

100 Most Congested Roadways for Trucks in Texas

2021 Executive Summary

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 roadways in the state. This list measures congestion by the number of extra hours of travel time (also called 'delay') experienced by travelers on over 1,800 road sections. Because of the significant delay values in the most congested corridors, and the slow nature of solution implementation to address a congested roadway, the overall list changes little from year to year in most years.

However, calendar year 2020 was not a normal year -- the COVID-19 pandemic temporarily changed travel in Texas as it did everywhere. Still, many of the most congested road sections remained near the top of the list, even as congestion dropped across the state. While congestion changes in this unusual year were not uniform, heavily traveled and economically-important corridors were still among the most congested during the different phases of the pandemic response. There were, however, some new entries for this year, especially into the bottom portion of the Top 100 list. For trucking around the state, truck travel might have waned a bit when the initial shutdown occurred in March, but in many cases this slowdown did not last long, and truck traffic returned to normal levels quickly. In some cases, truck traffic increased in corridors for the year despite the pandemic (e.g., Mines Road in Laredo, #8 on the list). Whether we are amid a pandemic situation or not, freight has to be delivered as goods are needed by consumers and businesses.

The 10 most congested road sections for trucks in the 2021 report are shown in Exhibit T-1. IH 35 in Austin remains in the top spot in the year 2020. Seven of the top 10 roads remained in the top 10 from the previous report. The three new road sections in the top 10 list are:

- IH 35 in Austin - #6 this year, #11 last year (adjacent to the #1 ranked section for trucks)
- Mines Rd / FM 1472 in Laredo - #8 this year, #110 last year (along the 30-plus miles of Mines Rd-FM 1472 all-vehicle travel was down about 16 percent from 2019 levels but truck travel was up over 22 percent in 2020 compared with 2019. At least two factors likely contributed to this result: 1) expansions of warehousing and distribution centers along Mines Road itself, and 2) empty trucks were returned to Mexico via the Columbia Bridge which accesses Mines Road.
- South Fwy / SH 288 in Houston - #9 this year, #16 last year (this increase is likely due to construction along the SH288 corridor)

Full results and multi-year comparisons of all road segments, over 1,800 in all, 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 sections and the Texas Transportation Commission accelerated those solutions for several road segments through the Texas Clear Lanes program, a 2015 initiative spurred by 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 sections in the top 100 list.

Exhibit T-1: 2020 10 Most Congested Roads for Trucks in Texas

2021 Report	County	Road segment	From	To	2020 Report
1	Travis	IH 35	US 290 N / SS 69	Ben White Blvd / SH 71	1
2	Tarrant	North Fwy / IH 35W / US 287	SH 183	IH 30	8
3	Harris	W Loop Fwy / IH 610	Katy Fwy / IH 10 / US 90	Southwest Fwy / IH 69 / US 59	3
4	Harris	Eastex Fwy / IH 69 / US 59	SH 288	IH 10	2
5	Harris	Southwest Fwy / IH 69 / US 59	W Loop Fwy / IH 610	South Fwy / SH 288	10
6	Travis	IH 35	Ben White Blvd / SH 71	Slaughter Ln	11
7	Dallas	Stemmons Fwy / IH 35E / US 77	John W Carpenter Fwy / SH 183	Tom Landry Fwy / IH 30	7
8	Webb	Mines Rd / FM 1472	Pan American Blvd	Bob Bullock Loop / SL 20	110
9	Harris	South Fwy / SH 288	Gulf Fwy / IH 45	S Loop W Fwy / IH 610	16
10	Harris	N Loop W Fwy / IH 610	North Fwy / IH 45	Katy Fwy / IH 10 / US 90	6

THE PANDEMIC EFFECT

The 2021 Texas 100 Most Congested Road Sections data is from **calendar year 2020 (the pandemic year)**. The pandemic had major effects on traffic volumes and travel patterns across the state; some of the causes for the changes in ranks are discussed below.

The *2021 Urban Mobility Report* was released by the Texas A&M Transportation Institute in June 2021 with mobility statistics for all 494 U.S. urban regions and observations from 1982 through the 2020 pandemic year (1). Several of these national observations were also seen in Texas in 2020.

- There were four congestion years rolled into one:
 - First couple of months were “regular” and traffic looked like 2019.
 - The shutdown period happened in March to May and traffic congestion all but disappeared.
 - The initial recovery began in the summer when traffic and congestion began to return.
 - The “closer to normal” period hit in the fall when rush hours returned levels shorter-than 2019.
- Truck traffic volumes did not decline nearly as much as passenger car travel due to increases in at-home delivery of essential goods and services.
- Congestion levels were more indicative of early 1990’s levels during shutdown and early 2000’s levels later in the year.
- Overall, there was a shift to more travel in the middle of the day and a larger percentage of travel on the streets as compared with the freeways.
- Around the U.S., employment was down about 9 percent while traffic volume was down 18 percent.

The *2021 Texas 100 Most Congested Road Sections* list was affected by the pandemic in different ways across the state. Some of these reasons exist in almost every Texas 100 list while others are linked to the pandemic effects. Due to economic activity during the pandemic year, sections in the different urban regions across the state were affected by:

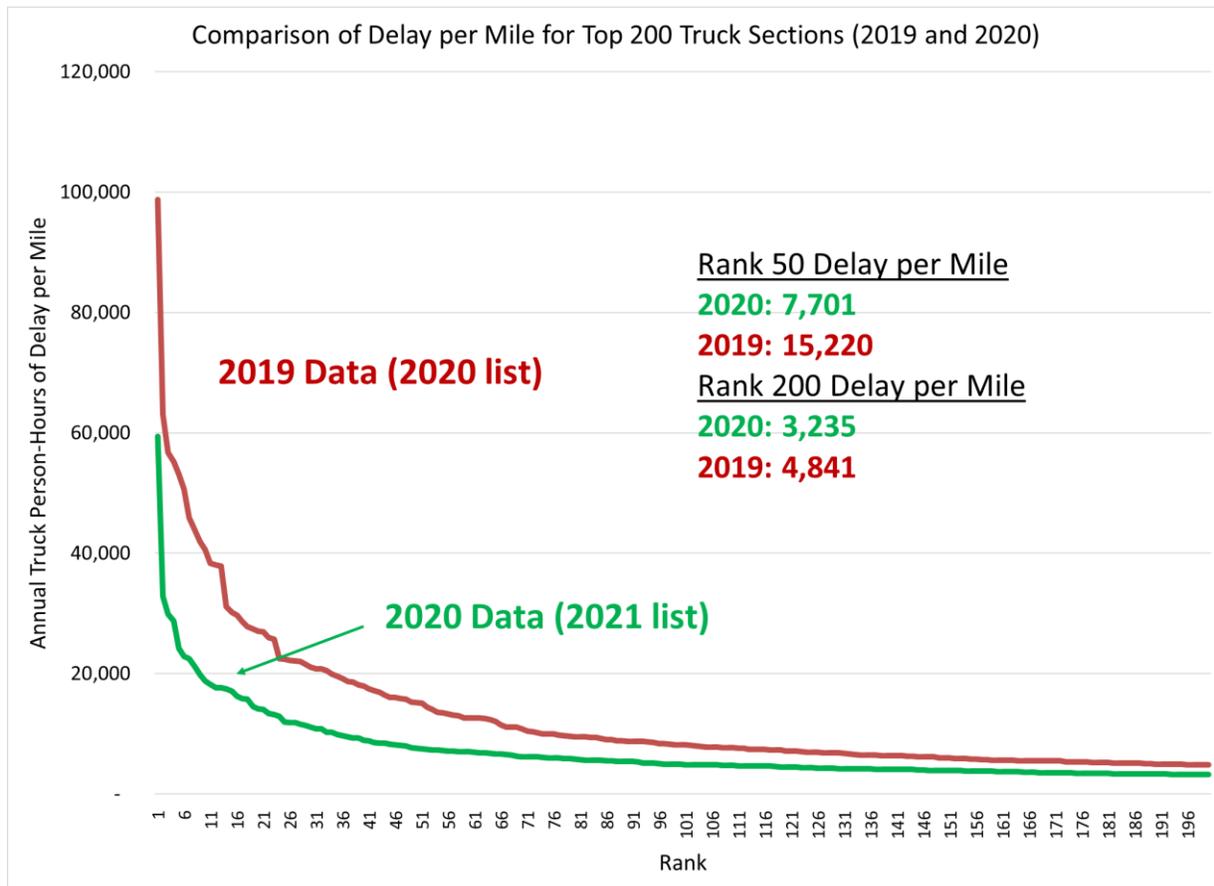
- The composition of the local job market – essential workers had to report to work, office-based workers had more options, and students worked and studied from home. A U.S. Bureau of Labor Statistics study last year showed that most jobs (63 percent) cannot be accomplished at home, but the remaining jobs can be performed entirely from home (2). On average, more than one-third of jobs were working from home during 2020, however in some areas, this percentage might be higher than one-third and in other areas more workers were reporting to work.
- Influence of steady truck traffic – truckers kept on trucking in 2020. Truckers had to keep hauling the goods that the state needed and truck volumes did not drop like auto volumes. Some roadways and regions experienced increased truck volumes due to changes in consumer demands of essential goods and increases in e-commerce and at-home deliveries.

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 sections due to pandemic changes to traffic:

- Auto and truck volume changes (2019 to 2020), up or down
- Road construction on the specific road section of interest
- Road construction on a nearby road section that often encourages some traffic to shift to a different facility or different time

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 Top 200 ranked road sections and demonstrates the dramatic changes between congestion in calendar years 2019 and 2020. There are a few sections each year (usually the same ones) where congestion is much worse than on other roads; the roads to the left of the diagram are among the most congested in the U.S. The 2019 curve shows large differences from one ranked section to the next in the highest rankings; the 2020 curve has a similar but lower shape. The 2019 line does not flatten out much before the 75 to 100 rank area; the 2020 curve flattens out by about rank 50. Road sections ranked better than 50 in the 2020 data year have similar congestion levels making it easier to change ranks with a few more vehicles added or subtracted, a nearby construction project, or even that the section did not lose traffic during the pandemic as much as some of its peers. Large shifts in ranks can happen more easily and more often in a flatter curve.

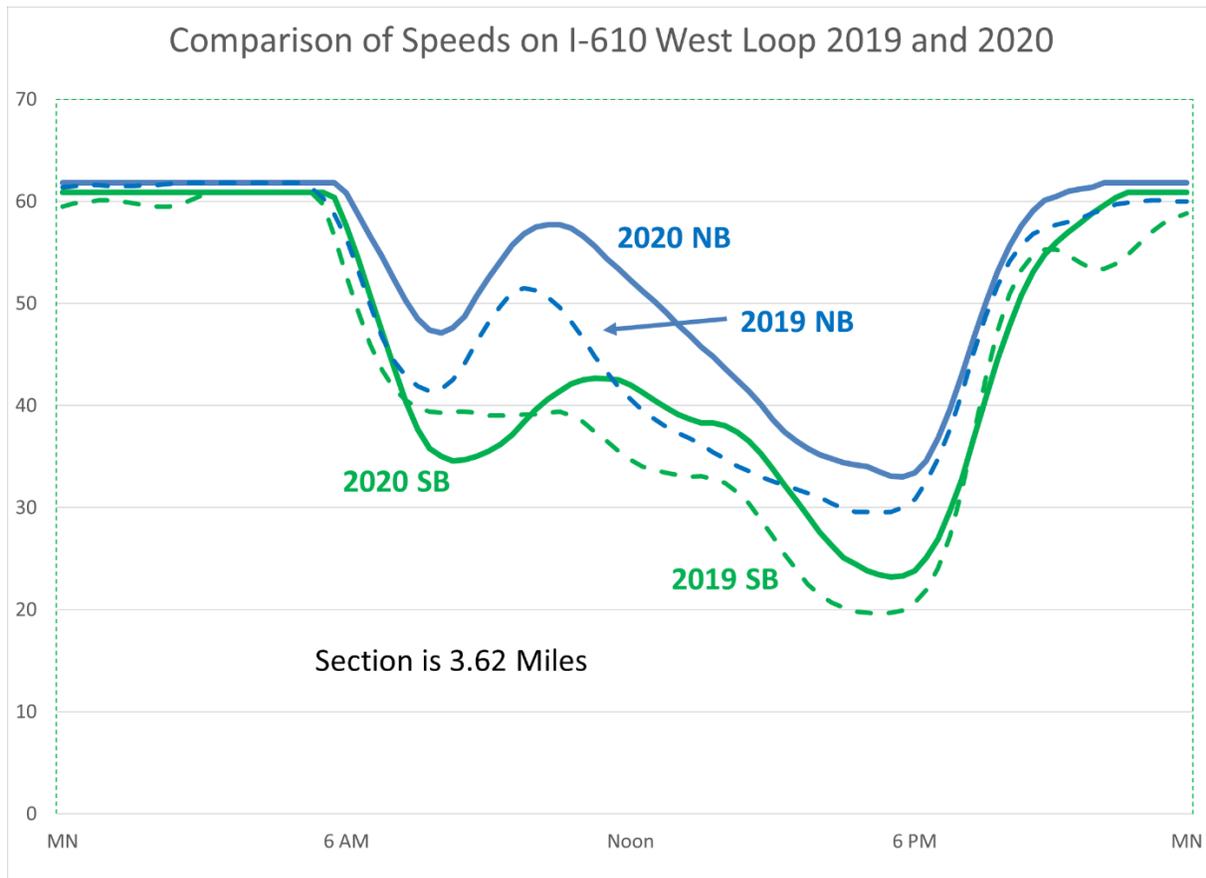
Exhibit T-2. Changes between 2020 and 2021 Texas 100 in Top 200 Truck Sections



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 feel. 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 T-3 on IH 610 West Loop in Houston show the 2020 speeds to be 5 to 10 mph faster almost all day in each direction as compared with 2019. With 2020 vehicle traffic volume at 85 percent of 2019 levels, it is easy to see how the delay reduction happened. 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 it is about half a minute per mile. Every traveler that comes through this 3.6 mile long road section at various times of the day can be saving 30 to 60 seconds per mile because of the 2020 speed increase.

Exhibit T-3. Speed Changes between 2019 and 2020 on Houston's West Loop IH 610



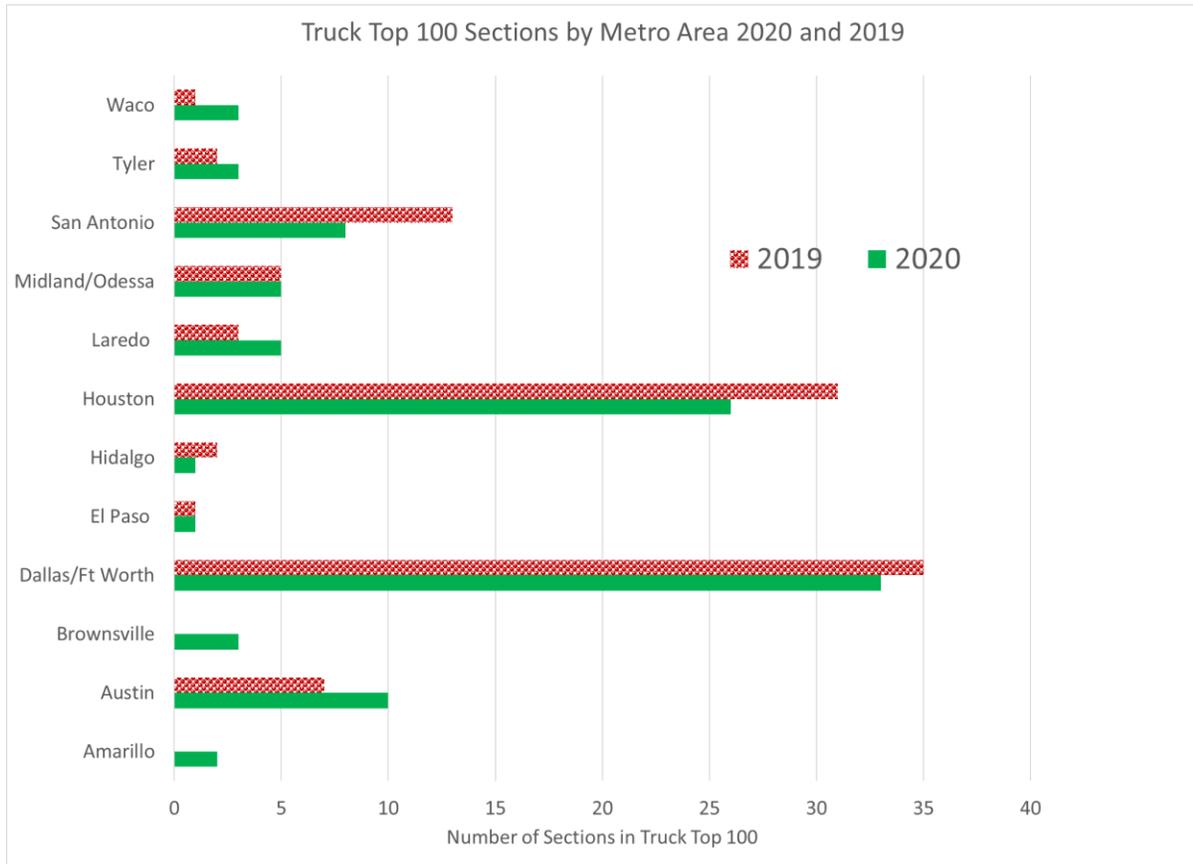
WHAT'S ON THE LIST

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 1,800 road sections across the state, in urban and suburban areas, including at least 18 sections (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. Rural Texas congestion is not tracked in this effort.

In the 2020 data, 32 of the Truck Top 100 sections were not in the top 100 in 2019; this is up from 24 in 2019. More arterial street sections were included in the Truck Top 100 in the 2020 data than in 2019. Streets accounted for 33 sections in the top 100 in 2020 as compared with 20 in 2019. Both freeways and streets experienced more delay outside of the peak periods in 2020 than in 2019, likely due to higher work at home levels and schools doing remote learning. Peak period freeway truck delay fell from 53 percent to 49 percent of all freeway truck delay. Peak period arterial street truck delay fell from 32 percent to 29 percent of all arterial street truck delay. Midday and weekend truck delay rose from 58 percent to 62 percent of all annual delay.

Exhibit T-4 displays a comparison of the number of road sections per urban area in the Truck Top 100 between calendar years 2019 and 2020. Houston and Dallas/Fort Worth had about the same number of sections in the Truck Top 100 while Austin and San Antonio had less in 2020 than 2019. Two areas—Hidalgo and Waco—only had sections in the Truck Top 100 in the 2020 data while Waco did not have a Truck Top 100 section in 2020.

Exhibit T-4. Truck Top 100 Sections in 2020 and 2021 Texas 100 by Urban Area



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

- 9 of the top 10 most congested roadways are in these four metro regions, and 19 of the top 20 in 2020 compared with 18 in 2019,
- 77 of the top 100 congested sections are in these four metro regions in 2020 compared with 85 in 2019,
- 151 of the top 200 are in the four largest metro regions (157 in 2019)

Truck traffic levels dropped across Texas in 2020 with few exceptions. The change in traffic levels for some of the key counties in Texas is shown in Exhibit T-5. These key counties include the core metro and border crossing counties. The travel shown is from all freeways, arterials, and collector roadways but does not include local streets. Overall, in Texas, all-vehicle travel was down about 10 percent while

truck-only travel was down about 4 percent. Truck travel was down a smaller percentage in all core metro and border counties than the all-vehicle travel and usually quite a bit less reduction except in Harris and Bexar counties. Harris County actually had truck travel decrease more than the all-vehicle travel while Bexar County had about the same decline in truck travel as all-vehicle travel. Travis County showed an increase in truck travel between 2019 and 2020. Cameron County had the greatest reduction in truck travel of the border counties.

One possible explanation for the reduction in truck travel in Harris and Bexar counties could be the collapse of the oil and gas production in Texas in 2020. There was a significant reduction in oil demand due to reduced travel demand caused by work-from-home and school-from-home requirements. Additionally, there was an international oil price war between Saudi Arabia and Russia which resulted in a global oversupply of inexpensive oil. These two events led to historically low oil prices that significantly impacted drilling activity and oil production in Texas. The number of oil rigs in the Permian Basin declined by almost 70 percent (i.e., from 400 oil rigs in January 2020 to 125 oil rigs in July 2020), greatly impacting the trucking sector. Given the role of transportation in the oil supply chain, the reduction of oil drilling activity and production resulted in a decrease in trucking, rail carloads, and pipeline shipments across the state. [\(3\)](#)

Despite some of the drops in economic activity such as the oil and gas industry, inbound trucks at the border crossings dropped only slightly in 2020. Border crossings were closed for only a few days during the pandemic year of 2020. Exhibit T-6 displays the entering truck volumes at the Texas and Mexico border from 2016 to 2020. Entering trucks were only down 1.6 percent at the border crossings during the pandemic year of 2020. Laredo, which has the most inbound truck trips, was down just under two percent for 2020. The consistency of inbound trucks in 2020 at the border crossings contributed to the increase in the number of sections from border regions in the Truck Top 100 as traffic did not decline as rapidly in some of these regions as some of their peers across the state.

Exhibit T-5. Change in Travel Between 2019 and 2020 in Core Border and Metro Counties on Major Roadways (4)

County	Daily Truck Vehicle-Miles of Travel (mil)			Daily All Vehicle-Miles of Travel (mil)		
	% change 2019-2020	2020	2019	% change 2019-2020	2020	2019
All	-4.3%	78.25	81.77	-10.0%	674.93	749.59
Metro Counties						
Bexar	-10.0%	2.78	3.09	-10.8%	40.08	44.92
Dallas	-2.3%	4.24	4.34	-7.4%	62.36	67.33
Harris	-11.3%	6.18	6.97	-10.5%	101.75	113.69
Tarrant	-1.4%	2.89	2.93	-10.3%	42.88	47.82
Travis	4.2%	1.72	1.65	-21.8%	23.56	30.14
Border Counties						
Cameron	-6.8%	0.41	0.44	-12.8%	7.02	8.05
El Paso	-1.6%	1.23	1.25	-10.8%	15.96	17.89
Hidalgo	-2.2%	0.88	0.90	-11.8%	13.83	15.68
Webb	-6.4%	0.88	0.94	-9.3%	4.87	5.37

Exhibit T-6. Entering Trucks at Texas/Mexico Ports of Entry 2016 to 2020 (5)

Port of Entry	% change 2019-2020	2020	2019	2018	2017	2016
Brownsville	-2.6%	280,172	287,538	255,169	228,188	217,331
Del Rio	-9.2%	68,511	75,493	78,328	74,207	74,290
Eagle Pass	-3.3%	173,975	179,832	173,105	169,578	159,538
El Paso	-4.5%	756,960	792,441	810,935	779,410	763,868
Hidalgo	3.1%	671,506	651,579	647,157	620,236	568,235
Laredo	-1.9%	2,319,901	2,364,681	2,313,967	2,182,984	2,083,964
Presidio	-10.0%	9,177	10,198	8,829	8,697	7,561
Progreso	-4.2%	52,509	54,800	50,795	52,516	48,983
Rio Grande City	-1.3%	40,582	41,108	38,094	37,521	35,996
Roma	86.5%	23,146	12,412	8,111	7,608	7,494
Tornillo		0	0	0	104	173
Total	-1.6%	4,396,439	4,470,082	4,384,490	4,161,049	3,967,433

Note: El Paso and Ysleta truck volumes combined for El Paso in 2020

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

COVID-19 Pandemic

COVID-19 changed traffic patterns across Texas in 2020. It changed when or if trips were made, where they were made, how they were made, and had large impacts on trucking and goods movement. All these factors affected each road section in the list differently. Some road sections did not experience the large delay reductions as some of their peers because of how these changing traffic patterns affected them.

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. For example, recent high-density development along Westheimer Road in Houston between SH-6 and IH-610 is one reason that this segment of road is ranked at #49 on the list in 2020. That kind of change can send a roadway to a higher position on the list in a short period of time. However, this section fell to #237 on the list in 2021 primarily due to work from home along the very developed corridor.

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. For example, recent construction on Brownsville's Boca Chica Blvd created congestion on other nearby roadways (E 14 St, International Blvd, E Price Rd, and Paredes Line Rd) when traffic along Boca Chica was slowed due to construction.

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 I-35 through Central Austin, or I-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.

WHAT ARE THE LASTING EFFECTS OF COVID-19 ON TRANSPORTATION?

It is not yet clear what the lasting effect of the COVID-19 pandemic will be on urban transportation systems. The mix of strategies that are deployed in Texas will continue to be different for each region — better traffic operations; more travel options; more highways, streets, and public transportation; new land development styles; advanced technology will all play a role. Working from home, long an underappreciated solution, will certainly have a much bigger role after the pandemic experience.

The changes in travel and congestion levels during the 2020 COVID-19 pandemic were massive. The declines in congestion were unprecedented. With 2020 congestion at levels about half of the 2019 levels, the “congestion recovery” may take a few years, but it also seems clear that some aspects of the problem and the solutions may have changed forever. But if we try to use that experience to make decisions about the future, it is difficult to know what has been learned from the past year.

- How soon will the employment market bounce back?
- To what extent will office workers continue to work from home?
- How does the type of jobs in the travel corridor affect the congestion patterns, and which mobility solutions will work best for that job mix?
- Will trip departure times remain similar — fewer auto trips in the normal rush hours, and more travel in the midday and early evening?
- Will public transportation ridership rebound?
- Will construction projects fast-tracked during the pandemic have an effect?
- What are the effects of transportation and land use changes given where people choose to work, live, shop, go to school, and recreate?
- How will the shift in where businesses and people locate affect how, where, and when goods are moved?
- How will freight travel patterns change in a post-pandemic world? How will that impact congestion and traffic flow going forward?

On some level, congestion analysis of 2020 data will never be relevant again; the conditions are not likely to be repeated. On the other hand, the conditions are like some of those in the past. The connection between the economy and congestion has been very solid. The great recession in 2008/9 caused a national reduction in traffic congestion, and other regional recessions have also caused

congestion reductions. Early 2021 data suggests that the economy and congestion are rebounding, but the answers to the above questions will go a long way toward determining the mobility problems and solutions in the next decade. All the potential congestion-reducing strategies should be considered, and there is a role and location for most of the strategies:

Freight-specific strategies

- Active curb management practices in dense, urban areas. Managing time spent in loading zones. Common delivery areas such as locked spaces where deliveries and pick-ups can be done at different times.
- Technology. Delivery robots are rolling out in many areas for food deliveries. Automated vehicles are being tested for longer-haul trips.
- Capacity investment. Investment in last-mile roadway connectors that provide vital connectivity between freight routes (Interstates, etc.) and freight receivers (consumers), warehousing, distribution centers, manufacturing, ports, etc.
- Thoughtful land use practices that limit truck miles of truck traffic by co-locating freight uses (manufacturing, warehousing, etc.)

Broad strategies

- The COVID-19 pandemic reaction has convinced employers and workers that many more tasks can be accomplished remotely. This will not be the same everywhere for every job. Some employers might require in-person attendance. Some may allow full-time, not-in-an-office work schedule. Some will encourage telework for a few days each week or even just a few hours each day.
- In growth corridors, there also may be a role for additional road and public transportation capacity to move people and freight more rapidly and reliably.
- Rapidly clearing crashes and stalled vehicles, efficiently timing the traffic signals, getting reliable information to travelers so that they can plan their trip — all of these are ways to get the “best bang for the buck” productivity out of the existing road and public transportation systems.
- Some areas are seeing renewed interest in higher density living in neighborhoods with a mix of residential, office, shopping, and other developments. These places can promote shorter trips that are more amenable to walking, cycling, or public transportation modes.

CONCLUSION

The 2020 pandemic year was full of surprises when it came to changes in traffic patterns and travel behavior. The 100 Most Congested Roadway Sections report provides a birds-eye view of congestion in Texas and captured the changes in travel due to the pandemic. Total truck delay in 2020 was down 43 percent from 2019 levels in the 1,800 plus sections of tracked roadways; total delay was down 58 percent from 2019 levels. In a typical Truck Top 100 list, between 15 and 20 road sections may jump up into the Top 100 for at least a year; in the 2020 data this number was 32 sections. There was a larger proportion of the Top 100 sections outside of the four large metro regions in 2020 - 23 compared with 14 in 2019. As noted, there are many potential reasons for these changes in a pandemic year whether it is due to local labor markets, truck traffic, or work-from-home effects as well as many others.

The detailed data in this report does not show what specifically is causing the congestion on a given roadway, nor identify specific solutions. The 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. *2021 Urban Mobility Report*. Texas A&M Transportation Institute. June 2021.
2. U.S. Bureau of Labor Statistics. <https://www.bls.gov/opub/mlr/2020/article/ability-to-work-from-home.htm>
3. Texas Freight Impacts of COVID-19. Texas Department of Transportation – Transportation Planning and Programming Division.
4. Texas Department of Transportation 2021 Roadway Inventory File.
5. U.S. Department of Transportation Bureau of Transportation Statistics Transborder Data.

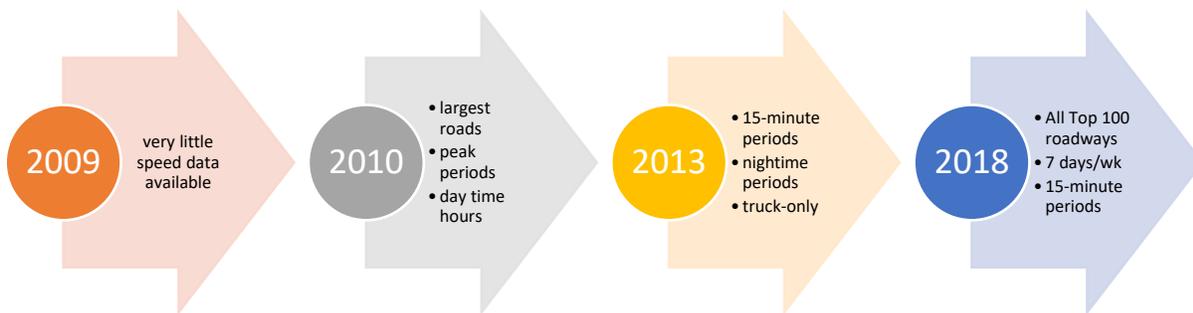
APPENDIX A. METHODOLOGY & DEFINITIONS

How has the Methodology Changed Over the Years?

Eleven 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 sections.

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 section 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 discrete 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 – 2021 Method (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.