Technical Memorandum
100 Most Congested Texas Road Segments
2023 Executive Summary

The analysis is supported by and prepared for TxDOT
November 2023

In response to urban roadway congestion, in 2009 the Texas Legislature mandated that the Texas Department of Transportation annually produce a ranked list of the most congested road segments in the state. This list measures congestion by the number of extra hours of travel time (also called 'delay') experienced by travelers on over 2,100 road segments covering roughly 10,000 miles. Because of the significant delay values in the most congested segments and the slow nature of solution implementation to address a congested roadway, the overall list changes little from year to year in most years. The 2023 Top 100 Congested Road Segments reports on the 2022 calendar year conditions. Congestion was higher in 2022 compared to 2021: 7 percent across all monitored roads and 16 percent across the top 100. Heavily traveled and economically important corridors in the metropolitan areas are still among the most congested. There were, however, some new entries for this year throughout the Top 100 list.

The 10 most congested road segments for the 2023 report are shown in Exhibit 1. The West Loop (IH 610) in Houston is at the top of the list again this year. Nine of the top 10 roads from the 2022 Top 100 Report and eight from 2021 Top 100 Report remain in the top 10 for the 2023 report. The one new road segment in the top 10 compared with last year's list is:

- Katy Fwy / IH 10 / US 90 – ranked 7 this year, ranked 13 last year

Exhibit 1: 2023 Texas 100 Report Top 10 Congested Road Segments in Texas

2023 Ranking	County	Road Segment	From	To	22/21/20 Ranking
1	Harris	W Loop Fwy / IH 610	Katy Fwy / IH 10 / US 90	Southwest Fwy / US 59 / IH 69	1 / 1 / 2
2	Harris	Eastex Fwy / IH 69 / US 59	SH 288	IH 10	4 / 5 / 5
3	Dallas	Woodall Rodgers Fwy / SS 366	US 75	N Beckley Ave	2 / 4 / 4
4	Travis	IH 35	US 290 N / SS 69	Ben White Blvd / SH 71	3 / 2 / 1
5	Harris	Southwest Fwy / IH 69 / US 59	W Loop Fwy / IH 610	South Fwy / SH 288	5 / 3 / 3
6	Harris	N Loop W Fwy / IH 610	North Fwy / IH 45	Katy Fwy / IH 10 / US 90	8 / 14 / 6
7	Harris	Katy Fwy / IH 10 / US 90	W Loop N Fwy / IH 610	North Fwy / IH 45	13 / 16 /11
8	Harris	Gulf Fwy / IH 45	IH 10 / US 90	S Loop E Fwy / IH 610	10 / 6 / 7
9	Tarrant	North Fwy / IH 35W / US 287	SH 183	IH 30	6 / 9 / 16
10	Dallas	US 75	Lyndon B. Johnson Fwy / IH 635	Woodall Rodgers Fwy / SS 366	9 / 7 / 9

All-vehicle delay in the complete list of road segments was up seven percent from 2021 but remained 22 percent below the 2019, pre-COVID delay levels. Across the top 100 segments from this year, vehicle travel was up about 3 percent from last year and up 1 percent from pre-COVID values. Truck delay was up 15 percent in 2022 when comparing against 2021 levels and was up 1 percent relative to pre-COVID truck delay experienced in 2019.

The 10 most congested road segments for trucks in the 2023 report are shown in Exhibit T-1. Eastex Freeway in downtown Houston claims the top spot, up from #2 last year. Eight of the top 10 roads remained in the top 10 from the previous report. The two new road segments in the top 10 list are:

- Mines Road in Laredo –ranked 2 this year, ranked 17 last year
- Stemmons Freeway in Dallas – ranked 10 this year, ranked 14 last year

Exhibit T-1: 2023 10 Most Congested Road Segments for Trucks in Texas

2023 Ranking	County	Road Segment	From	To	22/21/20 Ranking
1	Harris	Eastex Fwy / IH 69 / US 59	SH 288	IH 10	2 / 4 / 2
2	Webb	Mines Rd / FM 1472	Pan American Blvd	Bob Bullock Loop / SL 20	17 / 8 / 110
3	Travis	IH 35	US 290 N / SS 69	Ben White Blvd / SH 71	1 / 1 / 1
4	Harris	N Loop W Fwy / IH 610	North Fwy / IH 45	Katy Fwy / IH 10 / US 90	6 /10 / 6
5	Harris	IH 10 / US 90	North Fwy / IH 45	Eastex Fwy / IH 69 / US 59	8 / 12 / 4
6	Tarrant	North Fwy / IH 35W / US 287	US 81 / US 287	28th St / SH 183	5 /18 / 33
7	Harris	Katy Fwy / IH 10 / US 90	W Loop N Fwy / IH 610	North Fwy / IH 45	4 / 22 / 13
8	Dallas	ERL Thornton Fwy / IH 30 / US 67	Jefferson Viaduct	Buckner Blvd / SL 12E	9 / 15 / 15
9	Harris	W Loop N Fwy / IH 610	Katy Fwy / IH 10 / US 90	Southwest Fwy / IH 69 / US 59	7 / 3 / 3
10	Dallas	Stemmons Fwy / IH 35E / US 77	John W. Carpenter / SH 183	Tom Landry Fwy / IH 30	14 / 7 / 7

Full results and multi-year comparisons of almost 10,000 miles on more than 2,100 road segments can be found in the full spreadsheet at https://mobility.tamu.edu/texas-most-congested-roadways/.

While congestion is often a by-product of desirable economic growth, for individuals attempting to navigate a congested roadway it is simply "a problem." TxDOT is already seeking solutions to many of these problem segments and the Texas Transportation Commission continues to accelerate those solutions for several road segments through the Texas Clear Lanes program, a 2015 initiative spurred by Texas Governor Greg Abbott to provide relief at major chokepoints across the state. Many of the Texas Clear Lanes projects are in or near some of the most congested segments in the Top 100 list.

COMING OUT OF THE PANDEMIC

The 2023 Texas 100 Most Congested Road Segments list is compiled from **calendar year 2022 data.** These data and trends from the last four years are starting to show a return to pre-pandemic levels of delay and congestion across the state. As stated last year and still a factor worth repeating this year, segments in the different urban regions across the state may be affected by a new normal:

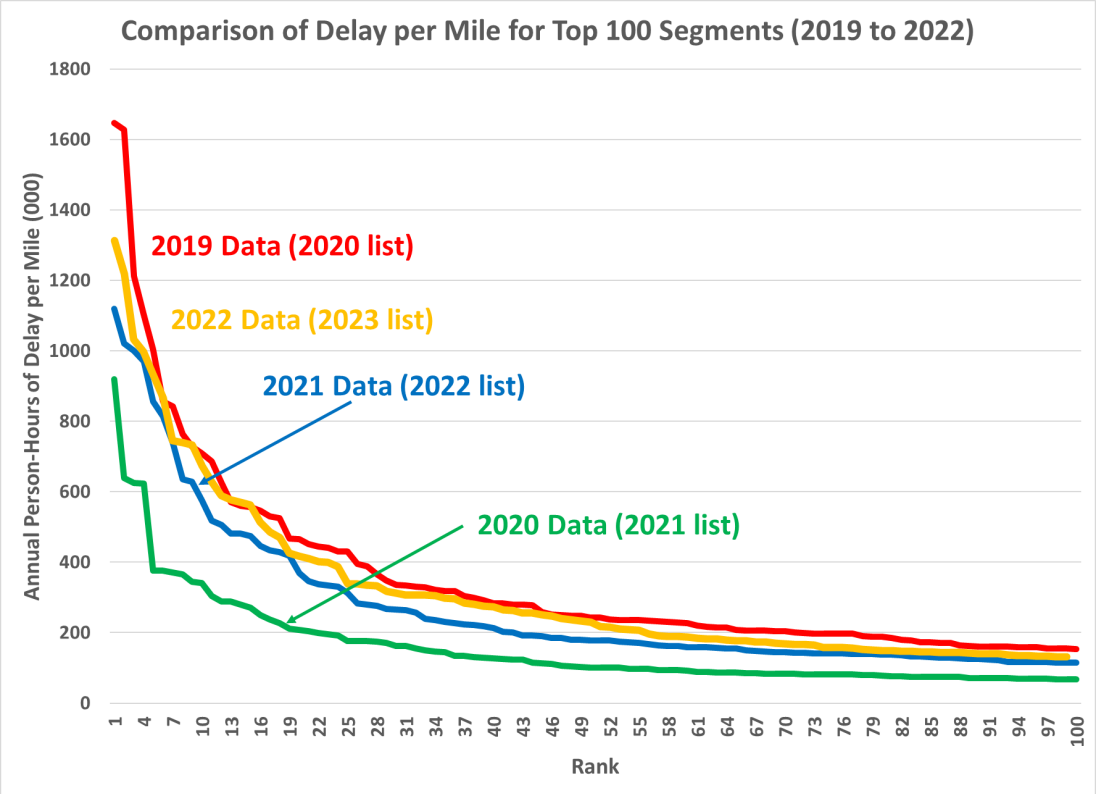
- The composition of the local job market – essential workers had to report to work, office-based workers had more options, and students studied from home for at least part of the year. Most jobs (63 percent) cannot be accomplished at home per a U.S. Bureau of Labor Statistics study last year. *The remaining jobs can be performed entirely from home (1).*
- Influence of trucking in the corridor – trucks have continued to keep hauling what the state needed, and truck delay has increased since the pandemic and is now above pre-pandemic levels.

Movement in the ranking of a segment will be due to both relative and absolute changes as compared with other similarly ranked segments across the state. An individual segment may be evaluated and deemed locally as improving or getting worse, but consideration should be given to the multiple factors that may cause a change in ranking. As with any year of tracking the bottleneck ranks, the following factors affect the rank in a given year but could have been higher or lower relative to other segments due to changes to traffic:

- Auto and truck volume changes, up or down.
- Free-flow and peak period speed variations.
- Road construction on the specific road segment of interest.
- Road construction on a nearby road segment that often encourages some traffic to shift to a different facility or travel at different times.

Exhibit 2 shows a comparison of travel delay per mile (the amount of yearly extra travel time for each roadway mile) for the Top 100 ranked road segments and demonstrates the changes between congestion in calendar years 2019, 2020, 2021, and 2022. As Texas continues the process of recovery from the pandemic, the 2021 data is between 2019 and 2020, and the newest 2022 data shows that congestion is returning but has not fully returned to the 2019 pre-pandemic levels. As the curves flatten and the rank increases, road segments can easily shuffle along the curve due to occurrences such as a few more vehicles added or subtracted or a nearby construction project affecting travel patterns. Larger shifts in rank can happen more easily and more often in this flatter section of the curve.

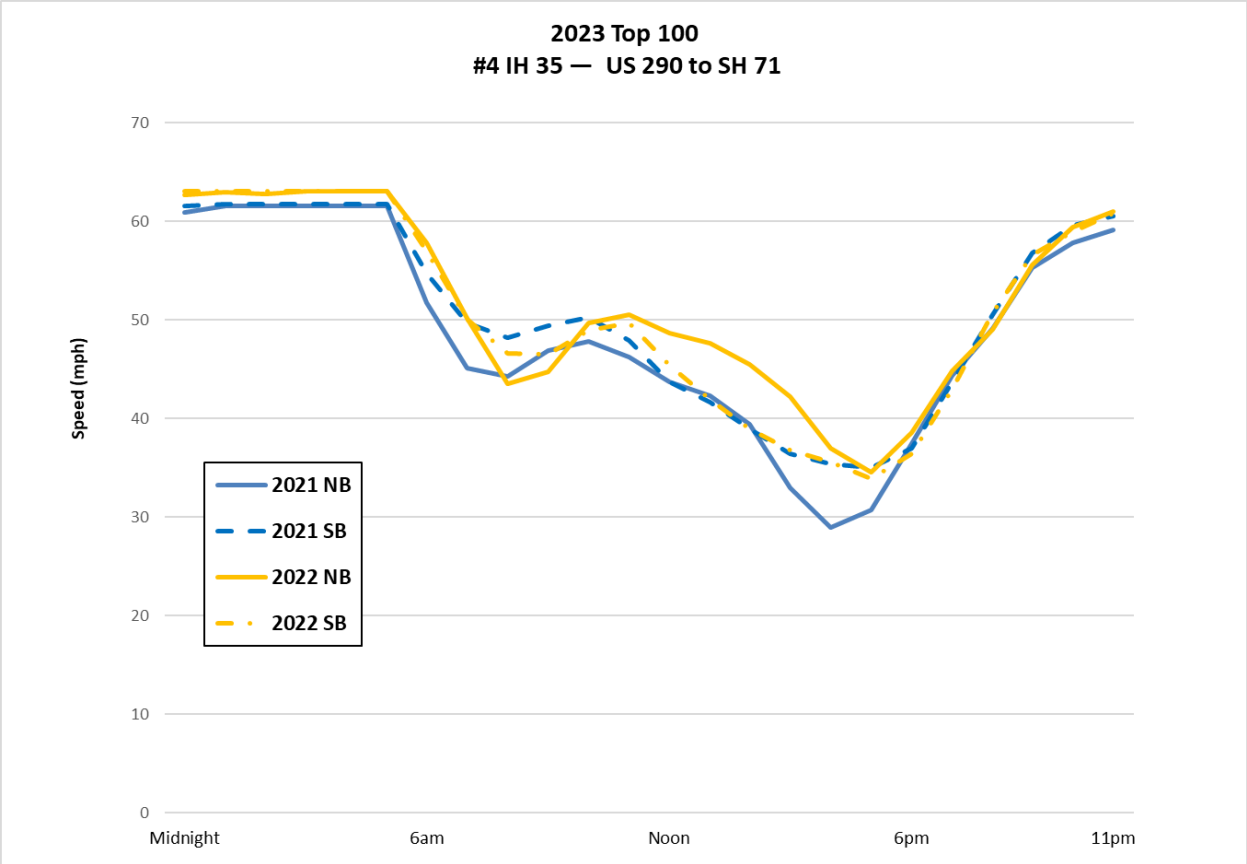
Exhibit 2. Changes Between Years for Texas 100 in the Top 100 Segments



What has not changed since its beginning in 2009 is the goal of the Texas 100 ranking: to use traffic volume and speed data to arrive at a measure of traffic congestion and the frustration that travelers and shippers experience. The primary measure quantifies how much more time it takes to travel a mile on a congested road than it does to travel that same mile of road during uncongested conditions.

The comparison of speeds in Exhibit 3 for IH 35 in Austin (ranked 4 on the list this year) show the 2022 speeds to be about 5 mph faster most of the afternoon in the northbound direction as compared with 2021. The southbound direction indicates that the speeds varied across the day but are pretty similar to last year. It is important to point out that a 5 to 10 mph savings does not have the same effect at all speed ranges. The difference between 20 and 30 mph is about 1 minute per mile and between 30 and 40 mph is about half a minute per mile. Travelers that come through this road segment northbound in the afternoon could be saving 2-5 minutes across the 8-mile segment because of the speed increase.

Exhibit 3. Speed Changes between 2021 and 2022 on IH 35 in Austin



TxDOT PROJECTS MAKING A DIFFERENCE

When comparing 2019 and 2022 conditions, vehicle-miles traveled are generally up above or about the same as 2019, while delay is still significantly below 2019. Shown in Exhibit 4 is a comparison of 2019 and 2022 vehicle-miles traveled and delay, and how this equates to annual congestion cost savings in total and to individual commuters. This analysis shows that commuters are spending less time in traffic because of TxDOT project efforts combined and the new trend of hybrid work schedules.

In looking at statewide and Top 100 data, vehicle-miles traveled was up slightly from 2019 while delay was down 23 percent statewide and 6 percent for the Top 100 segments. There was a similar trend across the big metro districts where vehicle-miles traveled, and delay had different trends. In Dallas and Fort Worth vehicle-miles traveled are well above 2019, while delay is down 16 percent and 10 percent, respectively. In the other metro districts vehicle-miles traveled are either about the same or slightly below 2019 levels, while delay saw a significant decrease of greater than 20 percent. Non-metro districts saw an increase in vehicle-miles traveled of 2% while delay decreased by 29% since 2019.

Throughout the state a commuter making a 20-mile commute, saw a savings in fuel and vehicle operating costs compared with pre-COVID conditions, which ranged from $93 per year per commuter in non-metro areas to $331 per year per commuter in Austin.

Exhibit 4. Comparing 2019 and 2022 Conditions Statewide, Large Districts, and Non-Metro

Area	Vehicle – Miles of Travel	Annual Hours of Delay	Congestion Cost Savings ($million)	Annual Savings per Commuter[1]
Top 100	**+ 1%**	**– 6%**	**$341**	**$ 109**
Austin District	– 4%	– 30%	$429	$ 331
Dallas District	+ 7%	– 16%	$539	$ 188
Ft Worth District	+ 5%	– 10%	$156	$ 118
Houston District	– 2%	– 24%	$1,018	$ 284
San Antonio District	0 %	– 23%	$248	$ 187
Non-Metro Districts	+ 2%	– 29%	$562	$ 93
Statewide	**+ 2%**	**– 23%**	**$3,007**	**$ 223**
[1] Assumes a 20-mile commute, 5 days a week				

Significant decreases in delay and annual savings to commuters were also seen at the individual project level. Shown in Exhibit 5 are seven key projects in the metro districts, with changes in vehicle-miles traveled and delay and dollars saved per commuter per year. This table includes five Texas Clear Lanes projects and two projects of similar scale that were not part of the Texas Clear Lanes program.

Trends on individual segments were similar to trends at the regional level with vehicle-miles traveled generally near or above pre-project levels and delay significantly decreased. One exception is SH 121 in Fort Worth where vehicle-miles traveled is up so significantly (37%) that delay is up (24%) as well. There is still a savings for commuters because delay would be much worse if the project had not been completed with the ability to handle traffic more efficiently. On these segments commuters saved between $69 and $2,500 per year in fuel and vehicle operating costs with I-35 and US 290 resulting in four-digit annual savings for commuters due to the combination of enhancements in the corridor and the hybrid work situation in 2022.

Exhibit 5. Comparing 2019 and 2022 Conditions for Significant Projects on Top 100 Segments

Section	District	TCL Project	Texas 100 Rank, [highest prior rank]	Texas 100 Segment Length (mi)	Vehicle – Miles of Travel	Annual Hours of Delay	Annual Savings per Commuter[1]
Stemmons I-35E (Viaduct to SH 114) - TCL	Dallas	1	12, [5]	5.5	+ 2%	– 22%	$ 155
Stemmons I-35E (US 67 to Viaduct) - TCL	Dallas	2	62, [17]	4.6	– 9%	– 45%	$ 108
LBJ I-635 (I-35E to US 75)[2] - Not TCL	Dallas	N/A	14, [2]	8.0	+ 15%	– 13%	$ 210
SH 121 (SH 26 to I-820) - TCL	Fort Worth	1	43, [29]	12.6	+ 37%	+ 24%	$ 69
US 281 (SL1604 to Stone Oak) - TCL	San Antonio	3	278, [15]	2.9	– 2%	– 85%	$ 357
I-35 (US 290E to SH 71) - TCL	Austin	1,2,3,6	4, [1]	7.9	– 1%	– 39%	$ 1,000
US 290 (I-610 to BW 8)[3] - Not TCL	Houston	N/A	126, [11]	8.3	+ 4%	– 58%	$ 2,500

[1] Assumes commute through the corridor both directions, 5 days a week
[2] 2018 to 2022 conditions
[3] 2015 to 2018 conditions

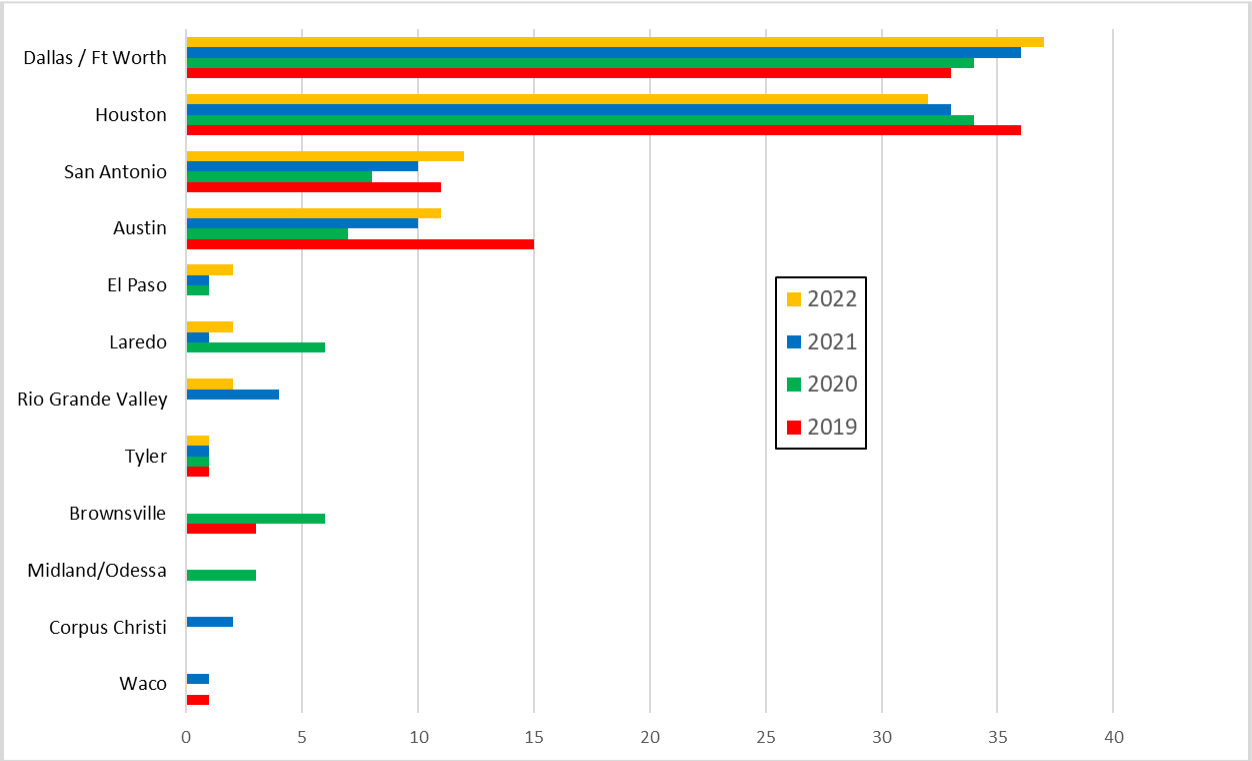
WHAT'S ON THE LIST

Congestion is widespread, but its relevance can be subjective – what is very congested in small cities might be considered acceptable in larger cities. In an effort to demonstrate these contextual differences, this study tracks roughly 2,100 road segments across the state, in urban and suburban areas, including at least 18 segments (60 miles) in each of the 25 Texas metro areas (see map on the TTI website (https://mobility.tamu.edu/texas-most-congested-roadways/) for the urban regions). The resulting database is useful in tracking statewide congestion and can be used to help prioritize projects that address congestion problems in each metro area.

The 2023 Top 100 list contains 22 segments that were not in the 2022 Top 100 list. The mix of freeway and arterial street segments skewed to the freeways this year with 85 of the Top 100 list being freeway segments in 2022 compared to 70 in 2021. Freeways experienced more delay during the peak periods in 2022 than in 2021 but still have not returned to the pre-COVID levels, likely due to remaining work-at-home levels or flexible work schedules. Peak period freeway delay rose from 55 percent to 62 percent of all freeway delay. Peak period arterial street delay also rose from 37 percent to 44 percent of all arterial street delay. Weekend delay as a percentage of total delay dropped for both freeway and arterial streets in 2022.

Exhibit 6 displays a comparison of the number of road segments in the Top 100 in the 2019 through 2022 data years for the metro areas. Dallas/Fort Worth has consistently added more segments since 2019 while Houston has lost a few in the Top 100. Austin and Houston have had the largest loss in Top 100 segments with 4 fewer segments in 2022 than 2019. Corpus Christi, Midland-Odessa, and Waco have had segments drop in and out of the Top 100 list over the last four years.

Exhibit 6. Top 100 Segments in Texas 100 by Metro Area for 2019 to 2022



The majority of the congested segments on the list are in the four largest metro areas of the state: Austin, Dallas/Fort Worth, Houston, and San Antonio:

- The 24 of the top 25 most congested segments are in these four metro regions, and 49 of the top 50.
- 93 of the top 100 congested segments are in these four metro regions (90 in 2021, 83 in 2020, 95 in 2019).
- 172 of the top 200 are in the four largest metro regions (165 in 2021, 163 in 2020, 174 in 2019).

WHAT ARE THE INFLUENCING FACTORS THAT PUT ROADS ON THE LIST?

Economic Prosperity

The most enduring trend since 2009 has been growth—in population, jobs, travel demands, traffic volume—everything except road and transit capacity necessary to accommodate the growth. Traffic congestion may be an inevitable result of growth, but the congestion growth rate is not seen as reasonable.

Land Use

Land use changes along or near a corridor can have a dramatic impact on that corridor. In urban areas that are developing densely, thousands of trips may be added to a corridor very quickly when people move into newly available housing units or take advantage of new offices, retail stores or restaurants. That kind of change can send a roadway to a higher position on the list in a short period of time.

Construction

Construction on a road—or on a nearby road—can be the reason for congestion changes. Big construction projects often cause congestion on the road where the project is being built. In smaller cities, even short-term and smaller projects like pavement overlays, re-striping, traffic signal work at a single intersection or right-turn additions can affect annual congestion statistics.

Projects on nearby or connecting roads can also cause congestion on a road where there would otherwise be none. When the road under construction becomes congested, backed-up traffic shifts to connecting roads and they become congested as well.

Congestion Outside the Peak Period

Congestion outside the normal peak traffic periods is another frequent condition that moves a road up on the congested list. These roads “where it’s always rush hour” not only see regular congestion, but also see more intense problems from traffic crashes and stalled vehicles. This is the case with IH 35 through Central Austin, or IH 610 West in Houston.

Off-peak period delay can also be significant on arterials, or high-capacity urban thoroughfares, whose traffic lights are timed to serve all travel directions at smaller cross street intersections, rather than prioritizing the major street peak direction, causing delay on the bigger arterial streets. During rush hour, however, the arterials are prioritized, and their delay time is lessened.

Weather

Even an exceptionally bad weather year can cause a road segment to appear in the congestion data. Heavy rains can slow traffic, regular flooding can block it, and high winds can deposit debris on the roads or down signs that obstruct traffic until removed or repaired. Extreme weather, especially high heat followed by excessive rains, can accelerate roadway damage, creating large cracks that worsen with the weight of traffic. That kind of damage can slow traffic, and the effort to repair the problem can also obstruct a road and cause congestion.

ADDITIONAL DETAILS FOR A FEW SELECTED ROAD SEGMENTS

The only addition to the top ten this year was the segment of IH 10 Katy Freeway in Houston between IH 10 and IH 45. Last year this segment was 13th in the list and this year it moved up to the 7th position. Looking at the speed curves, there is a noticeable decrease in the peak hour speeds on average compared to last year in both AM and PM periods. Exhibit 7 shows the average speed by hour of the day for both eastbound and westbound directions for 2021 and 2022. Exhibit 7a depicts the annual values for Delay per Mile and the Cost of Congestion over the last four years.

Exhibit 7. Speed Profile for Katy Freeway between West Loop and IH 45.

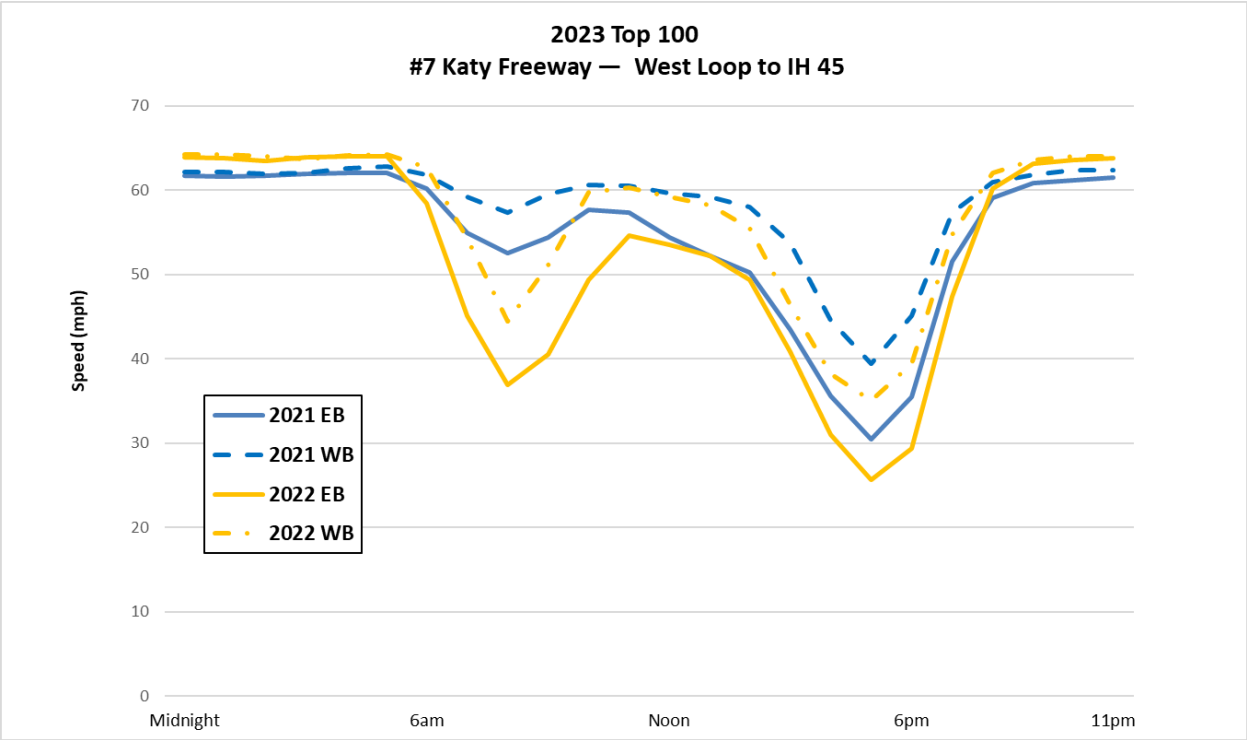


Exhibit 7a. Annual Values for Katy Freeway between West Loop and IH 45.

Year	Delay per Mile (All Vehicles)	Delay per Mile (Trucks)		All Congestion Cost ($)	Truck Congestion Cost ($)
2022	744,232	50,515		$111,255,447	$17,909,228
2021	481,429	46,098		$71,386,142	$15,597,496
2020	249,965	14,031		$31,039,029	$4,087,658
2019	686,642	37,844		$84,468,539	$12,422,240

Falling out of the top 10 this year was the section of IH 345 in downtown Dallas. This segment was seventh last year and is now ranked at 13th. Exhibit 8 displays the daily speed profiles from 2021 and 2022. The average speed increased in 2022 across the entire day in in both directions except for the AM peak in the Northbound direction. Exhibit 8a depicts the annual values for Delay per Mile and the Cost of Congestion over the last four years.

Exhibit 8. Speed Profile for IH 345 between US 75 and IH 45.

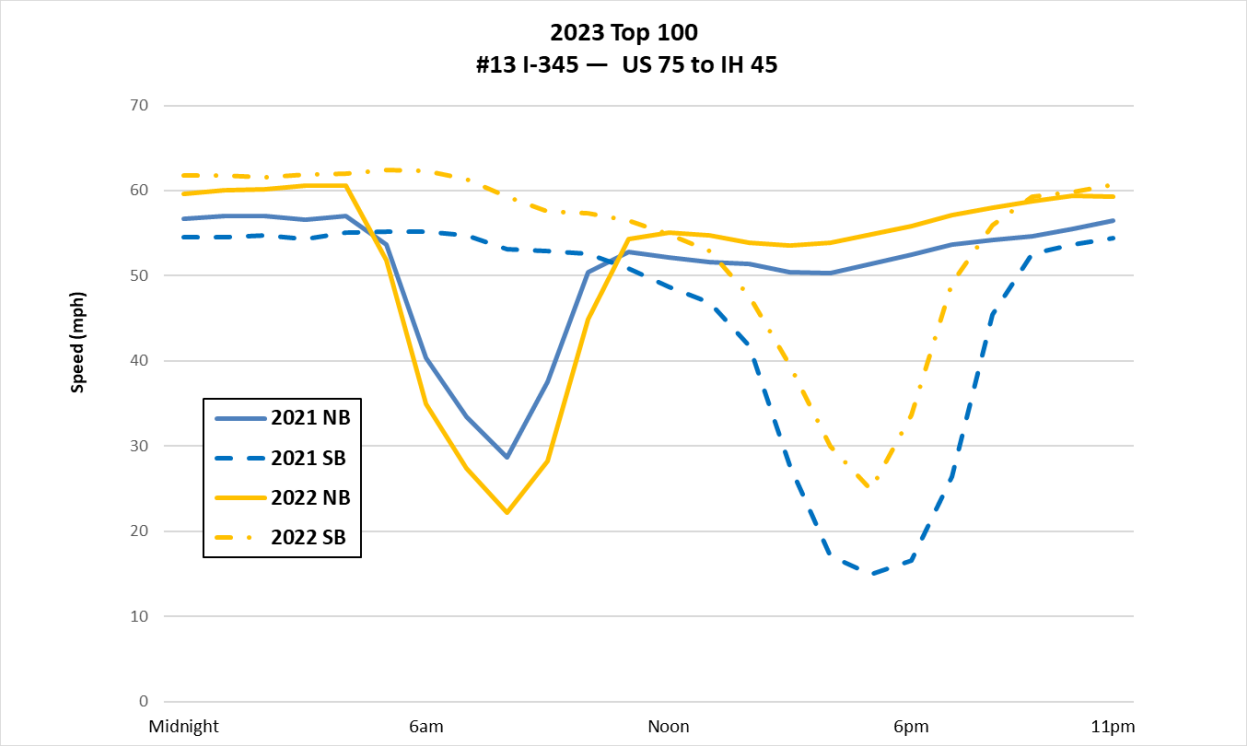


Exhibit 8a. Annual Values for IH 345 between US 75 and IH 45.

Year	Delay per Mile (All Vehicles)	Delay per Mile (Trucks)		All Congestion Cost ($)	Truck Congestion Cost ($)
2022	576,651	33,483		$35,832,828	$5,072,687
2021	738,942	41,980		$43,901,923	$6,025,972
2020	289,083	15,767		$15,284,957	$1,956,612
2019	430,786	20,749		$22,146,901	$2,889,760

Some arterial roads also had significant changes in their delay in 2022 and one example of this was Mines Road in Laredo. Last year this segment was ranked 40th and has now moved up to 25th. Exhibit 9 presents the average daily speed profile for Mines Road between Pan American Blvd. and Bob Bullock Loop. In addition to additional traffic volumes this year the speeds for this segment of road slowed during most of the daytime hours compared to last year. The free flow overnight and early morning speeds; however, showed an increase of about 5 mph. Exhibit 9a depicts the annual values for Delay per Mile and the Cost of Congestion over the last four years.

Exhibit 9. Speed Profile for Mines Road between Pan American Blvd. and Bob Bullock Loop.

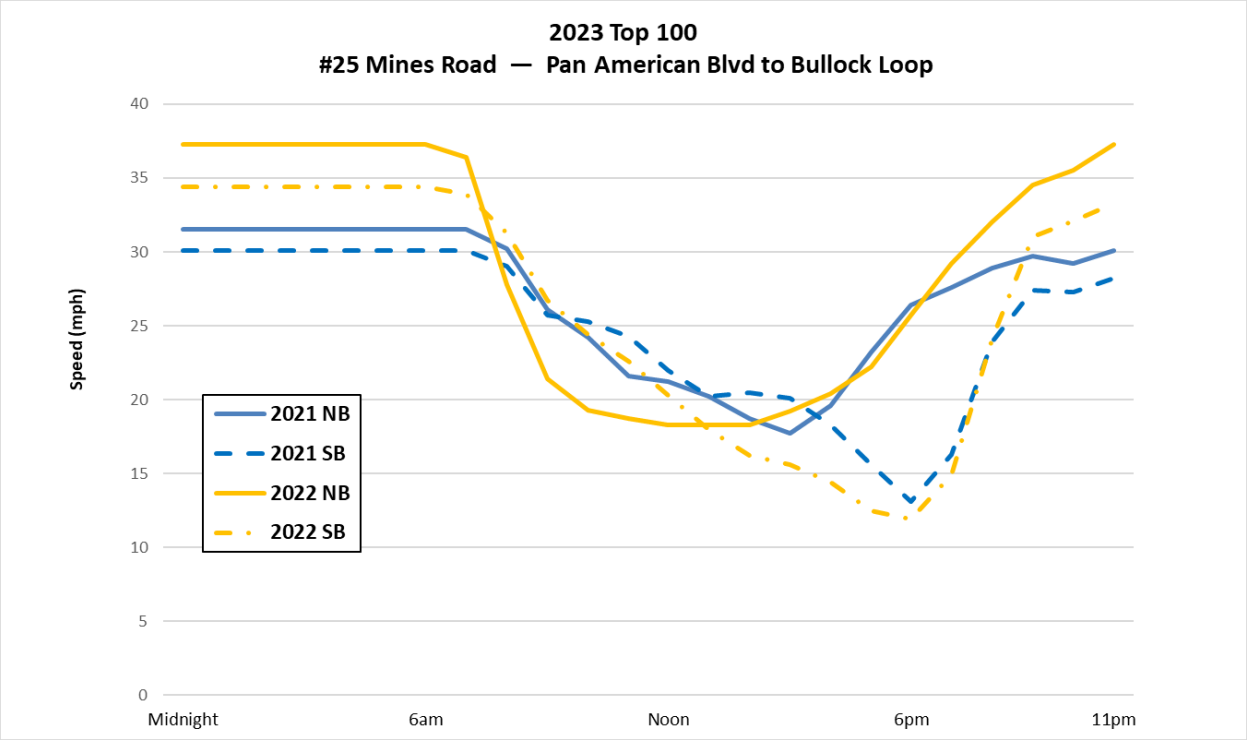


Exhibit 9a. Annual Values for Mines Road between Pan American Blvd. and Bullock Loop.

Year	Delay per Mile (All Vehicles)	Delay per Mile (Trucks)		All Congestion Cost ($)	Truck Congestion Cost ($)
2022	337,907	72,102		$26,414,026	$10,865,577
2021	213,331	28,640		$14,308,294	$4,038,747
2020	133,925	21,138		$7,418,127	$2,349,638
2019	109,953	7,677		$5,994,597	$1,064,935

Exhibit 10 has another arterial road that shuffled in the top 50 this year. Culebra Road between Galm Road and Loop 1604 was ranked 21 last year and has moved down to 36 this year. Other than eastbound traffic in the AM period, speeds generally increased across the segment for most of the day. Traffic volume was also recorded to be slightly less this year, down about 2 percent compared to last year. Exhibit 10a depicts the annual values for Delay per Mile and the Cost of Congestion over the last four years.

Exhibit 10. Speed Profile for Culebra Road between Galm Road and Loop 1604.

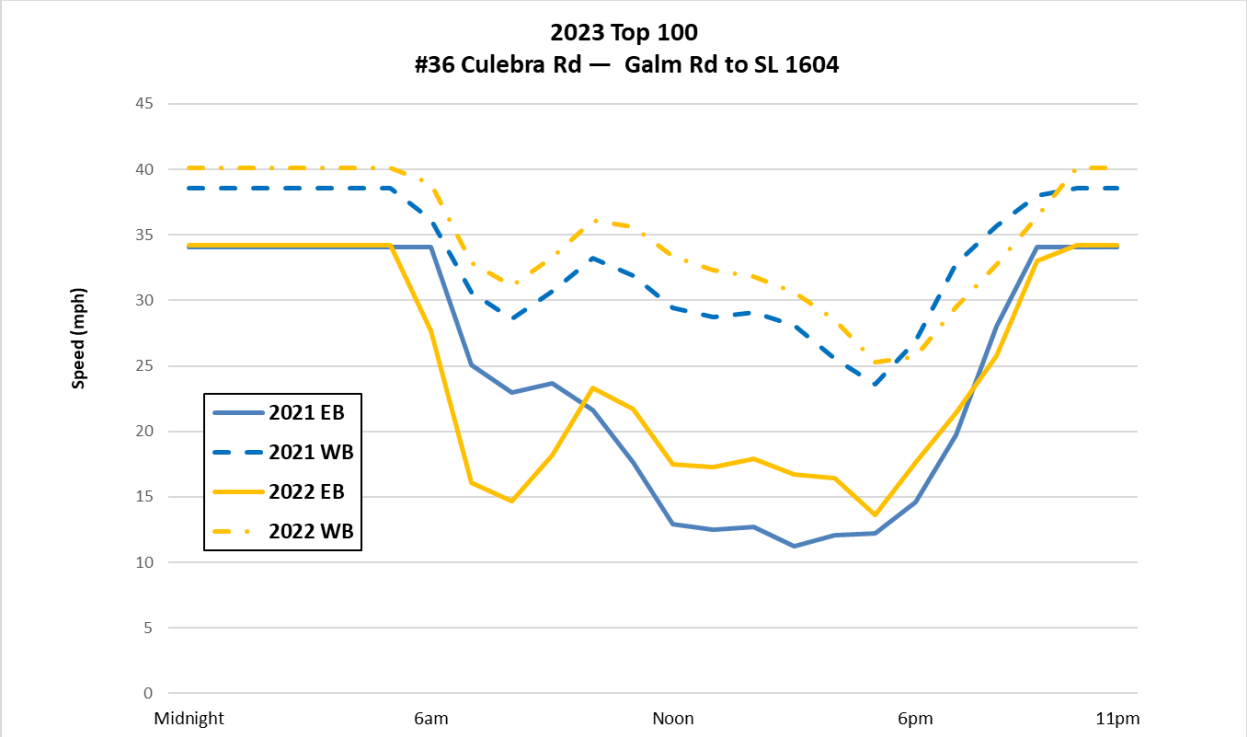


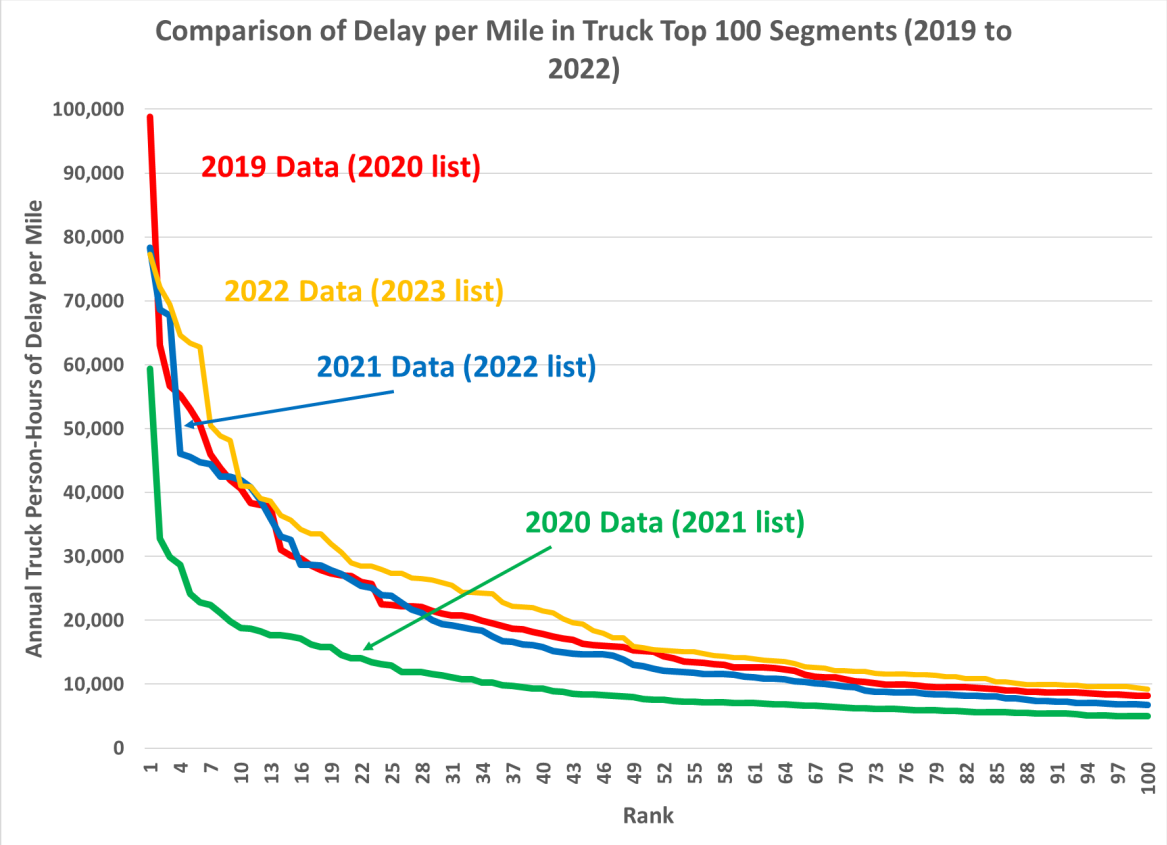
Exhibit 10a. Annual Values for Culebra Road between Galm Road and Loop 1604.

Year	Delay per Mile (All Vehicles)	Delay per Mile (Trucks)		All Congestion Cost ($)	Truck Congestion Cost ($)
2022	296,153	7,558		$26,709,585	$1,694,154
2021	345,372	6,953		$29,348,503	$1,483,126
2020	25,354	2,003		$2,012,948	$361,277
2019	131,944	4,064		$9,995,652	$848,666

ADDITIONAL DETAILS FOR A FEW SELECTED TRUCK TOP 100 ROAD SEGMENTS

Exhibit T-2 shows a comparison of truck travel delay per mile (the amount of yearly extra travel time for each roadway mile) for the Truck Top 100 ranked segments and shows the changes between delay per mile in calendar years 2019 to 2022. There are a few segments each year (usually the same ones) where congestion is much worse than on other roads; the roads to the left of the graph are among the most congested in the country. The 2022 curve remains at or above the 2019 curve after the third rank, indicating that the truck delay for 2022 surpassed the 2019 pre-COVID values. The 2021 curve closely mirrors the 2019 (pre-pandemic) line but does not quite reach the delay per mile values in the most congested segments to the left of the graph. Road segments ranked above 50, to the right in the graph, have similar congestion levels, making it easier to change ranks with a few more vehicles added or subtracted, a nearby construction project starting or finishing, or even that the segment did not lose traffic during the pandemic as much as similar roads in other cities. Large shifts in ranks can happen more easily and more often in the flatter part of the curve.

Exhibit T-2. Changes in Delay per Mile from 2019 to 2022 in the Truck Top 100 Segments



The comparison of speeds in Exhibit T-3 on IH 35 in Austin, a heavily travelled truck segment, show the 2022 speeds to be about 5 mph faster most of the afternoon in the northbound direction as compared with 2021. The southbound direction indicates that the speeds varied across the day but are similar to 2021 speeds. Trucks that come through this road segment northbound in the afternoon could be saving 2-5 minutes across the 8-mile segment because of the speed increase.

Exhibit T-3. Speed Changes between 2021 and 2022 on IH 35 in Austin

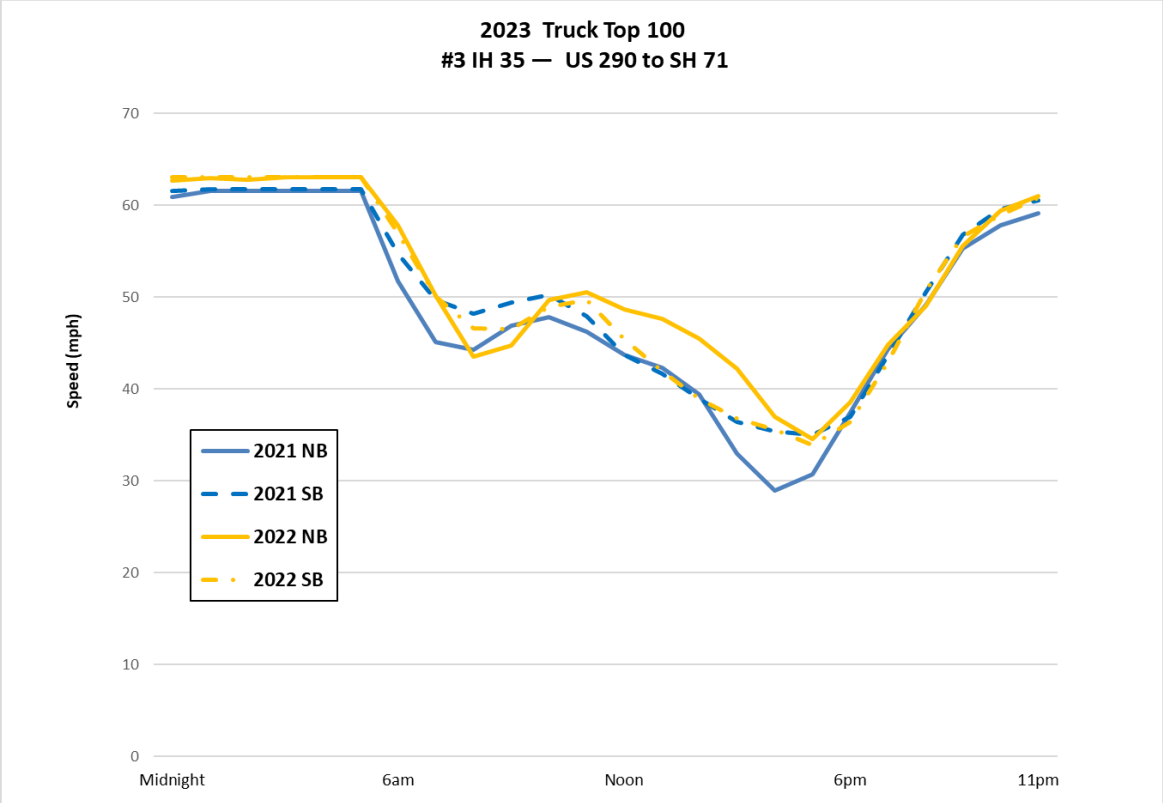
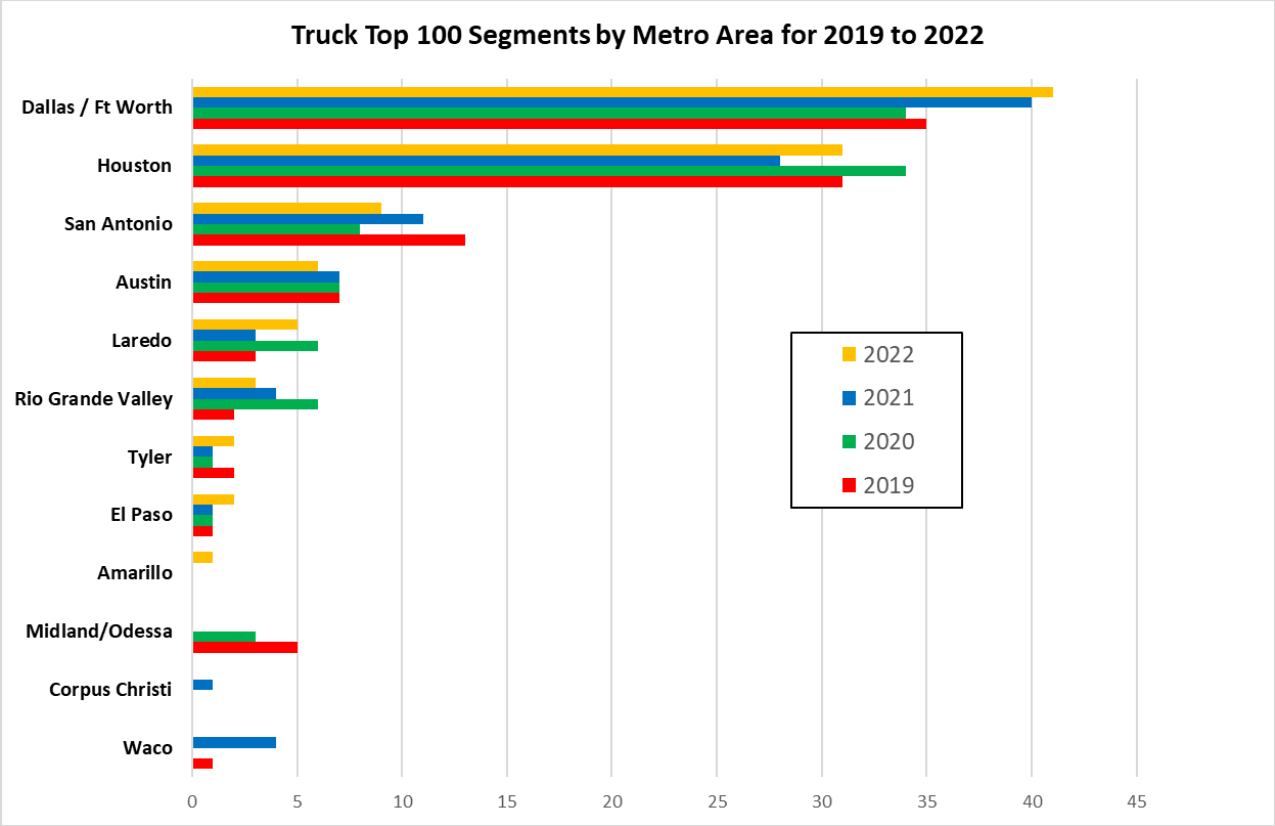


Exhibit T-4 displays a comparison of the number of road segments per urban area in the Truck Top 100 between calendar years 2019 and 2022. Dallas/Fort Worth added a new Truck Top 100 segment while Houston added three. San Antonio lost a couple of segments from the Truck Top 100 while Austin lost one segment compared to years 2019 through 2021. One area—Amarillo—was new to the Truck Top 100 in 2022. Midland/Odessa, Corpus Christi, and Waco did not have a Truck Top 100 segment in 2022 but had at least one segment ranked in the top 100 at one time in the previous three years.

Exhibit T-4. Truck Top 100 Segments from 2019 to 2022 in Texas 100 by Metro Area



Most of the congested road segments on the Truck Top 100 list are in the four largest metro areas of the state: Austin, Dallas/Fort Worth, Houston, and San Antonio:

- Nine of the top 10 most congested road segments are in these four largest metro regions, and 23 of the top 25 in 2022 are in the four largest metro regions compared with 23 in 2019 and 19 in 2020, and 23 in 2021,
- 87 of the top 100 congested segments are in these four largest metro regions in 2022, which is one more than 2021; in 2020 there were 77,
- 160 of the top 200 are in the four largest metro regions again this year (158 in 2019, 151 in 2020, 160 in 2021)

The additions to the truck top ten this year were Stemmons Freeway in Dallas between SH183 and IH 30 which moved from 14th last year to 10th and Mines Road in Laredo between Pan American Blvd. and Bob Bullock Loop which moved to 2nd. Last year this Mines Road segment was 17th in the truck list. Exhibit T-5 shows the average speed by hour of the day for both northbound and southbound directions for 2021 and 2022. Looking at the speed curves there is a noticeable decrease in the mid-day period on average compared to last year. Exhibit T-5a depicts the annual values for Delay per Mile and the Cost of Congestion over the last four years for trucks and all vehicles.

Exhibit T-5. Speed Profile for Mines Road between Pan American Blvd. and Bob Bullock Loop.

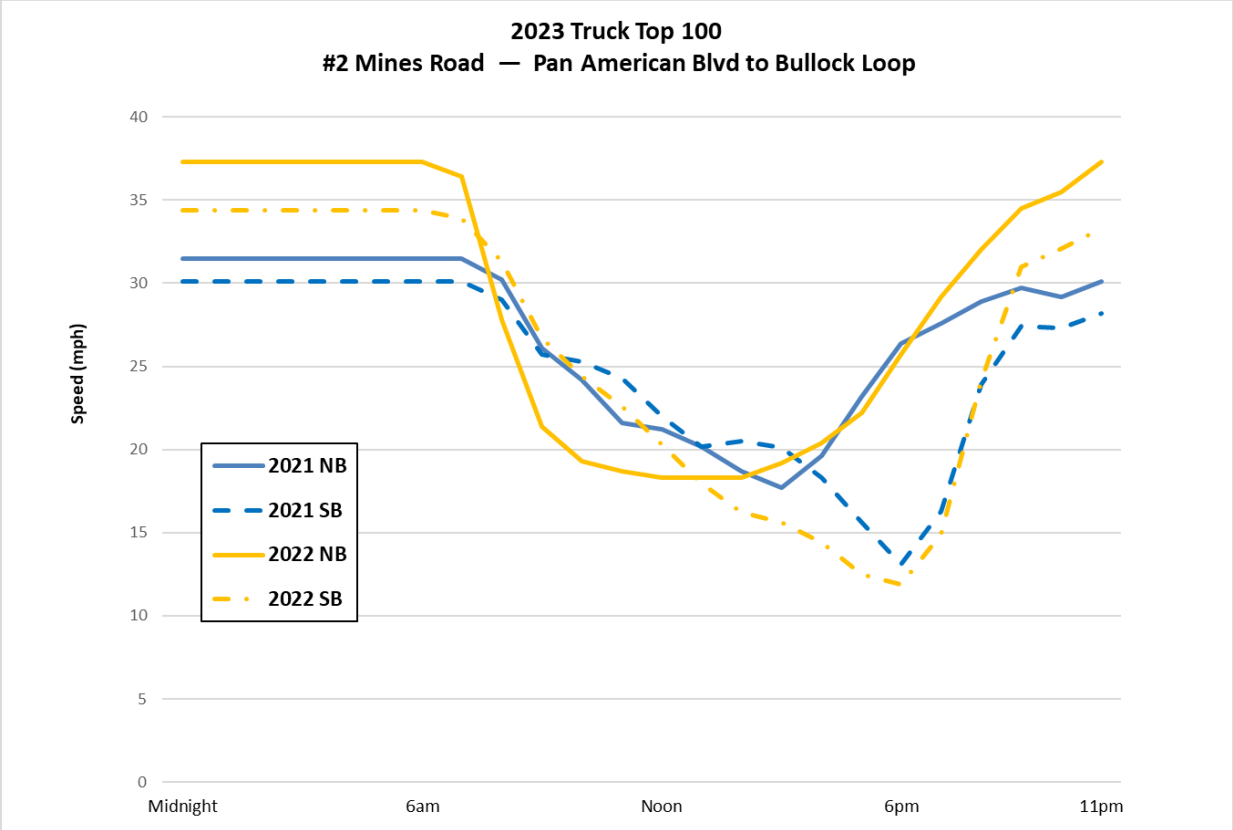


Exhibit T-5a. Annual Values for Mines Road between Pan American Blvd. and Bullock Loop.

Year	Delay per Mile (All Vehicles)	Delay per Mile (Trucks)		All Congestion Cost ($)	Truck Congestion Cost ($)
2022	337,907	72,102		$26,414,026	$10,865,577
2021	213,331	28,640		$14,308,294	$4,038,747
2020	133,925	21,138		$7,418,127	$2,349,638
2019	109,953	7,677		$5,994,597	$1,064,935

Exhibit T-6 has information for another road that shuffled up the top 50 this year. East Loop Freeway in Houston moved from 55 last year to 15th this year. Other than Northbound traffic in the AM period, speeds generally decreased across the segment for most of the day this last year. The biggest difference was the southbound AM peak where the difference was nearly 10mph. Exhibit T-6a depicts the annual values for Delay per Mile and the Cost of Congestion over the last four years for trucks and all vehicles.

Exhibit T-6. Speed Profile for East Loop 610 between IH 10 and IH 45.

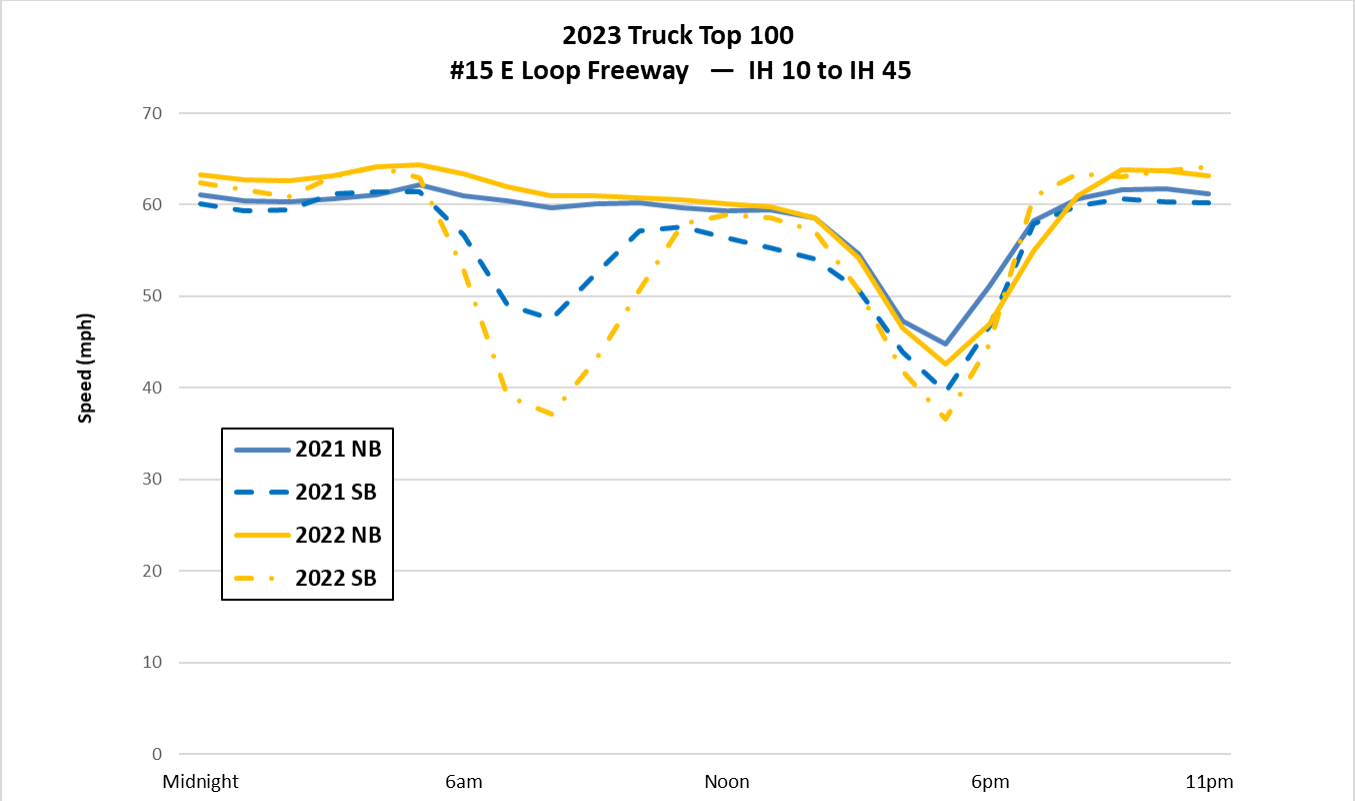


Exhibit T-6a. Annual Values for East Loop 610 between IH 10 and IH 45.

Year	Delay per Mile (All Vehicles)	Delay per Mile (Trucks)		All Congestion Cost ($)	Truck Congestion Cost ($)
2022	210,949	35,700		$38,914,032	$13,594,153
2021	139,202	11,777		$21,925,506	$4,319,352
2020	80,176	4,901		$11,014,700	$1,556,739
2019	200,988	13,022		$27,203,098	$4,626,392

Falling down in the top 50 this year was the segment of IH 35W in downtown Fort Worth between US 287 and SH 183. This segment of road was 5th last year and is now ranked at 45th. Exhibit T-7 displays the daily speed profiles from 2021 and 2022. The average speed increased significantly in 2022 across the mid-day and PM peak in the southbound direction and VMT was down about 4 percent compared to last year. Exhibit T-7a depicts the annual values for Delay per Mile and the Cost of Congestion over the last four years for trucks and all vehicles.

Exhibit T-7. Speed Profile for IH 35W between US 287 and SH183.

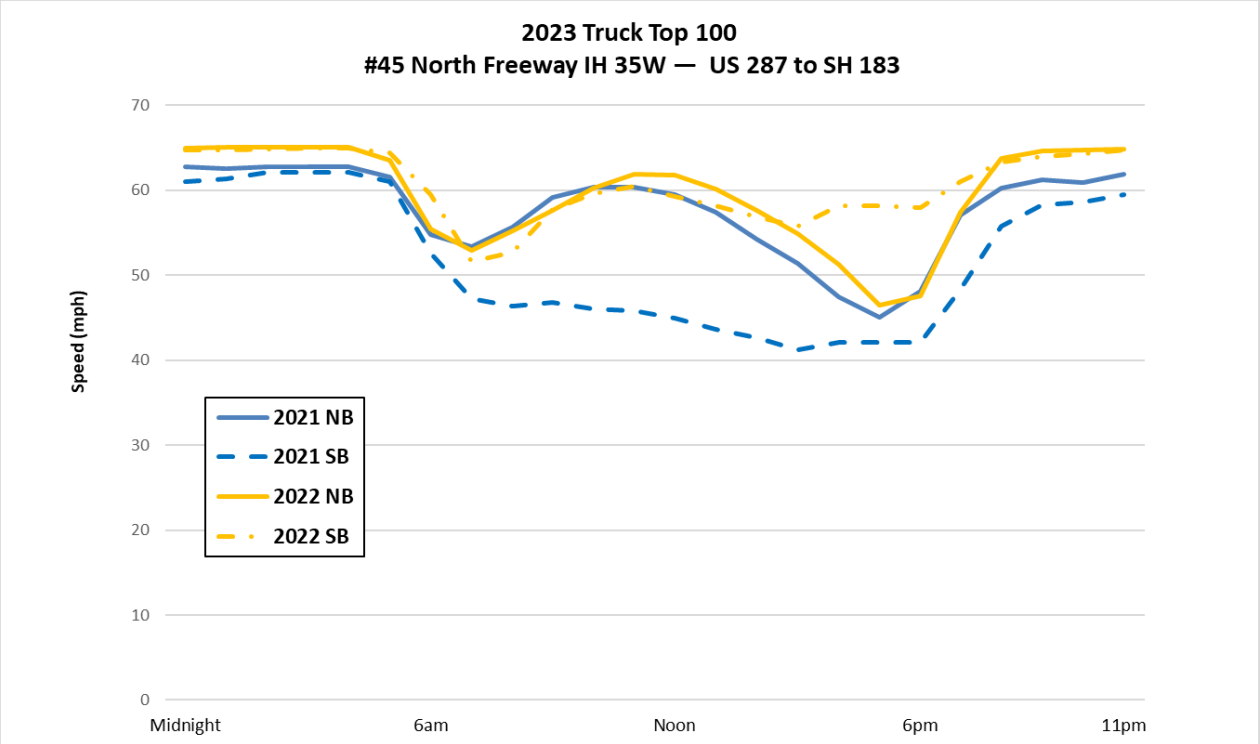


Exhibit T-7a. Annual Values for IH 35W between US 287 and SH183.

Year	Delay per Mile (All Vehicles)	Delay per Mile (Trucks)		All Congestion Cost ($)	Truck Congestion Cost ($)
2022	179,464	18,404		$30,942,264	$6,987,992
2021	480,963	45,604		$80,171,284	$17,306,186
2020	150,240	15,850		$22,767,588	$5,233,680
2019	234,575	20,481		$34,181,124	$7,532,031

CONCLUSION

The 2023 Texas 100 Most Congested Road Segments report adds another important year of data that provides an overview of the trends of congestion on Texas' most congested roads. The data collected in 2022 indicate that traffic is returning to and, in some cases, surpassing pre-COVID levels of activity.

All-vehicle delay was up 7 percent across the 2,100 monitored segments of the state compared to last year and up 16 percent for the top 100 road segments. However, levels of delay were still below pre-COVID levels. Truck delay was up 15 percent over last year and up 1 percent over the pre-COVID levels. In a typical Top 100 list, about 15 to 20 road segments may jump up into the Top 100 for at least a year; in the 2022 list this number was 22. There were fewer of the Top 100 segments outside of the four large metro regions in 2022—only 7 compared with 10 in 2021, 17 in 2020, and five in 2019. As noted, there are many potential reasons for these changes.

Levels of delay for trucks was higher in the Truck Top 100 road segments by 19 percent over 2021 and 13 percent above the 2020 levels. Overall truck delay in the complete list of road segments monitored

throughout the state was up 15 percent in 2022 when comparing with 2021 levels and was 1.2 percent higher than 2019 truck delay levels.

The detailed data in this report does not show what specifically is causing the congestion on a given segment, nor identify specific solutions. These data can give analysts some insight into what strategies might be effective. It is clear with the growth that Texas has experienced and is projected to experience in the coming decades that many different solutions will be needed to address the future of transportation in Texas. Programs like Texas Clear Lanes will continue to play a key role in addressing some of the major chokepoints in the transportation system in Texas.

SOURCES

1. U.S. Bureau of Labor Statistics. https://www.bls.gov/opub/mlr/2020/article/ability-to-work-from-home.htm

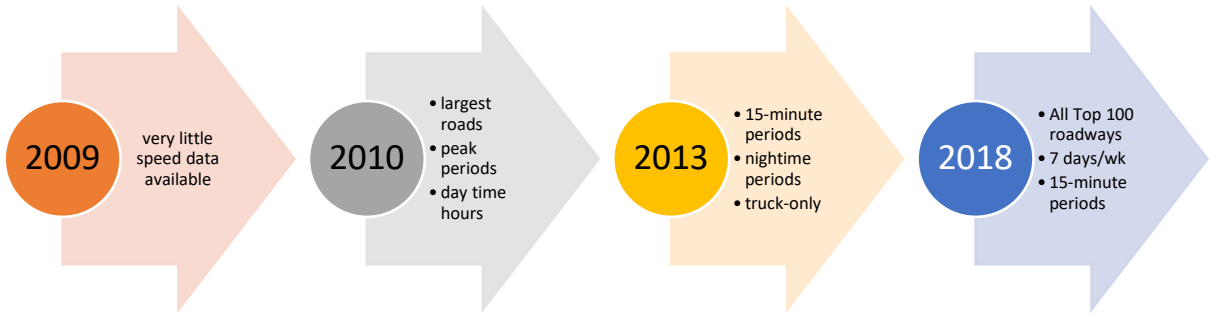
APPENDIX A. METHODOLOGY & DEFINITIONS

How has the Methodology Changed Over the Years?

Thirteen years of this project have seen changes to road use in Texas. There have also been changes to speed data availability since the first year of this report, both for the time periods and the number of roadways for which it was captured. In 2009, the study's first year, there was very little directly collected speed data, so speeds were estimated using traffic volume and number of roadway lanes. Since 2010, however, speed data has continued to improve in both temporal and spatial coverage. In that year, private sector companies were supplying hourly speed data for only the state's largest roadways, generally during higher traffic periods, and during most daytime hours. However, by year four of the report, speeds were available for 15-minute periods, including many overnight periods. As of the 2017 reporting period, speed data was available for over 95 percent of the 15-minute periods for all seven days of the week on all the Texas 100 roadway segments.

In addition, data collection companies who once collected only truck or fleet data now collect passenger vehicle data from anonymized sources like cell phones and in-dash devices. As of the 2019 report, connected vehicles became a large portion of the probe vehicles reporting roadway performance information to the private sector companies. The result is that the reporting has become more accurate both in terms of the timeframes and vehicle types they measure.

Exhibit A-1: Timeline Showing Changes to Speed Data Availability



Annual Hours of Delay

The annual measure of delay is the starting point for calculating all of the congestion measures below. To arrive at this measure, researchers must first acquire four data elements:

- Actual travel speed
- Free-flow travel speed
- Vehicle volume (passenger vehicles and trucks)
- Vehicle occupancy (persons per vehicle) to calculate delay in person-hours

Researchers use the traffic volume and traffic speed data for each segment of road to create the large dataset that contains each of the Texas 100 reporting segments. For example, on a given point on a roadway, researchers gather the travel speed and traffic volume for each 15-minute time period of the average week. This means that data is gathered for 672 discreet periods of each week for each segment. They can then compare this data with free flow speeds to determine the difference between a congested period and a free flowing one. By factoring in vehicle occupancy, they are then able to calculate the delay time per person for each roadway. For details about the methodology used and any changes made since the prior year, see *100 Texas Congested – 2023 Methodology (final)*.

Definitions of Measures

DELAY	
Annual Delay	The sum of the extra travel time in the peak period, off-peak period, and weekend.
Annual Delay Per Mile	Annual hours of delay divided by segment length so that comparable values are obtained.
Peak Period Delay	The hours of delay that occur during the 6:00am-9:00am and 4:00-7:00pm timeframe on weekdays.
Off-Peak Period Delay	The hours of delay that occur on weekdays outside of the peak period.
Weekend Delay	The hours of delay that occur on weekends.
Texas Congestion Index	Score indicating the relationship between the peak-period, average travel time and the free-flow travel time. The score is arrived at by dividing the congested travel time by the free flow travel time. For example, for a segment where a free-flow trip takes 30 minutes, and a trip during peak periods takes 36 minutes, the TCI score would be 1.2.
Planning Time Index	A travel time reliability measure indicating the amount of time that should be planned to arrive on-time for 19 trips out of 20. A value of 2.50 means that for a 30-minute trip in light traffic, 75 minutes should be planned.
Commuter Stress Index	Score indicating the relationship between the peak period, average travel time for the morning and evening peak travel direction and the free-flow travel time for the peak direction of travel only.
VOLUME, SPEED & FUNCTIONAL CLASS	
Peak Period Average Speed	The average speed during the 6:00am-9:00am and 4:00-7:00pm timeframe.
Average Uncongested Speed	The average operating speeds during light traffic conditions, typically during overnight hours.
Functional Class	Coding system for road segments for purposes of analysis. 1=interstates and freeways, 3=major and minor arterial streets.
TRUCKS	
Annual Truck Delay	The portion of annual delay from trucks.
Annual Truck Delay Per Mile	Annual hours of truck delay divided by the segment length
Peak Period Truck Delay	The hours of truck delay that occur during the 6:00am-9:00am and 4:00-7:00pm timeframe on weekdays.
Off-Peak Period Truck Delay	The hours of truck delay that occur in non-peak periods on weekdays.
Weekend Truck Delay	The hours of truck delay that occur on weekends.
Annual Truck Congestion Cost	The portion of annual congestion cost from trucks.
Peak Period Average Truck Speed	The average truck speed during the 6:00am-9:00am and 4:00-7:00pm timeframe.
Average Uncongested Truck Speed	The average truck operating speeds during light traffic conditions, typically during overnight hours.

CONGESTION COST, EXCESS FUEL & ADDITIONAL EMISSIONS DUE TO CONGESTION	
Annual Congestion Cost	The cost of wasted time and fuel associated with congestion.
Excess Fuel Consumed	Additional gallons of fuel consumed due to congestion.
Excess Truck Fuel Consumed	The portion of excess fuel consumed by trucks due to congestion.
Additional CO2 Produced	Pounds of additional carbon dioxide produced because of congestion.
Additional Truck CO2 Produced	Pounds of additional carbon dioxide produced by trucks because of congestion.