Resolution 2022-35
ATTACHMENT 1

CMAQ Performance Plan

Full Performance Period Progress Report

(2018 – 2021)

Houston-Galveston Area Council

Approved by the Transportation Policy Council
September 23, 2022

Introduction

The purpose of this full performance period progress report is to document the efforts to meet the region's two- and four-year targets for the federal performance measures of peak hour excessive delay, non-single occupancy vehicle travel, and the Congestion Mitigation Air Quality (CMAQ) on-road mobile source total emission reductions for ozone. The 2020 targets were established in 2018 and some of the 2022 targets were adjusted in 2020 by the Houston-Galveston Area Transportation Policy Council. Target setting activities occurred with regional stakeholder input, and in coordination and consultation with the Texas Department of Transportation (TxDOT), H-GAC subcommittees, as well as other regional metropolitan planning organizations (MPOs) within the State of Texas. The Transportation Policy Council approved the performance reporting and targets in September 2018, 2020, and 2022. The performance period for these performance measures is from 2018 to 2021.

For the CMAQ Performance Plan, H-GAC and TxDOT looked at conditions and projects in the Houston-Galveston region for three specific measures that relate to the CMAQ program:

- Peak Hour Excessive Delay Measure (PHED)
- Non-Single Occupancy Vehicle Travel Measure (Non-SOV)
- On-Road Mobile Source Emission Reductions Measure

The final analyses for these performance measures are documented below.

Traffic Congestion Measures: PHED

Two of the congestion measures relate to traffic conditions: Peak Hour Excessive Delay (PHED) and Non-Single Vehicle Occupancy Travel (Non-SOV). The PHED measure is defined as the annual hours of peak hour excessive delay per capita. Excessive delay refers to the additional annual hours spent in congestion based on an established speed threshold during peak periods. Peak periods are defined as Monday through Friday 6:00 AM – 10:00 AM and 3:00 PM – 7:00 PM. The federal threshold for excessive delay on a roadway is 20 mph or 60% of the speed limit, whichever is greater. On a segment with a speed limit of 60 mph, the excessive delay (60% of 60 mph) would be 36 mph. The baseline annual PHED per capita measure for the Houston Urbanized Area for the first performance period was 14.0 hours. After many years of construction, the opening of US 290 and other major corridors in the 8-county region contributed to better reliability. Peak Hour Excessive Delay held steady at 14.0 hours for 2018 and 2020 enabling the region to meet the two-year target for 2020. The final four-year target for 2022 remained at 14.0 hours. This target was achieved and exceeded in 2022 with a final PHED measure of 13.5 due partly to the COVID pandemic and a reduction in personal vehicle trips. Additional information about PHED target progress can be found in Table 1.

Table 1 – PHED Baseline, Targets and Target Achievement

Measure	2018 Baseline	2020 Targets	2020 Actuals	2020 Target achieved?	2022 Targets	2022 Actuals	2022 Target achieved?
Peak Hour Excessive Delay (Houston Urban Area)	16.8	14.0	14.0	YES	14.0	13.5	YES
(A decreased value indicates improvement.)							

While H-GAC achieved the both the 2020 and 2022 performance targets for Peak Hour Excessive Delay (PHED), it is important to identify issues with the underlying data used to calculate the performance and

achievement. Methods for calculating this measure are prescribed in federal guidance. The paragraphs that follow detail some of the data issues with measuring Peak Hour Excessive Delay.

The Texas Department of Transportation contracts with the Texas A&M Transportation Institute (TTI) to calculate the conditions of Peak Hour Excessive Delay (PHED). TTI used the National Performance Management Research Data Set (NPMRDS) roadway segments defined as Traffic Message Channel (TMC) segments for their estimation of the PHED. These TMC roadway lengths are updated periodically by the NPMRDS vendor INRIX; these changes can have significant impacts on the PHED. The TMC length changes were the results of INRIX changing its base map when switching from TomTom to HERE Technologies.

The TMC roadway segments for the years of 2017-2018 and 2018-2019 were compared to determine if there were any changes. This comparison showed that between 2017 and 2018, approximately 1% of the TMC segments changed by +/- 10%, however, during that time, the Annual Average Daily Traffic (AADT) assigned to TMCs changed by over 20%. The important point is that between 2018 and 2019, over 80% of the TMC segment lengths changed by +/- at least 10%, and a minimum of 20% of the AADT assigned to TMCs changed by at least +/- 10%.

Generally, one of the two inputs to personal-miles of travel (the variable combined with speed data to calculate delay) changed between 2017 and 2018. However, both variables (length and AADT) changed significantly between 2018 and 2019, consequently amplifying the effects. When the lengths of the TMC roadway segments or AADT change, this alters the personal miles of travel assigned to the TMC. As a result, these changes can modify the speeds that are captured inside the shorter or longer TMC segments causing the TMCs to have completely different characteristics across the years. The data is not consistent enough to be able to monitor Peak Hour Excessive Delay (PHED) of the transportation system. The analysis of data changes shows that PHED estimates are highly variable and meeting PHED targets may be problematic in the future. H-GAC will continue working with Texas Transportation Institute staff to review future changes to the input data and monitor the performance of excessive delay.

Traffic Congestion Measures: Non-SOV

The Non-Single Vehicle Occupancy Travel (Non-SOV) performance measure is computed as the percent of working population that do not drive alone to work in a car, van or truck or those who ride public transit, rideshare, bicycle or telecommute to work. The conditions and targets for the percent of the Non-Single Occupancy Vehicles are based on the Houston-Galveston Area Council travel demand model mode choice model output. Mode choice predicts the choices that individuals or groups make in selecting their transportation modes: single occupancy vehicles, carpool, transit, and non-motorized. An important objective of the model is to predict the share of trips attracted to public transportation. Other factors considered for mode choice include socio-economic or household characteristics, travel time, travel cost and access to mass transit options. H-GAC staff will continue to monitor the performance of mode choice. Additional information about Non-SOV target progress can be found in Table 2.

Table 2 – Non-SOV Baseline, Targets and Target Achievement

Measure	2018 Baseline	2020 Target	2020 Actual	2020 Target achieved?	2022 Target	2022 Actual	2022 Target achieved?
Non-Single Occupancy Vehicle Trips (Houston Urban Area)	20.1%	21.1%	21.1%	YES	20.0%	21.1%	YES
(An increased value indicates improvement.)							

The COVID-19 pandemic began in 2020 and drastically impacted reliability and congestion performance which made it unclear what the outcomes would be in future years. As a result, in order to determine the best possible target projections and achievements. In 2020 during the mid-performance period reassessment, H-GAC staff recommended that the Non-Single Occupancy Vehicle four-year target for 2022 be reduced to 20% to take into account the expected impacts from the COVID-19 pandemic.

Despite this uncertainty, the Houston Urban Area achieved a Non-SOV value of 21.1% which was unchanged from the measured values in 2020. In conclusion, H-GAC staff will continue to work with the Texas Transportation Institute, the Texas Department of Transportation, and other partners to monitor and understand the performance of the background data used to calculate reliability and congestion measures. This is expected to result in the best possible target projections and achievements for future performance measure cycles.

CMAQ On-Road Mobile Source Emissions Measures Targets

During the initial performance period in 2018, H-GAC developed an estimate of on-road mobile source emissions reduction targets for CMAQ-funded projects within the agency's 8-county service area. H-GAC, in coordination with other MPOs within Texas, and TxDOT used the Transportation Improvement Program (TIP) to develop initial performance target estimates. For this initial target, emission reduction estimates attributed to TIP projects in federal fiscal years 2019-2022 were summed in kg/day to determine initial target estimates. The two-year target was determined by summing TIP projects from 2019 and 2020, while the four-year target was determined by summing TIP projects from 2019, 2020, 2021, and 2022.

During the mid-performance period reassessment in 2020, it was necessary to revise the initial four-year targets downwards due to lower-than-expected progress towards meeting the two- and four- year total emission reduction performance measure targets. In addition to the target revisions, H-GAC staff also revised the time frame for the remainder of the performance period to include the years 2018 through 2021 to match FHWA guidance that was not available during the initial development of the targets. The revised four-year target used a combination of verified outcomes from 2018 and 2019 as well as a revised estimate of CMAQ-funded emissions reductions for fiscal years 2020 and 2021. The revised four-year target resulting from this analysis can be found in Table 3.

Table 3 – Established H-GAC Region CMAQ-Focused 2- and 4-year Targets as revised in 2020

Performance Measure	2-Year Target	4-Year Target
Emission reductions – NO_x	1,419.426	1,429.077
Emission reductions- VOC	169.301	234.604

Review of Two-Year Target Progress

In 2020, at the mid-point of the first performance period, H-GAC staff began to analyze the emission reductions attributable to TIP projects that let within the years 2019 and 2020 and were reported to the Federal Highway Administration's (FHWA) CMAQ Public Access System. Based on these projects, staff was able to compare the emissions reduction targets formulated in 2018 with the actual emission reduction performance of regional CMAQ projects. These results can be found in Table 4.

Table 4 – Established H-GAC Region CMAQ-Focused 2-Year Targets (2019-2022)

Performance Measure	2-Year Target	2-Year Progress	2-Year Delta
Emissions – NO_x	1,419.426	158.319	(1,261.107)
Emissions – VOC	169.301	52.010	(117.291)

There has been significantly less progress on the initial two-year target than was anticipated when the targets were initially set in 2018. As a result, the Houston region was unable to meet these two-year targets. This variance can be attributed to several factors:

- Letting Date Variance: Due to the formulation of the performance measures, all emission reductions attributed to any given project are counted in the year the project is initially obligated. As a result of this, approximately 825 kg/day of targeted NOx and 22.9 kg/day of targeted VOC were lost due to projects being unexpectedly let in 2018. The largest of these rescheduled projects is H-GAC's Clean Vehicles Program, which accounts for 822.66 kg/day of NOx and 22.46 kg/day of VOC emission reductions and was obligated in 2018 rather than 2019 as anticipated.
- Project Delays: Similarly, one of our Transportation Improvement Plan projects was delayed until a later year which removed it from this analysis. This accounted for 0.07 kg/day of NOx emissions reductions and 0.02 kg/day of VOC emissions reductions.
- Funding Category Changes and Project Cancellations: Finally, a small portion of the emissions reduction decreases are the result of four projects that were either moved to a separate, non-CMAQ funding category or were canceled altogether by the project's sponsor. This set of projects resulted in 0.04 kg/day of NOx reductions and 0.01 kg/day of VOC reductions.

Following the completion, approval by H-GAC's Transportation Policy Council, and submission of the initial two- and four-year targets in September 2018, FHWA released guidance in January 2019 to assist with the development of CMAQ targets. This guidance recommended that MPOs and state DOTs should use the time frame of 2018 through 2021 rather than 2019 through 2022 as H-GAC utilized in our initial target estimates. Using the revised time frame recommended in the guidance would result in a significant increase in emissions attributable to progress towards meeting the two-year performance target. Calculating the two-year target progress from 2018 through 2021 would have resulted in two-year progress of 919.445 kg/day of NOx and 68.570 kg/day of VOC. Additional details related to the 2-year targets and progress can be found in the "CMAQ Performance Plan Mid Performance Period Progress Report" that was published by H-GAC in September of 2020.

Assessment of Four-Year Target Progress

In 2022, at the end of the first performance period, H-GAC staff began to analyze emission reductions attributable to TIP projects that went to construction between the years 2018 and 2021 and were reported as obligations to the Federal Highway Administration's (FHWA) CMAQ Public Access System. Based on these projects, staff was able to compare the emissions reduction targets formulated in 2018 with the actual emission reduction performance of regional CMAQ projects. These results can be found in Table 5.

Table 5 – Established H-GAC Region CMAQ-Focused 4-Year Targets and Progress (2018-2021)

Performance Measure	4-Year Target	4-Year Progress	4-Year Delta
Emission reductions NO_x	1,429.077	1,383.040	(46.037)
Emission reductions VOC	234.604	98.863	(135.741)

In summary, for the first four-year performance period of 2018 to 2021, the Houston-Galveston-Brazoria nonattainment region has been unable to meet its air quality targets for CMAQ programs as developed in 2018 and revised in 2020, despite the region's best efforts. This variance can be attributed to several factors:

- Letting Date Variance: Due to the formulation of the performance measures, all emission reductions attributed to any given project are counted in the year the project is initially obligated. As a result of this, small variations or delays in the project schedule or letting date can result in significant changes to the progress made towards meeting targets.
- Funding Category Changes and Project Cancellations: Another portion of the emissions reduction decreases are the result of projects that were either moved to a separate, non-CMAQ funding category or were canceled altogether by the project sponsor.

Description of CMAQ Projects

The Houston-Galveston Area Council coordinates with local stakeholders to select CMAQ projects for deployment in the Houston-Galveston-Brazoria ozone nonattainment area. These projects are selected to meet the program goals of reducing congestion and/or reducing emissions of ozone precursor pollutants. Emissions estimates for these projects are developed by H-GAC using methodologies developed as part of the Texas Guide to Accepted Mobile Source Emission Reduction Strategies (MOSERS). In cases where no practical MOSERS methodology exists, verified past emission reduction performance is used to create an emissions reduction estimate. The results from these analyses are then uploaded by TxDOT into the CMAQ Public Access System upon the obligation of funding for the individual projects. The CMAQ projects that were obligated during the 2018-2021 performance period are accounted for in the table below. To simplify reporting, projects are grouped in Table 6, below, based on general categories H-GAC uses to report project types in the TIP. Finally, H-GAC is not required to report benefits for pollutants other than VOC and NO_x. As such, the table below reports only on these pollutants.

Table 6 – FY2018, 2019, 2020, and 2021 Obligated CMAQ Projects in the Houston-Galveston Region (reported in CMAQ Public Access System)

Project Type	MPO ID	Project Description	Year of CMAQ Obligation	NOx Benefit (kg/day)	VOC Benefit (kg/day)	PHED Benefit	Non-SOV Benefit
Traffic Flow Improvements	17043	US 90 ITS Implementation	**2018**	0.980	0.190	Yes – reduces peak hour delay	No
Traffic Flow Improvements	17042	IH 10 ITS Implementation	**2018**	1.788	0.260	Yes – reduces peak hour delay	No
Air Quality	14723	H-GAC Commuter and Transit Pilot Program Implementation	**2018**	11.530	17.260	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
Air Quality	17127	H-GAC Clean Vehicles Program Implementation	**2018**	822.660	22.460	No	No
Pedestrian/Bicycle	17047	City of Houston Automated Parking Guidance System	**2018**	0.53	0.13	Yes – reduces peak hour delay	No
Traffic Flow Improvements	17155	IH 10 ITS Implementation	**2018**	1.03	0.150	Yes – reduces peak hour delay	No
2018 Emissions Total				**838.520**	**40.45**		

Project Type	MPO ID	Project Description	Year of CMAQ Obligation	NOx Benefit (kg/day)	VOC Benefit (kg/day)	PHED Benefit	Non-SOV Benefit
Air Quality	14727	H-GAC Commute Solutions Program	**2019**	11.530	17.260	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
Air Quality	11717	Regional METRO Star Vanpool Operations	**2019**	31.680	6.540	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
Air Quality	17124	H-GAC Travel Demand Management Marketing, Education and Public Outreach	**2019**	69.550	3.750	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
Traffic Flow Improvements	17062	Regional ITS Implementation	**2019**	1.750	0.430	Yes – reduces peak hour delay	No
Pedestrian/Bicycle	7814	Spring Creek Hike & Bike Trail Construction	**2019**	0.318	0.224	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
2019 Emissions Total				**114.828**	**28.204**		
Project Type	**MPO ID**	**Project Description**	**Year of CMAQ Obligation**	**NOx Benefit (kg/day)**	**VOC Benefit (kg/day)**	**PHED Benefit**	**Non-SOV Benefit**
Traffic Flow Improvements	17051	FM 1960 Intersection Improvements	**2020**	0.160	0.020	Yes – reduces peak hour delay	No
Transit Improvements	18012	Purchase New Fort Bend County Commuter Buses	**2020**	0.010	2.510	Yes – reduces peak hour delay	Yes – Increases non-SOV travel

Transit Improvements	11028	Fort Bend County Administration and Operations Facility	**2020**	0.030	0.010	Yes – reduces peak hour delay	No
Transit Improvements	18013	METRO Universal Accessibility Improvements	**2020**	6.770	4.460	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
Pedestrian/Bicycle	16203	City of Galveston On-Street Bicycle Network	**2020**	1.580	2.680	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
Transit Improvements	16222	Texas City Park and Ride	**2020**	1.980	0.470	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
Traffic Flow Improvements	17064	Montgomery County ITS Implementation	**2020**	1.880	0.300	Yes – reduces peak hour delay	No
Traffic Flow Improvements	17044	Fort Bend County ITS Implementation	**2020**	0.210	0.070	Yes – reduces peak hour delay	No
2020 Emissions Total				**12.620**	**10.520**		
Project Type	**MPO ID**	**Project Description**	**Year of CMAQ Obligation**	**NOx Benefit (kg/day)**	**VOC Benefit (kg/day)**	**PHED Benefit**	**Non-SOV Benefit**
Traffic Flow Improvements	17076	US 90A ITS Implementation	**2021**	1.200	1.400	Yes – reduces peak hour delay	No
Traffic Flow Improvements	18026	City of Sugarland ITS Rehabilitation	**2021**	2.220	0.610	Yes – reduces peak hour delay	No
Traffic Flow Improvements	11916	Regional “Tow and Go” Program	**2021**	11.870	2.330	Yes – reduces peak hour delay	No
Air Quality	12092	H-GAC Clean Vehicles Program Implementation	**2021**	395.390	10.790	No	No
Traffic Flow Improvements	18145	FM 2920 Access Management Improvements	**2021**	3.200	1.000	Yes – reduces peak hour delay	No

Transit Improvements	18163	Regional Fare Collection System	**2021**	0.500	0.340	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
Transit Improvements	18017	West Bellfort Park & Ride Improvements	**2021**	2.690	3.220	Yes – reduces peak hour delay	Yes – Increases non-SOV travel
2021 Emissions Total				**417.070**	**19.690**		