

Memphis Urban Area MPO CMAQ Performance Plan Memphis, TN-MS-AR Urbanized Area

Mid Performance Period
2020



Memphis MPO
METROPOLITAN PLANNING ORGANIZATION

Strengthening Regional Transportation

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1. Overview and Background

In July 2012, Congress passed the Moving Ahead for Progress in the 21st Century Act (MAP-21) and created a performance-based surface transportation program. The Fixing America’s Surface Transportation Act (FAST Act), signed into law in December 2015, continued and refined those efforts.

MAP-21 and FAST Act integrated performance into many Federal surface transportation programs and required the USDOT to establish a set of national measures on which State DOTs must report performance or condition.

To carry out the Congestion Mitigation and Air Quality Improvement (CMAQ) Program, FHWA finalized three performance measures - two congestion measures and one on-road mobile source emission reduction measure. Two Subparts of 23 CFR part 490, promulgated through the PM3 regulation, established the performance measures for the CMAQ Program required by MAP-21:

- a) Subpart G (Measures to Assess the CMAQ Program – Traffic Congestion) and
- b) Subpart H (Measure to Assess the CMAQ Program – On-Road Mobile Source Emissions)

Table 1: CMAQ Performance Measures associated with the PM3 Regulation

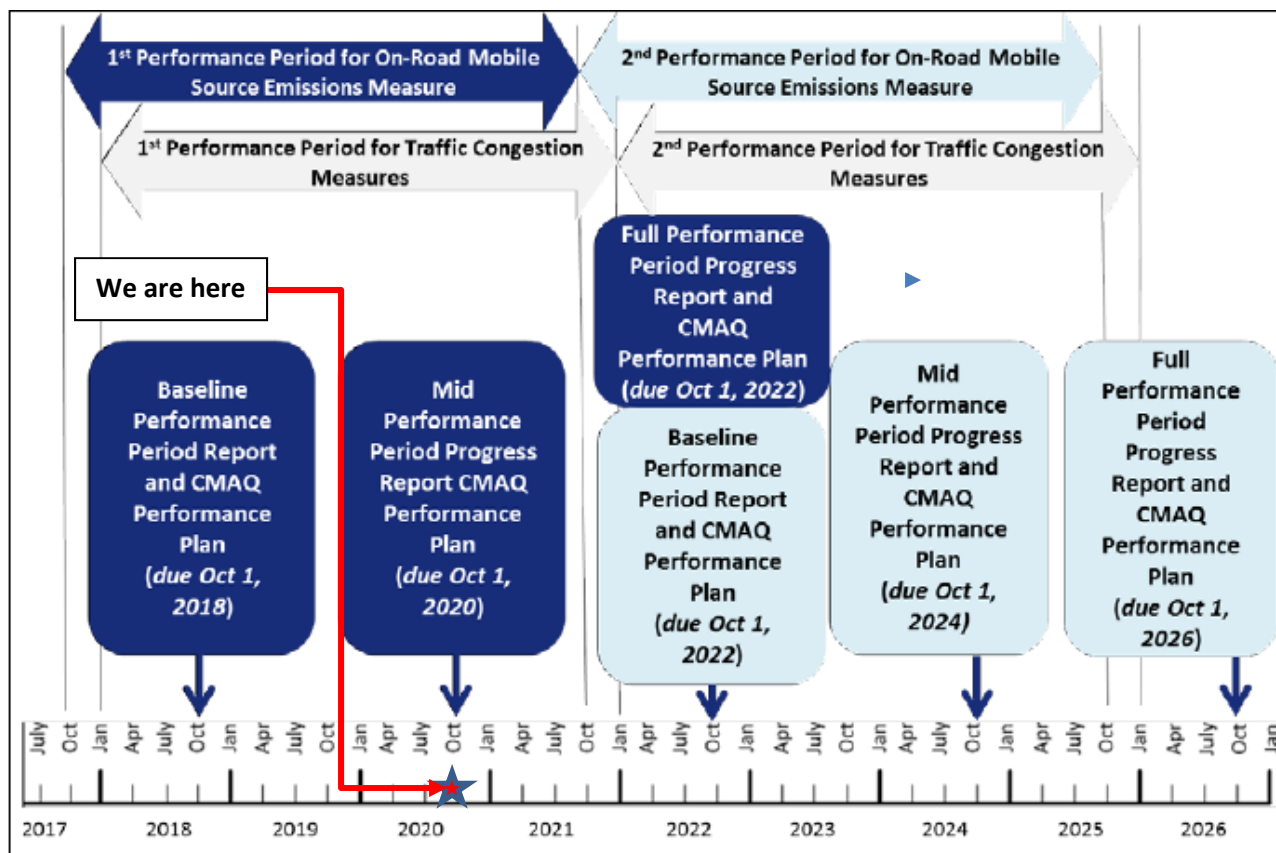
Subpart and Measure	Measure Description
Subpart G: Traffic Congestion	PHED Measure: Annual Hours of Peak Hour Excessive Delay (PHED) Per Capita
	Percent of Non-SOV Travel Measure: Percent of Non-Single Occupancy Vehicle (SOV) Travel
Subpart H: On-Road Mobile Source Emissions	Total Emissions Reduction Measure: 2 and 4-year Total Emission Reductions for each applicable criteria pollutant and precursor for all projects funded with CMAQ funds

In addition to the reporting required by the PM3 regulation, Title 23 U.S.C. 149(l) requires MPOs that serve a Transportation Management Area (TMA) with a population over one million for which the boundaries of that TMA overlap a nonattainment or maintenance area for at least one of the transportation-related criteria pollutants to biennially prepare and submit a CMAQ Performance Plan.

In the CMAQ Performance Plan and its biennial updates, the MPOs report 2 and 4-year targets, describe how they plan to meet their targets, and detail their progress toward achieving the targets throughout the performance period.

Memphis MPO, which covers parts of Tennessee and Mississippi is subject to this requirement. In October 2018, the Memphis MPO submitted its baseline CMAQ Performance Plan to both Tennessee and Mississippi State DOTs. This biennial update of the CMAQ Performance Plan is part of the State DOTs Mid Performance Period Progress Report, which is due to FHWA on October 1, 2020.

Figure 1: Performance Periods for the Measures and Reporting Timeline for the State Biennial Performance Report and the MPO CMAQ Performance Plans (FHWA)



2. Summary of the Current PM3 Targets

The two targets that require Tri-State adoption are, Peak-Hour Excessive Delay (PHED) and Percent of Non-SOV Travel. The On-Road Mobile Source Emissions are individual target for the States of Tennessee, Mississippi, and Arkansas.

As previously agreed by the Tri-State Partners, the 4-Year (2021) target for PHED was 18.8 hrs. and the 2-Year (2019) and 4-Year (2021) target for Percent of Non-SOV Travel was 16.5%.

The On-Road Mobile Source Emissions targets were based on cumulative 2 and 4-year emission reductions for CMAQ funded projects of reduced emissions for Nitrogen Oxide (NOx), Volatile Organic Compounds (VOC) and Carbon Monoxide (CO).

Tables 2 and 3: Summary of the PM3 Baseline and Targets (2018 Adopted)

SUBPART G			
	Memphis, TN-MS-AR Urbanized Area		
	Baseline (2017)	2-Year Target (2019)	4-Year Target (2021)
Annual Hours of Peak-Hour Excessive Delay per Capita	N/A	N/A	18.8
Percentage of Non-Single Occupancy Vehicle Travel	16.6%	16.5%	16.5%

SUBPART H						
	Tennessee (TDOT)			Mississippi (MDOT)		
	Baseline (FY 2014-17)	2-Year Target (FY 2018-19)	4-Year Target (FY 2018-2021)	Baseline (FY 2014-17)	2-Year Target (FY 2018-19)	4-Year Target (FY 2018-2021)
Total Emissions Reductions (VOC) kg/day	230.025	30.698	61.396	28.000	> 0	> 0
Total Emissions Reductions (CO) kg/day	530.282	75.000	150.000	N/A	N/A	N/A
Total Emissions Reductions (NOx) kg/day	363.399	62.840	125.680	85.000	> 0	> 0

3. Biennial CMAQ Performance Plan – Memphis MPO

Memphis MPO Biennial CMAQ Performance Plan Applicability:

- a) Serves a TMA > 1 Million Population
- b) Includes Maintenance for Ozone (O₃)
 - i. Entire Shelby County TN – Maintenance for O₃
 - ii. Partial DeSoto County, MS – Maintenance for O₃
 - iii. Entire Shelby County TN – Attainment for CO (reached on December 26, 2017)

4. 2-Year Condition/Performance for Traffic Congestion Measures

The Memphis Urbanized Area, which covers parts of Tennessee, Mississippi, and Arkansas, including Memphis Urban Area MPO (MMPO) and West Memphis MPO (WMPO), meets the threshold set in Subpart G:

- a) Population – 1,079,752 (ACS 2018)
- b) NAAQS Designation
 - i. Entire Shelby County TN – Maintenance for O₃
 - ii. Entire Crittenden County, AR – Maintenance for O₃
 - iii. Partial DeSoto County, MS – Maintenance for O₃
 - iv. Entire Shelby County TN – Attainment for CO (reached on December 26, 2017)

Thus, requiring the Tri-State Urbanized Area to establish single, unified targets for the following two measures under Subpart G:

- a) The annual hours of Peak Hour Excessive Delay (PHED) per capita, and
- b) The percent of Non-Single Occupancy Vehicles (SOV) travel

The following Tri-State Partners participated in the review and update of the Traffic Congestion Measures Targets.

- a) Tennessee Department of Transportation (TDOT)
- b) Arkansas Department of Transportation (ArDOT)
- c) Mississippi Department of Transportation (MDOT)
- d) Memphis Urban Area MPO (MMPO)
- e) West Memphis MPO (WMPO)
- f) Federal Highway Administration (FHWA) – TN
- g) Federal Highway Administration (FHWA) – AR
- h) Federal Highway Administration (FHWA) – MS

Additional coordination efforts were done individually by each of the State DOTs and MPOs by engaging and updating their leadership on the ongoing efforts related to target setting.

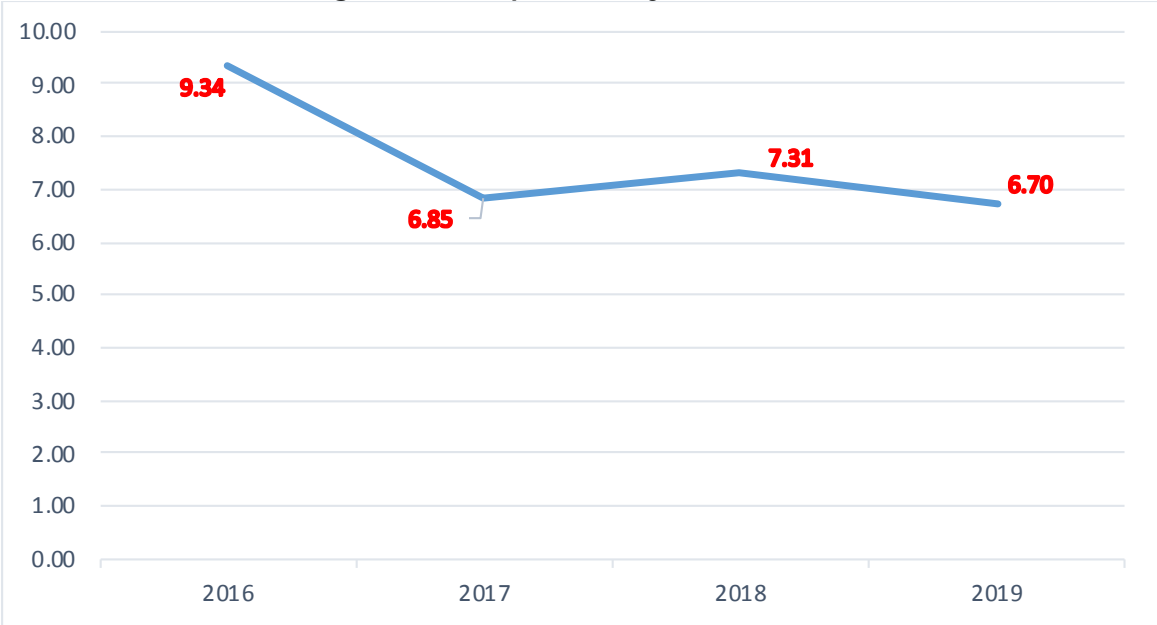
4.1. Peak Hour Excessive Delay Measure (PHED)

As shown in the Table 2, the 4-Year (2021) target, as adopted in 2018, for PHED was 18.8. Analyzing data for the most recent years, shows the PHED value of 6.7 hrs. (see Table 4 and Figure 2). This is significantly lower from the 4-year target, which was adopted in 2018. The group noted that this was primarily attributed to low construction activity in the Greater Memphis Area.

Table 4: Memphis Quarterly PHED

Memphis PHED					
	Q1	Q2	Q3	Q4	Yearly
2016	2.08	2.46	2.57	2.22	9.34
2017	1.61	1.74	1.70	1.80	6.85
2018	1.74	1.93	1.78	1.86	7.31
2019	1.60	1.70	1.70	1.80	6.70

Figure 2: Memphis Yearly PHED (Source: NPMRDS)



MPO staff conducted linear, exponential, and logarithmic trend analysis for PHED using the yearly data (Figure 3) and the INRIX data (Figure 4). Projections using INRIX data, yielded lower values: linear (7.0 hrs.), exponential (7.0 hrs.), and logarithmic (7.3 hrs.), as compared to the value in 2018, which was 8.0 hrs. (Figure 4).

The Tri-State working group reviewed the analysis as well as future projects that could potentially be under construction in 2021 and concurred that the trends would exceed the peak hour excessive delay using the INRIX data from 2018, which was 8.0 hours.

Additionally, this allowed for a 1.0 hr. buffer from the linear and exponential projections for 2021.

Figure 3: Memphis PHED Trend Analysis (Yearly)

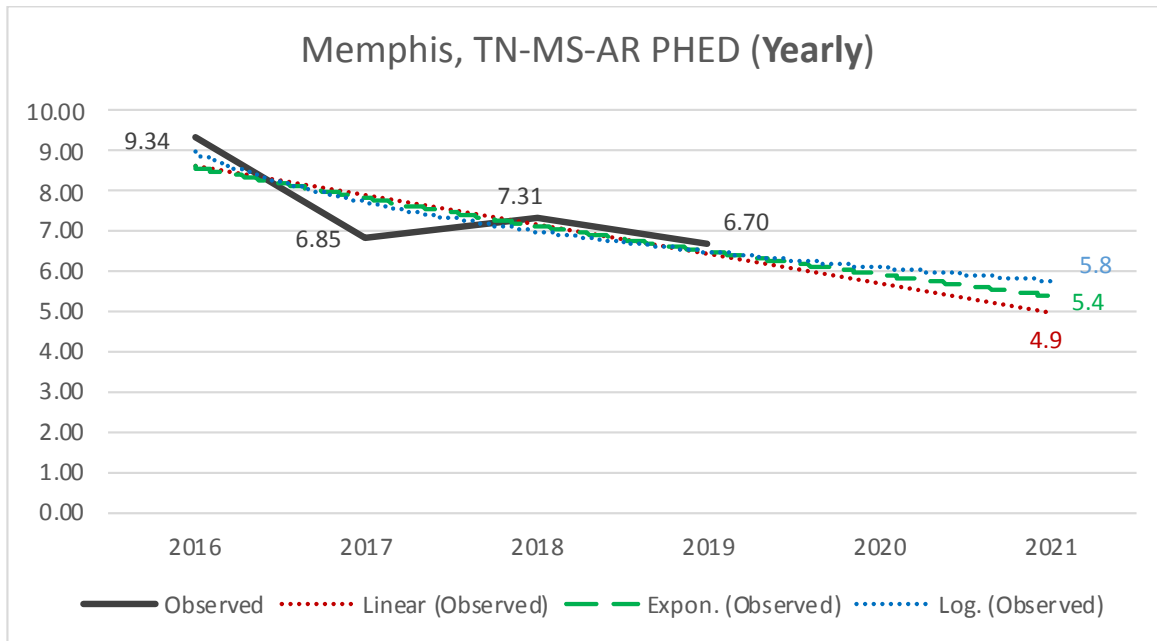
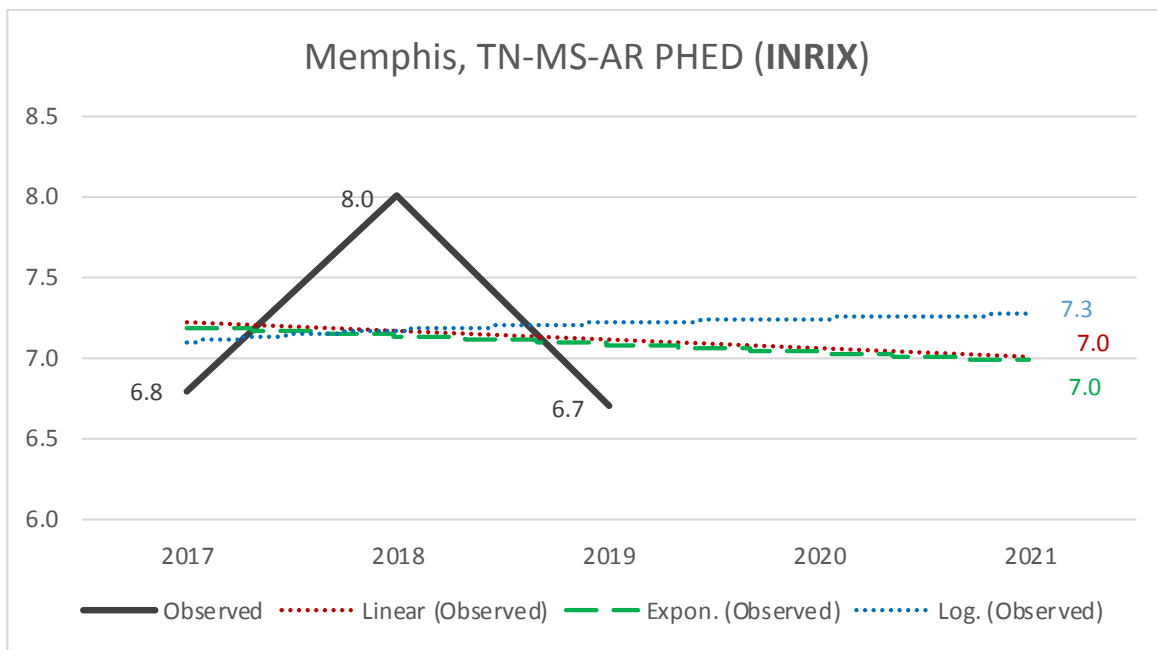


Figure 4: Memphis PHED Trend Analysis (INRIX)



Tri-State members including Tennessee, Mississippi, Arkansas, the West Memphis MPO and Memphis MPO agreed to update the 4-year target for Peak-Hour Excessive Delay (PHED) to 8.0 hours.

- 4-Year Tri-State Target: **8.0 Hrs. (2021)**

4.2. Percentage of Non-Single Occupancy Vehicle (Non-SOV) Travel

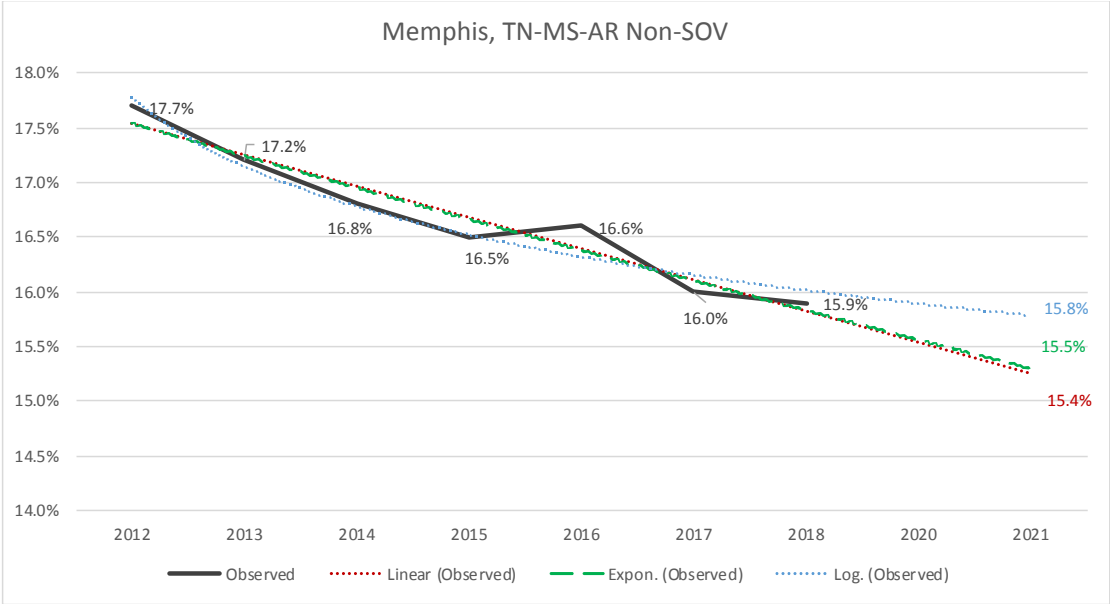
The 2-Year (2019) and 4-Year (2021) target for Percent of Non-SOV Travel, as adopted in 2018 was 16.5% (Table 2). MPO staff reviewed the 2017 and 2018 American Community Survey (ACS) data to analyze the current trend for the Percent of Non-SOV Travel for the Memphis TN-MS-AR Urbanized Area. Data for both years, show that the percentage has been declining from 16.5% to 16.0% in 2017 and 15.9% in 2018.

Table 5 Percent of Non-SOV 2012 to 2018

% Non-SOV - 2012 to 2018				
Year	AR	MS	TN	Memphis TN-MS-AR
2012	18.4	16.8	16.6	17.7
2013	17.8	16.4	16.1	17.2
2014	17.5	15.9	16.3	16.8
2015	17.4	15.6	16.3	16.5
2016	17.3	15.3	16.4	16.6
2017	17.1	14.9	16.4	16.0
2018	17.2	14.7	16.6	15.9

MPO staff used the updated ACS data to project the following three trend analysis for the 4-year target. All three of the trend analyses yielded a lower value: linear (15.4%), exponential (15.5%), and logarithmic (15.8%) for 2021 (Figure 5).

Figure 5: Percent of Non-SOV Trend Analysis



The Tri-State working group reviewed the analysis and discussed other factors that could impact the 2021 target including, the change in the number of people commuting to work due to COVID-19. It was noted that those traveling to work are essential employees and less likely to have the opportunity to carpool. Understanding that these factors, may cause the future percentage to be lower than the trend, the group decided to build in a buffer that was slightly lower than the linear trend analysis.

Tri-State members including Tennessee, Mississippi, Arkansas, the West Memphis MPO and Memphis MPO agreed to update the 4-year target for Percent of Non-SOV Travel to 14.5%.

- 4-Year Tri-State Target: **14.5% (2021)**

5. 2-Year Condition/Performance for On-Road Mobile Source Emission Measures

Memphis MPO is currently designated as Maintenance Area for Ozone (VOC & NOx) and is required to establish targets for the on-road mobile source emissions measure. Previously, Shelby County, TN was designated maintenance for CO and emission reduction target was established and reported in the 2018 CMAQ Performance Plan. On December 26, 2017, Shelby County was designated attainment for CO and the Memphis MPO was no longer required to report on CO due to reaching the end of the 20-year maintenance period, as defined in the Applicability Determination for CMAQ Traffic Congestion and CMAQ On-Road Mobile Source Emissions Measures on October 1, 2019. Therefore, reporting on CO emissions and targets was removed from the biennial update of the CMAQ Performance Plan.

In Tennessee, only Memphis and Knoxville MPOs are required to report on this performance measure. To provide an update on the current emission reduction targets (Table 3) FHWA CMAQ Public Access System (UPACS) Data 2018 & 2019 and the 2020 TDOT project obligation data were used to review the emission reductions for NOx and VOC (Table 6 & 7).

Table 6: Annual Emissions Reductions for Memphis MPO

Annual Emissions Reductions Memphis (kg reduced/day - Sum 2014 -2020)					
	VOC	CO	NOx	PM10	PM2.5
2014	0.000	0.000	0.000	NA	NA
2015	24.320	284.880	29.790	NA	NA
2016	14.549	207.902	101.740	NA	NA
2017	154.320	37.500	136.420	NA	NA
2018	1.761	NA	1.345	NA	NA
2019	18.730	NA	61.830	NA	NA
2020	0.083	NA	0.179	NA	NA

Table 7: Annual Emissions Reductions Knoxville MPO

Annual Emissions Reductions Knoxville (kg reduced/day - Sum 2014 -2020)					
	VOC	CO	NOx	PM10	PM2.5
2014	0.000	NA	0.000	NA	0.000
2015	20.936	NA	52.719	NA	1.817
2016	15.100	NA	41.100	NA	1.020
2017	0.800	NA	1.630	NA	0.060
2018	5.630	NA	14.021	NA	0.856
2019	13.940	NA	96.100	NA	6.130
2020	1.305	NA	8.204	NA	0.354

The TDOT Working Group agreed that for VOC the original 4-year target was found to be a little high and the original target for NOx was found to be overly conservative (Table 8). The 3-Year (FY 2018-20) Actual data give a more accurate picture. The group agreed to use the 3-Year Actual emission number as the updated 4-Year Target.

Table 8: Targets (as adopted in 2018) vs Actual Emission Reductions in TN

	VOC	NOx
2-Year Target (FY 2018-19)	30.698	62.840
2-Year Actual (FY 2018-19)	40.061	173.296
3-Year Actual (FY 2018-20)	41.449	181.679
4-Year Target (FY 2018-21)	61.396	125.680

- VOC 4-Year ('18-'21) Target: **41.449 (kg/day)**
- NOx 4-Year ('18-'21) Target: **181.679 (kg/day)**

The Mississippi portion of the Memphis MPO area (partial DeSoto County) is designated as maintenance for Ozone (VOC and NO_x). No project was reported in UPACS for DeSoto County from 2018-2019 that used CMAQ funding and incurred air quality reduction. The 4-year target > 0 remains unchanged.

Tables 9 and 10: Summary of the PM3 Updated 4-Year Targets

SUBPART G	
	Memphis, TN-MS-AR Urbanized Area
	4-Year Target (2021)
Annual Hours of Peak-Hour Excessive Delay per Capita	8.0 Hours
Percentage of Non-Single Occupancy Vehicle Travel	14.5%

SUBPART H		
	Tennessee (TDOT)	Mississippi (MDOT)
	4-Year Target (FY 2018-2021)	4-Year Target (FY 2018-2021)
Total Emissions Reductions (VOC) kg/day	41.449	> 0
Total Emissions Reductions (NOx) kg/day	181.679	> 0

6. Description of Projects

For the Mid Performance Period, this report includes the CMAQ funded projects which are anticipated to contribute to maintain the remaining 2-year targets for the traffic congestion and on-road mobile source emissions measures, as applicable. Table 11 below lists the projects for the Tennessee portion of the Memphis MPO Area, which are anticipated to contribute to maintaining the targets for the State of Tennessee.

Table 11: Description of Projects for the Tennessee Portion - Performance Period 2020 – 2021

	Project Category	Description of Projects	Applicable Pollutant	Year Anticipated for CMAQ Obligation	NOx Benefit (Kg/Day)	VOC Benefit (Kg/Day)	Traffic Congestion Benefit - PHED	Traffic Congestion Benefit - NON-SOV
1	Alternative Fuel Project	University of Memphis Alternative Fuel & Non-Recreational Bicycle Project	Ozone	2020	0.810	0.370	NO	YES
2	Diesel Emission Reduction Projects	MATA Fixed-Route Bus Electrification Project - Purchase 10 all-electric buses, 8 electronic charging stations and 4 opportunity charging stations	Ozone	2020	126.962	34.936	NO	YES
3	Bicycle Pedestrian Projects	University of Memphis Partnership with Explore Bike Share: Installation and Promotion of Campus Smart Bike Share	Ozone	2021	0.025	0.037	NO	YES

The above project description table currently does not include any project from Mississippi portion of the Memphis MPO area. But if any projects are funded through CMAQ funding in next two years they will be reported in the Full Performance Report due in October 2022.

7. Assessment of Progress Towards Achieving the remaining 2-Year Targets (2020 – 2021)

The Baseline Performance Period Report submitted to FHWA in 2018 included 11 CMAQ funded projects for the Tennessee portion of the Memphis MPO area to be obligated between 2018 to 2021 to meet the 2-Year and 4-Year targets for Ozone. The 2018 and 2019 data from UPACS identified 8 CMAQ funded projects within the Tennessee portion of the Memphis MPO area that received obligation. As shown in the Table 8, the working group agreed to use the 3-Year Actual emission numbers as the updated 4-year target to capture a more accurate picture. The remaining three projects listed in Table 11, located within the Tennessee portion of the Memphis MPO Area is expected to be obligated in FY2020 and FY2021 and will contribute to maintain the updated 4-year performance targets for the State of Tennessee in the area of traffic congestion and on-road mobile source emissions measures.

As noted in Section 5, there were no projects reported in UPACS for DeSoto County from 2018-2019 that used CMAQ funding and incurred air quality reduction. The 4-year target > 0 remains unchanged.