

# Appendix II: Transportation Performance Management

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# Appendix II: Transportation Performance Management

## Introduction

Transportation performance management is a strategic approach to transportation investments that uses system data to make investment and policy decisions to meet national performance goals. The Moving Ahead for Progress in the 21<sup>st</sup> Century Act (MAP-21) and Fixing America's Surface Transportation (FAST) Act established Performance-Based Planning and Programming (PBPP) requirements as part of Transportation Performance Management rules for both highway programs and public transportation.

National transportation goals cover a range of key management issues: highway safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability and reduced delivery delays (23 U.S. Code Section 150). The legislative framework also establishes performance measure requirements for the National Highway Performance Program (NHPP), the Highway Safety Improvement Program (HSIP), and Congestion Mitigation and Air Quality (CMAQ) Program. These performance measure processes are further detailed in 23 CFR Part 490.

National public transportation policy and goals focus on individual mobility and environmental impacts and also include related national goals such as air quality, energy conservation, international competitiveness, and specific individual mobility needs (elderly, disabilities, and economically disadvantaged). Performance measure requirements are established in two key areas: Transit Asset Management (49 U.S. Code Section 5326) and Public Transportation Safety (49 U.S. Code Section 5329).

State Departments of Transportation, Metropolitan Planning Organizations (MPO), and operators of public transportation are required by 23 CFR Part 450 to jointly agree upon written provisions to collect and share data, cooperatively develop and update performance targets, and report performance targets and ongoing progress towards attaining the targets.

PennDOT in cooperation with MPOs/RPOs has developed a *PBPP Procedures* document (March 2019) to serve as Pennsylvania's provisions for PBPP roles and responsibilities. An SPC-PennDOT Written Provisions Acknowledgement letter dated 3/29/2019 establishes these cooperatively-developed PBPP joint-processes for highway safety performance (PM1), National Highway System performance (PM2), and NHS system performance/freight movement/CMAQ measures (PM3).

A more complete description of the cooperative processes used to develop the PBPP planning framework and performance targets is included in the SPC 2019-2022 TIP (Appendix 3). Separate processes for Transit Asset Management measures are

documented in the Port Authority of Allegheny County Transit Asset Management Plan (PAAC TAM Plan, October 2018) and the Pennsylvania Transit Asset Management Group Plan (PennDOT, September 2018). Written Provision Acknowledgements between SPC-PennDOT and each transit agency in the region have been completed accepting PBPP-based Transit Asset Management roles and responsibilities. Transit Safety measures have not yet been completed; development processes are ongoing.

The federal PBPP targets must be integrated with (and consistent with) other performance based planning efforts undertaken, such as the Pennsylvania Strategic Highway Safety Plan (and Regional Safety Action Plan), the National Public Transportation Safety Plan (and Transit Agency Safety Plans), state and agency transit asset management plans, the Pennsylvania Transportation Asset Management Plan (anticipated June 2019), MPO Congestion Management Process, and the MPO CMAQ performance plan.

The scope of MPO Long Range Transportation Plan (LRTP) planning requirements is included in 23 CFR 450.324. The MPO LRTP must include required performance measures, performance targets and a system performance report that includes an evaluation of system performance with respect to the performance targets, describing progress in comparison with system performance recorded in previous reports. The SPC LRTP includes performance measures and targets as noted as well as baseline performance data for these measures. The initial system performance report and progress description will be due upon completion of the first scheduled performance period for each measure. The SPC TIP is an important element for achieving SPC performance targets.

The Transportation Improvement Program (TIP) must demonstrate consistency with the Long Range Transportation Plan as well as other performance management plans. Projects included in the TIP must be consistent with and reflect the LRTP's investment priorities. The TIP should also provide a description of how the TIP will work toward achievement of the performance targets established in the LRTP and link the performance targets with investment priorities.

## **Highway Safety Performance Measures**

The FHWA final rule for the *National Performance Management Measures: Highway Safety Improvement Program (Safety PM)* and *Highway Safety Improvement Program (HSIP)* were published in the Federal Register (81 FR 13881 and 81 FR 13722) on March 15, 2016 and became effective on April 14, 2016.

The HSIP Final Rule updates the HSIP regulation under 23 CFR Part 924 to be consistent with MAP-21 and the FAST Act, and clarifies existing program requirements. The Safety PM Final Rule adds Part 490 Subpart B to Title 23 of the Code of Federal Regulations to implement the performance management requirements in 23 U.S.C. 150.

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The Safety PM, also referred to as PM1, Final Rule supports the HSIP, as it establishes safety performance measure requirements for carrying out the HSIP and to assess fatalities and serious injuries on all public roads.

The Safety PM Final Rule establishes five performance measures as the five-year rolling averages to include:

- Number of Fatalities
- Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT)
- Number of Serious Injuries
- Rate of Serious Injuries per 100 million VMT
- Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries

### Coordination on Target Setting

Pennsylvania's historic comprehensive approach to the planning and programming process was utilized as a basis for PennDOT and MPO/RPO coordination on the state's safety targets.

The coordinated efforts to deliver the Safety Targets began in April 2016 at a Statewide Safety Summit. The Summit focused on a variety of legislative, engineering, technology and behavioral topics.

Efforts continued when staff with representation from PennDOT and MPO/RPOs, including SPC, participated in a Federal Highway Administration (FHWA) Target Setting Peer Exchange in May 2016. At this meeting, participants discussed Pennsylvania data trends, MPO coordination, approval processes, and what it would take to be successful with implementing performance targets in PA.

Pennsylvania's current [Strategic Highway Safety Plan \(SHSP\)](#) was updated in early 2017. It serves as a blueprint to reduce fatalities and serious injuries on Pennsylvania roadways and targets priority Safety Focus Areas (SFAs) that have the most influence on improving highway safety throughout the state. The SHSP contains Pennsylvania's statewide goals for fatalities and serious injuries over the next 3-4 years. The SHSP was developed and will be updated in conjunction with stakeholders including federal, state, local and private sector agencies including Pennsylvania's MPOs/RPOs.

To strengthen communication and coordination efforts, Pennsylvania established a Safety Planning Workgroup with representation from PennDOT, the MPOs/RPOs and FHWA. The group includes technical safety and planning professionals that meet regularly to discuss relative topics such as the SHSP and performance measures. PennDOT and the MPOs/RPOs will continue to utilize the Workgroup to coordinate the state's safety target setting. Information discussed as part of this workgroup will be shared at annual Statewide Planning Partners Meetings and bi-monthly conference calls.

PennDOT will be responsible for scheduling and conducting Safety Planning Workgroup calls, as well as annual Planning Partners meetings and conference calls where coordination on target setting will occur.

MPOs/RPOs, including SPC, will be responsible for ensuring there is adequate representation on the Safety Planning Workgroup. SPC will ensure staff participates in Planning Partners meeting and conference calls to provide input into target setting.

## Data Collection and Analysis

Data for the fatality-related measures are taken from the Fatality Analysis Reporting System (FARS) and data for the serious injury-related measures are taken from the state motor vehicle crash database. The VMT are derived from the Highway Performance Monitoring System (HPMS).

PennDOT has collected traffic volumes for about 2,500 local highways. This extra traffic volume task for the network screening will also be a benefit for the new Model Inventory of Roadway Elements (MIRE) Fundamental Data Elements (FDE) collection mandate in the FAST Act.

PennDOT is responsible for reviewing the state's crash and fatality data and evaluate it for overall trends. PennDOT will compare these trends to what was can be observed at a national level. PennDOT will assess the state and national trends to determine how they relate to the SHSP Goals and the [National Toward Zero Deaths initiative](#).

PennDOT will share both the statewide data and planning region specific findings with the MPOs/RPOs to assist in their decision-making process as to whether they were going to support the State's targets or adopt their own. SPC also evaluated regional trends over a 15 year period (2002-2016).

PennDOT evaluated the overall trends for the state's crash and fatality data for the Baseline (2012-2016) and Target (2014-2018) periods. Over the past several years data yielded a downward trend of approximately one percent. This was compared to what was observed at a national level. Nationally these same numbers were rising by almost seven percent per year. In support of the National Toward Zero Deaths initiative there was the desire to be aggressive in trying to further reduce the numbers in PA. This coupled with emerging technologies like autonomous vehicles lead all those involved to the belief that a two percent annual reduce goal was both aggressive and obtainable. Upon reaching this conclusion PennDOT shared both the statewide data and planning region specific data to the MPOs/RPOs to assist them in their decision-making process as to whether they were going to support the state targets or adopt their own.

## Safety Targets

In December 2017 and again in January 2019, SPC took action to endorse PennDOT's statewide Safety Performance Target of a 2% reduction for all five federal safety metrics for the 2014-2018 reporting period. The following table shows the CY 2018 Statewide Targets established based on 2% reduction of the five-year average (2014-2018) and aggregated supporting regional SPC targets.

**Table II-1:** Pennsylvania Statewide and Southwestern Pennsylvania Regional Safety Targets

Safety Performance Measure	Baseline (2012-2016)	Statewide Target (2014-2018)	SPC Target (2014-2018)
Number of fatalities	1,220.2	1,177.6	221.5
Rate of fatalities per 100 million VMT	1.220	1.161	1.072
Number of serious injuries	3,434.0	3,799.8	759.7
Rate of serious injuries per 100 million VMT	3.433	3.746	3.677
Number of non-motorized fatalities and non-motorized serious injuries	602.4	654.4	97.9

The targets for number of fatalities, number of serious injuries and rate of fatalities must be identical in submission to National Highway Traffic Safety Administration (NHTSA). PennDOT included the required three targets in the [Federal Fiscal Year 2018 Pennsylvania Highway Safety Plan](#) submitted to NHTSA by July 1, 2017. PennDOT included all five targets as part of the [2017 Pennsylvania Highway Safety Improvement Program](#) annual report submitted to FHWA in August 2017.

PennDOT will include state targets for all five of the safety performance measures as part of the annual Pennsylvania Highway Safety Improvement Program (HSIP) report submitted by PennDOT to FHWA by August 31<sup>st</sup> of each year. The state targets for number of fatalities, number of serious injuries and rate of fatalities must be identical in submission to National Highway Traffic Safety Administration (NHTSA). PennDOT will submit the state targets as part of the annual Pennsylvania Highway Safety Plan submitted to NHTSA by July 1<sup>st</sup> of each year.

## Reporting on Progress toward Target Achievement

The 2019 STIP and individual TIPs were developed to ensure progress toward target achievement. The following has helped to ensure planned HSIP projects help to achieve a significant reduction of traffic fatalities and serious injuries on all public roads:

- Implementing the strategies in the 2017 Strategic Highway Safety Plan (SHSP) through a data-driven safety analysis, and the use of low-cost safety improvements system-wide support achieving these reductions.
- In January 2017 the HSIP funding site was opened in SharePoint. The HSIP funding site provides a single point of communication for all HSIP project eligibility and funding requests. Project applications are reviewed through an approval workflow involving PennDOT District and Central Office safety and planning staff.
- Projects are being planned and completed that were associated with the Intersection Safety Implementation Plan (ISIP) and Roadway Departure Safety Implementation Plan (RDIP).
- Pennsylvania started using the PA Regionalized Safety Performance Functions (SPFs) developed for a statewide network screening of about 20,000 locations. These new evaluations will use the Highway Safety Manual's (HSM) analysis method of Excess Expected Average Crash Frequency with Empirical Bayes (EB) adjustments also known as Potential for Safety Improvement (PSI). This method will use the calculated expected crashes for a location and subtract the predicted crashes for that same location to produce an excess (or PSI) value. The new regionalized SPFs have been added to a Pennsylvania specific HSM analytical tool.
- Pennsylvania sets aside \$35 million per federal fiscal year (FFY) of HSIP funds to utilize to advance projects statewide that are evaluated and ranked based on benefit/cost analysis, HSM analysis, fatal and injury crashes, application of systematic improvements, improvements on local roads, and deliverability.

PennDOT will continue to include information on Safety Targets and progress towards meeting these targets as part of annual safety submissions to NHTSA and FHWA. It is expected that FHWA will determine if Pennsylvania has met or made significant progress toward meeting their 2014-2018 HSIP targets in December 2019. Four of the five measures will need to be met or significantly improved upon. FHWA will utilize 2012-2016 data as a baseline period for assessing significant progress. FHWA will report their findings to PennDOT by March 2020.

## **Pavement/Bridge Performance Measures**

The FHWA final rule for the National Performance Management Measures; Assessing Pavement Condition for the National Highway Performance Program and Bridge was published in the Federal Register (82 FR 5886) on January 18, 2017 and became effective on February 17, 2017.

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This final rule is the second in a series of three related rulemakings that together establish a set of performance measures for state DOTs and MPOs to use as required by the MAP-21 and the FAST Act.

The final rule established performance measures for all state DOTs to use to carry out the National Highway Performance Program (NHPP) and to assess the condition of the following: Pavements on the National Highway System (NHS) (excluding the Interstate System), bridges carrying the NHS that includes on- and off-ramps connected to the NHS, and pavements on the Interstate System. The NHPP is a core federal-aid highway program that provides support for the condition and performance of the NHS and the construction of new facilities on the NHS. The NHPP also ensures that investments of federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a State's Transportation Asset Management Plan (TAMP) for the NHS. This final rule establishes regulations for the new performance aspects of the NHPP that address measures, targets, and reporting.

The pavement and bridge performance measures include:

- Percent (%) of Interstate pavements in Good condition
- Percent (%) of Interstate pavements in Poor condition
- Percent (%) of non-Interstate NHS pavements in Good condition
- Percent (%) of non-Interstate NHS pavements in Poor condition
- Percent (%) of NHS bridges by deck area classified in Good condition
- Percent (%) of NHS bridges by deck area classified in Poor condition

### Coordination on Target setting

State 2-year and 4-year targets were due May 20, 2018 and were also reported to FHWA in the 2017 baseline report that was due October 2018. To satisfy coordination requirements [23 CFR 490.105(e)(2)], PennDOT has coordinated with Planning Partners in the development of the measures and selection of targets to ensure consistency to the maximum extent practicable. Specific coordination efforts are highlighted below:

- A Transportation Asset Management Plan Steering Committee was formed in January 2017.
  - The committee is comprised of PennDOT Executive Management, staff from the Federal Highway Administration, the Pennsylvania Turnpike Commission, as well as PennDOT's Engineering Districts, Asset Management Division, Center for Program Development and Management, Bureau of Planning and Research, and Highway Safety and Traffic Operations Division.
  - The purpose is to manage and coordinate the development, submission, and implementation of the Transportation Asset Management Plan (TAMP), and the pavement and bridge condition performance measures.
  - The Steering Committee met on January 4, 2017, February 6, 2017, September 21, 2017, October 31, 2017, November 13, 2017, December 21, 2017, and April 16, 2018.

- A workshop was conducted on October 12, 2017 with PennDOT, Planning Partners and FHWA Pennsylvania Division staff related to fully integrating an asset management approach into decision-making.
- A workshop was conducted on January 11, 2018 with PennDOT and FHWA Pennsylvania Division staff to identify future steps and requirements related to the Transportation Performance Management (TPM) rulemaking.
- PennDOT provided status updates on the development of performance measure data, tools and methodologies to the Planning Partners. On October 18, 2017, PennDOT provided an overview of the performance measures and general approaches for target setting at the Planning Partners fall conference in State College. On a March 20, 2018 conference call, PennDOT provided a status update on the development of baseline measures and targets.
- PennDOT conducted a webinar May 9, 2018 to review the state DOT targets with the Planning Partners.
- PennDOT has developed the *Pennsylvania Department of Transportation MAP-21 and FAST Act Performance Management Road Map* to provide Planning Partners with a resource on the performance measure requirements and calculations.

Any portion of the applicable transportation network within the SPC region must establish targets for the performance measures no later than 180 days after PennDOT establishes (or amends in future) their targets. SPC must establish targets for the performance measures no later than 180 days after PennDOT establishes (or amends in future) their targets. SPC agreed to adopt the statewide targets as the region's targets on September 24, 2019.

## Data Collection and Analysis

PennDOT will collect and perform the analysis of the data for the pavement and bridge performance measures.

### Pavement

Determining pavement condition requires rigorous data collection. In the past, all PennDOT data was collected for each roadway segment, which are approximately one-half-mile in length. 23 U.S.C. 119 now requires that all distress component information be collected for one-tenth-mile increments. PennDOT and its partners have adjusted their pavement data collection to meet FHWA standards. Data collection at the tenth-mile increment level began in 2017 for cracking, rutting, and faulting and is used for submission of the TAMP.

Pavement performance measures required for FHWA reporting include the following four distress components:

- **International Roughness Index (IRI)** – Quantifies how rough the pavement is by measuring the longitudinal profile of a traveled wheel track and generating a standardized roughness value in inches per mile.
- **Cracking** – Measures the percentage of pavement surface that is cracked.
- **Rutting** – Measures the depth of ruts (surface depression) in bituminous pavement in inches.

- **Faulting** – Quantifies the difference in elevation across transverse concrete pavement joints in inches.

These distress measurements translate to good, fair, or poor condition scores. The table below summarizes the pavement condition metrics for IRI, cracking percent, rutting, and faulting.

**Table II-2: Pavement Condition Metrics for IRI**

<b>Rating</b>	<b>Good</b>	<b>Fair</b>	<b>Poor</b>
<b>IRI (inches/mile)</b>	<95	95–170	>170
<b>Cracking Percentage (%)</b>	<5	CRCP: 5–10 Jointed: 5–15 Asphalt: 5–20	CRCP: >10 Jointed: >15 Asphalt: >20
<b>Rutting (inches)</b>	<0.20	0.20–0.40	>0.40
<b>Faulting (inches)</b>	<0.10	0.10–0.15	>0.15

IRI and cracking apply to both bituminous and concrete pavements, while rutting is exclusively for bituminous and faulting is exclusively for concrete. Each one-tenth-mile pavement section is considered in good condition if all three of its distress components are rated as good, and in poor condition if two or more of its three distress components are rated as poor.

23 CFR part 490.315(a), Subpart C, requires that no more than 5 percent of a state's NHS Interstate lane-miles be in poor pavement condition. If the threshold is not met, restrictions are placed on PennDOT's federal funding—specifically, National Highway Performance Program and Surface Transportation Program funds. FHWA has not established a minimum condition for NHS non-Interstate roadways, but requires the state DOT to establish performance targets.

23 CFR 490.313(b)(4)(i) requires the total mainline lane-miles of missing, invalid, or unresolved sections for Interstate System and non-Interstate NHS shall be limited to no more than 5 percent of the total lane miles. A section is missing if any one of the data requirements specified in 23 CFR 490.309 and 23 CFR 490.311(c) are not met or that reported section does not provide sufficient data to determine its Overall Condition.

Previously collected segment-level data for the years 2013-2016 was quantified and used to determine deterioration rates for each condition. Some assumptions related to significant repairs, segment averages and minor maintenance were included in deterioration. The overall deterioration rate was then increased by 3 percent to reflect the impact of inflation.

The resultant deterioration rates are provided in the following table:

**Table II-3: Pavement Deterioration Rates**

<b>Condition</b>	<b>Interstate</b>	<b>NHS Non-Interstate</b>
<b>Faulting (inch)</b>	0.00024	0.00153
<b>Concrete Cracking</b>	0.94%	0.89%
<b>Rutting (inch)</b>	0.00651	0.00890
<b>Bituminous Cracking</b>	0.56%	0.90%

The appropriate deterioration rates were applied to each condition, and values for each tenth-mile increment were determined for the years 2021, 2025, and 2029 if nothing is done. Data from MPMS for anticipated projects on the Interstate and NHS non-Interstate networks for the next eight years (2018-2029) was compiled. The mileage of the projects that affected pavement condition was determined, and these proportions were projected over the next four-year period (2022-2025) and the following four-year period (2026-2029). Projecting mileage beyond four years provided a better representation of the volume of work to be expected, assuming constant funding while reducing affected miles by 3 percent annual inflation. Given the mileages in good, fair, and poor condition, and the projected programmed miles in each condition, resultant mileages were determined for the years 2021, 2025, and 2029. The mileage with missing data was assumed constant over this duration.

### **Bridge**

The FHWA final rulemaking also established performance measures for all mainline Interstate Highway System and non-Interstate NHS bridges (23 CFR 490 Subpart D) regardless of ownership or maintenance responsibility, including bridges on ramps connecting to the NHS and NHS bridges that span a state border. FHWA's performance measures aim to assess bridge condition by deriving the percentage of NHS bridges rated in good and poor condition by deck area on the NHS.

Separate bridge structure condition ratings are collected for deck, superstructure, and substructure components during regular inspections using the National Bridge Inventory (NBI) Standards. For culvert structures, only one condition rating is collected (the culvert rating). A rating of 9 to 0 on the FHWA condition scale is assigned to each component. Based on its score a component is given a good, fair or poor condition score rating.

The table below summarizes the FHWA scoring system for bridge condition metrics for deck, superstructure, substructure, and culvert components.

**Table II-4: FHWA Scoring System for Bridge Condition**

Rating	Good	Fair	Poor
Deck	≥7	5 or 6	≤4
Superstructure	≥7	5 or 6	≤4
Substructure	≥7	5 or 6	≤4
Culvert	≥7	5 or 6	≤4

A structure's overall condition rating is determined by the lowest rating of its deck, superstructure, substructure, and/or culvert. If any of the components of a structure qualify as poor, the structure is rated as poor.

23 CFR 490.411(a) requires that no more than 10 percent of a state's total NHS bridges by deck area are in poor condition.

Several different types of models have been created and run with historic data to determine the level of accuracy of the predictive models based on previous deterioration investigations.

The outputs from the best performing models were combined and used in conjunction with historic trends to produce a short-term projection.

### State Pavement and Bridge Performance Targets

**Table II-5: State Interstate and Non-Interstate NHS Pavement Targets**

Pavement Performance			
Measure	Baseline 2017	2-year Target 2019	4-year Target 2021
% of Interstate pavements in Good condition	67.2 %	N/A	60.0 %
% of Interstate pavements in Poor condition	0.4 %	N/A	2.0 %
% of non-Interstate NHS pavements in Good condition	36.8 %	35.0 %	33.0 %
% of non-Interstate NHS pavements in Poor condition	2.3 %	4.0 %	5.0 %

PennDOT's pavement condition targets (its desired state of good repair) for NHS Interstate roadways mirror the federal standard: no more than 5 percent of Pennsylvania's NHS Interstate pavements shall be rated in poor condition.

PennDOT's pavement condition targets are consistent with its asset management objectives of maintaining the system at the desired state of good repair, managing to lowest life cycle costs (LLCC), and achieving national and state transportation goals.

Table II-6: State NHS Bridge Targets

Bridge Performance			
Measure	Baseline 2017	2-year Target 2019	4-year Target 2021
% of NHS bridges by deck area classified in Good condition	25.6 %	25.8%	26.0 %
% of NHS bridges by deck area classified in Poor condition	5.5 %	5.6%	6.0%

PennDOT's bridge condition targets are consistent with its asset management objectives of maintaining the system at the desired state of good repair, managing to LLCC, and achieving national and state transportation goals.

### Reporting on Progress Toward Target Achievement

PennDOT will need to report on performance at regular intervals. The first State DOT baseline performance period report was due October 1, 2018, for all measures in this rule.

Pennsylvania MPOs/RPOs that include, within their respective geographic boundaries, any portion of the applicable transportation network or area must report baseline conditions, targets and progress toward the achievement of their targets in TIPs and L RTPs adopted after May 20, 2019.

### System Performance Measures

The FHWA final rule for the *National Performance Management Measures; Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program* was published in the Federal Register (82 FR 5970) on January 18, 2017 and became effective on May 20, 2017.

This final rule is the third in a series of three related rulemakings that together establishes a set of performance measures for state DOTs and MPOs to use as required by MAP-21 and the FAST Act. The measures in this third final rule will be used by state DOTs and MPOs to assess the performance of the Interstate and non-Interstate National Highway System (NHS) for the purpose of carrying out the National Highway Performance Program (NHPP) (23 CFR 490 Subpart E); to assess freight movement on the Interstate System (23 CFR 490 Subpart F); and to assess traffic congestion and on-road mobile source emissions for the purpose of carrying out the Congestion Mitigation and Air Quality Improvement (CMAQ) Program (23 CFR 490 Subparts G and H). These system performance measures are collectively referred to as the PM-3 measures.

The PM-3 performance measures include:

- Percent of Person-miles Traveled on the Interstate System that are Reliable

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- Percent of Person-miles Traveled on the Non-Interstate NHS that are Reliable
  - Interstate System Truck Travel Time Reliability Index
  - Annual Hours of Peak-Hour Excessive Delay (PHED) per Capita
  - Percent Non-Single Occupant Vehicle (SOV) Travel
  - On-Road Mobile Source Emissions Reduction for CMAQ-funded Projects

## Coordination on Target Setting

State 2-year and 4-year targets were due May 20, 2018 and were also reported to FHWA in the 2017 baseline report that was due October 2018. To satisfy coordination requirements [23 CFR 490.105(e)(2)], PennDOT has coordinated with Planning Partners in the development of the measures and selection of targets to ensure consistency to the maximum extent practicable. Specific coordination efforts are highlighted below:

- A workshop was conducted on January 11, 2018 with PennDOT and FHWA Pennsylvania Division staff to identify future steps and requirements related to the Transportation Performance Management (TPM) rulemaking.
- PennDOT conducted a performance measure workshop on February 26-27, 2018 with the Pittsburgh, Philadelphia and York MPO planning staff to evaluate baseline performance measure trends and methodologies for target setting.
- PennDOT provided status updates on the development of performance measure data, tools and methodologies to the Planning Partners. On October 18, 2017, PennDOT provided an overview of the performance measures and general approaches for target setting at the Planning Partners fall conference in State College. On a March 20, 2018 conference call, PennDOT provided a status update on the development of baseline measures and targets.
- PennDOT conducted a webinar May 9, 2018 to review the State DOT targets with the Planning Partners.
- PennDOT has worked to develop the Pennsylvania Department of Transportation MAP-21 and FAST Act Performance Management Road Map to provide Planning Partners a resource on the performance measure requirements and calculations.

Any portion of the applicable transportation network within the SPC region, must establish targets for the performance measures no later than 180 days after PennDOT establishes (or amends in future) their targets. SPC must establish targets for the performance measures no later than 180 days after PennDOT establishes (or amends in future) their targets. SPC agreed to adopt the statewide targets as the region's targets on September 24, 2019.

## Data Collection and Analysis

PennDOT has worked to identify and evaluate the data and tools used to produce the baseline performance measures. The University of Maryland CATT Lab RITIS software platform is used to generate all the travel time based measures. Data from the American Community Survey (ACS) and FHWA's CMAQ annual reporting system are used for the non-SOV travel and mobile source emissions measures, respectively. Future revisions and modifications to these tools may impact the reported performance measures and established targets.

### State System Performance Measure (PM3) Targets:

Due to potential tool enhancements, limited historic information, and the need for additional research to understand the variances and factors influencing each of the performance measures, PennDOT has established conservative targets. In some respects, these may be more appropriately referred to as benchmarks. PennDOT will track the measures over the next two years. States are permitted to adjust their 4-year targets at the midterm of the performance period, representing data through 2019 in a report due to FHWA by October 1, 2020. PennDOT will coordinate any updates to the performance measures with the Planning Partners. SPC will also track the annual PHED and Non-SOV travel measures and revisit the estimated established 4-year targets at the mid-term period.

For the three reliability measures, PennDOT has set statewide targets (sub-state targets are optional). MPO baseline reliability measures have been provided for information purposes only. For the first performance period, the annual peak hour excessive delay and non-SOV travel measures must be developed for the Pittsburgh and Philadelphia urbanized areas only. PennDOT has worked closely with SPC and DVRPC to develop these targets and to include the necessary multi-state coordination partners in the target-setting process. The mobile source emission measure targets are produced statewide and for each MPO that is in nonattainment or maintenance of the National Ambient Air Quality Standards. The targets represent the amount of emissions to be reduced per day via projects selected to be funded with regional Congestion Mitigation and Air Quality (CMAQ) program funds.

**Table II-7: Travel Time and Annual Peak Hour Excessive Delay Measures**

<b>Travel Time and Annual Peak Hour Excessive Delay Measures</b> (Estimated using RITIS Data Extract from May 8, 2018)			
Measure	Baseline 2017	2-year Target 2019	4-year Target 2021
Interstate Reliability (Statewide)	89.8 %	89.8 %	89.8 %
Non-Interstate Reliability (Statewide)	87.4 %	N/A	87.4 %
Truck Reliability Index (Statewide)	1.34	1.34	1.34
Annual Peak Hour Excessive Delay Hours Per Capita (Urbanized Area)	SPC - 11.1	N/A	11.8

**Table II-8:** Travel Baseline and Target Values for Non-SOV Travel Measure

<b>PM-3 Baseline and Target Values for Non-SOV Travel Measure</b>			
<b>Measure</b>	<b>Baseline 2017</b>	<b>2-year Target 2019</b>	<b>4-year Target 2021</b>
<b>Percent Non-Single Occupant Vehicle Travel (Urbanized Area)</b>	SPC - 24.8 %	24.6%	24.4 %

**Table II-9:** PM-3 Target Values for CMAQ Emission Measures

<b>PM-3 Target Values for CMAQ Emission Measures</b> Applicable MPOs and Pollutants Determined from: <a href="https://www.fhwa.dot.gov/environment/air_quality/cmaq/measures/cmaq_applicability/page03.cfm#toc494364458">https://www.fhwa.dot.gov/environment/air_quality/cmaq/measures/cmaq_applicability/page03.cfm#toc494364458</a>			
<b>Measure</b>	<b>MPO</b>	<b>Emission Reductions (kg/day)</b>	
		<b>2-year Target* 2019</b>	<b>4-year Target 2021</b>
<b>VOC Emissions</b>	Statewide	109.460	201.730
	<b>SPC</b>	<b>58.060</b>	<b>107.000</b>
<b>NOx Emissions</b>	Statewide	337.700	612.820
	<b>SPC</b>	<b>256.110</b>	<b>464.770</b>
<b>PM<sub>2.5</sub> Emissions</b>	Statewide	10.760	20.490
	<b>SPC</b>	<b>7.010</b>	<b>13.350</b>
<b>PM<sub>10</sub> Emissions</b>	Statewide	9.540	17.470
	SPC	9.540	17.470
<b>CO Emissions</b>	Statewide	567.700	1135.400
	<b>SPC</b>	<b>284.970</b>	<b>569.930</b>

\* 2-year emission targets are only applicable for states and for MPOs with populations >1 million. MPOs with populations < 1 million are not required to report 2-year emission targets. The values were used to establish statewide 2-year targets.

## Reporting on Progress Toward Target Achievement

PennDOT and MPOs will need to report on performance at regular intervals. The first state DOT baseline performance period report was due October 1, 2018, for all measures in this rule.

SPC must establish targets for the performance measures no later than 180 days after PennDOT establishes (or amends in future) their targets. SPC agreed to adopt the statewide targets as the region's targets on September 24, 2019. SPC also adopted its CMAQ Performance plan that monitors progress toward targets, reporting progress on September 24, 2019. The CMAQ performance plan includes a process for reviewing and revising targets on a regular 2-year cycle.

## Public Transit Safety Performance Measures

Safety performance management is a critical tool that will support transit providers and FTA in identifying safety concerns and monitoring progress in safety improvements throughout the transit industry. FTA's National Public Transportation Safety Plan (January 2017) established safety performance measures for all modes of public transportation through its multifaceted safety performance framework. The performance measures include:

- Fatalities (total number, and rate per vehicle revenue miles by mode)
- Injuries (total number, and rate per vehicle revenue miles by mode)
- Safety events – accidents, incidents or occurrences (total number, and rate per vehicle revenue miles by mode)
- System Reliability (mean distance between major mechanical failures by mode)

The National Safety Plan requires Transit Service Operators to develop agency-specific Public Transportation Agency Safety Plans that would set performance targets based on the identified national measures. Agencies are permitted to develop additional sub-measures useful for local performance management purposes. Agency Safety Plans would be developed and certified by FTA and agency staff trained and certified through a national-level Public Transportation Safety Certification Training Program. These prerequisites are in the development stage. A national safety performance management tool – the SMS (Safety Management System) is also under development.

There are currently no agency-specific safety performance measures or performance targets in place for the region's public transportation agencies pending completion of the pre-requisite safety management processes (national safety training and certification; Agency Safety Plans with tailored measures and targets; and FTA Safety Management System).

### Southwestern Pennsylvania Public Transit Providers:

- Port Authority of Allegheny County (PAAC)
- Beaver County Transit Authority (BCTA)
- Butler Transit Authority (BTA)
- Fayette County (FACT)
- Indiana County Transit Authority (IndiGO)
- Mid-County Transit Authority (TACT)
- Mid-Mon Valley Transit Authority (MMVTA)
- New Castle Area Transit Authority (NCATA)
- Washington County Transit Authority (WASH)
- Westmoreland County Transit Authority (WCTA)
- ACTA Shared Ride
- Allied Coordinated Transit Services (ACTS)
- Butler County Shared Ride
- Greene County Shared Ride
- Heritage Community Transportation (HHF)
- SPC CommuteInfo

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## Transit Asset Management Performance Measures:

Transit Asset Management (TAM) is a systematic process that enables public transportation agencies to reach and maintain assets in a State of Good Repair (SGR). TAM planning accounts for the full life-cycle of an asset used for public transportation service, from procurement through operations and maintenance to final disposition. Basic objectives for the TAM planning model are:

- Monitor and manage public transportation assets
- Increase reliability and performance
- Establish asset performance measures
- Improve safety

Federal PBPP requirements (Performance-Based Planning Program) require the use of certified TAM practices by all recipients of certain types of federal transit funds. For management purposes, transit agencies fall into two basic types based on size and mode. The region has one Tier I agency – Port Authority of Allegheny County. There are 15 Tier II transit service providers.

Port Authority of Allegheny County (Port Authority or PAAC) is a Tier I agency, operating rail fixed guideway service as well as a fixed route bus system with more than 100 vehicles. Tier I agencies manage their TAM planning functions internally. Planning systems and outputs, including performance measures and targets, are reported and reviewed directly by the Federal Transit Administration (FTA). Port Authority published its *Transit Asset Management Plan* in October 2018, establishing 20 asset-based performance measures across four investment categories (vehicles, facilities, systems and guideways).

PAAC asset management data and capital needs are much more extensive and complex compared to the region's smaller agencies. PAAC manages its own asset management systems, and also participates in PennDOT's capital planning tool for public transportation providers. SPC and the Port Authority have a formal agreement on sharing public transportation performance data, and an acknowledgement that PBPP processes were cooperatively developed and involved required participants.

There are 15 small Tier II agencies in the region operating fewer than 100 vehicles in either fixed route or non-fixed route modes. Small urban transit agencies can elect to participate in a state-managed TAM Group Plan. Rural and community-based transit agencies as sub-recipients of FTA Section 5310 and Section 5311 funding are required to participate in the state-managed group plan. All of the small transit agencies in the SPC region have established formal cooperative agreements with PennDOT guiding their participation in PennDOT's TAM Group Plan.

PennDOT's TAM Group Plan (September 2018) provides consolidated transit asset management services for both required and elective program participants. The TAM Group Plan fulfills federal PBPP requirements and encourages cooperative communications between participating transit agencies and their respective MPOs. SPC and each of the

small transit agencies have separate formal agreements on sharing public transportation performance data, and an acknowledgement that PBPP processes were cooperatively developed and involved required participants. All of the participating transit agencies are responsible for providing extensive data updates on the physical condition of transit assets, working within the PennDOT capital planning tool described below.

PennDOT's Bureau of Public Transportation (BPT) has developed a Capital Planning Tool (CPT) and used it since 2016 to complete a range of asset and performance management activities. Its functions are described in the PennDOT TAM Group Plan:

- Inventory all public transportation system assets
- Collect relevant data on those assets
- Predict asset replacement schedules based on Estimated Service Life (ESL) and asset condition
- Create a four-year capital program for each public transportation system to submit to their regional planning organization for review and approval
- Create an annual capital program for each public transportation system which becomes an agency's individual capital application in PennDOT's electronic granting system (dotGrants)
- Create an annual statewide public transportation capital program
- Compare statewide capital needs to available funding
- Prioritize statewide capital program decisions based on meeting state-of-good-repair (SGR) targets within available funding

The PennDOT CPT maintains crucial information about every asset type and maintains a complete history of the asset as it ages. Transit agencies record changes in condition, usage, value, depreciation, etc. for the following asset categories:

- **Rolling Stock (Revenue Vehicles):** Transit agency-owned or leased fixed route & paratransit vehicles, used to provide public transportation
- **Equipment:** Tangible support property having a useful life of at least one year, including all nonrevenue/support vehicles
- **Facilities:** A building or structure that is used in the provision of public transportation, including administration and maintenance, and passenger and parking facilities

Based on CPT data provided by the participating agencies, PennDOT annually updates performance targets for each agency based on two primary elements: prior year's performance, and anticipated/obligated funding levels.

In summary, transit agencies use the PennDOT TAM Plan tool – the CPT – to input information on asset inventories and detailed asset conditions into a statewide transit asset management computer system. The CPT uses the input data for each agency to generate

four-year capital plans and performance targets based on asset-specific State-of-good-repair performance criteria for various categories of vehicles, equipment, and facilities (for the Port Authority, also includes systems and guideways/infrastructure). These sources inform the development of annual capital programs, which are shared with the MPO for approval and inclusion in the region's TIP. The CPT provides performance measure baseline conditions and informs the annual update of agency performance targets. Performance targets have already taken into account anticipated capital spending based on available transit revenues and CPT-determined prioritization of statewide TAM-based capital needs.

Port Authority uses internal management systems and processes described in its TAM Plan to determine performance targets for its more-extensive set of asset class measures.

### Transit Performance Measures and Performance Targets

The Port Authority TAM Plan and PennDOT TAM Group Plan identify the asset management performance measures applying to transit capital investment for the region's 16 transit service providers. Baseline performance has been determined using 2018 data on asset condition and a complete inventory of agency assets. If the performance measure is based on a general asset condition rating, the FTA standard on asset conditions applies:

**Table II-10: FTA Asset Condition Ratings**

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

Port Authority uses FTA standards for Useful Life Benchmarks (ULB) to measure the useful service life remaining for various asset classes. The PennDOT CPT and its performance reports use statewide PennDOT Estimated Service Life (ESL) standards which are referenced in the TAM Group Plan. The PennDOT standards are acknowledged and approved by FTA for Pennsylvania's PBPP transit use.

TAM performance measure tables for the Port Authority identify for each performance measure actual condition data for 2018 and applicable performance targets for 2019. The performance data will be updated annually; an updated performance target will also be determined based on current conditions and anticipated capital investments. This

information will be reported directly to FTA and shared with the MPO as described in the planning agreements.

TAM performance measure tables for statewide small transit agencies are provided from the PennDOT TAM Group Plan. PennDOT CPT output is not yet available for each agency; the performance measures and performance targets represent asset conditions statewide for each investment category or class. Performance measures identify actual condition data for 2017 and applicable performance targets for FY 2018-2019. A Performance Measures Summary is provided on the following pages. The performance data will be updated annually; an updated performance target will be developed through the PennDOT CPT, both statewide and for each agency. PennDOT will report this information to FTA and share it with the MPO along with investment information on priority capital projects anticipated for the following year. An Asset Inventory and Conditions Summary from the TAM Group Plan is also provided for statewide small transit agencies.

Table II-11: PAAC Vehicle Condition Targets

PAAC Vehicles	PM Description	Target	Actual
Bus	<b>Useful Life Benchmark (ULB) - 12 years</b>		
	Average Useful Service Life Remaining	5.0	5.9
	Percentage of fleet over ULB	10%	6%
Rail (4200)	<b>Useful Life Benchmark (ULB) - 41 years</b>		
	Average Useful Service Life Remaining	5.0	8.0
	Percentage of fleet over ULB	10%	0%
Rail (4300)	<b>Useful Life Benchmark (ULB) - 31 years</b>		
	Average Useful Service Life Remaining	5	17
	Percentage of fleet over ULB	10%	0%
Non-Revenue Vehicles	<b>Useful Life Benchmark (ULB) - 8 years</b>		
	Average Useful Service Life Remaining	2.0	-0.7
	Percentage of fleet over ULB	20%	42%
Non-Revenue Vehicles (other rubber tire)	<b>Useful Life Benchmark (ULB) - 14 years</b>		
	Average Useful Service Life Remaining	3.0	0.2
	Percentage of fleet over ULB	20%	49%
Non-Revenue Vehicles (steel wheel)	<b>Useful Life Benchmark (ULB) - 25 years</b>		
	Average Useful Service Life Remaining	5.0	-4.8
	Percentage of fleet over ULB	20%	75%
Incline Cars	<b>Useful Life Benchmark (ULB) - 51 years</b>		
	Average Useful Service Life Remaining	10	49
	Percentage of fleet over ULB	0%	0%

Table II-12: PAAC Ancillary Vehicle Condition

PAAC Vehicles	Number	Average Age	ULB	Actual	% over
Bus	725	6.1 yrs	12 yrs	5.9	6%
Rail (4200)	55	33 yrs	41 yrs	8	0%
Rail (4300)	28	14 yrs	31 yrs	17	0%
NRV	225	8.7 yrs	8 yrs	-0.7	42%
NRV (other)	89	13.8 yrs	14 yrs	0.2	49%
NRV (steel)	4	29.8 yrs	25 yrs	-4.8	75%
Incline Cars	2	2 yrs	51 yrs	49	0%

**Table II-13: PAAC Facility Condition**

<b>PAAC Facilities</b>	<b>Performance Measure Description</b> (Weighted aggregate average rating of asset categories 1 to 5)	<b>Target</b>	<b>Actual</b>
<b>Maintenance</b>	Average Condition Rating	2.8	<b>3.1</b>
	Percentage rated below FTA condition state 3 (FTA 1 or 2)	≤ 17%	<b>17%</b>
<b>Service</b>	Average Condition Rating	2.8	<b>2.9</b>
	Percentage rated below FTA condition state 3 (FTA 1 or 2)	≤ 20%	<b>50%</b>
<b>Stations</b>	Average Condition Rating	2.8	<b>3</b>
	Percentage rated below FTA condition state 3 (FTA 1 or 2)	≤ 10%	<b>26%</b>

**Table II-14: PAAC System Condition**

<b>PAAC Systems</b>	<b>Performance Measure Description</b> (Weighted aggregate average rating of asset categories 1 to 5)	<b>Target</b>	<b>Actual</b>
<b>Security</b>	Average Condition Rating	2.8	<b>3.0</b>
	Percentage rated below FTA condition state 3 (FTA 1 or 2)	≤ 10%	<b>0%</b>
<b>Traction Power</b>	Average Condition Rating	2.8	<b>3.0</b>
	Percentage rated below FTA condition state 3 (FTA 1 or 2)	≤ 10%	<b>0%</b>
<b>Signals</b>	Average Condition Rating	2.8	<b>3.0</b>
	Percentage rated below FTA condition state 3 (FTA 1 or 2)	≤ 10%	<b>0%</b>
<b>Communications</b>	Average Condition Rating	2.8	<b>3.0</b>
	Percentage rated below FTA condition state 3 (FTA 1 or 2)	≤ 10%	<b>0%</b>
<b>Revenue Collection</b>	Average Condition Rating	2.8	<b>3.0</b>
	Percentage rated below FTA condition state 3 (FTA 1 or 2)	≤ 10%	<b>0%</b>

**Table II-15: PAAC Fixed Guideway Condition**

PAAC Guideway	Performance Measure Description	Target	Actual
Trackway/Rail	Average Performance Restriction - # miles	<3 miles	N/A
	Percentage of trackway with performance restriction	≤ 10%	N/A
	Percentage of total linear feet of rail deficiencies	< 1%	N/A
	Number of rail deficiencies per 100 foot of rail	< 1	N/A
Busway	Average Performance Restriction - # miles	< 2 miles	N/A
	Percentage of busway with performance restriction	≤ 10%	N/A
	Average condition rating	2.8	N/A
Bridges	Average condition rating	2.8	3.3
	Percentage rated below condition state 3	≤ 10%	10%
	Percentage of structurally deficient bridges (≤ 4)	≤ 10%	N/A
Tunnels	Average condition rating	2.8	3.4
	Percentage rated below condition state 3	≤ 10%	0%
	Percentage rated ≥ CS3	≤ 10%	N/A
Ancillary Structures	Average condition rating	2.8	3.5
	Percentage rated below condition state 3	≤ 10%	0%

**Small Transit Agency Asset Inventory and Condition Summary (statewide)**

**Table II-16: Small Transit Agency Rolling Stock Condition**

Rolling Stock (Revenue Vehicles)					
Asset Class	Number	Average Mileage	Average Age	Number met or exceeding ESL	% met or exceeding ESL
AO-Automobile	34	132,567	6	5	15%
BU-Bus	1,052	217,385	7	188	18%
CU-Cutaway	1,025	106,989	4	450	44%
VN-Van	482	119,407	5	297	62%
SV -Sports Utility Vehicle	4	64,724	6	3	75%
<b>Grand Total</b>	<b>2,597</b>	<b>154,283</b>	<b>5</b>	<b>943</b>	<b>36%</b>

Table II-17: Small Transit Agency Equipment Condition

<b>Equipment (Non-Revenue Vehicles)</b>					
<b>Asset Class</b>	<b>Number</b>	<b>Average Mileage</b>	<b>Average Age</b>	<b>Number met or exceeding ESL</b>	<b>% met or exceeding ESL</b>
Automobiles	148	54,316	8	57	39%
Trucks and other Rubber Tire Vehicles	5	103,732	15	5	100%
<b>Grand Total</b>	<b>153</b>	<b>55,890</b>	<b>8</b>	<b>62</b>	<b>41%</b>

Table II-18: Small Transit Agency Facility Condition

<b>Asset Class</b>	<b>Number</b>	<b>Average Condition on TERM Scale</b>	<b>Number met or exceeding ESL</b>	<b>% met or exceeding ESL</b>
Administrative / Maintenance Facilities	34	3	9	26%
Passenger / Parking Facilities	49	3	10	20%
<b>Grand Total</b>	<b>83</b>	<b>3</b>	<b>19</b>	<b>23%</b>

**Small Transit Agency Asset Management Performance Summary (Statewide)**

<b>Performance Measure</b>	<b>Asset Class</b>	<b>Current Performance</b>	<b>FY 2018-19 Target</b>
<b>Rolling Stock (Revenue Vehicles)</b>			
Age - % of revenue vehicles within a particular asset class that have met or exceeded their Estimated Service Life (ESL)	AO – Automobile	15%	<b>15%</b>
	BU - Bus	18%	<b>18%</b>
	CU - Cutaway	44%	<b>44%</b>
	VN - Van	62%	<b>62%</b>
	SV – Sport Utility Vehicle	75%	<b>75%</b>
<b>Equipment (Non-Revenue Vehicles)</b>			
Age - % of non-revenue or service vehicles within a particular asset class that have met or exceeded their Estimated Service Life (ESL)	Automobiles	39%	<b>39%</b>
	Trucks and other Rubber Tire Vehicles	100%	<b>100%</b>
<b>Facilities</b>			
Condition - % of facilities with a condition rating below 3.0 on the FTA TERM scale	Administrative and Maintenance Facilities	26%	<b>26%</b>
	Passenger and Parking Facilities	20%	<b>20%</b>

## System Performance Reports

Federal planning regulations require MPOs to include in their LRTPs a performance-based planning section that includes applicable performance measures, current conditions, performance targets, and a System Performance Report that describes the progress that the MPO is making towards achieving the identified performance measures. While it is too early in the PBPP process to determine progress or performance gaps –baseline data and performance targets have been identified and adopted but formal conditions reports have yet to be produced – a number of observations can be made about existing conditions and targets.

### Port Authority:

- Port Authority's current asset baseline condition is mostly "adequate" or above; in some cases there are no assets in poor or marginal condition. In many cases the remaining useful life of an asset significantly exceeds the next-year target. Performance targets typically provide for some assets, on average, to drop into the "marginal" range. This is a conservative approach that allows for a "learning curve" as the TAM processes mature over time.
- Asset conditions for non-revenue vehicles are in the lower range of the poor rating. The targets, however, show that significant improvement is anticipated within the investment year.

### Small Transit Agencies (Statewide):

- Targets here have also been conservatively set, with expected condition in the next year equal to current performance for every TAM performance measure. It will be easy to compare regional transit agencies to these stable statewide averages and performance targets and learn how the state processes work.