired assets projects.

- ADA Services
- Risk management, Claims and Safety Department
- Public Safety Department

4 ASSETS AND CONDITION ASSESSMENTS

The following sections are the asset summaries. Asset classes are grouped as rolling stock, equipment, infrastructure or facilities. Each asset class is further broken down into sub-assets with related assets. The following plan sections are divided by asset class. This is the summary and big picture of the TAM program. Detailed asset lists are found in the referenced appendix. In the TAM framework, this is the asset class level.



The asset class break down is a challenge in that there are many ways to group systems. Grouping could be by department or location, one way may work better than another. The goal was to separate by departmental organizations and like equipment. However, these divisions must be functional in the new EAM system. Metro understands there will be changes to how the asset classes are grouped as the TAM program is used. At this time, Metro's asset categories are as follows:

ROLLING STOCK		INFRASTRUCTURE	FACILITIES
Passenger Vehicles • *Bus* • *Van* • *LRV*	**Non-Revenue Service Vehicles** • *< 1 ton trucks* • *>1 ton trucks,* • *Trailers* • *Snow removal* • *Tugs & mules* • *Forklift* • *Off Road Vehicles*	**System Communication** • *LRT Communication (SCADA, PA, CCTV)* • RF Radio • Core IT Systems	**Maintenance** • *Ewing Y&S* • *29th St Y&S* • *Central* • *BW garage* • *II garage* • *DeB garage* • *DeB power house* • *Swansea* • *Sarah*
		Structures • Bridges • Tunnels • Ancillary Bridges • Ancillary Tunnels • Ancillary Culverts • Ancillary Retaining walls • Radio Towers	**Parking** • *Parking lots* • *Parking garages*
		Systems Guideway • *Traction power* • *Signal* • *Track*	**Passenger** *Rail Stations* *Transit Centers*
		Systems • *Fare collection* • *Security*	

4.1 Rolling Stock-Passenger Vehicles Bus, Van & LRVs

Rolling stock includes Metro passenger vehicles. Passenger vehicles include 455 buses, 87 LRVs, and 135 paratransit vans, totaling 677 vehicles passenger vehicles. Each passenger vehicle asset condition rating, asset nomenclature, and replacement cost is found in the appendix section.

This multi-modal system serves a six county area in Missouri and Illinois. Metro operates 455 buses throughout this region. Bus service operates 365 days per year from 4:00 AM through about 2:00 AM. Light rail service, supported by 87 vehicles, operates from the Scott Air Force Base in Illinois to the Lambert Airport in Missouri with a southward eight-mile extension to Shrewsbury, Missouri. Light rail runs through a central corridor of the Metropolitan area and is well served by bus and van service. Call-A-Ride paratransit service, supported by 135 vans, operates throughout the Missouri side of the Metropolitan region. This service exists to augment bus and rail service and mirrors their hours of operation.

The stability and uniformity of the revenue fleets have greatly enhanced Metro's Vehicle Maintenance Team's ability to plan and execute a traditional preventative maintenance plan.

The result has been exceptional equipment reliability, a high standard for safety and cost control. System on time performance and customer satisfaction has been elevated over the last several years in recognition of equipment that is maintained as close to new standards as possible.

At the center of the great success that the VMD enjoys is a comprehensive predictive maintenance plan in conjunction with a vehicle replacement plan for all revenue equipment. This plan, conceived in 2002, recognizes a vehicle at the time a specification for the equipment is written all the way through the vehicles useful life to time of disposal. VMD utilizes the philosophy that when parts and labor costs equal the original purchase price, the equipment has met its useful life. Maintenance and preventative activities, as well as unit replacement and structural maintenance actions, are all predetermined, charted and planned for specific time points in the life of that vehicle.

All rolling stock are evaluated using the TAM ULB scale of evaluation. In addition, a non-TERM scale, also of 5 (excellent) to 0 (end of life), is utilized to evaluate vehicles. Accepted measures of performance adapted as performance indicators by the Metro Vehicle Maintenance Department are:

- Inspection on time performance
- Mean distance between failures
- Worker Comp injuries
- Customer complaints for revenue equipment

Performance standards and indicators are measured and monitored on a monthly basis, reported to the Executive Director Metro Transit quarterly and adjusted annually to reflect operational considerations. Performance standards and goals are measured by division and mode of operation.

Vehicles are listed in the following appendices:

Bus in Appendix A
Van in Appendix B
LRV in Appendix C

4.2 Rolling Stock-Non Revenue Service Vehicles

Equipment is Metro non-revenue service vehicles. The non-revenue fleet is dispersed throughout the working population and facilities. This includes the following service vehicles and appendix in which they are listed.

<1 ton trucks in Appendix D
>1 ton trucks in Appendix E
Trailers in Appendix F
Snow removal in Appendix G
Tugs & mules in Appendix H
Forklift in Appendix I
Backhoe in Appendix J

4.3 Infrastructure - System Communication

The system communication group includes LRT communication, radio frequency (RF) radio, and core information technology (IT) systems.

LRT communication includes the following asset groups.

At ML Stations		At Yard & Shops
CCTV	Outside Cable Plant	Clocks
CTS	Public Address System	SCADA
TS/PAT System	SCADA	
Fire Intrusion System	Tunnel Ventilation Control System	
Intelligent Video System	TVM Network	
	UPS	

The LRT communication assets are found in Appendix K.

The radio frequency (RF) and core IT systems will be identified by FY21. Those assets will be found in appendices L and M.

From the FY17 asset reporting, all communication system totals were:

All Communications System Totals for FY18		
Type	**FY17 Achieved**	**FY17 Goal**
Radio Towers (5)	3.60	3.60
RF Communications Facilities (15)	3.90	4.20
(MOW) Communications Maintenance Systems (7)	2.53	2.56
(VMD) Communications Maintenance Systems (4)	3.40	4.00
All Communications Average (Based on each item scored equally)	**3.49**	**3.66**

4.4 Infrastructure-Structures

Structures include bridges, tunnels, retaining walls, culverts and radio towers. The asset detail is found in the following appendices.

Asset	Appendix
Bridges	N
Tunnels	O
Ancillary Structures-Bridges	P
Ancillary Structures-Tunnels	Q
Ancillary Structures- Culverts	R
Ancillary Structures- Retaining Walls	S
Radio Towers	T

Inspections of MetroLink controlled structures are conducted to determine the physical and functional condition of the structure, to provide a continuous record of their condition and rate of deterioration, to establish priorities for repair and rehabilitation, and to initiate maintenance actions.

The type of inspection required for each structure is determined by Metro's Maintenance Structure Inspection Manual from one of the seven types of inspections listed below (from AASHTO's Manual for Bridge Evaluation):

No.	Inspection Type
1	Initial
2	Routine
3	Damage
4	In-Depth
5	Fracture Critical
6	Underwater
7	Special

4.4.1 Bridges

Bridges are rated using four separate categories, as applicable to each bridge, including Deck, Superstructure, Substructure, and Channel/Banks. 62 bridges with a total length of 27,542 ft. are included in the asset inventory. The shortest bridge span length is 33.58 ft. and the longest bridge is 4,514.75 ft.

4.4.2 Tunnels

7 tunnels with a total length of 12,568 ft. are included in the asset inventory. The shortest tunnel length is 450 ft. and the longest tunnel is 4,916 ft.

4.4.3 Ancillary Structures

Metro's ancillary structures include 9 pedestrian and off-system bridges, 1 pedestrian tunnel, 81 culverts, and 378 retaining walls.

4.5 Infrastructure-Systems Guideway

System guideway includes traction power, signal and track. The track and OCS linear assets will be accounted for by FY20. All of the MetroLink alignment is on semi-exclusive right-of-way. Phase I consists of approximately three-quarters of a mile of elevated structure at Lambert Airport, a former baggage cart tunnel under Union Station, the Washington/8th Street Tunnel under downtown St. Louis and the lower deck of the Eads Bridge. In addition, nine miles of the Phase I alignment is on continuous former railroad right-of-way. With the exception of a one-third of a mile single-track section just east of the Lambert Terminal One Station, the existing MetroLink route is double tracked. The alignment contains several bridges spanning highways, railroads, and the Mississippi River.

The St. Clair Extension is a 20.9-mile addition to MetroLink, heading southeast and east from the former 5th and Missouri terminus to Shiloh-Scott Station, and serving much of St. Clair County, Illinois. Phase II links Phase I with various activity centers and includes nine stations. Phase II is also on exclusive right-of-way and is also double tracked. Approximately 14 miles is on former CSX System railroad alignment. Phase II has no tunnels but there are several bridge structures over major highways and railroads.

The Cross County Extension (Phase III) is a 7.6-mile branch to MetroLink, first heading west from the Forest Park-DeBaliviere Station through Clayton and then south to Shrewsbury, serving a portion of southwest St. Louis City and County. It links Phase I and Phase II in Missouri and Illinois with various activity centers including Washington University, the St Louis County seat in Clayton, the Galleria Mall, and the Sunnen Industrial Park. Phase III is also on exclusive right-of-way, of which 4 miles is on former railroad alignment.

Performance Restriction (slow zone) calculation is presented in Appendix X.

4.6 Infrastructure-System

Fare collection includes TVMs and SAVs. All MetroLink stations have multiple TVMs and SAVs. Currently, Metro's asset inventory consists of 472 fareboxes, 14 cash receivers systems, 4 garage data management systems, 124 ticket vending machines and 177 stand-alone validation machines.

The fare collection assets are listed in Appendix Y.

4.7 Facilities

Currently, Metro's facility and station asset inventory consists of 9 maintenance facilities, 8 transit centers, 2 parking garages, and 38 rail stations. The maintenance, parking, rail passenger and bus transit centers include the following:

Facilities Maintenance	Facilities Parking	Facilities Passenger Stations	Facilities Passenger Transit Centers
• Ewing Yard & Shop • 29th Street Yard & Shop • Central Bus Maintenance Facility • Brentwood Bus Maintenance Facility • Illinois Bus Maintenance Facility • DeBaliviere Bus Maintenance Facility • DeBaliviere Power House • Swansea Maintenance Facility • Sarah Maintenance Facility	• North Hanley Garage • Meridian Garage	• Lambert Airport Main • Lambert Airport East • North Hanley • University of MO-St Louis North • University of MO-St. louis South • Rock Road • Wellston • Delmar Loop • DeBaliviere Forest Park • Central West End • Grand • Cortex • Union Station • Civic Center • Stadium • 8th & Pine • Convention Center • Arch-Laclede Landing • East Riverfront • 5th & Missouri • Emerson Park • JJK Center • Washington Park • Fairview Heights • Memorial Hospital • Swansea • Belleville • College • Shiloh-Scott • Skinker • University City-Big Bend • Forsyth • Clayton • Richmond Heights • Brentwood I-64 • Maplewood-Manchester • Sunnen • Shrewsbury-Lansdowne I-44	• Ballas Transit Center • Catlan Loop Transit Center • Gravois/Hampton Transit Center • North Broadway Transit Center • Rock Hill Transit Center • Riverview/Hall St Transit Center • Civic Transit Center • North County Transit Center

4.8 Facilities-Maintenance

Light rail is operated out of two locations on Ewing Street in St. Louis, Missouri and another location on St. Clair Avenue in East St. Louis, Illinois. Metro bus service operates out of three modern facilities; Brentwood and DeBaliviere in Missouri and East St. Louis in Illinois. All three facilities feature indoor parking for buses and indoor fueling facilities. In addition, Metro operates a heavy repair facility providing engine, transmission and body repairs for the various fleets at Central Bus Maintenance Facility. The paratransit van operation and non-revenue repair shops are based in the heavy repair facility at Central Bus Maintenance Facility.

4.8.1 Ewing Rail Facility

Ewing facility is located at 700 South Ewing Street, St. Louis MO 63103 and includes 12 acres of land. The facility was constructed in 1992 and also hosts Metro's Operation Control Center (OCC). In addition, the Ewing facility has office space occupied by MOW senior management. Appendix AA presents the current condition rating followed by a list of systems and components.

4.8.2 29th Street Facility

29th Street facility is located at 2901 St. Clair Ave., E. St. Louis, 62205, IL and includes 51,800 sq. ft. of land. The facility was constructed in 2001. In addition, the 29th Street facility contains Metro's only paint facility supporting the LRV fleet. Appendix BB presents facility assts.

4.8.3 Central Bus Maintenance Facility

Metro's Central bus maintenance facility is located 3300 Spruce Street, St. Louis, and MO 63103. The facility was constructed in 1983. Currently the facility has 321,000 sq. ft. Appendix CC presents the facilities asset condition rating followed by a list of assets, systems and components.

4.8.4 Brentwood Bus Facility

Brentwood facility is located at 3000 South Brentwood, St. Louis, MO 63144. The facility was constructed in 1983. Currently the facility has 281,066 sq. ft. Appendix DD presents the facility's asset condition rating followed by a list of assets, systems and components.

4.8.5 Illinois Bus Maintenance Facility

The Illinois Bus Maintenance Facility is located at 801 North 47th Street, East St. Louis, IL 62205. The facility was constructed in 1990. Currently the facility has 281,066 sq. ft. Appendix EE presents the facility's asset condition rating followed by a list of assets, systems and components.

4.8.6 DeBaliviere Bus Facility

DeBaliviere facility is located at 585 DeBaliviere Ave, St. Louis, MO, 62112. The facility was constructed in 1983. Currently the facility has 351,993sq. Ft. Appendix FF presents the facilities asset condition rating followed by a list of assets, systems and components.

4.8.7 Swansea Maintenance Facility

Swansea facility is located at 2208 North Illinois Street, Suite C, and Swansea, IL 6226. It is unknown when the facility was constructed. Currently the facility has 16,690 sq. ft. Appendix HH presents the facilities asset condition rating followed by a list of assets, systems and components.

4.8.8 Sarah Maintenance Facility

DeBaliviere facility is located at 327 South Sarah St, St. Louis MO 63110. The facility was constructed in 2002. Currently the facility has 2,000 sq. ft. Appendix II presents the facilities asset condition rating followed by a list of assets, systems and components.

4.9 Facilities-Parking, Passenger Stations & Passenger Transit Centers

Parking lots, parking garages, passenger rail stations, and passenger transit center assets will be added by FY20

4.10 References and Appendices

American Public Transportation Association (APTA), Recommended Practice, SGR-TAM-RP-002-13, “Defining a Transit Asset Management Framework to Achieve a State of Good Repair,” August 2013. http://www.apta.com/gap/fedreg/Documents/Defining.a.transit.asset.management.framework.to.achieve.a.state.of.good.repair.pdf

APTA Recommended Practice – SGR-TAM-RP-002-13 (Defining a Transit Asset Management Framework to Achieve a State of Good Repair)

Bi-State Development Agency (BSD) of the Missouri-Illinois Metropolitan District, Metro Operating and Capital Budget, St. Louis, MO.

BSD Capital Budget Manual.

Federal Transit Administration (FTA), “Asset Management Guide.” http://www.fta.dot.gov/documents/FTA_Asset_Mgt_Guide_-_FINAL.pdf

FTA, “Fact Sheet, MAP-21, Section 5326 (TAM).” http://www.fta.dot.gov/documents/MAP-21_Fact_Sheet_-_Transit_Asset_Management.pdf

FTA, “Transit Asset Management Practices, A National and International Review,” June 2010. http://www.fta.dot.gov/documents/TAM_A_National_and_International_Review_-_6.10_FINAL.pdf

FTA, “Transit Asset Management Guide”, November 2016, FTA Report No. 0098. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Report_No._0098.pdf

FTA, “TAM Facility Performance Measure Reporting Guidebook: Condition Assessment Calculation”, Version 1.2 March 2018, update Appendix B. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/regulations-and-guidance/asset-management/60361/tam-facility-performance-measure-reporting-guidebook-v1-2.pdf

MAP-21 legislation (49 U.S.C., Section 5326, Transit Asset Management): http://www.law.cornell.edu/uscode/text/49/5326

Metro System Safety Plan

MetroLink Right-of-Way Facilities Maintenance Plan

MetroLink Track and Rail Right-of-Way Maintenance Standards Manual

MetroLink Standard for Structures Inspection and Maintenance

NTD 2017-2018 Asset Inventory Module Reporting Guide.
https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/ntd/17691/report-year-17-18-asset-inventory-module-reporting-guide_0.pdf

Transit Cooperative Research Program (TCRP), Report 157, “State of Good Repair: Prioritizing the Rehabilitation and Replacement of Existing Capital Assets and Evaluating the Implications for Transit,” 2012.
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_157.pdf

U.S. Department of Transportation, Federal Transit Administration, Transit Asset Management Manual, Focusing on the Management of our Transit Investments, (Washington, DC, 2012).

APTA Asset Management Plan Checklist (if it’s approved in time)
Other APTA documents

4.11 Definitions

Key concepts and terms used throughout the TAM Plan are defined below to provide for a common understanding of the vocabulary.

Asset Management: Refers to the optimal lifecycle management of physical assets to sustainably achieve the stated business objectives.
Asset Hierarchy: Refers to segmenting assets into appropriate classifications. The asset hierarchy can be based on asset function or asset type or a combination of the two.
Asset Management Business Processes: Refers to the key processes that comprise the asset management framework. Business processes include: policy and strategy; inventory, condition assessment and performance monitoring, lifecycle management planning, capital planning and programming, O&M budgeting, and performance modeling.
Asset Management Maturity: Refers to an agency's level of asset management practice. An agency's asset management maturity may be as basic as understanding the nature of all critical assets owned.
Maintenance Management System: Refers to M5, the work order and maintenance tracking system used to manage, plan and track maintenance activities on all assets at Metro.
Physical Assets - Refers to an agency's facilities, stations and fixed guideways; as defined in the FTA Transit Asset Management Guide.
State of Good Repair: The condition in which a capital asset is able to operate at a full level of performance. An asset is considered to be in a state of good repair when that asset meets the following:
Is able to perform its designed function
Does not post a known unacceptable safety risk
Its lifecycle investments have been met or recovered

Acronyms

ADA	Americans with Disability Act
APTA	American Public Transportation Association
ASSHTO	American Association of State Highway and Transportation Officials
BSD	Bi-State Development
CEO	Chief Executive Officer
CFR	Code of Federal Registers
CCTV	Closed Circuit Television
CFO	Chief Financial Officer
CMO	Chief Mechanical Officer
CTS	Carrier Transmission System
EAM	Enterprise Asset Management
ET/PAT	Emergency Telephone/Passenger Assist Telephone
EWGCOG	East West Gateway Council of Governments
FAST	Fixing America's Surface Transportation
FI	Fire Intrusion
FHWA	Federal Highway Administration
FMS	Fuel Management System
FTA	Federal Transit Administration
HVAC	Heating, Ventilating, and Air Conditioning
IT	Information Technology
KPI	Key Performance Indicator
LRV	Light Rail Vehicle
LRT	Light Rail Train
MAP-21	Moving Ahead for Progress in the 21st Century
MAUs	Mass Air Units
MCC	main control center
M5	Computerized Maintenance Work Order Management System
MMS	Maintenance Management System
MOW	Maintenance of Way
MPO	Metropolitan Planning Organization
NTD	National Transit Database
OHD	Overhead Door
OSP	Outside Cable Plant
PA	Public Address
PM	Preventive Maintenance
PMI	Preventive Maintenance Inspection
PMMP	Pavement Maintenance and Management Plan
PRV	Primary Return Ventilation
QA	Quality Assurance

QC	Quality Control
RF	Radio Frequency
ROW	Right-of-Way
RTU	roof top unit
SAV	Stand Alone Validators
SCADA	Supervisory Control and Data Acquisition
SCU	Sound Card Used
SGR	State of Good Repair
SMS	Safety Management System
SSOA	State Safety Oversight Agency
SSPP	System Safety Program Plan
STIP	State Transportation Improvement Plan
TAM	Transit Asset Management
TAM Plan	Transit Asset Management Plan
TERM	Transit Economic Requirements Model
TIP	Transportation Improvement Plan
TVM	Ticket Vending Machine
ULB	Useful Life Benchmark
UPS	Uninterrupted Power Source
VMD	Vehicle Maintenance Department