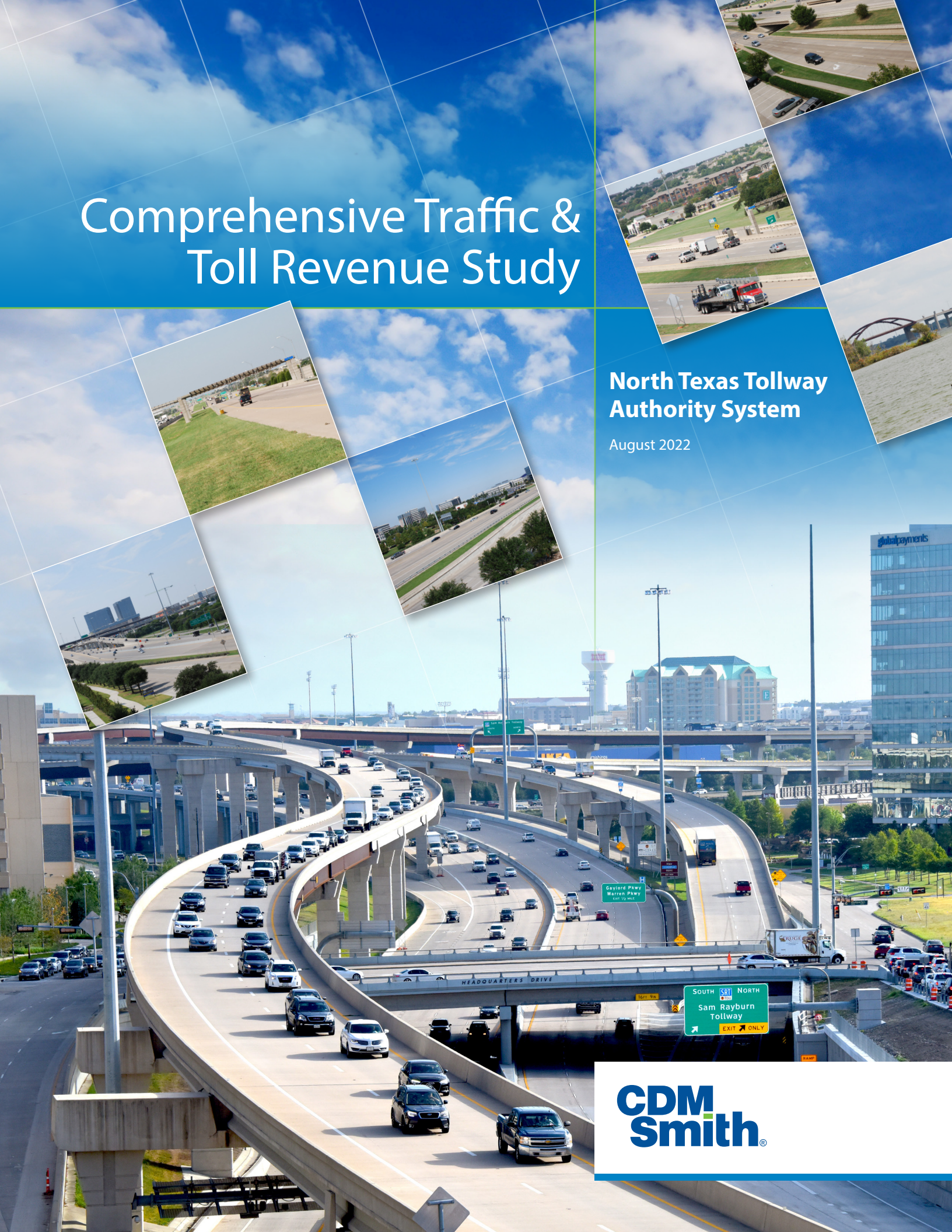


# Comprehensive Traffic & Toll Revenue Study

## North Texas Tollway Authority System

August 2022



**CDM  
Smith**



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# Disclaimer

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CDM Smith used currently-accepted professional practices and procedures in the development of traffic and revenue estimates. However, as with any forecast, differences between forecasted and actual results may occur, as caused by events and circumstances beyond the control of the forecasters. In formulating the estimates, CDM Smith reasonably relied upon the accuracy and completeness of information provided (both written and oral) by North Texas Tollway Authority (NTTA). CDM Smith also relied upon the reasonable assurances of independent parties and is not aware of any material facts that would make such information misleading.

CDM Smith made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this report.

All estimates and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from multiple agencies, including NTTA. These estimates and projections may not be indicative of actual or future values and are therefore subject to substantial uncertainty. Certain variables such as future developments, economic cycles, global pandemics, and impacts related to advances in automotive technology cannot be predicted with certainty and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that the projections and other forward-looking statements contained within the report are based on reasonable assumptions as of the date of the report, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd Frank Bill) to by NTTA and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to NTTA with respect to the information and material contained in this report. CDM Smith is not recommending and has not recommended any action to the NTTA. The NTTA should discuss the information and material contained in this report with any and all internal and external advisors that it deems appropriate before acting on this information.

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## Executive Summary

The North Texas Tollway Authority (NTTA) Comprehensive Traffic and Revenue (T&R) report includes a system-wide review of toll transactions and revenue, traffic data collection, independent socioeconomic forecasts, review of the latest transportation improvement plan, travel demand model updates, and development of long-term traffic and revenue estimates for the NTTA System. This study builds upon previous T&R studies, the most recent of which were the NTTA System Comprehensive Traffic and Toll Revenue Study, prepared by CDM Smith in September 2020 (the “September 2020 Study”) and the NTTA System Traffic and Revenue Letter Update, completed in March 2021 (the “March 2021 Letter Update”).

The purpose of this study was to develop T&R forecasts for the NTTA System, which includes the following facilities:

- Dallas North Tollway (DNT)
  - Limits: IH 35E in Dallas to US 380 in Frisco
  - Length: Approximately 31 miles
- President George Bush Turnpike (PGBT), excluding Eastern and Western Extensions
  - Limits: Belt Line Road in Irving to SH 78 in Garland
  - Length: Approximately 30 miles
- President George Bush Turnpike Eastern Extension (PGBT EE)
  - Limits: SH 78 in Garland to IH 30 in Garland
  - Length: Approximately 10 miles
- President George Bush Turnpike Western Extension (PGBT WE)
  - Limits: IH 20 in Grand Prairie to SH 183 in Irving
  - Length: Approximately 10 miles
- Sam Rayburn Tollway (SRT)
  - Limits: Business 121 in Coppell to US 75 in McKinney
  - Length: Approximately 26 miles
- Chisholm Trail Parkway (CTP)
  - Limits: US 67 in Cleburne to IH 30 in Fort Worth
  - Length: Approximately 28 miles
- 360 Tollway (CTP)
  - Limits: Camp Wisdom Road in Grand Prairie to US 287 in Mansfield
  - Length: Approximately 10 miles
- Addison Airport Toll Tunnel (AATT)
- Lewisville Lake Toll Bridge (LLTB)
- Mountain Creek Lake Bridge (MCLB)

Based on the traffic forecast at each toll gantry location, annual forecasts for each facility of the NTTA System were prepared through 2070. The projections extend from 2022 through 2070 and include the revenue forecasts for DNT, PGBT, PGBT EE, PGBT WE, SRT, CTP, 360T, AATT, MCLB, and LLTB. In each case, forecasts for each of the facilities are based on modeled traffic estimates at each toll collection location, through the year 2045. These modeled estimates were refined, using post-model adjustments, reflecting validation factors used to match observed 2022 traffic data and the baseline model year at each toll gantry location.

The average toll at each location was based on the current mix of passenger car and commercial vehicle traffic and the current average tolls, modified in future years to reflect changing assumptions in the proportion of AVI and ZipCash transaction shares. Passenger cars/commercial vehicles traffic shares have varied during the pandemic. Reasonable assumptions have been made to account for the variance in the short- and long-term impacts of the change in the shares. Further, toll rates for ZipCash transactions are 50 percent higher than the rates for AVI transactions (with a minimum differential of \$0.28 in 2022 dollars) in each case, as noted previously.

Estimates beyond year 2045 are based on nominal assumptions regarding future traffic growth, with assumed toll rate increases as noted previously. As shown in **Table ES-1**, the estimated annual revenue on the DNT is expected to increase from \$299.7 million in 2022 to \$427.5 million by 2030 and \$631.6 million by 2040. Revenue on the PGBT (excluding PGBT WE and PGBT EE) is expected to be \$250.3 million in 2022, increasing to \$370.6 million by 2030 and \$548.8 million by 2040. PGBT WE is anticipated to generate \$62.4 million in toll revenue in 2022, increasing to \$102.3 million and \$160.4 million by 2030 and 2040, respectively. NTTA's share of the revenue on the PGBT EE is expected to be \$47.1 million in 2022, increasing to \$71.8 million by 2030 and \$123.2 million by 2040.

Revenue on the SRT is expected to be \$209.5 million in 2022, increasing to \$324.3 million by 2030 and \$503.9 million by 2040. As fiscal year 2058 is the end of the fifty-year operational agreement of the SRT between NTTA and TxDOT, revenue from SRT is estimated through August 31, 2058, while the other facilities are assumed to generate revenue for NTTA in perpetuity. CTP is anticipated to generate \$70.3 million in toll revenue in 2022, increasing to \$116.5 million and \$194.8 million by 2030 and 2040, respectively.

The 360 Tollway is expected to generate \$23.7 million in toll revenue in 2022, increasing to \$41.1 million and \$75.2 million by 2030 and 2040, respectively. Revenue from the AATT, MCLB and LLTB combined is expected to be about \$14.3 million in 2022. By 2030, this is estimated to reach a combined \$20.4 million and increase in 2040 to \$31.3 million, still a very small share of total NTTA System revenue.

Total revenue on the existing NTTA System total revenue on the NTTA System is expected to increase from about \$977.4 million in 2022 to \$1.47 billion in 2030 and \$2.27 billion in 2040. Driven by nominal traffic growth and continued assumed modest inflationary adjustments in toll rates, annual revenue on the NTTA System is expected to reach more than \$3 billion per year by 2048.

Table ES-1. NTTA System Estimated Annual Toll Revenue (millions)

Year	DNT	PGBT	PGBT EE <sup>(1)</sup>	PGBT WE	SRT <sup>(2)</sup>	CTP	360T <sup>(3)</sup>	AATT-MCLB-LLTB	NTTA System
2022	\$299.7	\$250.3	\$47.1	\$62.4	\$209.5	\$70.3	\$23.7	\$14.3	\$977.4
2023	\$314.0	\$265.8	\$48.4	\$67.6	\$230.7	\$78.2	\$26.1	\$15.0	\$1,045.8
2024	\$330.6	\$284.4	\$52.5	\$78.7	\$247.5	\$82.5	\$27.7	\$15.8	\$1,119.6
2025	\$346.2	\$297.3	\$55.3	\$83.7	\$258.9	\$86.8	\$29.3	\$16.5	\$1,174.1
2026	\$363.0	\$310.9	\$58.3	\$88.7	\$270.9	\$92.4	\$31.1	\$17.2	\$1,232.5
2027	\$378.6	\$324.1	\$61.3	\$89.9	\$283.0	\$97.8	\$33.3	\$17.9	\$1,285.9
2028	\$393.3	\$338.3	\$64.5	\$91.8	\$295.8	\$103.5	\$35.8	\$18.6	\$1,341.6
2029	\$409.7	\$353.8	\$68.1	\$96.7	\$309.6	\$109.9	\$38.3	\$19.4	\$1,405.5
2030	\$427.5	\$370.6	\$71.8	\$102.3	\$324.3	\$116.5	\$41.1	\$20.4	\$1,474.5
2031	\$445.6	\$387.6	\$75.8	\$108.0	\$340.3	\$123.2	\$43.9	\$21.2	\$1,545.6
2032	\$465.0	\$403.4	\$79.8	\$113.0	\$356.0	\$129.5	\$47.0	\$22.1	\$1,615.8
2033	\$483.9	\$419.5	\$88.9	\$118.2	\$372.3	\$136.0	\$50.0	\$23.0	\$1,691.9
2034	\$504.1	\$436.6	\$93.7	\$123.8	\$389.5	\$142.9	\$53.3	\$24.1	\$1,768.0
2035	\$524.5	\$454.2	\$98.3	\$129.2	\$407.7	\$149.7	\$56.6	\$25.1	\$1,845.3
2036	\$546.3	\$473.1	\$103.1	\$135.1	\$426.8	\$157.1	\$60.2	\$26.3	\$1,928.0
2037	\$569.6	\$490.8	\$107.8	\$140.8	\$444.9	\$165.7	\$63.6	\$27.4	\$2,010.8
2038	\$590.1	\$509.4	\$112.8	\$147.1	\$464.0	\$175.1	\$67.2	\$28.6	\$2,094.4
2039	\$610.2	\$528.5	\$117.9	\$153.5	\$483.5	\$184.6	\$71.0	\$29.9	\$2,179.1
2040	\$631.6	\$548.8	\$123.2	\$160.4	\$503.9	\$194.8	\$75.2	\$31.3	\$2,269.0
2041	\$652.2	\$568.8	\$128.8	\$167.2	\$525.4	\$204.9	\$79.2	\$32.7	\$2,359.2
2042	\$674.1	\$590.2	\$134.6	\$174.6	\$548.1	\$215.8	\$83.5	\$34.2	\$2,455.1
2043	\$695.9	\$612.0	\$140.7	\$182.5	\$572.4	\$226.9	\$87.9	\$35.7	\$2,554.1
2044	\$719.4	\$635.5	\$147.1	\$191.1	\$598.1	\$239.0	\$92.7	\$37.2	\$2,660.1
2045	\$741.8	\$659.2	\$153.9	\$199.3	\$623.2	\$250.9	\$103.2	\$38.9	\$2,770.3
2046	\$764.6	\$681.5	\$159.8	\$206.6	\$645.0	\$261.1	\$108.2	\$40.3	\$2,867.0
2047	\$786.5	\$703.4	\$165.6	\$214.1	\$667.7	\$271.2	\$112.6	\$41.8	\$2,962.7
2048	\$809.7	\$726.7	\$171.5	\$222.2	\$691.5	\$282.0	\$117.5	\$43.3	\$3,064.5
2049	\$832.5	\$750.3	\$177.8	\$229.6	\$715.6	\$292.7	\$122.3	\$44.8	\$3,165.7
2050	\$857.0	\$775.8	\$184.3	\$237.6	\$741.0	\$304.4	\$63.8	\$46.4	\$3,210.3
2051	\$880.6	\$799.0	\$190.2	\$245.1	\$763.7	\$314.3	\$66.1	\$47.9	\$3,306.7
2052	\$905.7	\$823.4	\$196.2	\$253.1	\$787.1	\$324.9	\$68.5	\$49.5	\$3,408.4
2053	\$931.0	\$847.4	\$202.5	\$261.0	\$812.1	\$335.5	\$70.8	\$51.0	\$3,511.4
2054	\$958.2	\$873.2	\$209.0	\$269.6	\$838.5	\$347.1	\$73.2	\$52.6	\$3,621.5
2055	\$984.5	\$899.0	\$215.9	\$278.0	\$864.1	\$358.4	\$75.7	\$54.3	\$3,729.8
2056	\$1,012.7	\$926.8	\$222.9	\$287.1	\$890.9	\$370.8	\$78.4	\$56.1	\$3,845.7
2057	\$1,040.4	\$953.9	\$230.0	\$295.9	\$918.6	\$382.8	\$81.1	\$57.8	\$3,960.4
2058	\$1,070.4	\$983.3	\$237.4	\$305.4	\$627.5	\$396.1	\$84.1	\$59.7	\$3,763.9
2059	\$1,100.3	\$1,012.4	\$244.9	\$315.1	\$0.0	\$408.8	\$87.0	\$61.6	\$3,230.0
2060	\$1,132.4	\$1,043.6	\$252.6	\$325.6	\$0.0	\$422.7	\$90.1	\$63.6	\$3,330.6
2061	\$1,163.5	\$1,074.7	\$260.7	\$335.4	\$0.0	\$436.6	\$93.1	\$65.6	\$3,429.7
2062	\$1,196.7	\$1,107.7	\$269.0	\$346.0	\$0.0	\$451.7	\$96.5	\$67.6	\$3,535.2
2063	\$1,229.8	\$1,140.3	\$277.6	\$356.6	\$0.0	\$466.2	\$99.7	\$69.7	\$3,640.0
2064	\$1,265.4	\$1,175.2	\$286.5	\$368.3	\$0.0	\$482.2	\$103.2	\$72.0	\$3,752.8
2065	\$1,300.4	\$1,209.8	\$295.8	\$379.8	\$0.0	\$497.8	\$106.8	\$74.3	\$3,864.7
2066	\$1,338.0	\$1,247.1	\$305.3	\$392.3	\$0.0	\$514.9	\$110.7	\$76.7	\$3,984.9
2067	\$1,375.1	\$1,284.0	\$315.2	\$404.3	\$0.0	\$531.8	\$114.4	\$79.1	\$4,103.9
2068	\$1,414.4	\$1,322.9	\$325.2	\$417.2	\$0.0	\$550.1	\$118.5	\$81.7	\$4,230.0
2069	\$1,453.6	\$1,362.1	\$335.5	\$430.1	\$0.0	\$568.0	\$122.5	\$84.2	\$4,356.0
2070	\$1,495.6	\$1,404.0	\$346.1	\$444.0	\$0.0	\$587.5	\$126.9	\$87.0	\$4,491.1

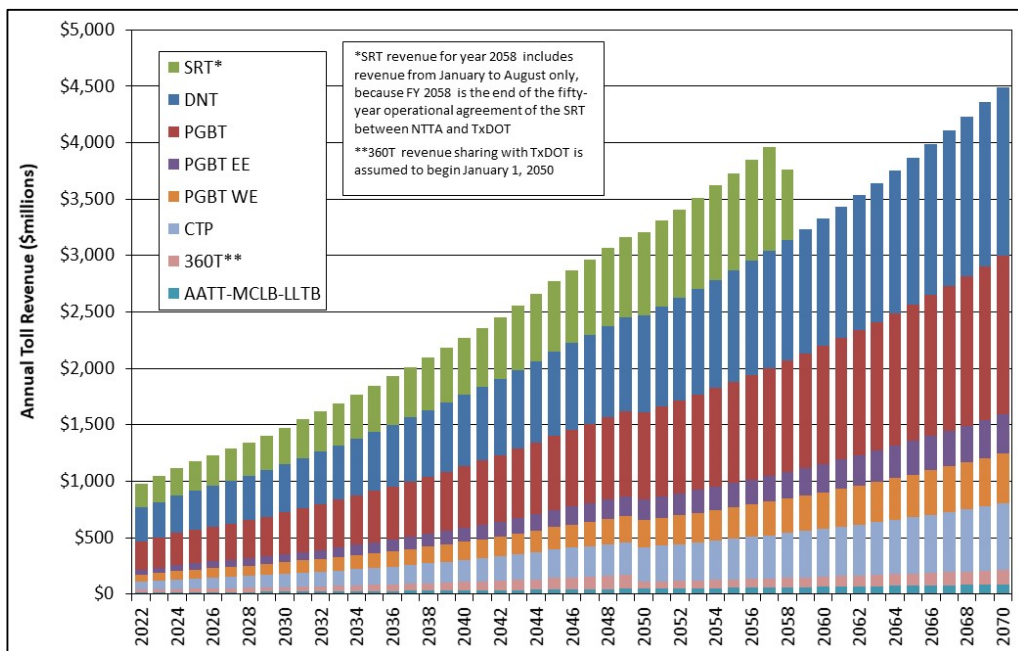
- 1) NTTA's share of the revenue collected from PGBT EE.
- 2) SRT revenue for year 2058 includes revenue from January to August only, because FY 2058 is the end of the fifty-year operational agreement of the SRT between NTTA and TxDOT
- 3) Revenue sharing agreement with TxDOT (50%/50%) is assumed to begin January 1, 2050

**Table ES-2** shows the projected annual transaction and revenue growth rates on the NTTA System. Annual transaction and revenue growth rates from 2022 through 2030 are projected to be 2.5 percent and 5.3 percent, respectively. During this period, the growth in transactions is driven mainly by the growth in the demographics along the NTTA System corridors, the opening of new ramps on DNT in 2023, and recently completed expansions on PGBT and SRT. The transaction growth rates progressively decrease to 1.6 percent between 2030 and 2040, and to 1.0 percent between 2040 and 2050. The corresponding growth rates in revenue are 4.4 percent and 3.5 percent, respectively, which incorporate the traffic growth and the assumed toll rate increases.

**Table ES-2. NTTA System Transactions and Revenue Annual Growth**

Period	Transactions Annual Growth (%)	Revenue Annual Growth (%)
2022-2030	2.5%	5.3%
2030-2040	1.6%	4.4%
2040-2050	1.0%	3.5%

**Figure ES-1** graphically displays the annual revenue forecasts shown previously in **Table 6-6** by facility. It is expected that the DNT, PGBT and SRT will continue to generate the vast majority of revenue on the NTTA System throughout the forecast period. The DNT will provide about 31 percent of all NTTA System revenue in 2022; this proportion decreases to 28 percent in 2045 as the SRT and CTP continue to mature. The PGBT (including EE and WE) will provide approximately 37 percent of all NTTA System revenue through 2045. The SRT will provide about 21 percent of all NTTA System revenue in 2022 and 22 percent by 2045. 360 Tollway is expected to generate two percent of overall revenue in 2022, but this share is projected to increase to four percent by 2045. The AATT, MCLB, and LLTB will contribute less than two percent of revenue through 2045.



**Figure ES-1.**

**NTTA System Estimated Annual Revenue by Facility**

Note: PGBT-EE toll revenue shown is the NTTA’s share of the toll revenue

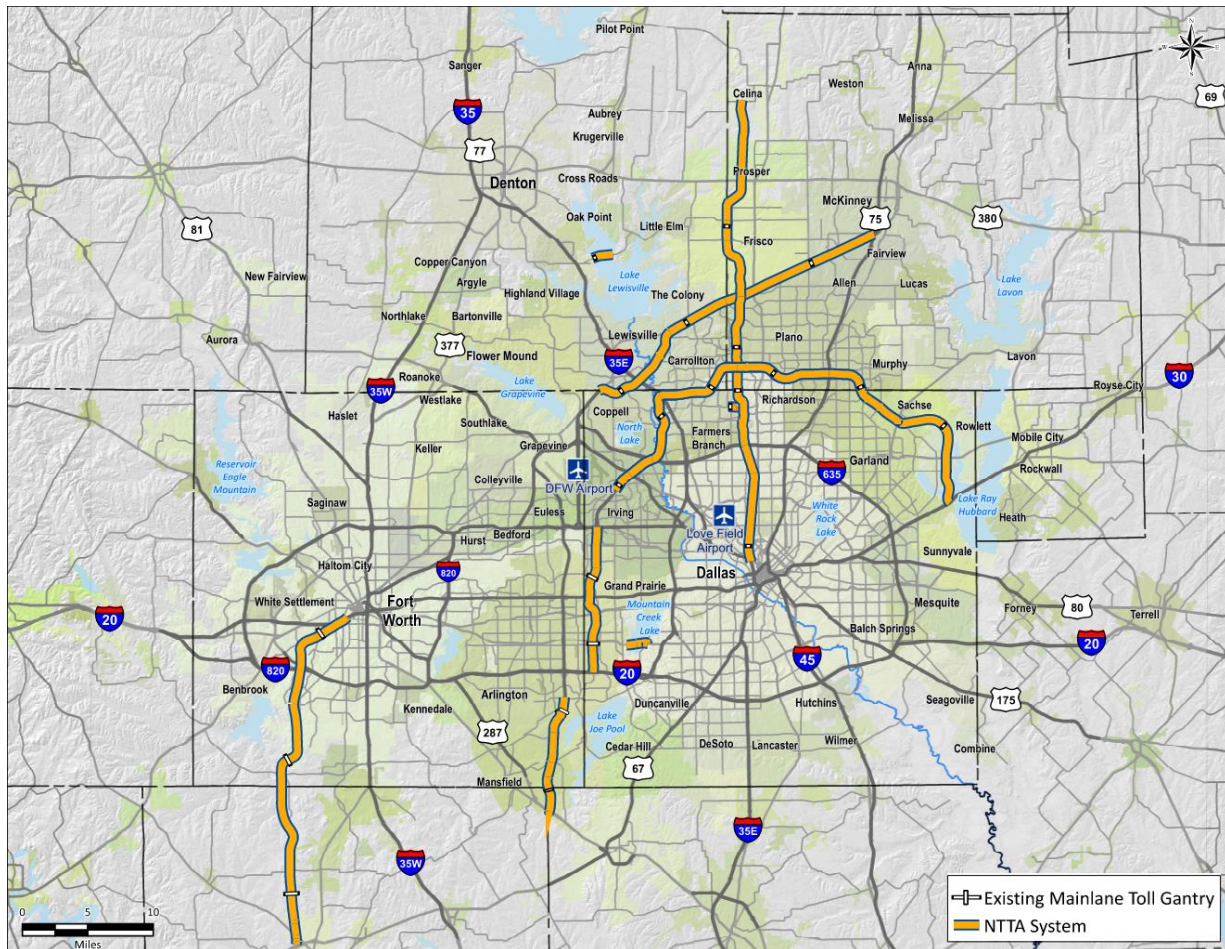
# Section 1

## Introduction

At the request of the North Texas Tollway Authority (NTTA), CDM Smith conducted a Comprehensive Traffic and Revenue (T&R) Study of the NTTA System. The study included a system-wide review of transactions and toll revenue, traffic data collection, independent socioeconomic forecasts, review of the latest transportation improvement plan, travel demand model updates, and development of long-term traffic and toll revenue estimates for the NTTA System.

**Figure 1-1** illustrates the NTTA System, which includes the following:

- **Dallas North Tollway (DNT)**
  - Limits: IH 35E in Dallas to US 380 in Frisco
  - Length: Approximately 31 miles
- **President George Bush Turnpike (PGBT), Excluding Eastern and Western Extensions**
  - Limits: Belt Line Road in Irving to SH 78 in Garland
  - Length: Approximately 30 miles
- **President George Bush Turnpike Eastern Extension (PGBT EE)**
  - Limits: SH 78 in Garland to IH 30 in Garland
  - Length: Approximately 10 miles
- **President George Bush Turnpike Western Extension (PGBT WE)**
  - Limits: IH 20 in Grand Prairie to SH 183 in Irving
  - Length: Approximately 10 miles
- **Sam Rayburn Tollway (SRT)**
  - Limits: Business 121 in Coppell to US 75 in McKinney
  - Length: Approximately 26 miles
- **Chisholm Trail Parkway (CTP)**
  - Limits: US 67 in Cleburne to IH 30 in Fort Worth
  - Length: Approximately 28 miles
- **360 Tollway (360T)**
  - Limits: Camp Wisdom Road/Sublett Road to US 287
  - Length: Approximately 10 miles
- **Addison Airport Toll Tunnel (AATT)**
- **Lewisville Lake Toll Bridge (LLTB)**
- **Mountain Creek Lake Bridge (MCLB)**



**Figure 1-1.**  
**North Texas Tollway Authority System**

## 1.1. Study Background

This study builds upon previous T&R studies, the most recent of which were the *NTTA System Comprehensive Traffic and Toll Revenue Study*, prepared by CDM Smith in September 2020 (the “September 2020 Study”) and the *NTTA System Traffic and Revenue Letter Update*, completed in March 2021 (the “March 2021 Letter Update”).

Since the completion of the previous study, the North Central Texas Council of Governments (NCTCOG) released a new MTP called *Mobility 2045 – 2022 Update*, which was formally adopted by the Regional Transportation Council in June 2022. The updated travel demand networks from the new MTP have been incorporated in this comprehensive traffic and toll revenue study. This study includes an independent assessment of current economic conditions and other key factors influencing forecasted traffic and toll revenue on the NTTA System facilities. This study included an independent review of the *Mobility 2045 – 2022 Update* demographics along the NTTA System. Comprehensive traffic count and travel time data was collected for this study in addition to the observed transaction and toll revenue trends since the completion of the September 2020 Study that were also incorporated into this analysis.



## 1.2. Objective and Scope of Study

The purpose of this study was to develop T&R forecasts for the NTTA System shown in **Figure 1-1**. The following outlines the general structure of the report:

### Section 2 – NTTA System Traffic Trends and Characteristics

This section provides background information regarding the characteristics of NTTA's roadways and the highway infrastructure near NTTA System corridors. The information in this section provides a historical overview of traffic along and in the vicinity of the NTTA System corridors, which was used as input to the T&R forecasting process. CDM Smith collected traffic data that was used to calibrate the travel demand model. Data summarized in this chapter includes historical traffic and toll revenue data for the system (through June 2022), traffic counts on competing routes and non-tolled ramps along NTTA facilities, travel time data on the NTTA System facilities and other roadways along the NTTA System corridors, and origin-destination data.

### Section 3 – Dallas-Fort Worth Area Transportation Characteristics

This section contains a broad overview of the transportation system in the Dallas-Fort Worth (DFW) region and outlines the region-wide characteristics that may impact the NTTA System. The *Mobility 2045 – 2022 Update* transportation commitments are described in this section. This section also provides an update of the COVID-19 pandemic and its effects on the economic factors influencing travel. Additionally, this section includes a discussion on the observed impacts of the COVID-19 pandemic on the traffic trends across the NTTA System and the expected recovery of traffic on the NTTA System corridors is projected by examining data from other historical nationwide catastrophic events.

### Section 4 – Regional Demographic and Economic Trends

This section provides a description of the NCTCOG forecasting process used to generate the base demographics and details the historical and expected future growth in the DFW region. The historical and expected future growth of the individual counties within the study area is also investigated followed by a description of the demographic characteristics along NTTA System corridors. Research and Demographic Solutions Group (RDS) performed an independent review of the official demographic datasets from NCTCOG. RDS's demographic review report is included as **Appendix A** to this report. Their findings included the identification of necessary modifications to the regional growth projections within the study focus area. These modified growth projections were incorporated into the NCTCOG travel demand model resulting in an alternate set of trip tables. This alternate set of trip tables is referred to as the "revised" trip tables which were used in the development traffic and toll estimates for this study.

### Section 5 – Travel Demand Model Development

This section describes the databases utilized as part of the analysis and highlights the methodologies implemented to calibrate and validate the travel demand model. The proprietary toll diversion model developed by CDM Smith was used to forecast future traffic on toll facilities and was calibrated to ensure it could reasonably replicate current traffic conditions along NTTA System corridors.

## **Section 6 – Estimated Traffic and Revenue**

This section provides the updated traffic forecasts and toll revenue estimates for the NTTA System based on the inputs described in previous sections. The toll sensitivity analyses performed as part of the study are described in detail in this section, including several sensitivity tests to measure impacts of changes to key input variables to the base T&R forecasts. Also presented are the average weekday transactions and annual toll revenues anticipated on the NTTA System, including the COVID impact/recovery assumptions as well as a description of the various other assumptions used in the forecasting process.

## Section 2

# NTTA System Traffic Trends and Characteristics

This section provides background information regarding the characteristics of NTTA System facilities and the highway infrastructure near the NTTA System. The information in this section provides a historical overview of traffic in the vicinity of the NTTA System, which was used as input to the travel demand model utilized for the development of traffic and toll revenue forecasts. CDM Smith undertook a comprehensive exercise of collecting traffic data to feed into the travel demand model, discussed in **Section 5** which also contains a detailed explanation of the methodology employed to develop the long-range T&R forecasts. Data summaries in this section include historical traffic and toll revenue data for the NTTA System (through June 2022), traffic counts on competing routes and non-tolled ramps along NTTA facilities, travel time data on the NTTA System facilities and other roadways along the NTTA System corridors, and origin-destination data.

## 2.1. NTTA System Facilities in Operation

The NTTA System facilities currently in operation are the Dallas North Tollway (DNT), President George Bush Turnpike (PGBT), President George Bush Turnpike Eastern Extension (PGBT EE), President George Bush Turnpike Western Extension (PGBT WE), Sam Rayburn Tollway (SRT), Chisholm Trail Parkway (CTP), 360 Tollway (360T), Addison Airport Toll Tunnel (AATT), Mountain Creek Lake Bridge (MCLB), and Lewisville Lake Toll Bridge (LLTB).

### 2.1.1. Dallas North Tollway

DNT, shown in **Figure 2-1**, is a limited-access, high-speed toll facility which extends northward from the junction with Stemmons Freeway (IH 35E) north of downtown Dallas through the Dallas suburbs to US 380 in Frisco. The existing DNT corridor covers a distance of approximately 31 miles and includes 41 interchanges. The original DNT segment, which extended from its current southern terminus to IH 635, was constructed and opened to traffic in its entirety in June 1968. It was extended to Frankford Road in June 1987 and to Legacy Road in Plano in September 1994. In April 2004, with the completion of the grade-separated multi-level interchange with SRT, DNT was extended north to just south of Gaylord Parkway in Frisco. Extension Phase 3 extended the DNT corridor from Gaylord Parkway to US 380 and opened to traffic on September 28, 2007. The opening dates for the various DNT segments is shown in **Table 2-1**. The existing DNT facility utilizes a “closed” toll collection system. Each of the four major segments of the facility have one mainlane toll gantry at which tolls are collected in both directions, with toll gantries positioned at selected ramps to prohibit toll-free movements on the facility. The segments of DNT north of IH 635 are flanked by continuous city- or county-maintained frontage roads.

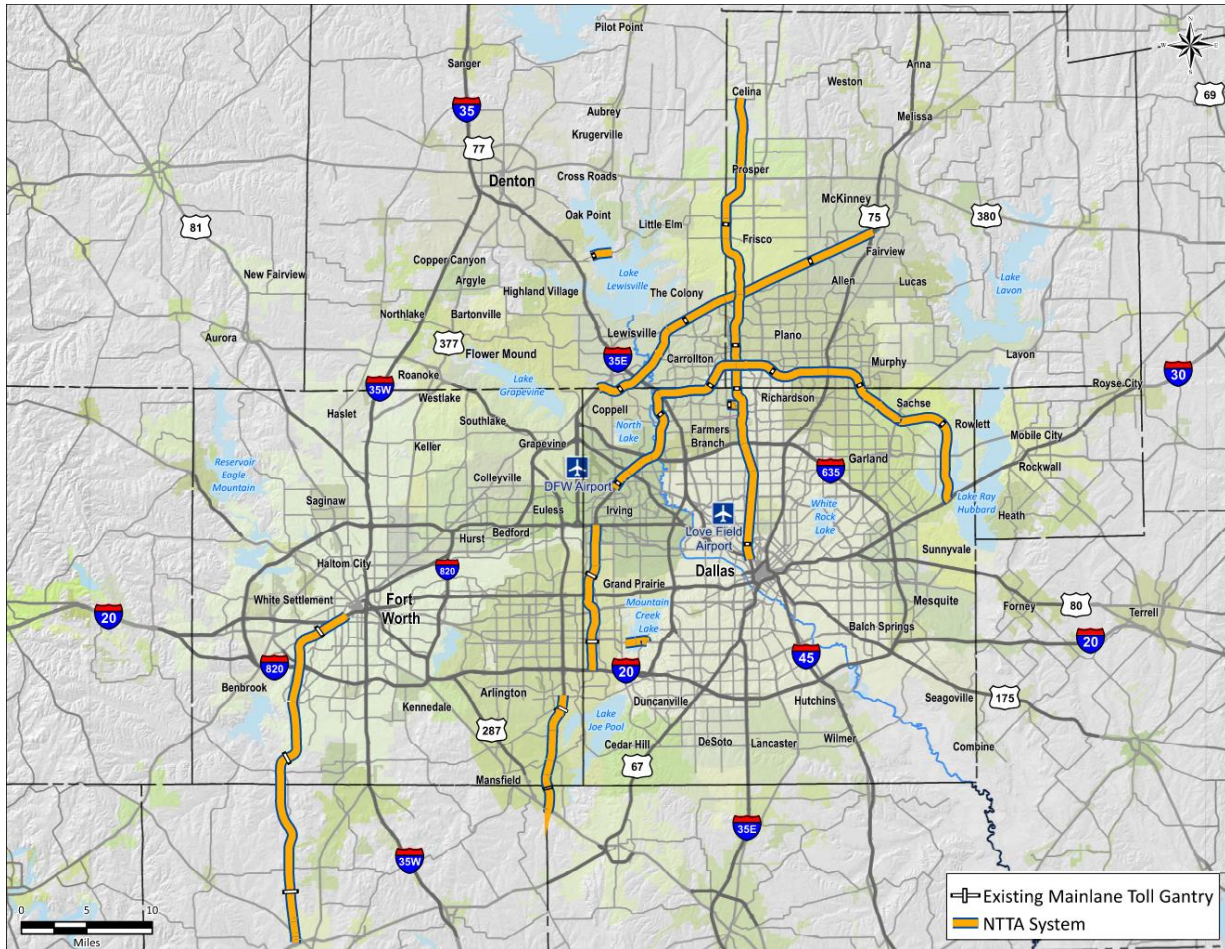


Figure 2-1. The NTTA System

Table 2-1. Opening Dates of DNT Segments

Project Phase	Segment	Opening Date
Phase 1	IH 35E to IH 635	June 1968
Phase 1 Extension	IH 635 to Frankford Road	June 1987
Phase 2	Frankford Road to Legacy Road	September 1994
Phase 2 Extension	Legacy Road to Gaylord Parkway	April 2004
Phase 3 Extension	Gaylord Parkway to US 380	September 2007

### 2.1.2. President George Bush Turnpike (Including Eastern Extension)

As illustrated in **Figure 2-1**, PGBT (including Eastern Extension) currently extends from the junction with IH 30 at its eastern terminus, traversing the communities of Rowlett, Garland and Richardson to a junction with US 75. PGBT continues westward through the cities of Plano and Dallas to an interchange with DNT. The facility then continues in a southwesterly direction through Carrollton to the interchange with IH 35E. At this point, it turns due south, along the section referred to as Segment IV, to the interchange with IH 635. From IH 635, PGBT section referred to as Segment V continues southwesterly through the city of Irving to the northern terminus of the existing SH 161 in the vicinity of Belt Line Road just east of the DFW International Airport. The

entire PGBT (excluding PGBT WE), from IH 30 to Belt Line Road covers a total distance of approximately 40 miles and includes 47 interchanges. The opening dates for the various segments of PGBT are shown in **Table 2-2**.

**Table 2-2. Opening Dates of PGBT Segments (Including Eastern Extension)**

Project Phase	Segment	Opening Date
Segment I A	Midway Road to Preston Road	November 1998
Segment I B	Preston Road to Coit Road	June 1999
Segment I C	Coit Road to US 75	December 1999
Segment II A	US 75 to Campbell Road	December 1999
Segment II B	Campbell Road to SH 78	April 2000
Segment III	Midway Road to IH 35E	July 2001
Segment IV	IH 35E to IH 635	September 2005
Segment V	IH 635 to Beltline Road	December 2001
Eastern Extension	SH 78 to IH 30	December 2011

PGBT utilizes a “semi-closed” system of toll collection and has six mainlane toll gantries positioned along the entire length of the facility with ramp gantries located on selected ramps along the corridor.

### 2.1.3. President George Bush Turnpike Western Extension

The PGBT WE toll facility is approximately 12 miles long and runs from IH 20 in Grand Prairie to SH 183 in Irving. The corridor includes 21 interchanges, including IH 20, SH 180 (Main Street), IH 30, and SH 183. Spur 303/Pioneer Parkway, which connects directly to the Mountain Creek Lake Toll Bridge, also crosses the PGBT WE corridor. There are two mainlane toll gantries along PGBT WE, one to the south of Lower Tarrant Parkway and the other to the south of Pioneer Parkway. PGBT WE was opened in phases, and the opening dates of the various segments of the facility are listed in **Table 2-3**.

**Table 2-3. Opening Dates of PGBT WE Segments**

Project Phase	Segment	Opening Date
Phase 1	SH 183 to Conflans Road	August 2009
Phase 2	Conflans Road to Egyptian Way	August 2009
Phase 3	Conflans Road to Egyptian Way (additional mainlanes)	April 2010
Phase 4	Egyptian Way to IH 20	October 2012

### 2.1.4. Sam Rayburn Tollway

The SRT corridor is approximately 26 miles in length and runs in a northeast/southwest direction between the interchange of US 75 in McKinney and Denton Tap Road near the bridge over Denton Creek in Coppell. In its 26-mile length, the SRT corridor includes 29 interchanges and has a total of three mainlane toll gantries. First of the three mainlane gantries is located at the western terminus of the corridor, to the east of Denton Tap Road. The second mainlane gantry is between the Standridge and Josey Lane interchange, and the third mainlane gantry is located between Custer Road and Exchange Parkway. The corridor intersects several major arterial as well as DNT and IH 35E. The opening dates for various segments of SRT are shown in **Table 2-4**. SRT currently

utilizes a “semi-closed” system of toll collection. Toll-free sections are currently located near the interchanges with IH 35E and DNT.

**Table 2-4. Opening Dates of SRT Segments**

Project Phase	Segment	Opening Date
Phase 1	Denton Tap Road to Old Denton Road	July 2006
Phase 2	Old Denton Road to Coit Road	August 2008
Phase 3	Coit Road to Hardin Boulevard	September 2009
Phase 4A	Hardin Boulevard to US 75	December 2010
Phase 4B	Interchange at US 75	March 2011*
Phase 5	Interchange at DNT	December 2011

\*Four direct connectors at this interchange opened in December 2010

### 2.1.5. Chisholm Trail Parkway

CTP is approximately 28 miles long and extends from US 67 in the City of Cleburne to IH 30 in the City of Fort Worth. The corridor intersects FM 1187, SH 183, and IH 20, as well as several east/west arterials including Vickery Boulevard, Berry Street, Seminary Drive, Altamesa Boulevard, and Sycamore School Road. CTP opened to traffic in May 2014.

### 2.1.6. 360 Tollway

The 360 Tollway is a 9.7-mile toll road between Camp Wisdom Road/Sublett Road in southern Tarrant County and US 287 in northwestern Ellis County and northeastern Johnson County. Built as a public/public partnership between the Texas Department of Transportation and NTTA, 360 Tollway opened to traffic on May 11, 2018.

### 2.1.7. Addison Airport Toll Tunnel

AATT is located in the town of Addison to the west of DNT between IH 635 and PGBT as shown in **Figure 2-1**. AATT is a connector for Keller Springs Road and covers a distance of approximately 3,700 feet from Midway Road to Addison Road with the actual tunnel length being 1,600 feet long traveling under the Addison Airport runway. AATT is a two-lane facility and is served by a single two-way toll gantry located at the western terminus. It opened to traffic in February 1999.

### 2.1.8. Mountain Creek Lake Bridge

MCLB is located in southwest Dallas and crosses Mountain Creek Lake and connects to Spur 303 on either side. The total length of MCLB including approach roads is approximately two miles. It is a two-lane facility served by a single two-way toll gantry located at its western terminus. MCLB was opened to traffic on April 30, 1979. Western terminus of the toll bridge connects to the President George Bush Turnpike Western Extension (PGBT WE)

### 2.1.9. Lewisville Lake Toll Bridge

LLTB is a 1.7-mile four-lane bridge in Denton County that is served by a single two-way toll gantry located at its western terminus. The western and eastern termini of the bridge lie in the cities of Lake Dallas and Little Elm, respectively. LLTB is part of a corridor that runs from IH 35E in Lake Dallas to the Dallas North Tollway in Frisco and was opened to traffic on August 1, 2009.

## 2.2. Toll Collection System and Rates

The following section provides a summary of the existing NTTA System toll collection configuration and toll rates.

### 2.2.1. TollTag Program

In July 1989, a voluntary subscription electronic toll collection (ETC) system based on automatic vehicle identification (AVI) was installed on DNT. Prior to August 1, 1999, the program, known as TollTag, charged patrons a slightly higher toll and a monthly service fee. After August 1, 1999, TollTag and cash patrons were assessed tolls under the revised cash differential toll rate scenario (\$0.60 for TollTag and \$0.75 for cash). On January 1, 2002, this same \$0.60/\$0.75 toll rate concept was implemented on the PGBT. Since its introduction, the TollTag program has gained substantial popularity due to the reduction of traffic congestion and delays at toll plazas. Approximately 15,000 TollTags were in circulation in 1989, which more than doubled to approximately 32,000 by the end of 1990 and reached the milestone of one million in November 2005. According to NTTA, there were more than 5.6 million TollTags in circulation by 2020.

### 2.2.2. ZipCash Program

Between 2007 and 2010, the NTTA replaced its cash toll collection system with an all-electronic toll collection (AET) system that includes the ZipCash program. The ZipCash system allows travelers to use NTTA facilities without a TollTag. When a motorist without a TollTag drives through tolling points, high-speed cameras take digital images of the license plate, and the tolls are billed to the registered owner of the vehicle. ZipCash toll rates are typically 50 percent higher than TollTag rates, reflecting the higher costs of collection. This surcharge is added to each toll to cover the costs of processing.

NTTA completed the conversion of all its existing toll roads, bridges and tunnels to AET in December 2010. SRT and LLTB were opened to traffic in 2008 and 2009 with an AET system and never offered a cash option. DNT's mainlane toll gantry near Wycliff Avenue was the first toll collection location that was converted to ZipCash in early 2007, and the first full facility in the NTTA System to be converted from cash to AET was PGBT in July 2009. Conversion of the rest of DNT, AATT and MCLB followed in December 2010.

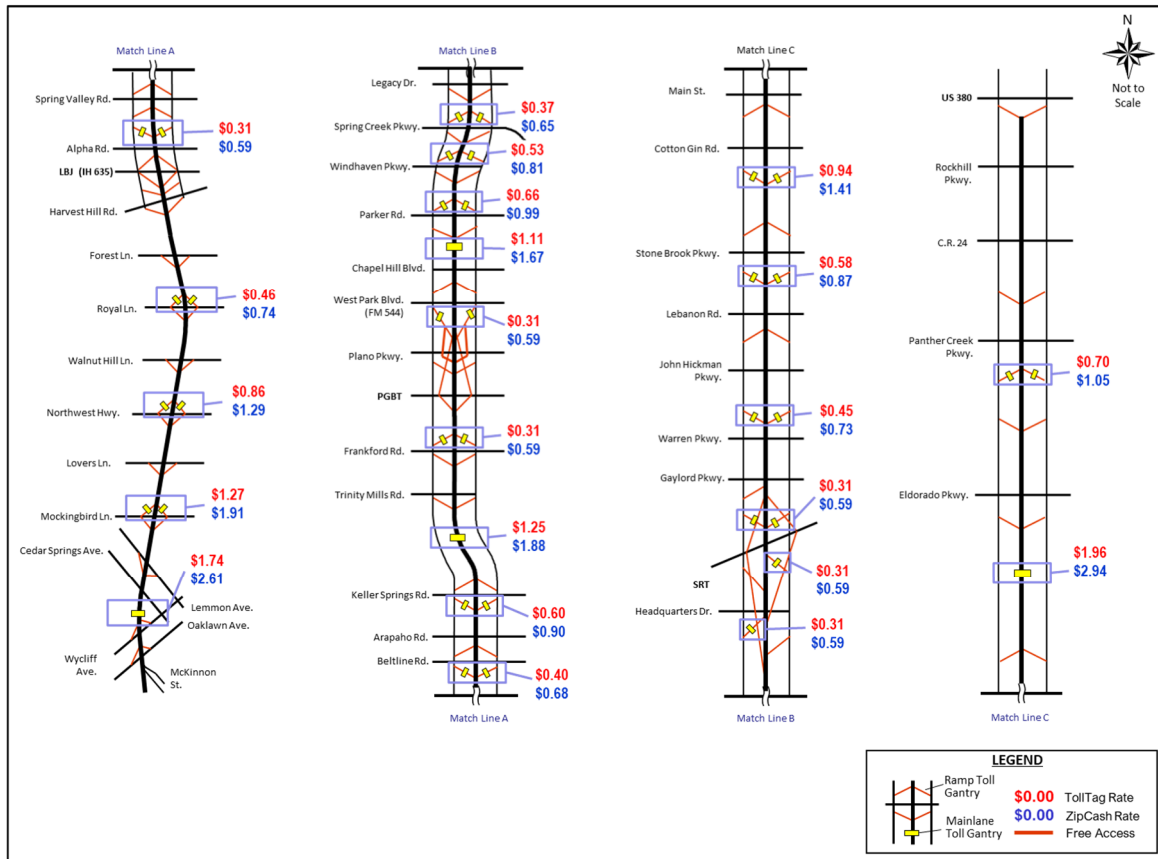
### 2.2.3. NTTA System Toll Rates

On July 1, 2009, a new toll policy went into effect on the NTTA System. Under the new toll rate policy, the base toll rate for AVI users on DNT, PGBT, SRT and PGBT WE was set at \$0.145 per mile (in 2009 dollars). On CTP, the per mile rate (in 2009 dollars) was set at \$0.185 for the segment between IH 30 and Altamesa Boulevard and \$0.145 per mile for the segment between Altamesa Boulevard and US 67. The per mile rates are to be adjusted every two years at an annual growth rate of 2.75 percent on all facilities. This toll policy was amended in late 2011, prior to the opening of the Eastern Extension of PGBT, which includes changes to the toll escalation rate on PGBT EE and toll revenue sharing terms with TxDOT. The most recent toll rate adjustment under this new policy was applied on July 1, 2021. The updated per mile AVI rate on NTTA System facilities for two-axle vehicles is approximately \$0.20 per mile. This rate applies to users with TollTags as well as other tags supported by the NTTA's various interoperability agreements.

NTTA uses an axle-based vehicle classification system for determining the toll that each vehicle pays. For example, tolls charged to vehicles with five axles are four times the toll charged to vehicles with two axles. Currently, all NTTA System facilities operate under cashless (ZipCash) toll collection system, where the license plates of vehicles using these facilities without valid transponders are photographed and are invoiced at a higher toll than the AVI toll.

### Dallas North Tollway

As shown in **Figure 2-2**, the southernmost Mainlane Gantry 1 (MLP 1) is located between Wycliff Avenue and Cedar Springs Road. Ramp toll gantries within the original segment of DNT are located at Mockingbird Lane, Northwest Highway and Royal Lane to and from the north only. On Extension Phase 1, the MLP 2 is located between Keller Springs Road and Trinity Mills Road. Ramp toll gantries within the Extension Phase 1 are located at Spring Valley Road, Belt Line Road, and Keller Springs Road to and from the south, and at Frankford Road to and from the north. The MLP 3 on Extension Phase 2 is located between Chapel Hill Boulevard and Parker Road. Ramp toll gantries within Extension Phase 2 are located to and from the south at West Park Boulevard, and to and from the north at Parker Road and Spring Creek Parkway. In addition, with the completion of SRT/DNT interchange ramp toll gantries are located to and from the south on the ramps just north of SRT. On the Extension Phase 3, the MLP 4 is located between Main Street and Eldorado Parkway. Ramp toll gantries within Extension Phase 3 are located to and from the south of John Hickman, Stonebrook Parkway, and Cotton Gin Road. Additional ramp toll gantries are located to and from the north at Eldorado Parkway.



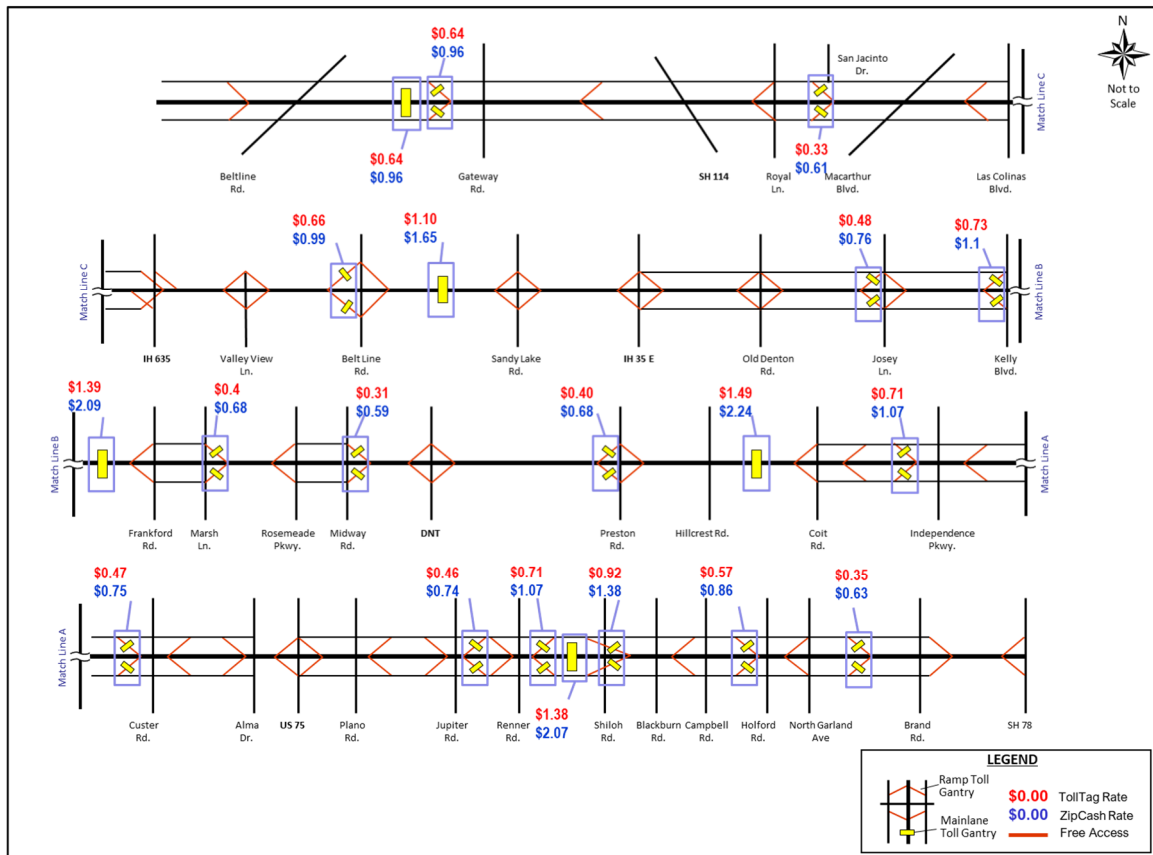


### President George Bush Turnpike (Including PGBT EE)

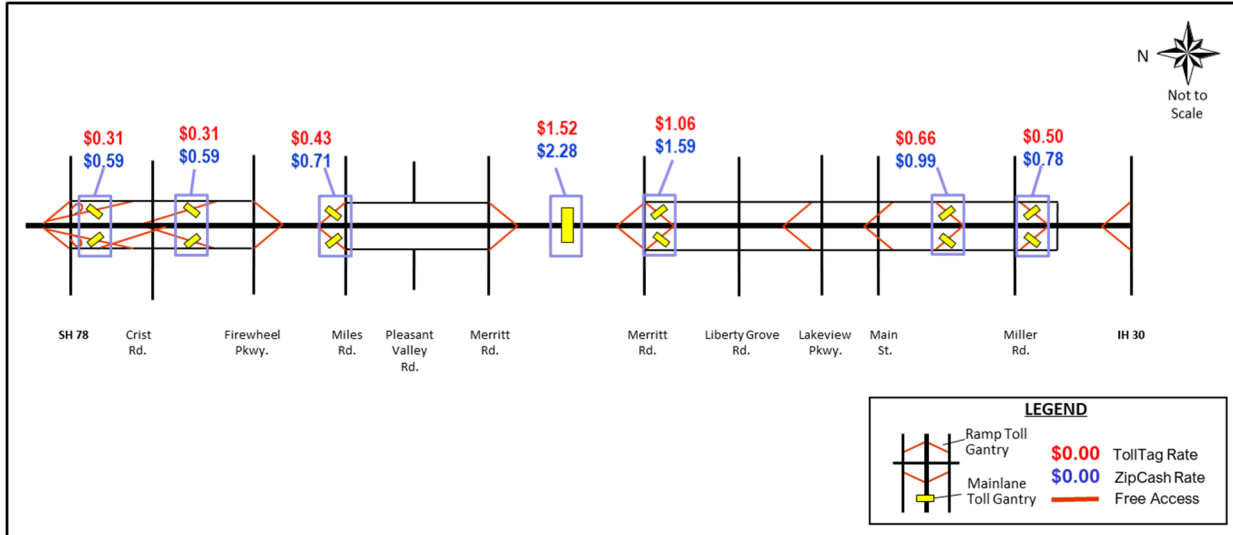
The collection system for PGBT (including PGBT EE) is presented in **Figures 2-3 and 2-4**. There are six mainlane toll gantries between IH 30 in the city of Garland and Belt Line Road in the city of Irving. MLP 5 is located near Merritt Road; MLP 6 lies between Shiloh Road and Renner Road; MLP 7 is located between Coit Road and Hillcrest Road; MLP 8 lies between Frankford Road and Kelly Boulevard; MLP 9 is located between Sandy Lake Road and Belt Line Road in Carrollton/Farmers Branch; and MLP 10 is located between Gateway Road and Belt Line Road in Irving.

When traveling eastbound on PGBT, toll gantries are located on the entrance ramps west of Gateway Road, east of Royal Lane, east of Marsh Lane, east of Midway Road, east of Coit Road, west of Custer Drive, east of Shiloh Road, east of Campbell Road, east of Garland Avenue, east of Merritt Road, east of Main Street and east of Miller Road. Toll gantries at exit ramps are located west of Belt Line Road, west of Josey Lane, west of Kelly Boulevard, west of Preston Road, east of Jupiter Road, east of Renner Road, west of Crist Road, west of Firewheel Parkway and west of Miles Road.

When traveling westbound on PGBT, toll gantries are located on the entrance ramps west of Miles Road, west of Firewheel Parkway, west of Crist Road, east of Renner Road, east of Jupiter Road, west of Preston Road, west of Kelly Boulevard, west of Josey Lane and west of Belt Line Road, while toll gantries are located on exit ramps east of Miller Road, east of Main Street, east of Merritt Road, east of Garland Avenue, east of Campbell Road, east of Shiloh Road, west of Custer Drive, east of Coit Road, east of Midway Road, east of Marsh Lane, east of Royal Lane and west of Gateway Road.



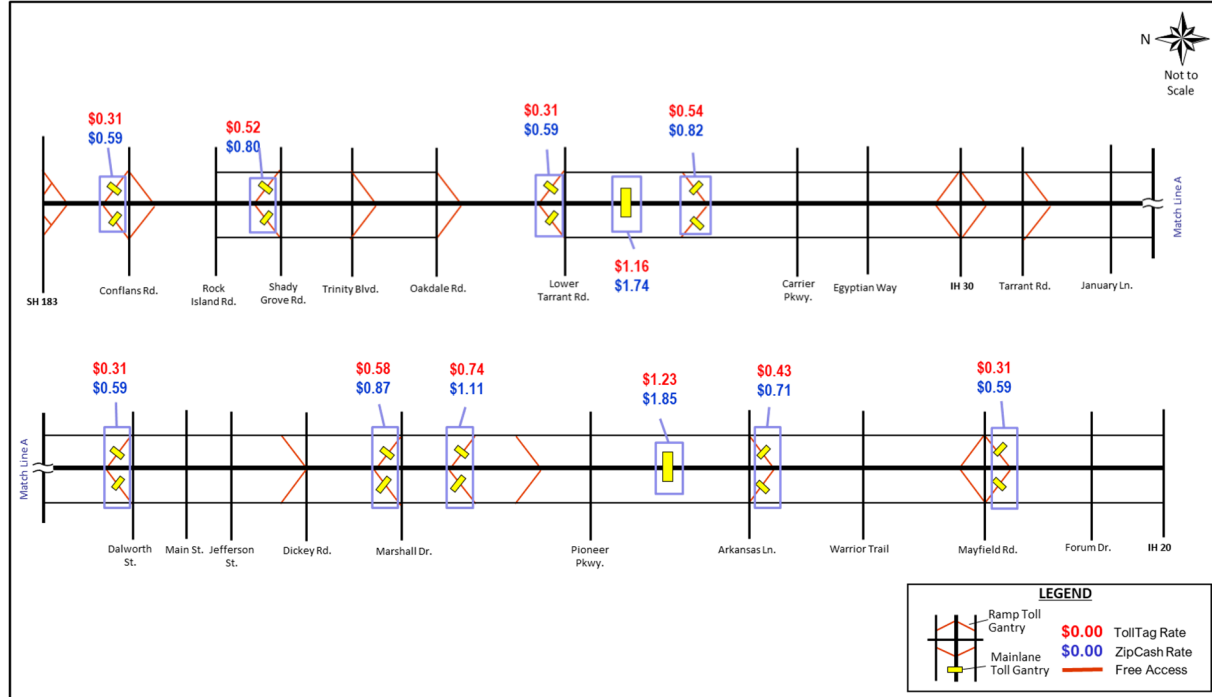
**Figure 2-3.**  
Toll Gantry Locations and 2022 Passenger Car Tolls – PGBT (Excluding PGBT EE)



**Figure 2-4.**  
Toll Gantry Locations and 2022 Passenger Car Tolls – PGBT EE

### President George Bush Turnpike Western Extension

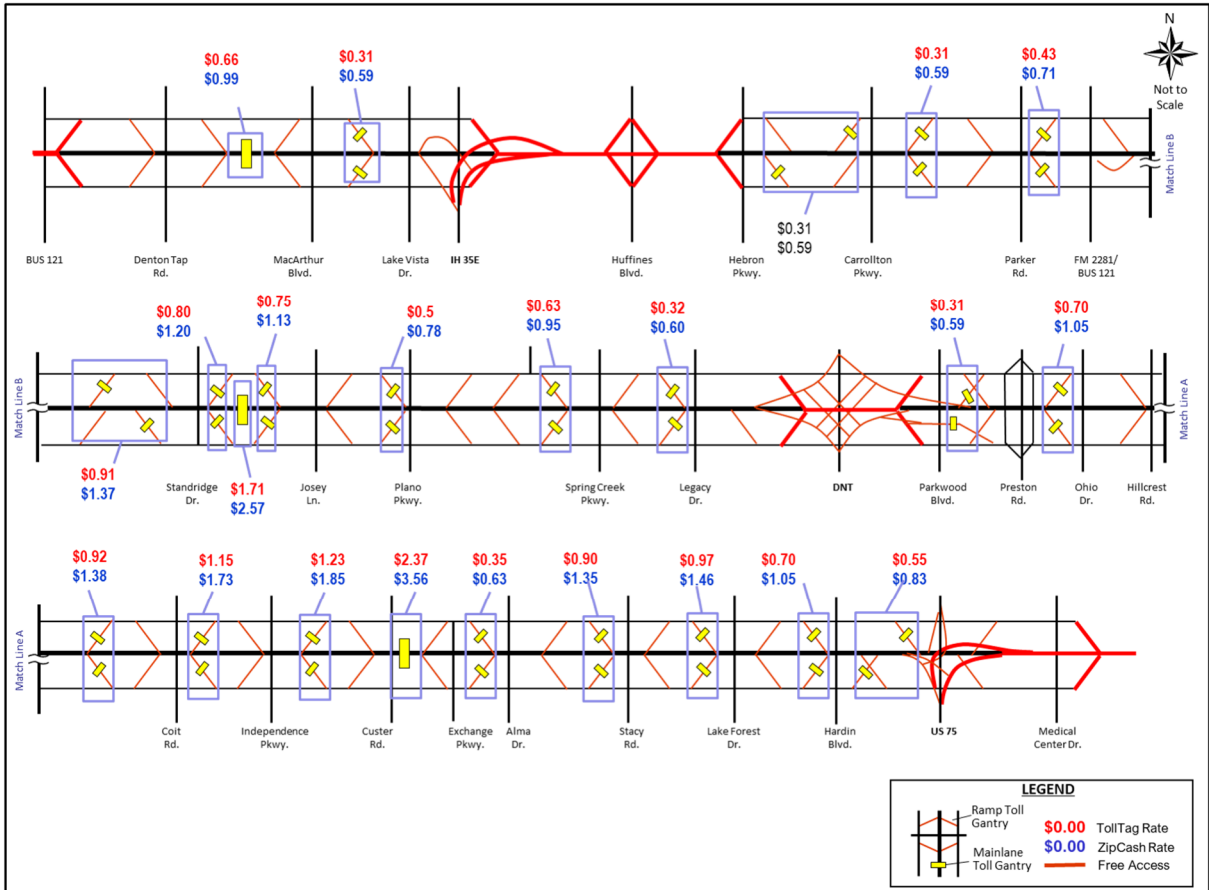
Tolls are currently collected on the PGBT WE at two mainlane gantries and eighteen ramp gantries as shown in **Figure 2-5**. The mainlane gantries are located near Lower Tarrant Road and Arkansas Lane. The ramp gantries are located at Conflans Road, Shady Grove Road, Lower Tarrant Road, Dalworth Street, Marshall Drive, Pioneer Parkway, Arkansas Lane and Mayfield Road.



**Figure 2-5.**  
Current (2022) PGBT WE Toll Collection System and Passenger Car Toll Rates

### Sam Rayburn Tollway

Tolls are currently collected on the SRT at three mainlane gantries and forty ramp gantries as shown in **Figure 2-6**. The mainlane gantries are located near Denton Tap Road, Josey Lane and Custer Road. The ramp gantries are located at MacArthur Boulevard, Carrollton Parkway, Parker Road, FM 2281, Standridge Drive, Josey Lane, Plano Parkway, Spring Creek Parkway, Preston Road, Ohio Drive, Coit Road, Independence Parkway, Custer Road, Alma Drive, Stacy Road, Lake Forest Drive and Hardin Boulevard.



**Figure 2-6.**  
Current (2022) SRT Toll Collection System and Passenger Car Toll Rates

### Chisholm Trail Parkway

Tolls are currently collected on the CTP at three mainlane gantries and twenty-four ramp gantries as shown in **Figure 2-7**. The mainlane gantries are located near Hulen Street, FM 1187 and CR 904. The ramp gantries are located at Edwards Ranch Road, Arborlawn Drive, Oakmont Boulevard, Altamesa Boulevard, Sycamore School Road, McPherson Boulevard, FM 1187, CR 920, CR 913, FM 917, CR 904 and Sparks Drive.

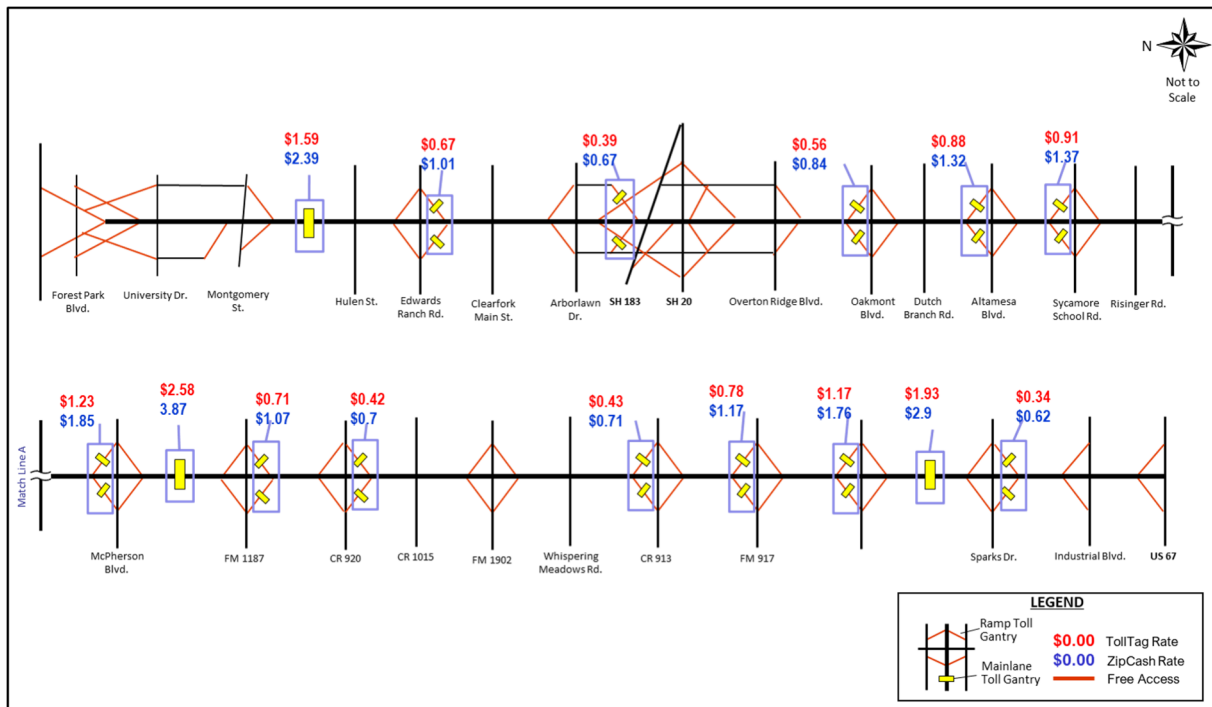
### 360 Tollway

Tolls are currently collected on 360 Tollway at two mainlane gantries and six ramp gantries as shown in **Figure 2-8**. The mainlane gantries are located near New York Avenue and Heritage Parkway. The ramp gantries are located at Holland Road, Debbie Lane, and Southeast Parkway. The current toll rates (effective through June 30, 2023) on various 360 Tollway gantries are shown in **Table 2-5**.

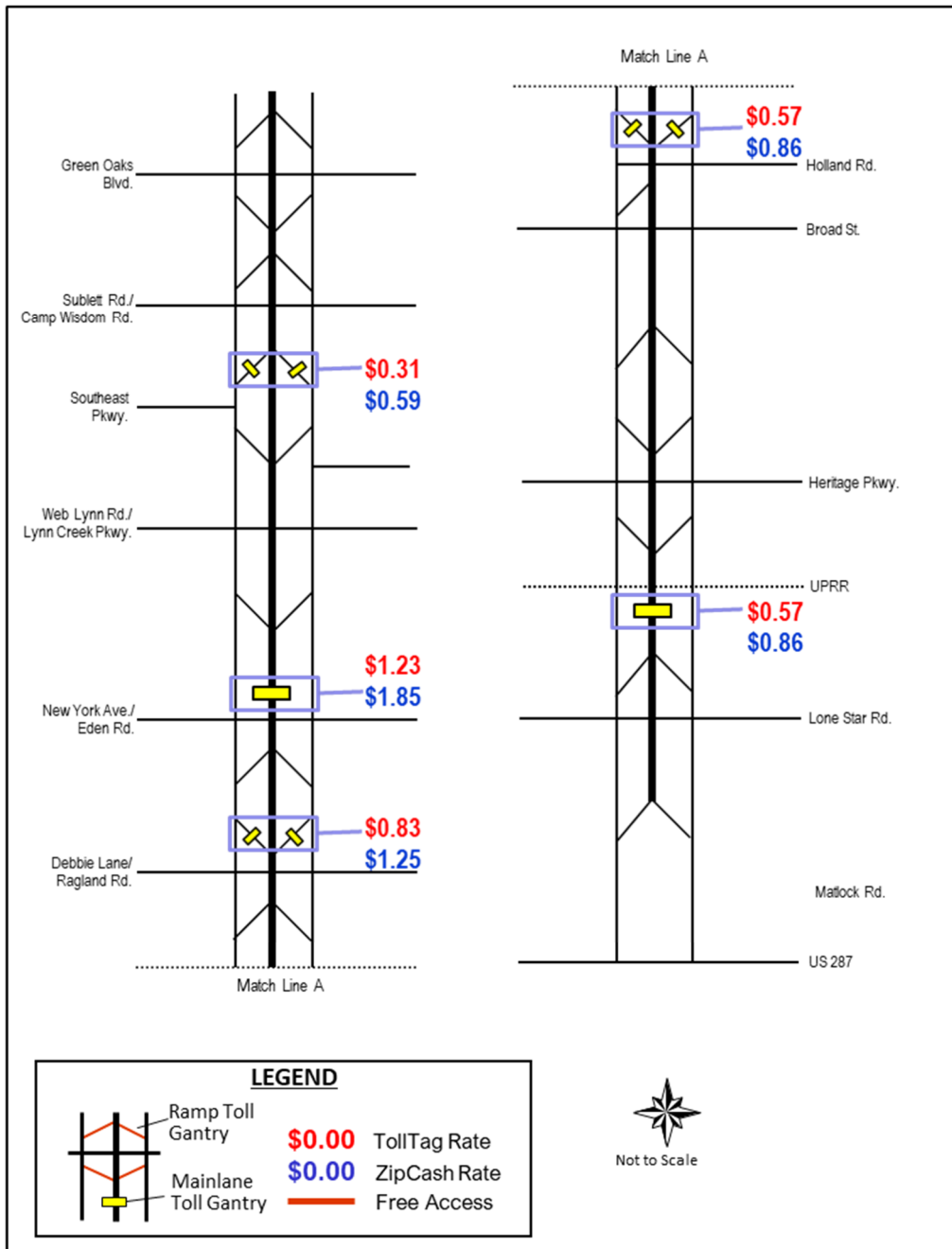
### AATT, MCLB and LLTB

As stated previously, the AATT, MCLB and LLTB are each served by a single mainlane toll gantry. The mainlane gantry for the AATT is positioned at the western terminus of the tunnel. The mainlane gantry for the MCLB is located at the bridge’s western terminus. The LLTB’s mainlane gantry is located at the western end of the bridge in Lake Dallas.

The current toll rates (effective through June 30, 2023) on various NTTA gantries are shown in **Table 2-5**.



**Figure 2-7.**  
Current (2022) CTP Toll Collection System and Passenger Car Toll Rates



**Figure 2-8.**  
**Current (2022) 360 Tollway Toll Collection System and Passenger Car Toll Rates**

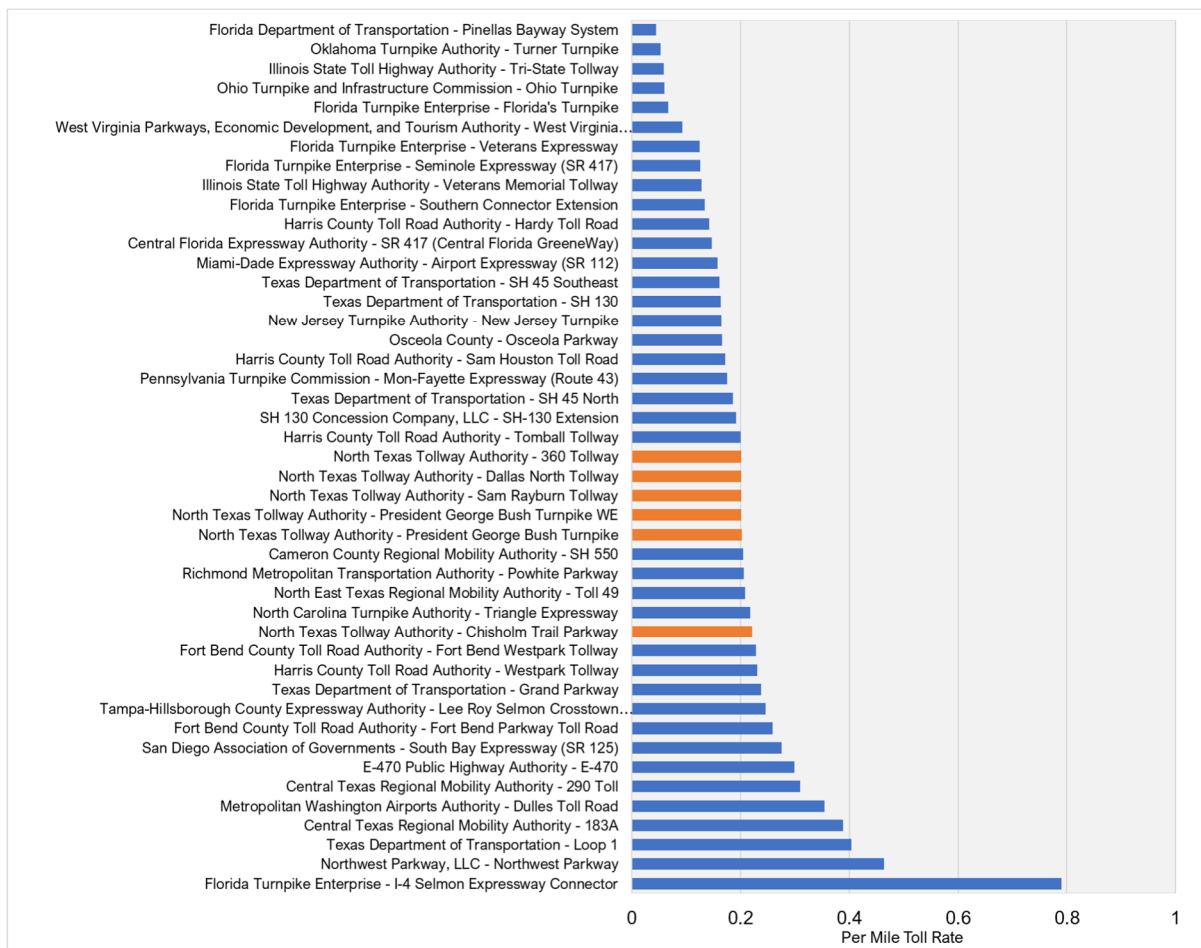
**Table 2-5. Existing NTTA System Toll Rates for Two-Axle Vehicles**

DNT	TT	ZC	PGBT	TT	ZC	CTP	TT	ZC
<b>MLG 1 (Wycliff)</b>	<b>\$1.74</b>	<b>\$2.61</b>	Miller Road	\$0.50	\$0.78	<b>MLG 1 (Montgomery)</b>	<b>\$1.59</b>	<b>\$2.39</b>
Mockingbird Lane	\$1.27	\$1.91	Main Street	\$0.66	\$0.99	Edwards Ranch Road	\$0.67	\$1.01
Northwest Highway	\$0.86	\$1.29	Merritt Road	\$1.06	\$1.59	Arborlawn Drive	\$0.39	\$0.67
Royal Lane	\$0.46	\$0.74	<b>MLG 5 (Merritt)</b>	<b>\$2.00</b>	<b>\$3.00</b>	Oakmont Boulevard	\$0.56	\$0.84
Spring Valley Road	\$0.31	\$0.59	Miles Road	\$0.43	\$0.71	Altamesa Boulevard	\$0.88	\$1.32
Belt Line Road	\$0.40	\$0.68	Firewheel Parkway	\$0.31	\$0.59	Sycamore School Road	\$0.91	\$1.37
Keller Springs Road	\$0.60	\$0.90	Crist Road	\$0.31	\$0.59	McPherson Boulevard	\$1.23	\$1.85
<b>MLG 2 (Trinity Mills)</b>	<b>\$1.25</b>	<b>\$1.88</b>	North Garland Avenue	\$0.35	\$0.63	<b>MLG 2 (Stewart Feltz)</b>	<b>\$2.58</b>	<b>\$3.87</b>
Frankford Road	\$0.31	\$0.59	Campbell Road	\$0.57	\$0.86	FM 1187	\$0.71	\$1.07
FM 544	\$0.31	\$0.59	East Renner Road	\$0.92	\$1.38	CR 920	\$0.42	\$0.70
<b>MLG 3 (Parker)</b>	<b>\$1.11</b>	<b>\$1.67</b>	<b>MLG 6 (Shiloh)</b>	<b>\$1.38</b>	<b>\$2.07</b>	CR 913	\$0.43	\$0.71
Parker Road	\$0.66	\$0.99	Shiloh Road	\$0.71	\$1.07	FM 917	\$0.78	\$1.17
Windhaven Parkway	\$0.53	\$0.81	West Renner Road	\$0.46	\$0.74	CR 904	\$1.17	\$1.76
Spring Creek Parkway	\$0.37	\$0.65	Independence Parkway	\$0.47	\$0.75	<b>MLG 3 (Sparks)</b>	<b>\$1.93</b>	<b>\$2.90</b>
Gaylord Parkway	\$0.31	\$0.59	Coit Road	\$0.71	\$1.07	Sparks Road	\$0.34	\$0.62
Legacy Drive	\$0.31	\$0.59	<b>MLG 7 (Coit)</b>	<b>\$1.49</b>	<b>\$2.24</b>			
Headquarters Drive	\$0.31	\$0.59	Preston Road	\$0.40	\$0.68	<b>360 Tollway</b>	<b>TT</b>	<b>ZC</b>
Lebanon Road	\$0.45	\$0.73	Midway Road	\$0.31	\$0.59	Webb Lynn Road	\$0.57	\$0.86
Stone Brook Parkway	\$0.58	\$0.87	Marsh Lane	\$0.40	\$0.68	<b>New York Mainlane Gantry</b>	<b>\$1.23</b>	<b>\$1.85</b>
Cotton Gin Rd./Main St.	\$0.94	\$1.41	<b>MLG 8 (Frankford)</b>	<b>\$1.39</b>	<b>\$2.09</b>	New York Avenue	\$0.83	\$1.25
<b>MLG 4 (Eldorado)</b>	<b>\$1.96</b>	<b>\$2.94</b>	Kelly Boulevard	\$0.73	\$1.10	Debbie Lane	\$0.31	\$0.59
Eldorado Parkway	\$0.70	\$1.05	Josey Lane	\$0.48	\$0.76	<b>Lone Star Mainlane Gantry</b>	<b>\$0.57</b>	<b>\$0.86</b>
			<b>MLG 9 (Sandy Lake)</b>	<b>\$1.10</b>	<b>\$1.65</b>			
<b>SRT</b>			Belt Line Road North	\$0.66	\$0.99			
<b>MLG 1 (Denton Tap)</b>	<b>\$0.66</b>	<b>\$0.99</b>	Royal Lane	\$0.33	\$0.61			
MacArthur Boulevard	\$0.31	\$0.59	Belt Line Road South	\$0.64	\$0.96			
Carrollton Parkway	\$0.31	\$0.59	<b>MLG 10 (Belt Line)</b>	<b>\$0.64</b>	<b>\$0.96</b>			
Parker Road	\$0.43	\$0.71	Conflans Road	\$0.31	\$0.59			
Old Denton Road	\$0.50	\$0.78	Shady Grove Road	\$0.52	\$0.80			
Standridge Drive West	\$0.75	\$1.13	Lower Tarrant North	\$0.54	\$0.82			
Josey Lane West	\$0.91	\$1.37	<b>MLG 11 (Lower Tarrant)</b>	<b>\$1.16</b>	<b>\$1.74</b>			
<b>MLG 2 (Josey)</b>	<b>\$1.71</b>	<b>\$2.57</b>	Lower Tarrant South	\$0.31	\$0.59			
Standridge Drive East	\$0.97	\$1.46	Dalworth Street	\$0.31	\$0.59			
Josey Lane East	\$0.80	\$1.20	Marshall Drive	\$0.58	\$0.87			
Plano Parkway	\$0.63	\$0.95	Pioneer Parkway	\$0.74	\$1.11			
Spring Creek Parkway	\$0.32	\$0.60	<b>MLG 12 (Arkansas)</b>	<b>\$1.23</b>	<b>\$1.85</b>			
Preston Road	\$0.31	\$0.59	Arkansas Lane	\$0.43	\$0.71			
Hillcrest Road	\$0.31	\$0.59	Mayfield Road	\$0.31	\$0.59			
Coit Road	\$0.70	\$1.05						
Independence Parkway	\$0.92	\$1.38	<b>Addison Airport Toll Tunnel</b>	<b>TT</b>	<b>ZC</b>			
Custer Road	\$1.15	\$1.73	Mainlane Gantry	\$0.70	\$1.05	<b>TollTag Rate</b>		
<b>MLG 3 (Custer)</b>	<b>\$2.37</b>	<b>\$3.56</b>				\$0.201 per mile		
Exchange Parkway	\$1.23	\$1.85	<b>Mountain Creek Lake Bridge</b>	<b>TT</b>	<b>ZC</b>			
Alma Drive	\$0.90	\$1.35	Mainlane Gantry	\$1.39	\$2.09	<b>ZipCash Rate</b>		
Stacy Road	\$0.70	\$1.05				TollTag rate + 50% surcharge (\$0.28 minimum)		
Lake Forest Drive	\$0.55	\$0.83	<b>Lewisville Lake Toll Bridge</b>	<b>TT</b>	<b>ZC</b>			
Hardin Boulevard	\$0.35	\$0.63	Mainlane Gantry	\$0.70	\$1.05	<b>Minimum Toll:</b>		
						\$0.31 (TollTag) / \$0.59 (ZipCash)		

Note: Tolls for vehicles with more than two axles are calculated using the (N-1) multiplier.

### 2.2.4. Comparison of Per-Mile Toll Rates

The average per-mile toll rates for passenger cars on the NTTA System are compared with other representative urban toll facilities throughout the United States in **Figure 2-9**. In general, toll rates on the NTTA System fall within the range of rates on other urban toll facilities. Currently, the average per-mile toll rate for two-axle vehicles is approximately \$0.20 per mile on all NTTA facilities for TollTag/AVI users, while ZipCash users are charged \$0.20 per mile plus a 50 percent surcharge with a minimum surcharge of \$0.28 per transaction. All the NTTA facilities employ “N-1” factor multiplier method to determine commercial vehicle (CV) toll rates. As per this method, the toll rate for a vehicle is computed as  $(N-1) \times (\text{two-axle toll rate})$ , where “N” is the number of axles on the vehicle, including any connected trailers. It should be noted that for most of the agencies using this method, a two-axle commercial truck, such as a delivery service or moving truck, is charged same as a two-axle passenger car.



**Figure 2-9.**  
Per Mile AVI Toll Rate Comparison to Other Toll Facilities

## 2.3. Annual Transaction Trends

CDM Smith evaluated transaction trends on the NTTA System from January 1, 2007 through June 30, 2022. This evaluation was used to provide a general understanding of the current, as well as historical, performance of the NTTA System facilities. The analysis provided useful insight into the effect that major toll configuration changes, such as the addition of extension projects, toll increases, and the impact COVID-19 pandemic have had on NTTA System growth trends.

### 2.3.1. Trends in Average Daily Transactions

Trends in annual average daily transactions from January 2010 to June 2022 for the NTTA System facilities are presented in **Table 2-6** and are based on unaudited transaction data from NTTA. Between 2010 and 2019, the average daily transaction for NTTA System has been growing at an annual rate ranging between 1.5 percent and 13.0 percent. However, due to the COVID-19 pandemic 2020 and 2021 transactions were lower than 2019 average daily transactions. However, in 2022 (through June 30) average daily transactions were higher by less than 0.1 percent than 2019 transactions.

In 2022 (through June 30), daily transactions averaged approximately 756,700 on the DNT. Annual average daily transactions was 0.9 percent lower than 2019. With the exception of 2017 (fourth lane expansion), 2020 and 2021 (COVID-19 pandemic), transactions on DNT have experienced consistent positive growth over the last ten years showing strong growth. After the complete opening of PGBT EE and PGBT WE in 2013 transactions on the PGBT (including PGBT EE and PGBT WE) have seen a consistent positive growth trajectory. Since 2013, the transactions increased from 797,100 daily transactions to 958,400 transactions in 2019. However, transactions on the PGBT (including PGBT EE and PGBT WE) declined by 2.6 percent between 2019 and 2022 (through June 30).

Transaction growth on the SRT has continued to be strong on the SRT since 2010. However, transactions on the SRT declined by 0.5 percent between 2019 and 2022 (through June 30). Transaction growth on the CTP has continued to be strong since its opening in 2014. Moreover, average daily transactions in 2022 are 10.4 percent higher than its average daily transactions in 2019. Transaction growth on the 360T has continued to be strong since its opening in 2018. Except for 2020, 360T has continued to grow strongly. Moreover, average daily transactions in 2022 are about 50 percent higher than its average daily transactions in 2019.

As indicated in **Table 2-6**, AATT saw consistent positive transaction growth between 2011 and 2015 but is on a declining trend since 2016. Moreover, transactions on the AATT declined by 11.6 percent between 2019 and 2022 (through June 30). Since its opening in November 1979, the MCLB has been subject to alternative periods of both positive and negative transactions and toll revenue growth, as is evident in **Table 2-6**. However, until 2019, transactions on the MCLB have typically seen positive growth. However, transactions on the MCLB declined by 9.1 percent between 2019 and 2022 (through June 30). Transactions on the LLTB has seen consistent positive transaction growth since its opening in 2009, and growth in transactions jumped noticeably since 2016 following the completion of the Eldorado Parkway corridor through Little Elm and Frisco. In addition to CTP, LLTB has also seen a positive growth between 2019 and 2022 average daily transactions. The average daily transactions for LLTB has increased by 8 percent.



Table 2-6. NTTA System Annual Average Daily Transactions (thousands)

Year	DNT	PGBT	SRT	CTP	AATT	MCLB	LLTB	360 T	Total
2010	563.8	523.8	244.4	--	4.8	7.3	8.2	--	1,352.3
2011	590.5	578.0	272.0	--	5.3	6.7	9.7	--	1,462.3
Change	4.7%	10.3%	11.3%	--	11.1%	-7.6%	18.7%	--	8.1%
2012	629.3	695.2	304.9	--	5.5	6.9	10.7	--	1,652.4
Change	6.6%	20.3%	12.1%	--	3.4%	2.3%	10.0%	--	13.0%
2013	638.9	797.1	328.6	--	5.8	6.5	11.1	--	1,788.0
Change	1.5%	14.7%	7.8%	--	4.7%	-6.1%	3.7%	--	8.2%
2014	668.3	850.5	360.5	40.1	6.3	6.6	12.0	--	1,944.2
Change	4.6%	6.7%	9.7%	--	9.0%	1.6%	8.0%	--	8.7%
2015	702.2	892.3	388.2	66.5	6.7	7.0	12.7	--	2,075.6
Change	5.1%	4.9%	7.7%	66.1%	6.4%	5.8%	6.0%	--	6.8%
2016	714.5	935.8	416.4	81.5	6.3	7.4	15.1	--	2,176.9
Change	1.8%	4.9%	7.3%	22.5%	-5.6%	5.8%	18.4%	--	4.9%
2017	707.8	940.1	436.7	94.2	5.9	7.3	17.4	--	2,209.4
Change	-0.9%	0.5%	4.9%	15.6%	-6.8%	-1.2%	15.7%	--	1.5%
2018	733.6	946.9	459.4	104.0	5.5	7.4	19.3	24.1	2,300.3
Change	3.6%	0.7%	5.2%	10.4%	-5.8%	2.2%	10.8%	--	4.1%
2019	763.7	958.4	464.7	110.5	5.2	7.1	21.5	45.5	2,376.6
Change	4.1%	1.2%	1.1%	6.2%	-5.7%	-4.2%	11.0%	11.0%	3.3%
2020	582.6	732.6	352.1	92.2	3.7	5.9	19.1	42.5	1,830.6
Change	-23.7%	-23.6%	-24.2%	-16.6%	-29.3%	-17.5%	-11.0%	-6.4%	-23.0%
2021	722.6	902.5	432.7	115.5	4.3	6.6	21.7	63.1	2,269.1
Change	24.0%	23.2%	22.9%	25.3%	17.3%	12.4%	13.8%	48.3%	24.0%
2022*	756.7	933.8	462.4	122.0	4.6	6.5	23.2	68.1	2,377.3
Change	4.7%	3.5%	6.9%	5.6%	6.5%	-2.0%	6.6%	7.9%	4.8%

Source: Unaudited NTTA Transaction and Revenue Data

\*2022 includes data till June 31st

### 2.3.2. Trends in Monthly Transactions: NTTA System

Tables 2-7 through 2-11 show the monthly transactions for each facility from January 2010 through June 2022. As can be seen from these tables, transactions on NTTA facilities have increased from 2010 through 2019, followed by a noticeable dip in 2020 after the onset of COVID-19 pandemic. However, 2021 transactions show recovery from the COVID-19 travel constraints and recessionary impacts. As shown in Table 2-12, overall NTTA system continues to show strong growth, month over month, in 2022 as compared to 2021.

Average monthly transaction variations on the NTTA System facilities for 2021 are presented as an index of the monthly transactions, as illustrated in Table 2-13. The peak travel months on DNT PGBT in 2021 were June through October, while the lightest travel months on the DNT were January and February due to the extreme cold weather on travel in the DFW region during the months. The SRT saw its peak month in December, with transactions at 11 percent higher than the annual average. The CTP experienced its lowest traffic in February and the highest transactions of the year in October. All the bridge tunnels, MCLB, AATT and LLTB experienced their highest traffic volumes in the summer months, while their highest levels of demand was recorded in October. Peak travel on the 360T in 2021 occurred October through December, during which transactions were 10 to 14 percent above the annual average. The lowest traveled month on 360T in 2021 was February.

Table 2-7. Monthly Transaction Trends – Dallas North Tollway (millions)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2010	16.2	15.4	17.8	17.6	17.5	17.4	17.2	17.5	16.8	17.8	16.6	17.9	205.8
2011	16.8	14.6	18.8	18.4	18.5	18.3	17.6	18.6	18.1	18.8	18.2	19.0	215.6
Change	3.2%	-4.8%	6.0%	4.7%	5.5%	4.9%	2.3%	6.0%	7.4%	5.6%	9.3%	6.2%	4.8%
2012	18.9	18.4	19.7	19.2	20.0	19.4	19.1	19.8	18.3	20.0	18.6	18.8	230.3
Change	13.0%	26.2%	4.8%	3.9%	8.3%	6.0%	8.4%	6.6%	1.5%	6.2%	2.5%	-1.1%	6.8%
2013	18.9	18.1	20.0	19.8	20.4	19.6	19.6	20.5	19.2	20.6	18.7	17.8	233.2
Change	-0.3%	-2.0%	1.1%	3.1%	2.0%	0.9%	2.5%	3.5%	4.7%	3.3%	0.6%	-5.0%	1.2%
2014	19.7	18.1	20.2	20.6	21.1	20.4	20.6	20.9	20.3	21.7	19.4	21.0	244.0
Change	4.1%	-0.2%	1.1%	4.3%	3.5%	4.3%	5.5%	1.9%	5.7%	5.0%	3.7%	17.7%	4.6%
2015	20.5	18.0	21.6	21.8	22.0	22.1	22.1	22.1	21.4	22.3	20.4	22.0	256.4
Change	4.2%	-0.1%	6.8%	5.8%	4.3%	8.6%	7.1%	5.9%	5.7%	2.9%	5.0%	4.8%	5.1%
2016	21.4	21.0	22.5	22.1	22.4	21.6	21.6	22.3	21.5	22.2	20.9	21.8	261.5
Change	4.4%	16.7%	4.6%	1.5%	1.5%	-2.4%	-2.4%	1.0%	0.5%	-0.3%	2.4%	-0.8%	2.0%
2017	21.2	20.2	22.8	21.5	22.8	21.7	21.5	21.7	21.0	22.0	21.0	21.0	258.4
Change	-1.0%	-4.0%	1.3%	-3.0%	1.9%	0.5%	-0.3%	-2.8%	-2.5%	-1.3%	0.6%	-3.7%	-1.2%
2018	21.2	19.6	22.8	22.3	23.5	23.0	22.4	23.5	21.5	23.3	22.1	22.4	267.7
Change	0.2%	-2.9%	0.0%	3.9%	2.9%	6.1%	4.2%	8.2%	2.5%	6.0%	5.4%	6.7%	3.6%
2019	22.5	21.1	23.6	23.3	24.1	23.4	23.6	24.2	22.9	24.2	22.6	23.4	278.8
Change	6.2%	7.4%	3.2%	4.4%	2.7%	1.3%	5.1%	2.8%	6.5%	4.2%	1.9%	4.4%	4.1%
2020	23.0	22.3	16.3	9.5	13.9	17.0	17.1	18.2	18.5	19.9	18.3	19.4	213.2
Change	2.1%	6.0%	-30.7%	-59.3%	-42.3%	-27.4%	-27.7%	-24.8%	-19.5%	-17.8%	-18.9%	-17.3%	-23.5%
2021	18.5	14.7	22.3	22.1	22.7	23.2	23.3	23.1	22.8	24.2	23.0	23.8	263.7
Change	-19.4%	-33.9%	36.5%	133.8%	63.2%	36.9%	36.5%	27.0%	23.6%	21.4%	25.5%	22.9%	23.7%
2022	21.2	19.0	24.4	24.2	24.5	23.6							137.0
Change	14.3%	28.6%	9.5%	9.4%	8.2%	1.9%							

Source: Unaudited NTTA Transaction Data

Table 2-8. Monthly Transaction Trends – President George Bush Turnpike (millions)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2010	14.4	13.8	16.2	16.2	16.4	16.4	16.2	16.7	16.1	16.9	15.8	16.2	191.2
2011	15.6	13.2	17.4	17.1	17.4	17.8	17.1	18.1	17.5	18.1	17.0	17.9	204.1
Change	8.0%	-3.7%	7.4%	5.2%	6.2%	8.7%	5.5%	8.3%	8.6%	7.0%	7.3%	10.8%	6.7%
2012	19.4	19.3	20.9	20.6	22.0	21.5	21.1	21.9	20.3	22.9	22.2	22.1	254.1
Change	24.6%	45.7%	20.5%	20.5%	26.2%	20.7%	23.0%	21.1%	16.1%	26.6%	30.8%	23.6%	24.5%
2013	22.4	21.7	24.2	24.4	25.8	24.7	24.9	26.0	24.4	26.2	24.1	21.9	290.9
Change	15.0%	12.4%	15.6%	18.7%	17.4%	15.2%	18.5%	18.6%	20.3%	14.8%	8.8%	-0.8%	14.5%
2014	24.4	22.7	25.6	26.5	27.2	26.4	26.7	26.7	26.0	27.6	24.7	26.1	310.5
Change	8.9%	4.5%	5.7%	8.3%	5.7%	6.7%	6.9%	2.7%	6.5%	5.1%	2.4%	19.1%	6.7%
2015	25.5	22.5	27.0	27.8	28.0	28.6	28.6	28.1	27.6	28.5	26.1	27.7	325.9
Change	4.7%	-0.9%	5.6%	5.1%	2.6%	8.2%	7.1%	5.2%	6.1%	3.4%	5.5%	6.0%	4.9%
2016	26.9	26.9	29.0	28.8	29.4	29.4	28.7	29.7	28.7	29.4	27.6	28.0	342.4
Change	5.4%	20.0%	7.1%	3.6%	5.1%	2.9%	0.3%	5.7%	4.2%	2.9%	5.8%	1.2%	5.1%
2017	27.1	26.1	30.0	28.6	30.2	29.6	28.6	29.8	28.2	29.7	28.0	27.2	343.1
Change	0.9%	-3.1%	3.5%	-0.8%	2.9%	0.7%	-0.1%	0.3%	-1.8%	1.1%	1.4%	-2.9%	0.2%
2018	27.1	25.6	30.0	29.0	30.7	29.8	29.3	30.7	27.7	29.7	28.4	27.7	345.6
Change	0.0%	-2.1%	-0.1%	1.5%	1.4%	0.8%	2.2%	3.0%	-1.9%	0.1%	1.4%	2.0%	0.7%
2019	27.9	26.6	29.8	29.4	30.4	29.5	29.7	30.5	28.8	30.8	28.0	28.5	349.8
Change	2.9%	3.9%	-0.5%	1.4%	-0.7%	-1.1%	1.5%	-0.8%	4.1%	3.4%	-1.2%	2.8%	1.2%
2020	28.3	27.7	21.3	13.1	17.8	21.4	21.8	23.0	22.9	24.7	22.6	23.4	268.1
Change	1.5%	4.3%	-28.4%	-55.4%	-41.4%	-27.4%	-26.7%	-24.5%	-20.4%	-19.5%	-19.4%	-18.0%	-23.4%
2021	22.5	18.1	28.0	27.5	28.2	29.4	29.4	29.0	28.6	31.4	28.5	28.9	329.4
Change	-20.5%	-34.6%	31.3%	109.3%	57.9%	37.5%	35.0%	26.0%	24.5%	26.9%	26.2%	23.8%	22.9%
2022	25.3	23.3	30.1	30.1	30.6	29.6							169.0
Change	12.4%	28.5%	7.6%	9.6%	8.8%	0.7%							

Source: Unaudited NTTA Transaction Data

Table 2-9. Monthly Transaction Trends – Sam Rayburn Tollway (millions)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2010	6.5	6.1	7.3	7.3	7.7	7.7	7.8	7.9	7.5	7.9	7.5	8.1	89.3
2011	7.5	6.5	8.3	8.2	8.6	8.7	8.5	8.7	8.3	8.6	8.4	8.9	99.4
Change	16.7%	5.5%	14.9%	11.8%	11.8%	12.8%	9.4%	10.1%	11.3%	9.0%	11.7%	11.0%	11.3%
2012	8.6	8.5	9.2	9.1	9.7	9.7	9.5	9.8	9.1	9.8	9.3	9.3	111.6
Change	14.4%	30.9%	10.2%	11.7%	13.3%	11.4%	11.2%	12.4%	9.2%	13.1%	10.1%	4.4%	12.3%
2013	9.2	8.8	9.9	9.9	10.4	10.3	10.4	10.8	10.1	10.7	10.0	9.4	120.0
Change	6.4%	4.1%	7.7%	8.6%	6.9%	6.4%	9.2%	10.3%	10.8%	9.9%	8.2%	1.0%	7.5%
2014	10.3	9.4	10.7	11.0	11.5	11.3	11.4	11.5	11.0	11.7	10.6	11.3	131.6
Change	11.6%	6.6%	8.0%	10.6%	10.9%	9.7%	9.8%	6.7%	9.2%	8.9%	5.5%	19.9%	9.7%
2015	10.8	9.5	11.6	11.8	12.2	12.5	12.7	12.5	12.0	12.3	11.5	12.4	141.8
Change	5.6%	0.6%	8.1%	7.9%	5.9%	11.0%	11.1%	8.3%	9.1%	5.7%	9.1%	9.2%	7.7%
2016	11.8	11.7	12.7	12.6	13.1	13.1	13.1	13.2	12.6	13.1	12.4	12.9	152.4
Change	9.1%	23.5%	10.1%	6.6%	7.4%	4.9%	3.3%	5.7%	5.2%	6.2%	7.9%	4.2%	7.5%
2017	12.3	11.7	13.5	13.2	14.1	13.8	13.5	13.9	13.1	13.8	13.2	13.3	159.4
Change	3.8%	0.6%	6.4%	4.4%	7.4%	5.1%	3.1%	5.3%	4.0%	4.9%	6.3%	3.5%	4.6%
2018	13.0	12.0	14.4	13.9	14.8	14.7	14.4	14.9	13.5	14.4	14.0	13.9	167.7
Change	6.1%	2.2%	6.3%	5.3%	5.1%	6.3%	6.6%	7.1%	2.8%	4.6%	5.6%	4.0%	5.2%
2019	13.6	12.7	14.4	14.2	14.9	14.4	14.7	14.7	13.8	14.6	13.6	14.0	169.6
Change	4.2%	5.9%	-0.2%	2.1%	0.9%	-1.7%	2.1%	-1.1%	2.4%	1.6%	-2.5%	1.2%	1.1%
2020	13.4	12.9	9.9	6.1	8.7	10.5	10.7	11.1	11.1	11.8	11.1	11.5	128.9
Change	-1.4%	1.4%	-31.1%	-57.0%	-41.5%	-26.9%	-26.9%	-24.3%	-20.1%	-18.9%	-18.8%	-17.8%	-24.0%
2021	10.9	8.6	13.1	12.9	13.5	14.0	14.5	13.9	13.6	14.5	14.0	14.5	157.9
Change	-18.7%	-33.6%	32.1%	112.3%	54.6%	32.8%	35.1%	24.8%	22.6%	22.4%	26.9%	26.4%	22.6%
2022	12.5	11.3	14.9	14.8	15.3	14.8							83.7
Change	15.3%	31.4%	13.9%	14.8%	13.7%	6.1%							

Source: Unaudited NTTA Transaction Data

Table 2-10. Monthly Transaction Trends – Chisholm Trail Parkway (millions)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2014	--	--	--	--	0.6	0.9	1.0	1.2	1.3	1.4	1.4	1.6	9.5
2015	1.7	1.5	1.8	2.0	2.1	2.1	2.1	2.1	2.2	2.3	2.1	2.3	24.3
Change	--	--	--	--	269.2%	122.9%	102.4%	79.5%	70.3%	60.9%	46.7%	40.9%	154.7%
2016	2.2	2.3	2.4	2.4	2.5	2.4	2.4	2.5	2.6	2.7	2.6	2.7	29.8
Change	34.1%	50.8%	33.7%	23.7%	20.8%	17.3%	13.7%	18.7%	17.6%	16.8%	21.9%	16.2%	22.7%
2017	2.6	2.5	2.9	2.8	3.0	2.9	2.7	3.0	2.9	3.1	2.9	2.9	34.4
Change	17.3%	12.5%	20.7%	16.6%	20.6%	16.6%	14.0%	16.5%	11.8%	14.2%	13.7%	10.0%	15.3%
2018	2.9	2.7	3.2	3.2	3.4	3.2	3.1	3.3	3.1	3.4	3.2	3.2	38.0
Change	12.0%	7.9%	10.0%	11.2%	11.7%	10.7%	12.3%	11.6%	7.2%	9.9%	10.1%	10.2%	10.4%
2019	3.2	3.1	3.4	3.4	3.5	3.2	3.3	3.4	3.3	3.6	3.3	3.4	40.3
Change	9.9%	11.4%	5.1%	8.9%	4.1%	2.7%	6.6%	4.1%	8.2%	6.5%	2.7%	5.9%	6.2%
2020	3.4	3.3	2.6	1.7	2.4	2.8	2.7	2.9	2.9	3.2	2.9	3.1	33.7
Change	5.7%	8.3%	-24.1%	-51.5%	-33.1%	-15.1%	-16.0%	-16.6%	-12.4%	-12.9%	-12.7%	-11.2%	-16.3%
2021	2.9	2.3	3.5	3.6	3.6	3.7	3.6	3.7	3.7	3.9	3.7	3.9	42.2
Change	-14.6%	-29.5%	37.4%	113.1%	54.1%	33.1%	31.9%	27.7%	26.6%	23.9%	28.1%	27.5%	25.0%
2022	3.5	3.1	4.0	3.9	4.0	3.7							22.1
Change	20.2%	30.6%	11.7%	10.7%	9.2%	0.1%							

Source: Unaudited NTTA Transaction Data

**Table 2-11. Monthly Transaction Trends – 360 Tollway (millions)**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<b>2018</b>	--	--	--	--	--	1.2	1.2	1.4	1.3	1.4	1.4	1.4	<b>9.3</b>
<b>2019</b>	1.4	1.3	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.6	1.6	<b>18.9</b>
<b>Change</b>	--	--	--	--	--	33.3%	30.7%	23.8%	29.5%	20.0%	14.0%	13.8%	<b>103.0%</b>
<b>2020</b>	1.6	1.6	1.3	1.0	1.3	1.5	1.5	1.6	1.5	1.7	1.5	1.6	<b>17.6</b>
<b>Change</b>	14.2%	18.7%	-14.5%	-37.6%	-21.6%	-5.6%	-6.6%	-7.6%	-8.9%	-3.4%	-5.5%	-1.4%	<b>-7.2%</b>
<b>2021</b>	1.5	1.2	1.8	1.9	1.9	2.0	2.1	2.1	2.0	2.2	2.1	2.1	<b>23.0</b>
<b>Change</b>	-3.8%	-20.6%	39.6%	91.8%	51.9%	35.5%	36.6%	31.3%	33.4%	31.6%	40.8%	32.6%	<b>30.9%</b>
<b>2022</b>	1.9	1.7	2.2	2.2	2.2	2.1							<b>12.3</b>
<b>Change</b>	21.6%	37.0%	18.6%	16.9%	15.7%	6.5%							

Source: Unaudited NTTA Transaction Data

**Table 2-12. Monthly Transaction Trends – NTTA System (millions)**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<b>2010</b>	37.7	35.8	41.8	41.8	42.2	42.1	41.9	42.8	41.0	43.3	40.6	42.7	<b>493.7</b>
<b>2011</b>	40.5	34.9	45.3	44.4	45.2	45.4	43.9	46.1	44.5	46.2	44.2	46.5	<b>527.1</b>
<b>Change</b>	7.4%	-2.6%	8.2%	6.2%	7.0%	7.9%	4.9%	7.6%	8.6%	6.8%	8.9%	8.8%	<b>6.8%</b>
<b>2012</b>	47.7	46.9	50.6	49.6	52.5	51.2	50.3	52.3	48.4	53.3	50.8	50.9	<b>604.5</b>
<b>Change</b>	17.7%	34.5%	11.8%	11.7%	16.1%	12.8%	14.6%	13.4%	8.7%	15.4%	14.9%	9.5%	<b>14.7%</b>
<b>2013</b>	51.1	49.3	54.8	54.8	57.4	55.3	55.6	58.1	54.4	58.4	53.6	49.8	<b>652.5</b>
<b>Change</b>	7.1%	5.0%	8.3%	10.6%	9.3%	7.9%	10.5%	11.1%	12.4%	9.5%	5.6%	-2.0%	<b>7.9%</b>
<b>2014</b>	55.0	50.8	57.2	58.8	61.3	59.8	60.5	61.1	59.3	63.2	56.9	60.8	<b>704.7</b>
<b>Change</b>	7.6%	3.1%	4.4%	7.2%	6.8%	8.1%	8.8%	5.3%	9.1%	8.3%	6.2%	22.0%	<b>8.0%</b>
<b>2015</b>	59.2	52.1	62.8	64.2	65.1	66.1	66.3	65.7	64.1	66.4	60.9	65.1	<b>758.0</b>
<b>Change</b>	7.7%	2.6%	9.7%	9.2%	6.2%	10.6%	9.5%	7.5%	7.9%	5.0%	7.0%	7.1%	<b>7.6%</b>
<b>2016</b>	63.1	62.7	67.6	66.9	68.3	67.4	66.6	68.7	66.4	68.4	64.4	66.2	<b>796.7</b>
<b>Change</b>	6.5%	20.4%	7.6%	4.1%	4.9%	2.0%	0.5%	4.6%	3.6%	3.0%	5.7%	1.7%	<b>5.1%</b>
<b>2017</b>	64.0	61.4	70.3	67.0	71.1	68.9	67.3	69.4	66.2	69.5	66.1	65.4	<b>806.5</b>
<b>Change</b>	1.5%	-2.1%	4.0%	0.2%	4.2%	2.1%	1.0%	1.0%	-0.3%	1.7%	2.6%	-1.3%	<b>1.2%</b>
<b>2018</b>	65.2	60.8	71.4	69.3	73.4	72.8	71.4	74.8	68.1	73.3	70.1	69.6	<b>840.2</b>
<b>Change</b>	1.8%	-1.0%	1.7%	3.5%	3.1%	5.7%	6.0%	7.8%	2.9%	5.4%	6.1%	6.5%	<b>4.2%</b>
<b>2019</b>	69.6	65.6	73.7	72.9	75.7	73.1	73.9	75.6	71.7	76.0	70.1	72.0	<b>869.8</b>
<b>Change</b>	6.8%	7.9%	3.1%	5.1%	3.2%	0.3%	3.5%	1.0%	5.3%	3.8%	0.0%	3.4%	<b>3.5%</b>
<b>2020</b>	70.7	68.8	52.3	31.9	44.9	54.0	54.7	57.7	57.8	62.3	57.2	59.8	<b>672.0</b>
<b>Change</b>	1.6%	4.9%	-29.0%	-56.2%	-40.7%	-26.1%	-26.0%	-23.7%	-19.4%	-18.1%	-18.4%	-17.0%	<b>-22.7%</b>
<b>2021</b>	57.2	45.7	69.8	69.0	70.9	73.3	73.9	72.8	71.7	77.3	72.4	74.3	<b>828.2</b>
<b>Change</b>	-19.1%	-33.6%	33.4%	116.0%	57.9%	35.8%	35.1%	26.1%	24.1%	24.1%	26.5%	24.4%	<b>23.2%</b>
<b>2022</b>	65.3	59.1	76.7	76.4	77.8	75.0							<b>430.3</b>
<b>Change</b>	14.2%	29.3%	9.9%	10.7%	9.8%	2.3%							

Source: Unaudited NTTA Transaction Data

Table 2-13. NTTA System Monthly Transaction Index in 2021

Month	DNT	PGBT	SRT	CTP	AATT	MCLB	LLTB	360T
January	84	82	83	83	83	87	86	80
February	67	66	65	67	71	69	69	65
March	102	102	99	101	101	104	104	96
April	101	100	98	101	101	107	102	97
May	103	103	103	103	97	105	103	101
June	106	107	106	104	103	98	104	104
July	106	107	110	103	102	99	106	108
August	105	106	106	104	106	106	105	107
September	104	104	103	106	109	107	105	106
October	110	114	110	111	115	111	109	114
November	104	104	107	106	109	106	103	110
December	108	105	111	111	105	100	105	110

## 2.4. AVI Utilization Trends

As mentioned previously, the TollTag program has been successful in terms of increased participation since its introduction in July 1989. Current levels of AVI transaction shares for NTTA System facilities are presented in **Figure 2-10**. The AVI transaction shares shown represent the levels by month beginning in January 2013, and include VToll transactions with an assumed 90-day lag. As shown in **Figure 2-10**, the average AVI share (including VToll) across all NTTA System facilities has been increasing consistently by 14 to 16 point higher as compared to the AVI share (excluding VToll) percent since 2015. Since the onset of the COVID-19 pandemic, there has been a three to five point decline in in overall AVI share on the system. As of June 2022, the AVI share (including VToll) is around 78 percent for the NTTA System. By comparison, AVI share (including VToll) had been over 83 percent in 2019.

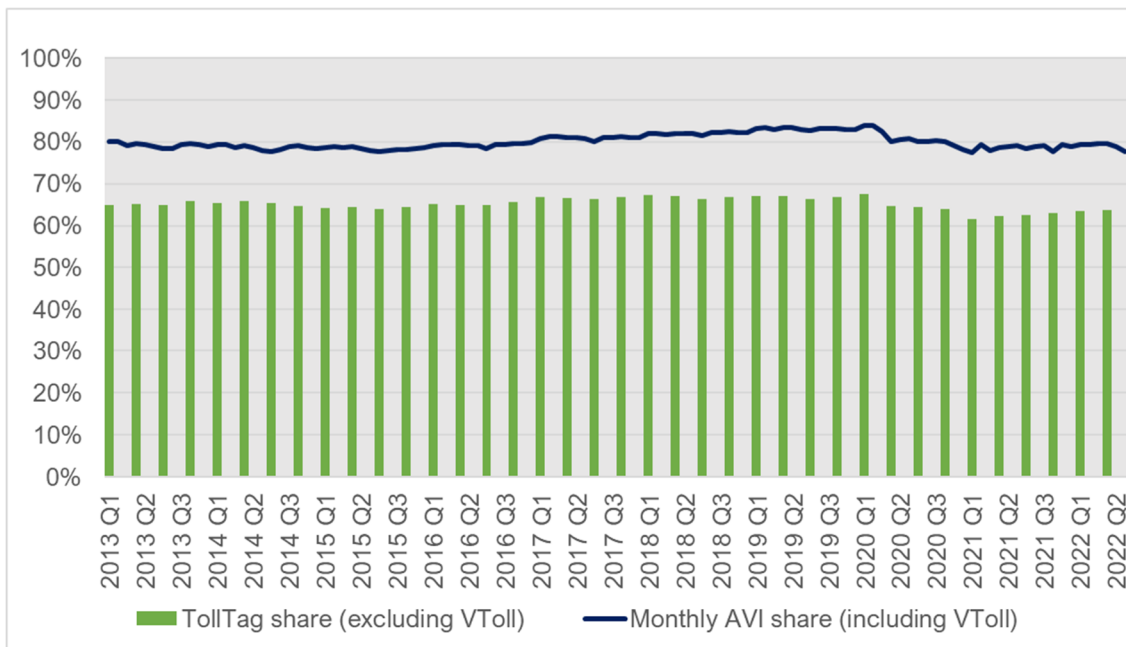


Figure 2-10. Recent NTTA System Average Monthly AVI Share

## 2.5. Traffic Count Program

CDM Smith embarked on a comprehensive traffic count program in the NTTA System area. This included counts along all NTTA System corridors. In addition, the traffic count program included a series of screenlines. The locations of the traffic count screenlines can be seen in **Figures 2-11** through **2-13**. Traffic counts from the transaction data were obtained from NTTA staff for all the existing mainlane gantries and each of the tolled ramp gantries on all NTTA facilities. In addition, traffic counts were collected at strategic locations along NTTA System corridors, such as the adjacent frontage roads to assist with the base year model calibration.

To collect data for non-NTTA facilities along the screenlines and for the non-tolled ramps on NTTA facilities, CDM Smith engaged GRAM Traffic NTX, a Dallas-based firm. All the counts at non-tolled locations and on the screenlines were conducted for a continuous 48-hour period on interior weekdays only (Tuesday, Wednesday and Thursday). By combining the ramp transaction data and the counts on the non-tolled ramps, CDM Smith was able to build an average weekday traffic profile for the NTTA System area. The results of the traffic count program were then used to calibrate the travel demand model. A summary of the screenline traffic volumes is presented in **Table 2-14**.

**Table 2-14. Screenline Traffic Summary**

Screenline ID	2022 Counts†	Screenline ID	2022 Counts†
<b>Dallas North Tollway</b>		<b>Sam Rayburn Tollway</b>	
Screenline 1	793,800	Screenline S1	233,700
Screenline 2	646,600	Screenline S2	369,100
Screenline 3	399,900	Screenline S3	440,600
Screenline 4	322,100	<b>Chisholm Trail Parkway</b>	
<b>President George Bush Turnpike (including PGBT EE)</b>		Screenline C1	312,100
Screenline 5	217,500	Screenline C2	295,600
Screenline 6	373,800	Screenline C3	41,900
Screenline 7	705,700	Screenline C4	155,800
Screenline 8	310,900	Screenline C5	80,900
Screenline 9	316,100	<b>360 Tollway</b>	
Screenline 10	321,700	Screenline 1	155,500
<b>PGBT Western Extension</b>		Screenline 2	318,300
Screenline W1	383,600	Screenline 3	380,700
Screenline W2	237,700	Screenline 4	76,300
Screenline W3	304,700	Screenline 5	272,200

†2022 Counts were seasonally adjusted to represent 2022 Average Daily Traffic

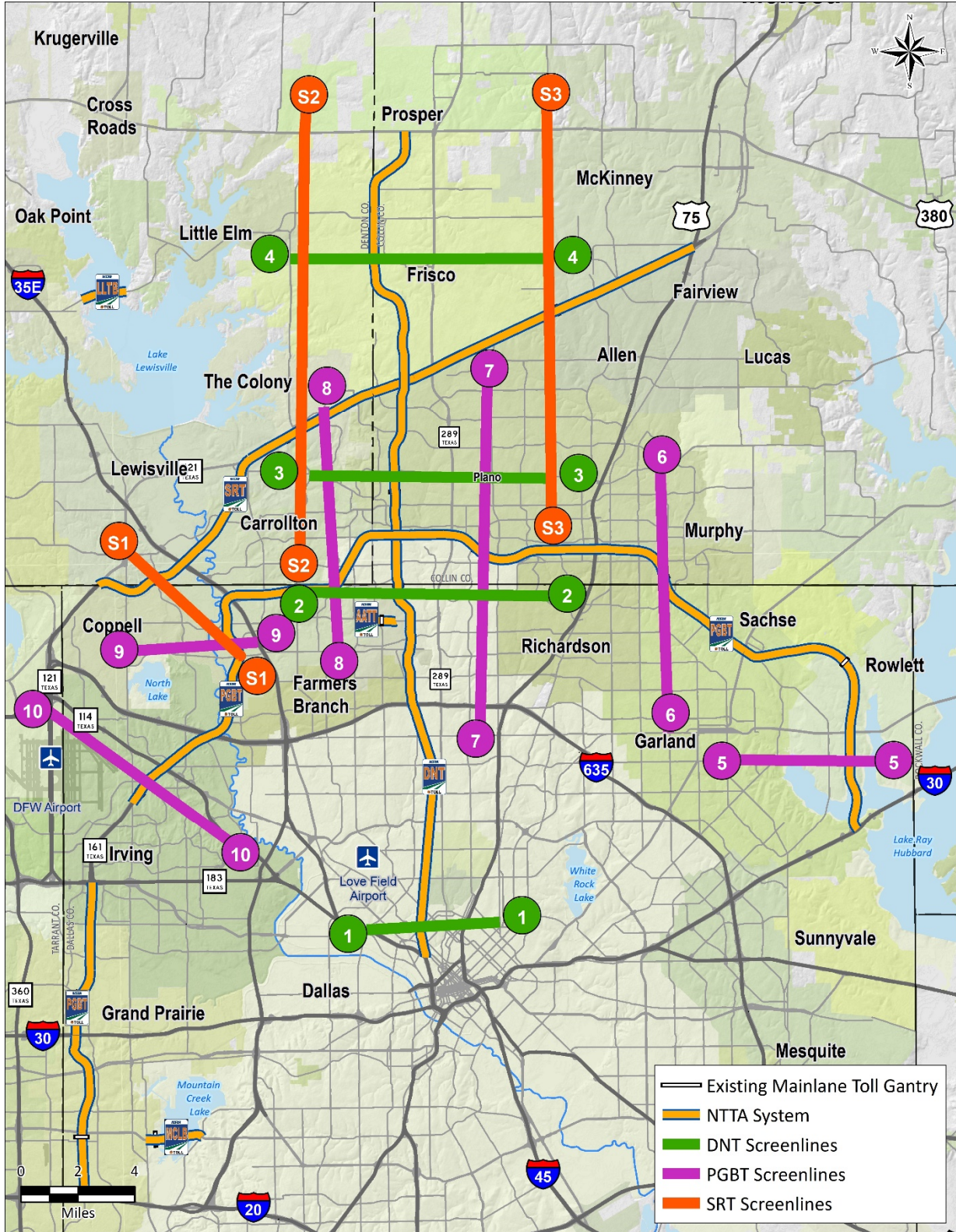


Figure 2-11.  
DNT/PGBT/SRT Traffic Count Screenlines

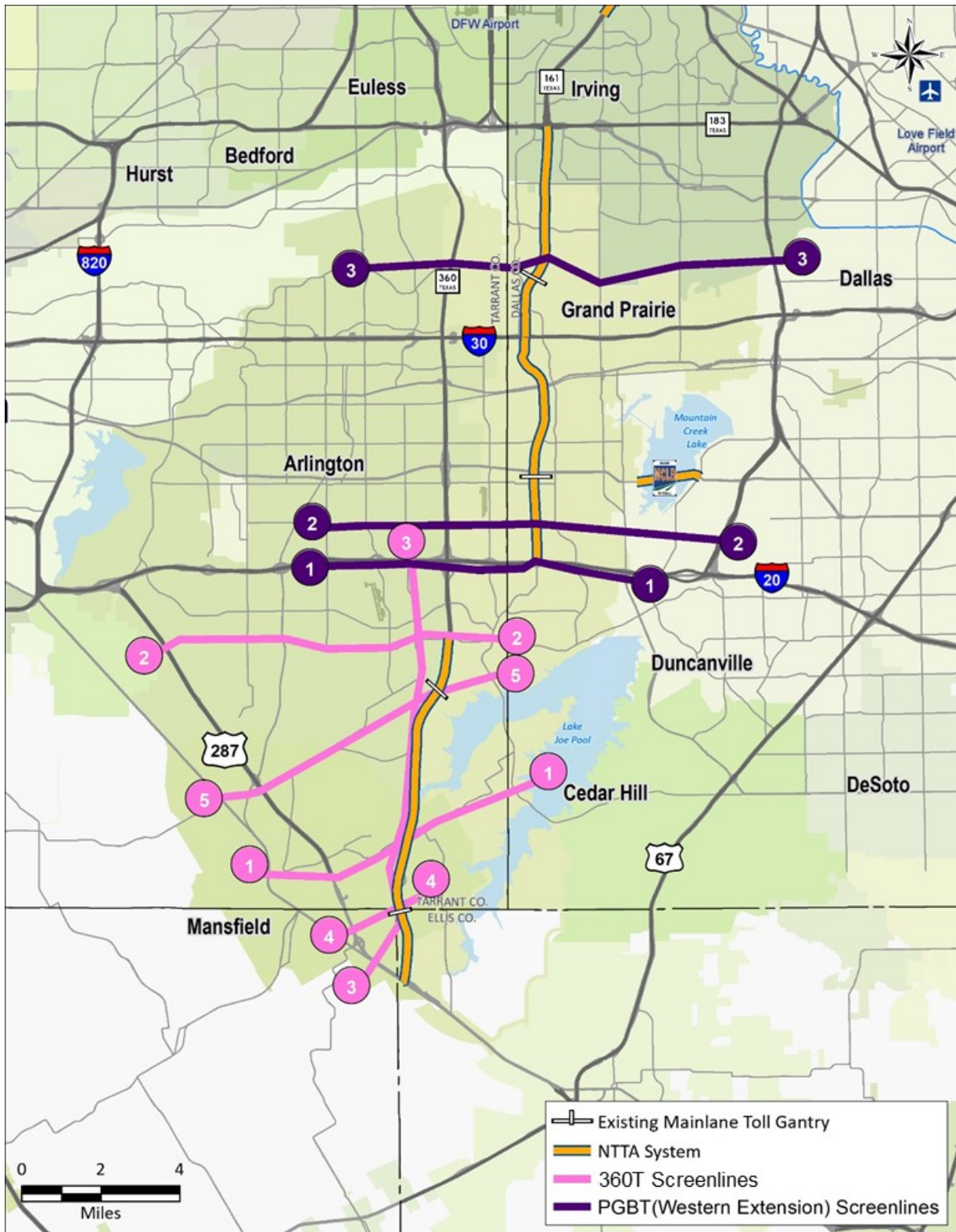


Figure 2-12.  
PGBT WE and 360T Traffic Count Screenlines



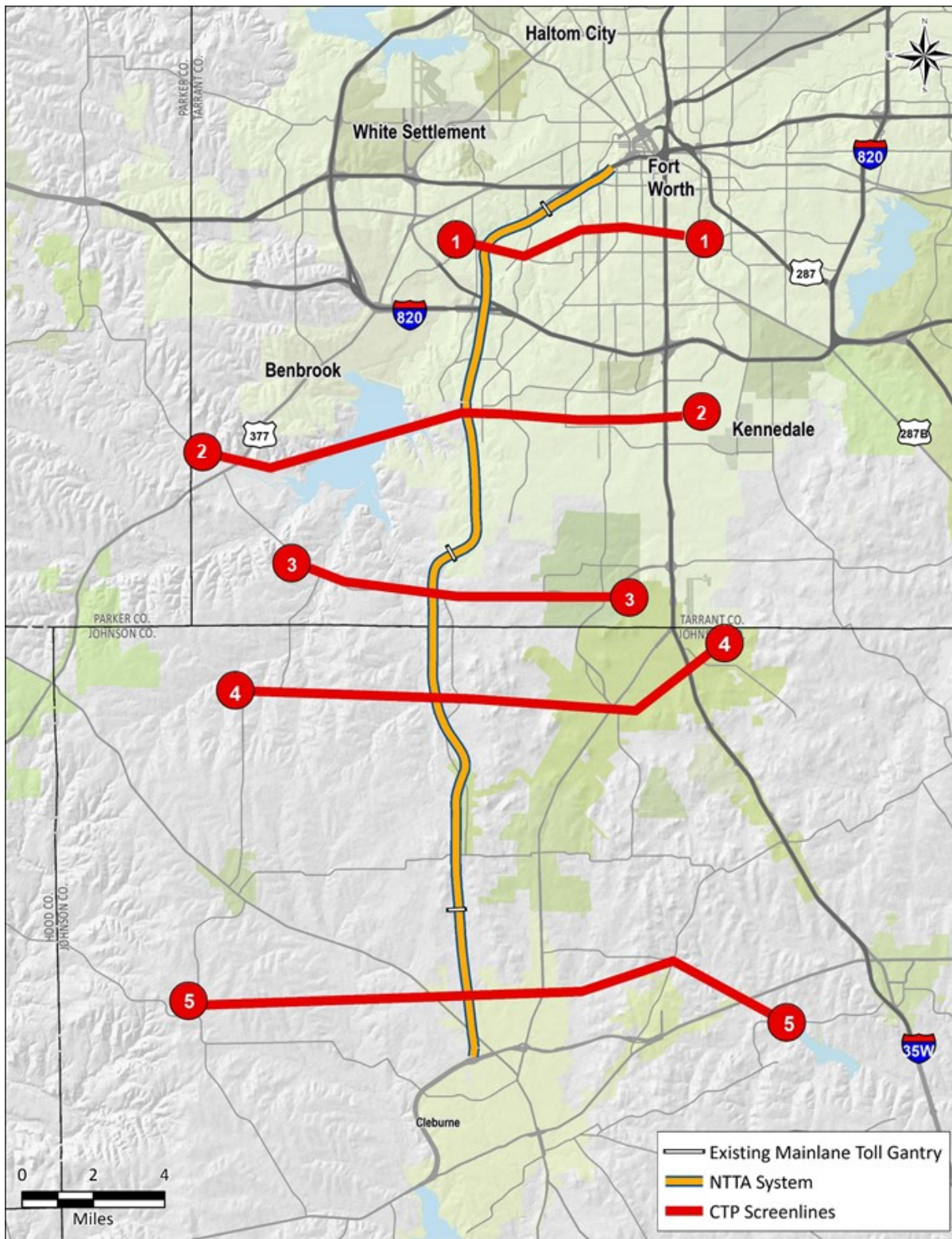


Figure 2-13.  
CTP Traffic Count Screenlines

**Figures 2-14 through 2-19** present the traffic profile for both travel directions on the DNT, PGBT, SRT, PGBT WE, CTP, and 360T for the AM, PM, and off-peak (OP) time periods. The AM peak period is from 6:30 to 9:00 AM (2.5 hours), PM peak period is from 3:00 to 6:30 PM (3.5 hours), and the off-peak (OP) represents the remainder of the day (18 hours).

### **Dallas North Tollway**

The northbound traffic during the PM peak period is higher than that in the AM peak and reflects the movement of traffic in the employment centers located along the southern and central portions of the DNT to the residential suburbs located along the northern segments of the DNT. During the PM peak, the highest volumes of traffic occur in the sections between PGBT and Legacy Drive (south of SRT). During the off-peak periods, highest volumes are seen between MLG 3 and Legacy Drive. In the southbound direction, AM and PM peak traffic volumes seem to be similar south of Windhaven Parkway. The highest levels of traffic are experienced between IH 635/LBJ and MLG 3.

### **President George Bush Turnpike (including PGBT EE)**

In the eastbound travel direction, the PM peak period is generally higher than the AM peak period for the PGBT. This would also be expected because of the movements between employment centers along the DNT and the growing residential areas of Collin County. As a result, the highest volumes in both directions on PGBT were recorded between US 75 and the DNT.

### **President George Bush Turnpike – Western Extension**

On PGBT WE, travel in both the northbound and southbound directions is much heavier for the segment north of IH 30. Throughout the day, volumes on PGBT WE north of IH 30 are generally about twenty-five percent higher north of IH 30 than south of IH 30. The highest volumes on PGBT WE occur near Oakdale Road.

### **Sam Rayburn Tollway**

The eastbound travel direction indicates the PM peak period is higher than the AM peak period. In the westbound direction, the AM peak period is higher than the PM peak period for the sections north of Stacy Road. There is a noticeable spike in both directions for all time periods at DNT/Parkwood and IH 35E. This spike is due to the fact that this section of the SRT is toll-free.

### **Chisholm Trail Parkway**

Traffic on CTP is much higher in both directions at the northern end of the facility than the southern end. The highest volumes occur near MLG #1, while the lowest volumes occur near MLG #3. Generally, volumes decline consistently further south on the facility. The highest volumes at the northern end of the facility are approximately five times as high as the lowest volumes at the southern end of the facility.

### **360 Tollway**

Traffic on 360 Tollway is much higher in both directions at the northern end of the facility than the southern end. The highest volumes occur near northern terminus followed by the New York Avenue mainlane gantry, while the lowest volumes occur near southern terminus at US 287. Generally, volumes decline consistently further south on the facility. The highest volumes at the northern end of the facility are approximately four times as high as the lowest volumes at the southern end of the facility.

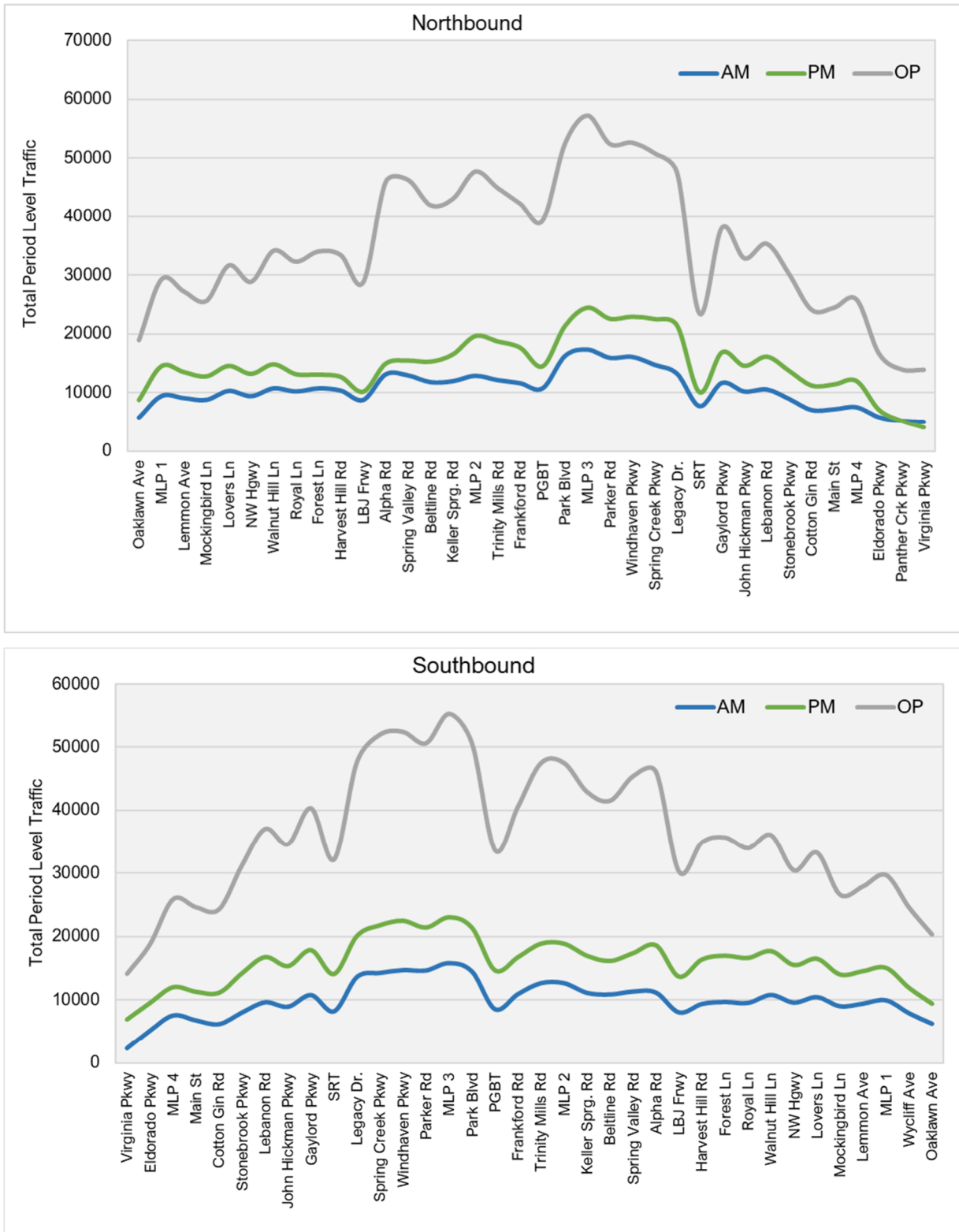
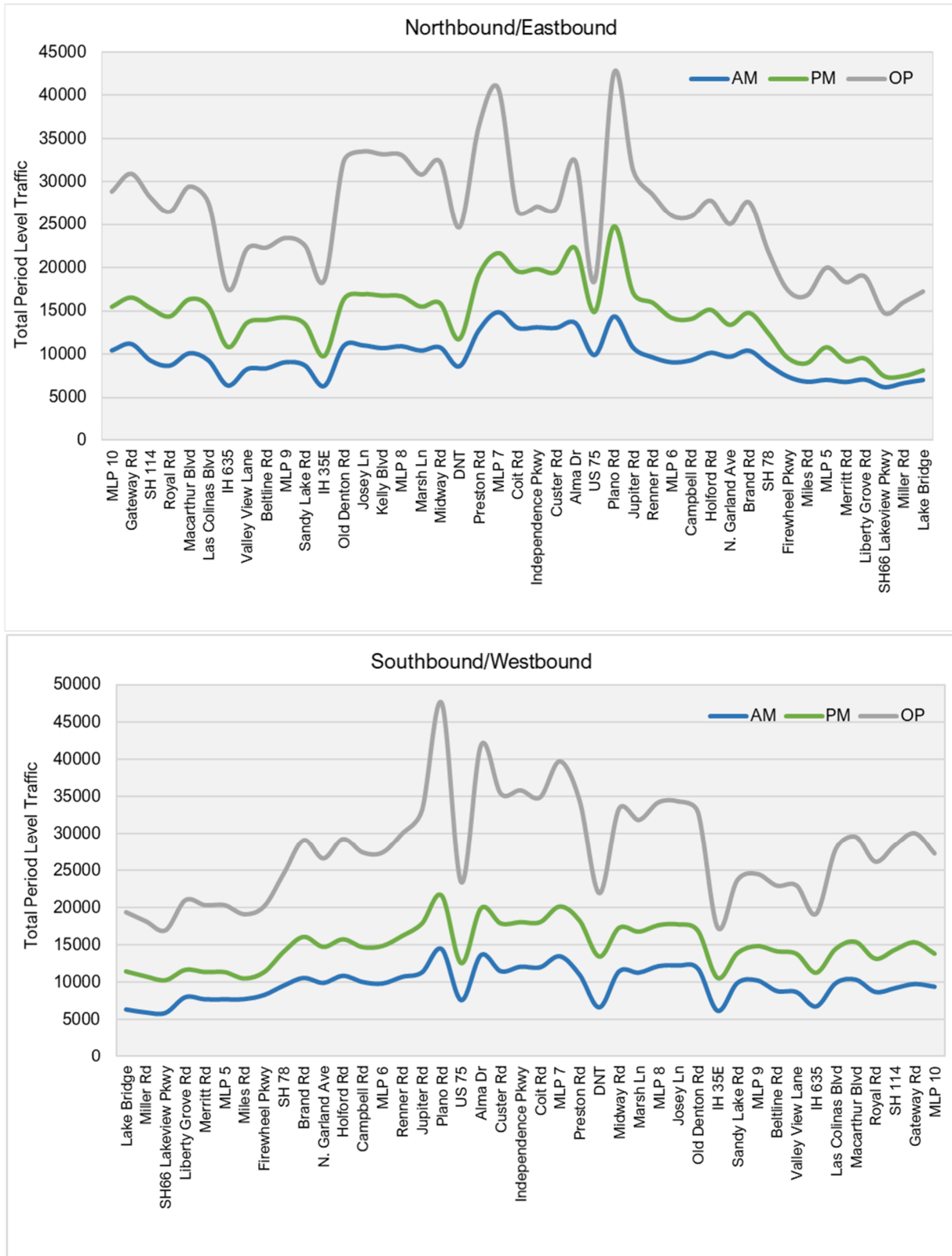


Figure 2-14. DNT Traffic Volume Profile



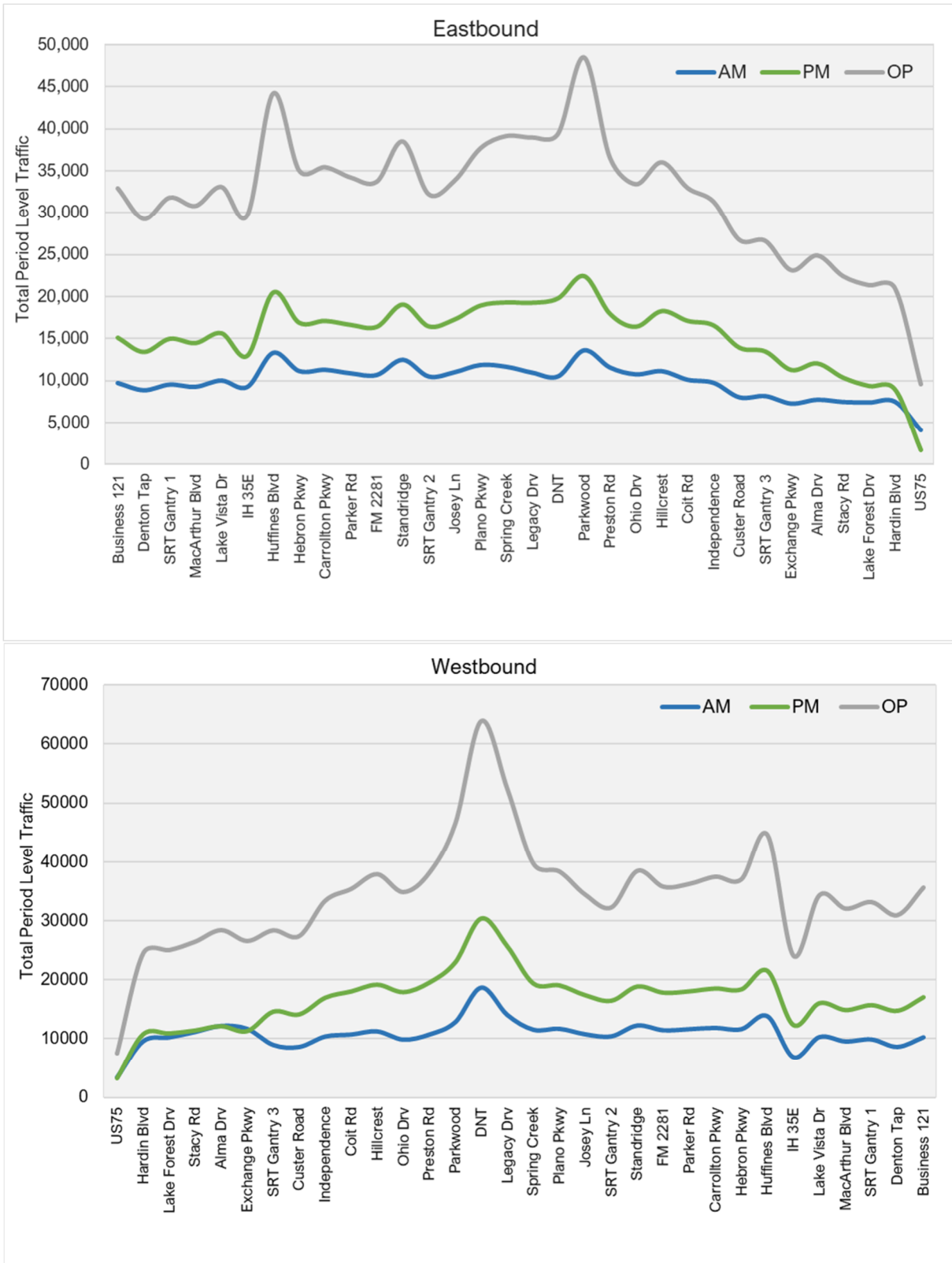


Figure 2-16. SRT Traffic Volume Profile

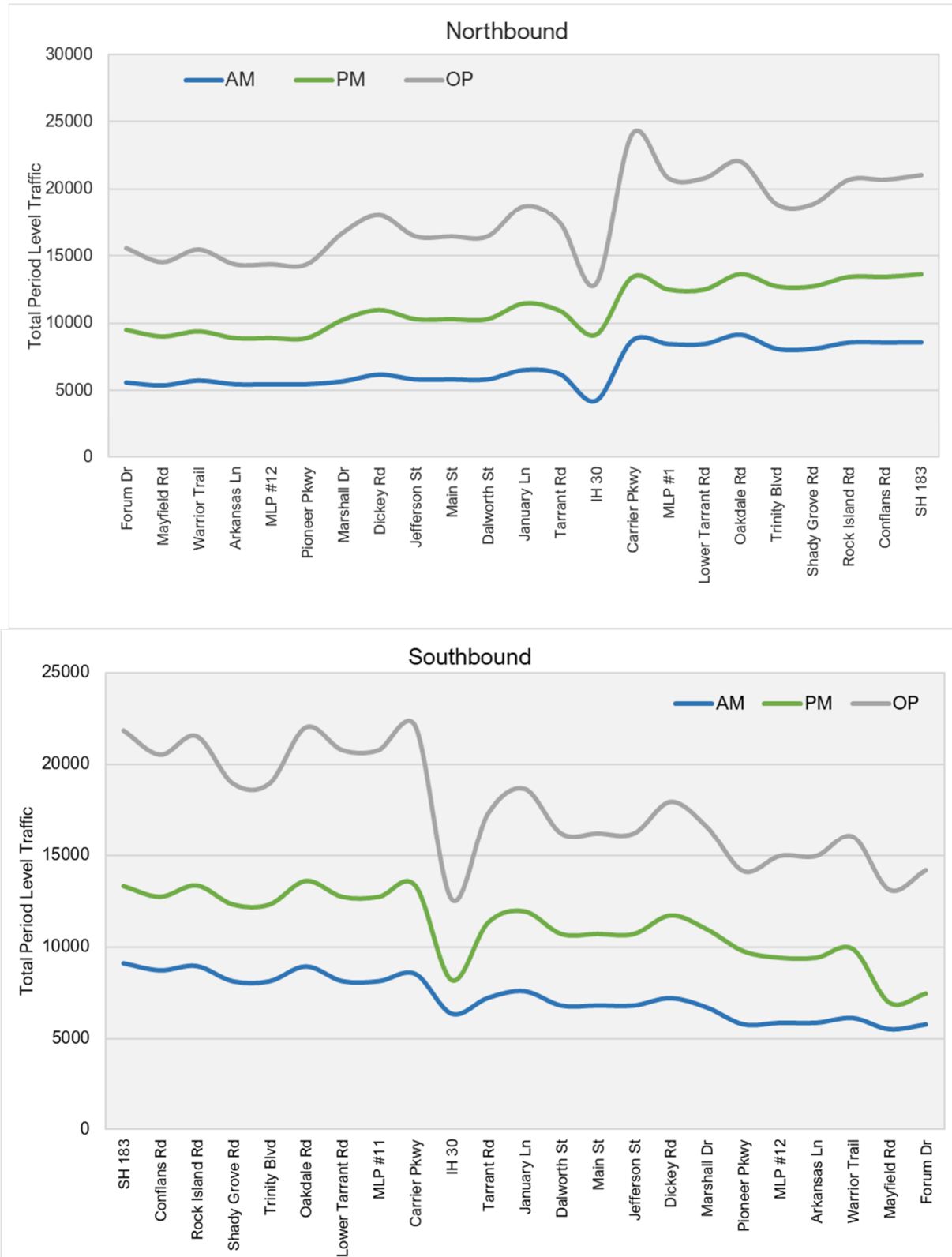


Figure 2-17. PGBT WE Traffic Volume Profile

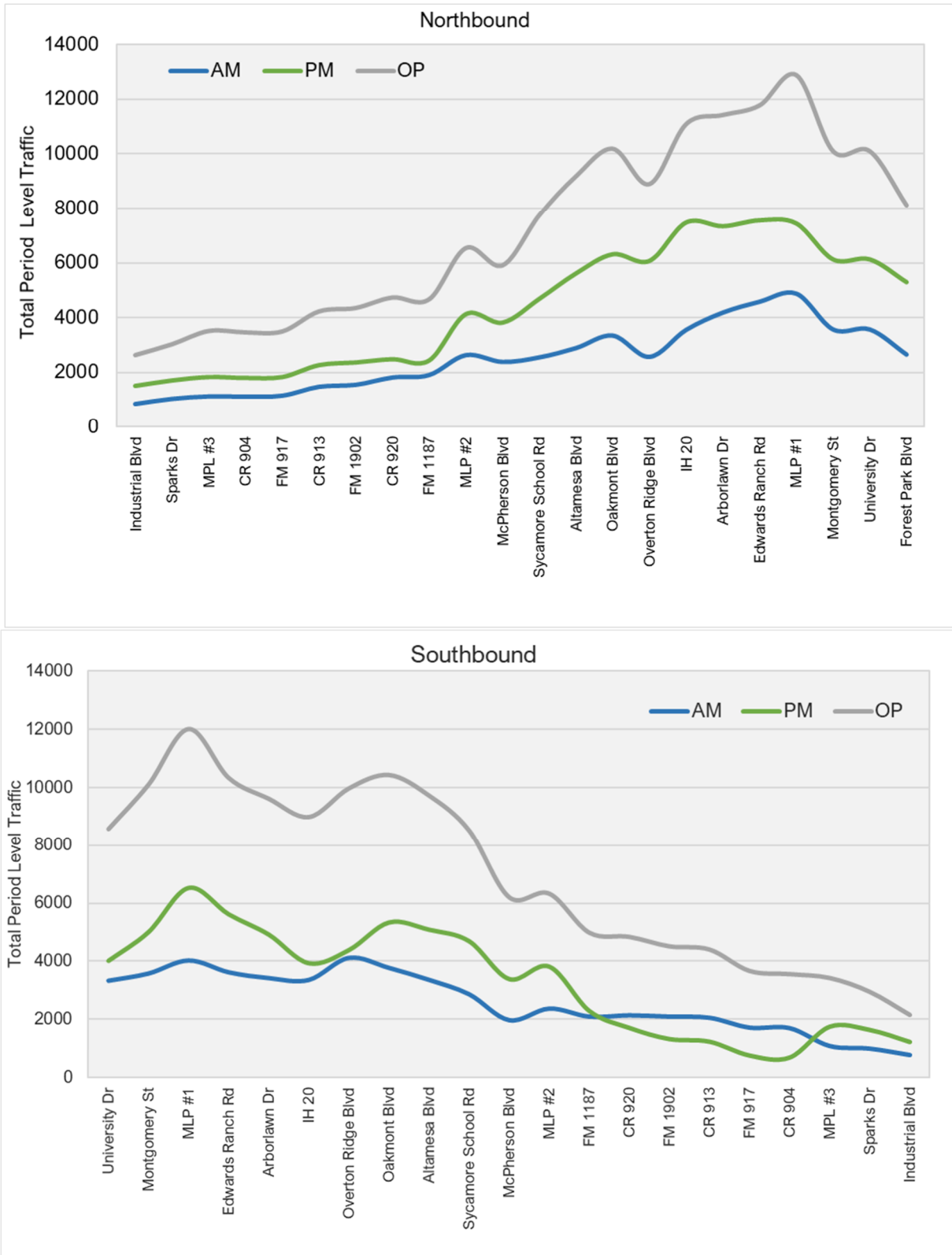
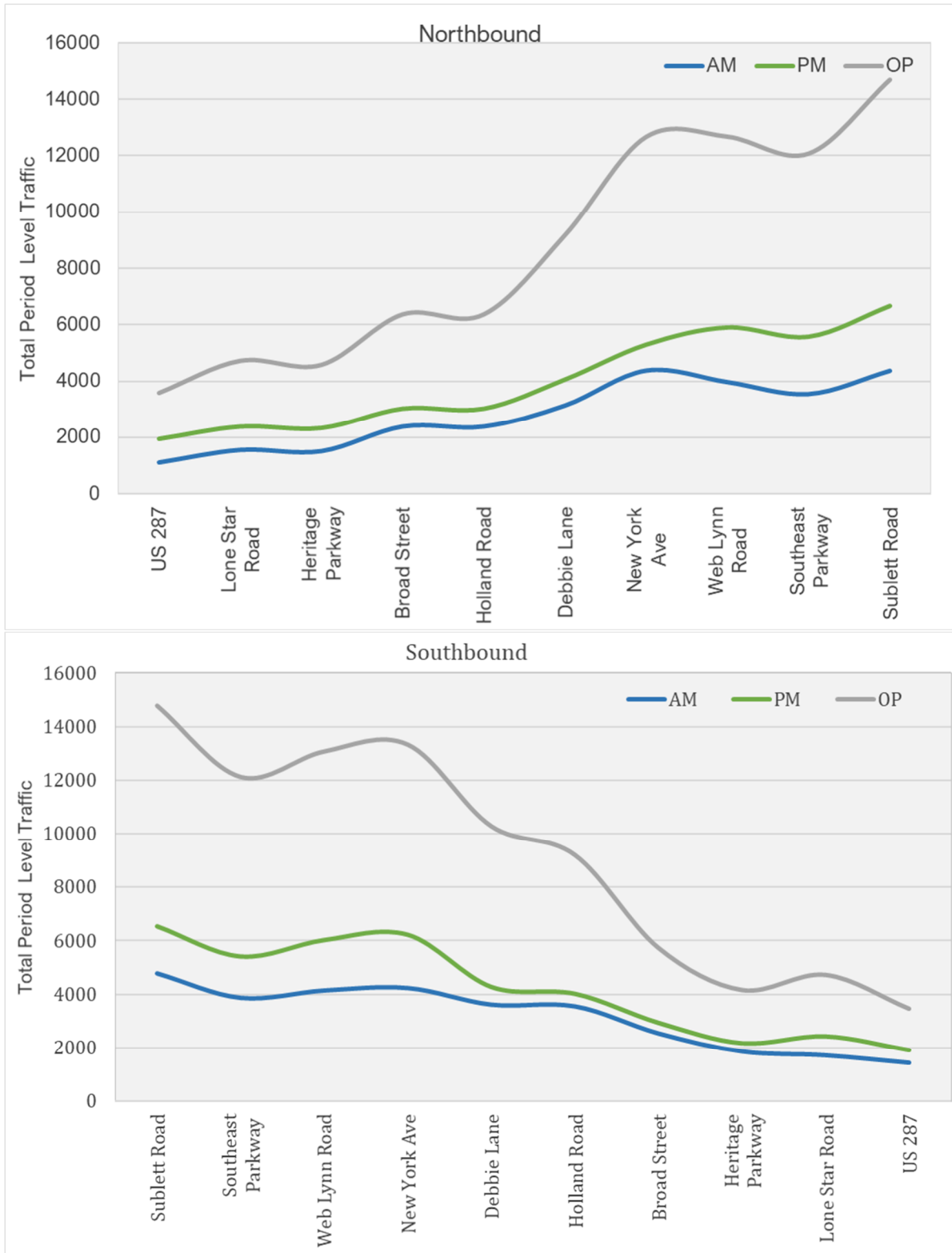


Figure 2-18. CTP Traffic Volume Profile



**Figure 2-19.**  
**360T Traffic Volume Profile**



## 2.6. Average Weekday Transactions by Location

Figures 2-20 through 2-26 show the estimated average weekday transactions in 2021 at each tolling location on the DNT, PGBT, PGBT EE, SRT, AATT, MCLB, LLTB, PGBT WE, CTP, and 360T. As would be expected, the mainlane gantries generated the highest number of transactions on each facility. Among the ramp tolling locations, the Mockingbird Lane ramps generated the most transactions on the DNT, while the Midway Road ramps, Miles Road and Pioneer Parkway ramps generated the most transactions on the PGBT, PGBT EE, and PGBT WE, respectively. On the SRT, the highest number of ramp transactions was generated at the Custer Road ramps. On CTP and 360T, the highest number of ramp transactions were generated at Oakmont Boulevard and Webb Lynn Road, respectively.

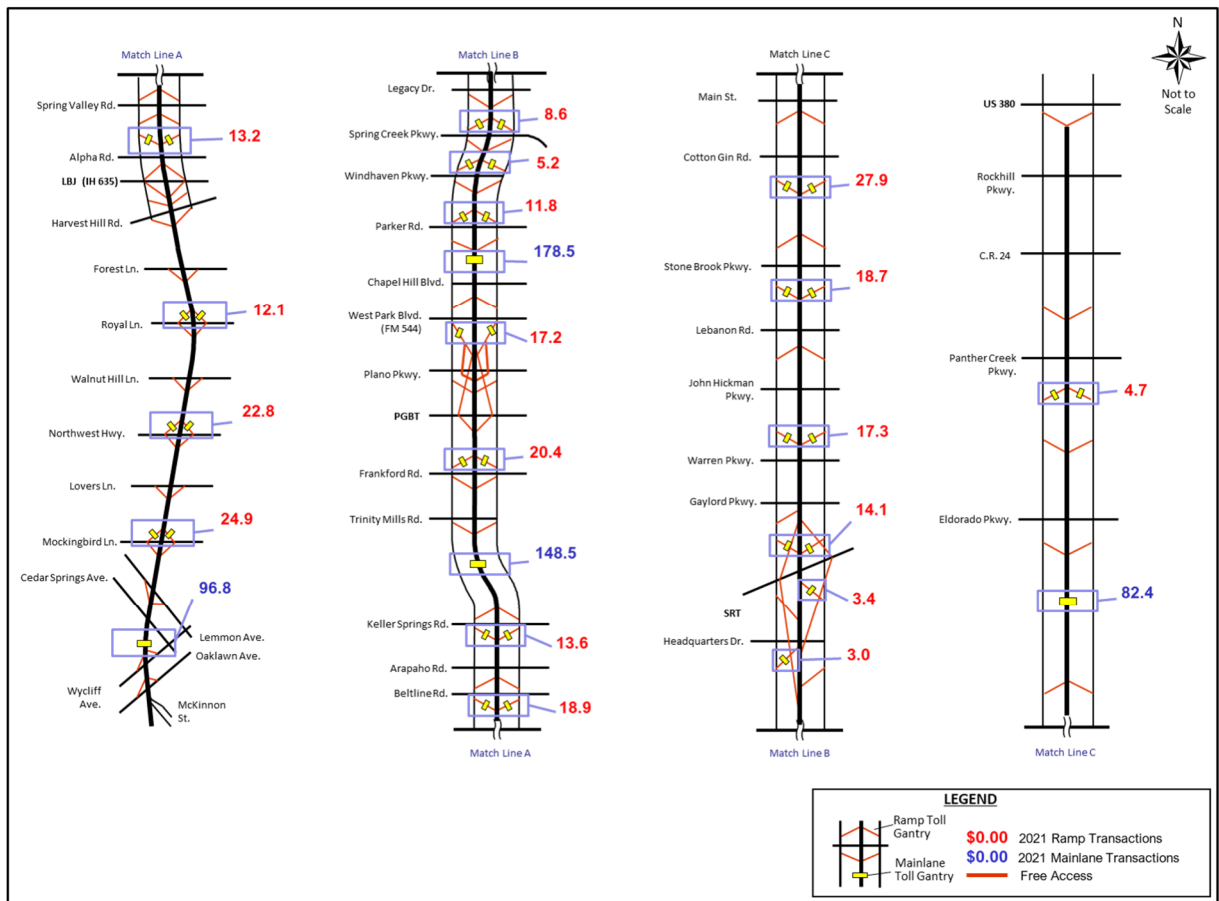


Figure 2-20.  
DNT 2021 Average Weekday Transactions by Tolling Location

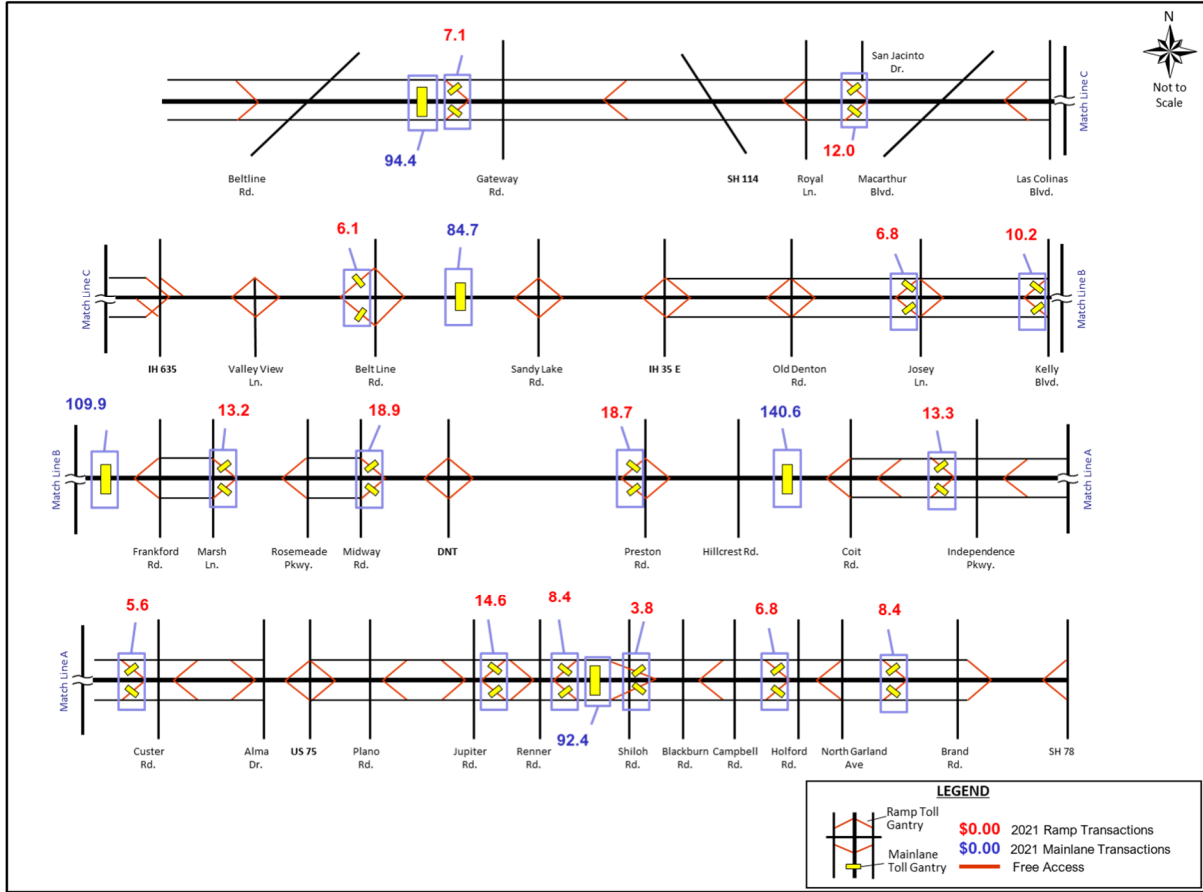


Figure 2-21. PGBT 2021 Average Weekday Transactions by Tolling Location

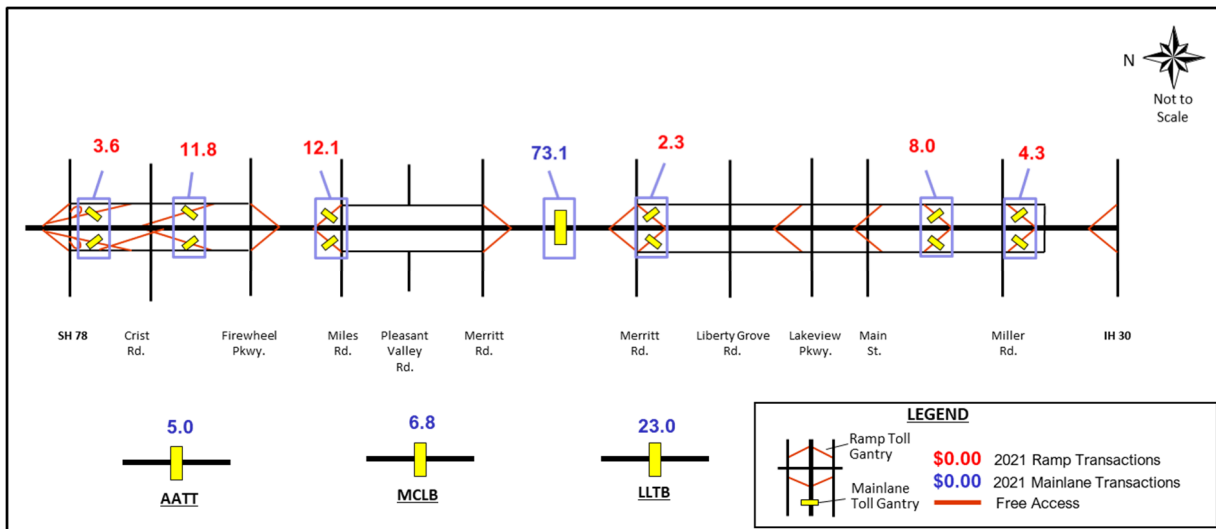


Figure 2-22. PGBT EE Average Weekday Transactions by Tolling Location

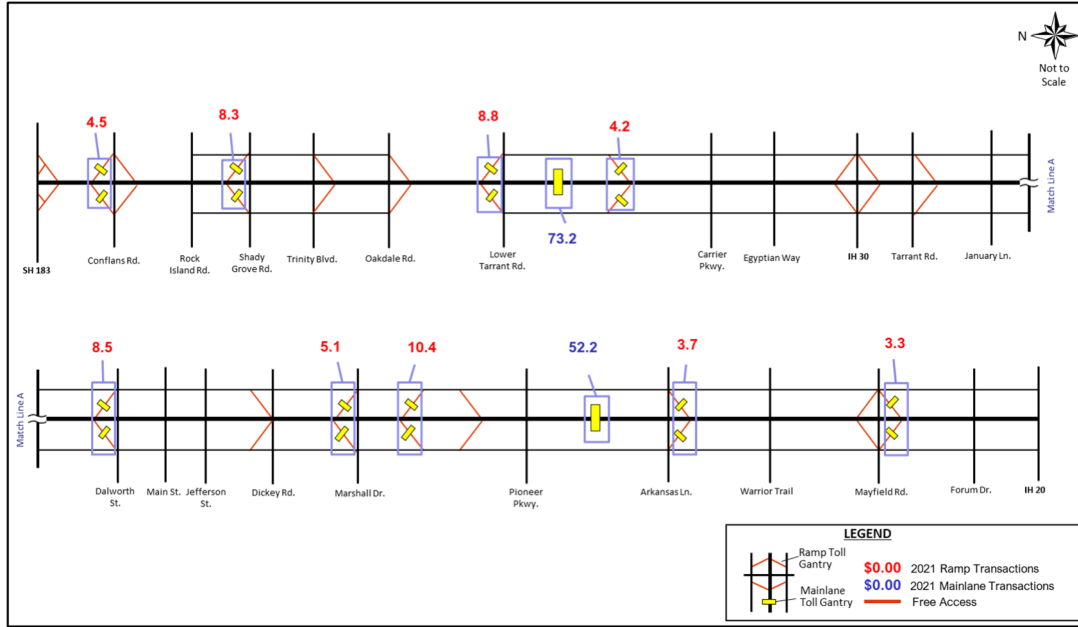


Figure 2-23. PGBT WE 2021 Average Weekday Transactions by Tolling Location

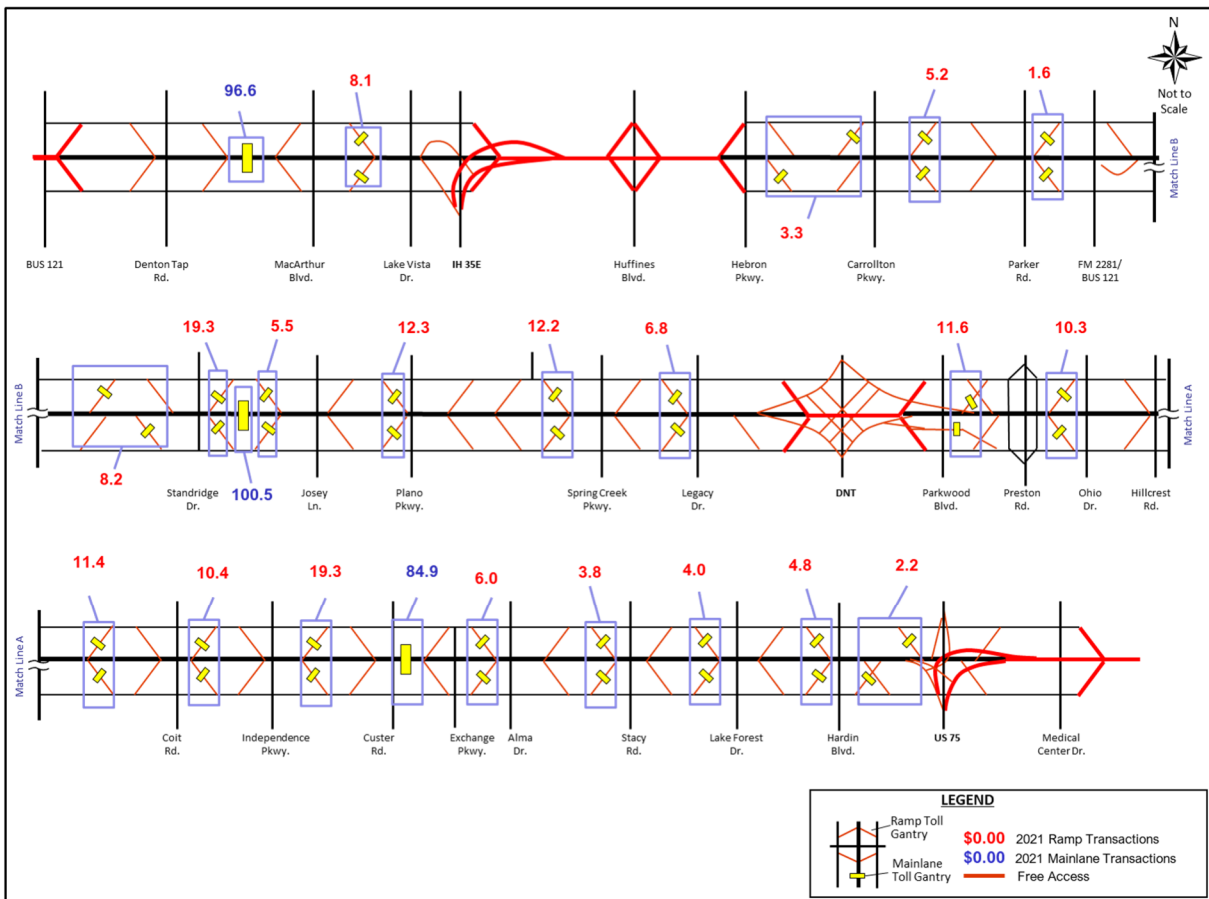


Figure 2-24. SRT 2021 Average Weekday Transactions by Tolling Location

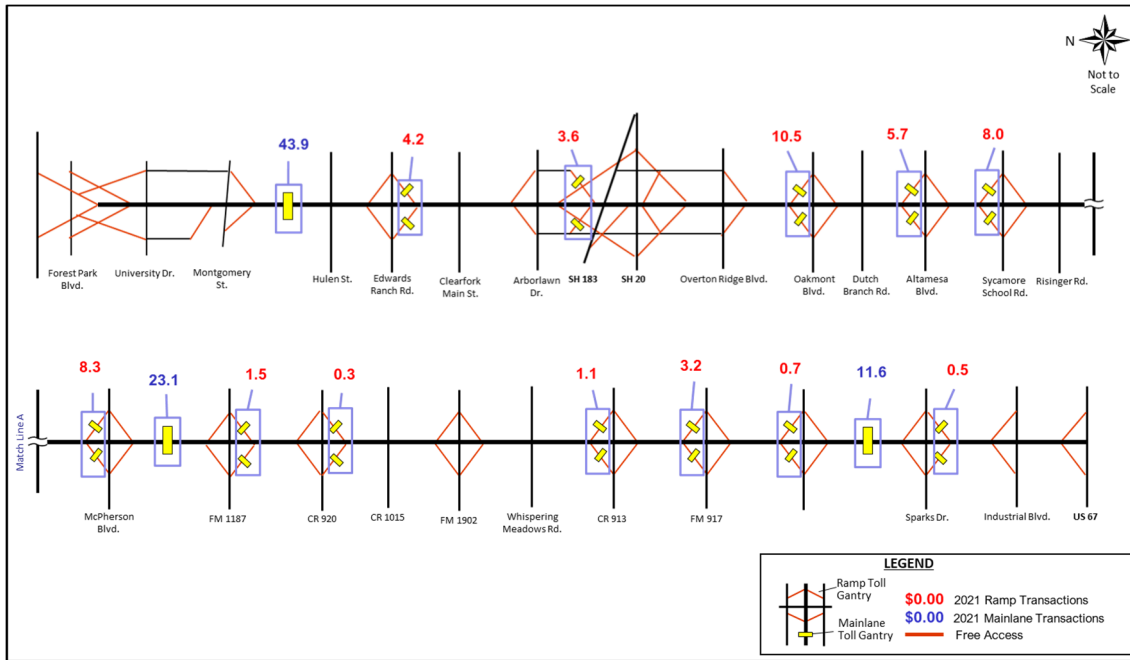


Figure 2-25. CTP 2021 Average Weekday Transactions by Tolling Location

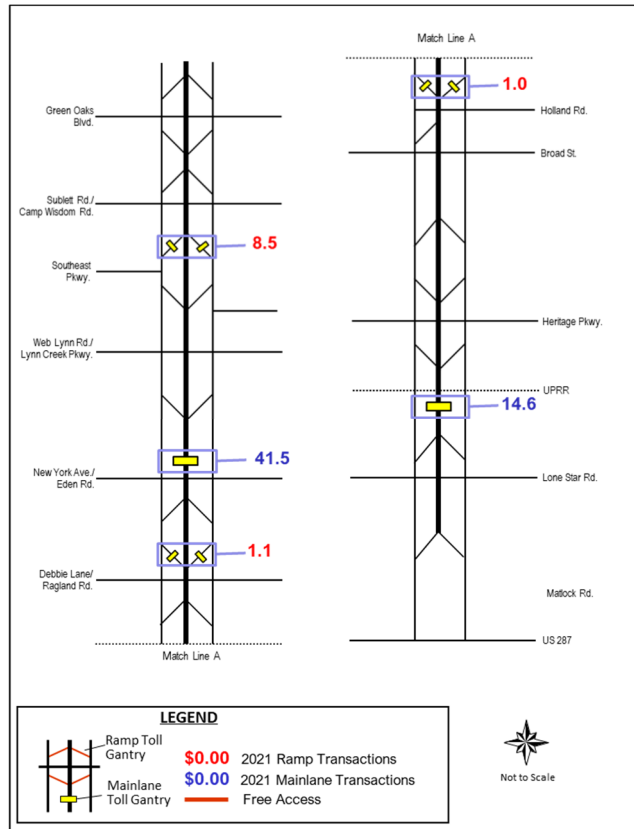


Figure 2-26. 360T 2021 Average Weekday Transactions by Tolling Location

## 2.7. Travel Time Characteristics

The evaluation of a toll facility's future traffic and revenue requires knowledge of the current travel time characteristics of the major roadways in the project area. For the current study, the historical travel time data was collected from INRIX, Inc., a traffic data company based in Washington State that maintains an archive of travel speed data for thousands of roadways across the United States accumulated from GPS-enabled devices along the highway network. INRIX monitors traffic flow along approximately 260,000 miles of major freeways, highways, urban and rural arterials, and side streets in the United States. This data provides historical as well as real-time traffic data seven days a week, 24 hours a day in as little as one-minute increments for all metro areas with a population of more than one million. They were engaged to provide a series of travel speed data for several roadways within the proposed study area.

INRIX obtains travel speed information from various probes; including anonymous cell phones/smartphones and vehicles equipped with GPS devices (trucks, delivery vans, transit vehicles, etc.). The collected data is then processed in real-time to create travel speed information along most of the major roadways. The real-time travel speed data is normalized to account for parameters that affect traffic flow conditions, such as weather forecasts, school schedules, special events, accidents, seasonal variation, and road construction.

In addition to NTTA's toll facilities, travel time analysis was also conducted on several freeways, local arterials and frontage roads that compete directly with NTTA System facilities. Several highway and arterial routes were selected for analysis to provide a profile of the fluctuation in operating speed throughout the corridor and the relationship between demand and congestion levels. For all the routes specified in the study area, INRIX data was summarized for April 2022. It should be however, note that data summarized includes travel speeds for Tuesday through Thursday. Hence, the summary represents typical weekday summary by excluding weekends and potentially atypical characteristics traffic on Mondays and Fridays. **Figures 2-27** through **2-28** show the locations for which travel time data was obtained.

The results are presented graphically in **Figures 2-29** through **2-32**. The figures illustrate the typical peak period speeds in each direction on various facilities. As expected, the DNT routes exhibit their slowest speeds in the southbound AM and northbound PM directions. The PGBT routes exhibit their slowest speeds in the westbound AM and eastbound PM directions. Similar to the PGBT, the SRT show slower speeds in the westbound direction in the AM peak and in the eastbound during the PM peak period. In the PGBT WE, CTP, and 360 Tollway corridors, slower speeds are experienced in the northbound direction during the AM peak period and in the southbound direction during the PM peak period.

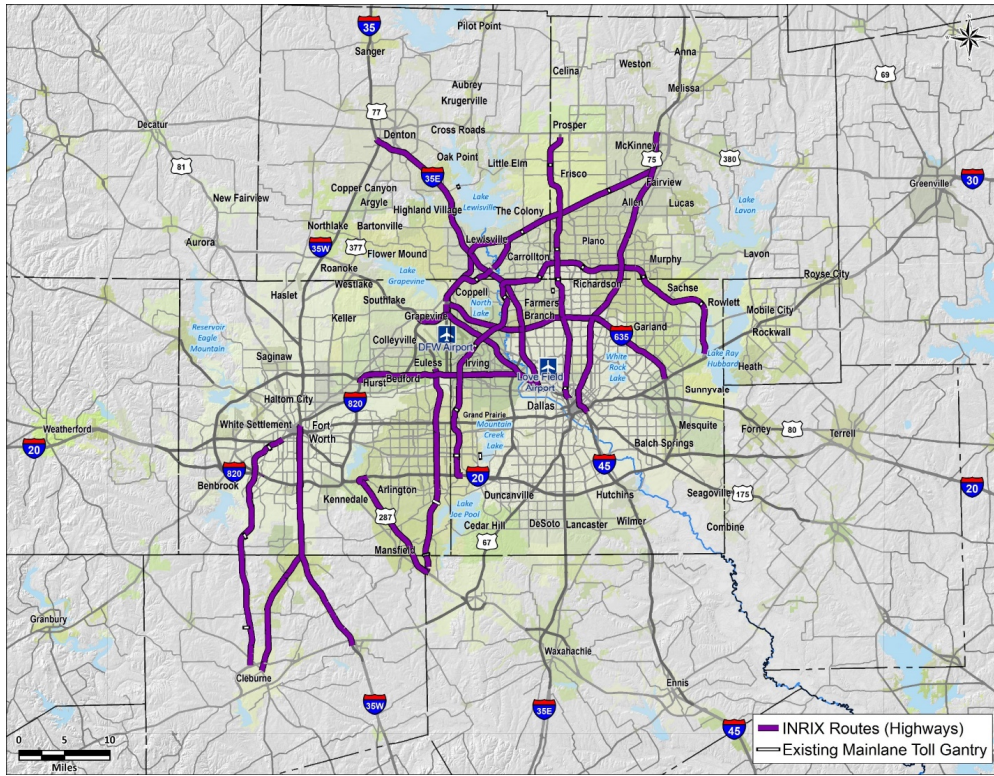


Figure 2-27.  
Travel Speed Data Collection Locations (Highways)

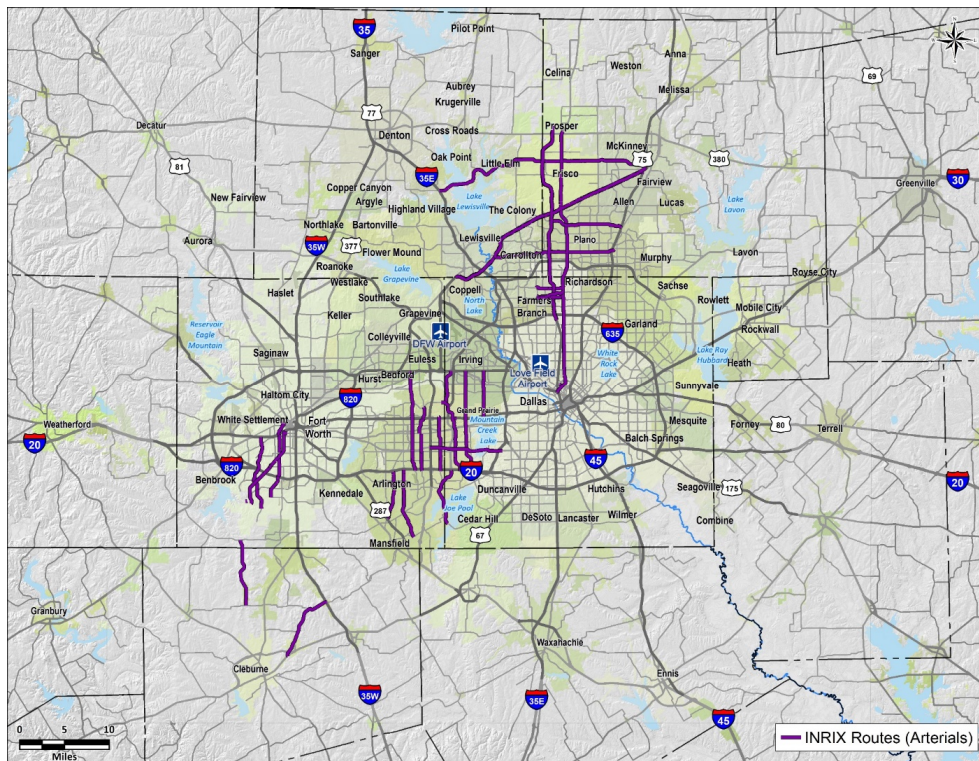


Figure 2-28.  
Travel Speed Data Collection Locations (Arterials)

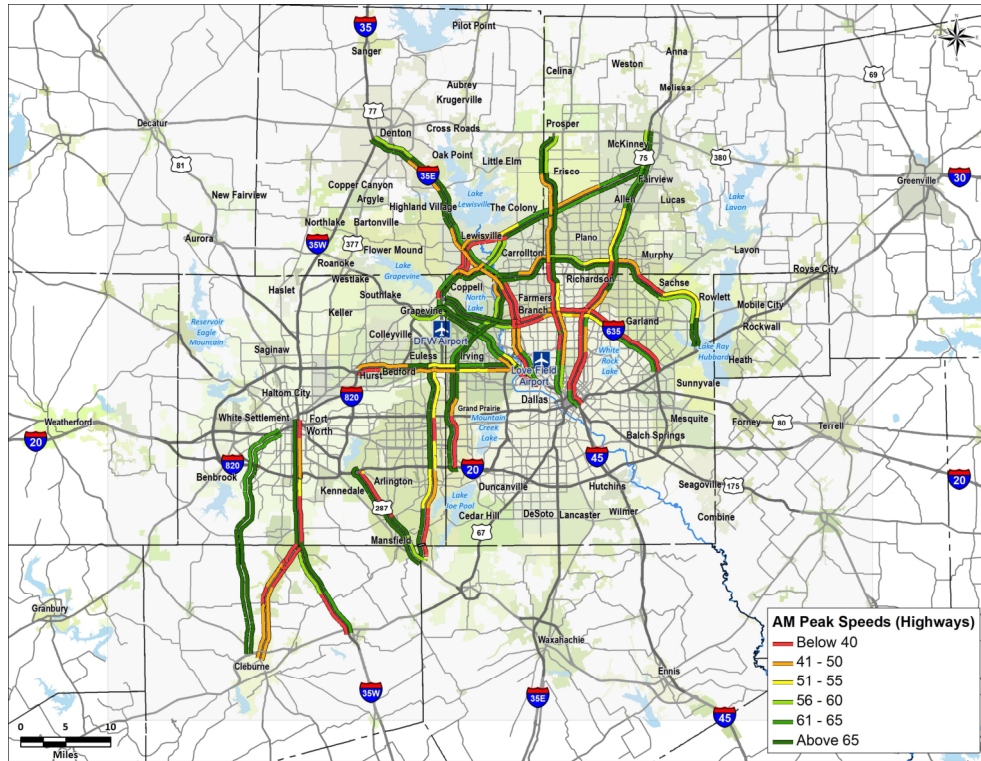


Figure 2-29.  
Travel Time Results: AM Peak Period (Highways)

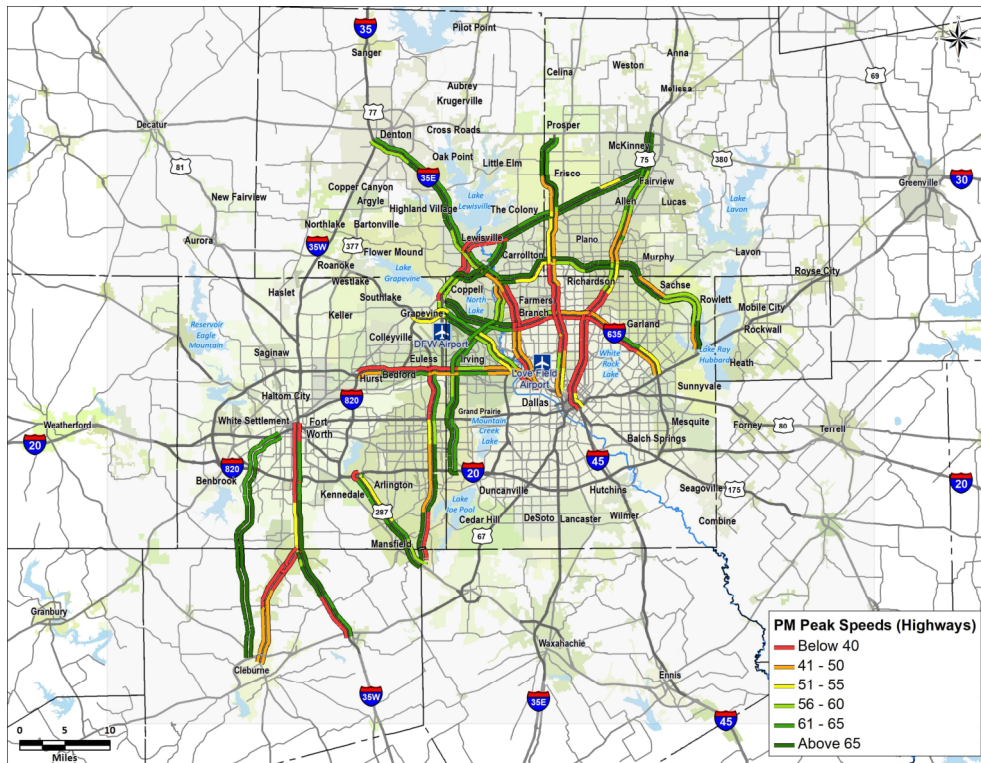
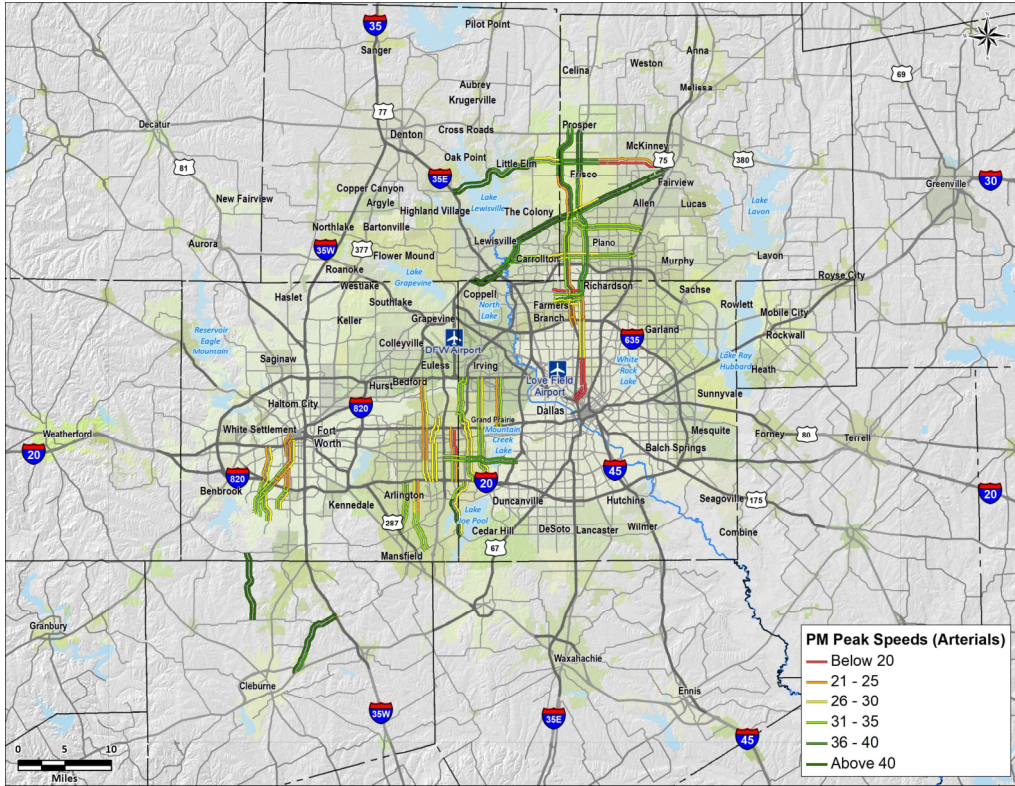
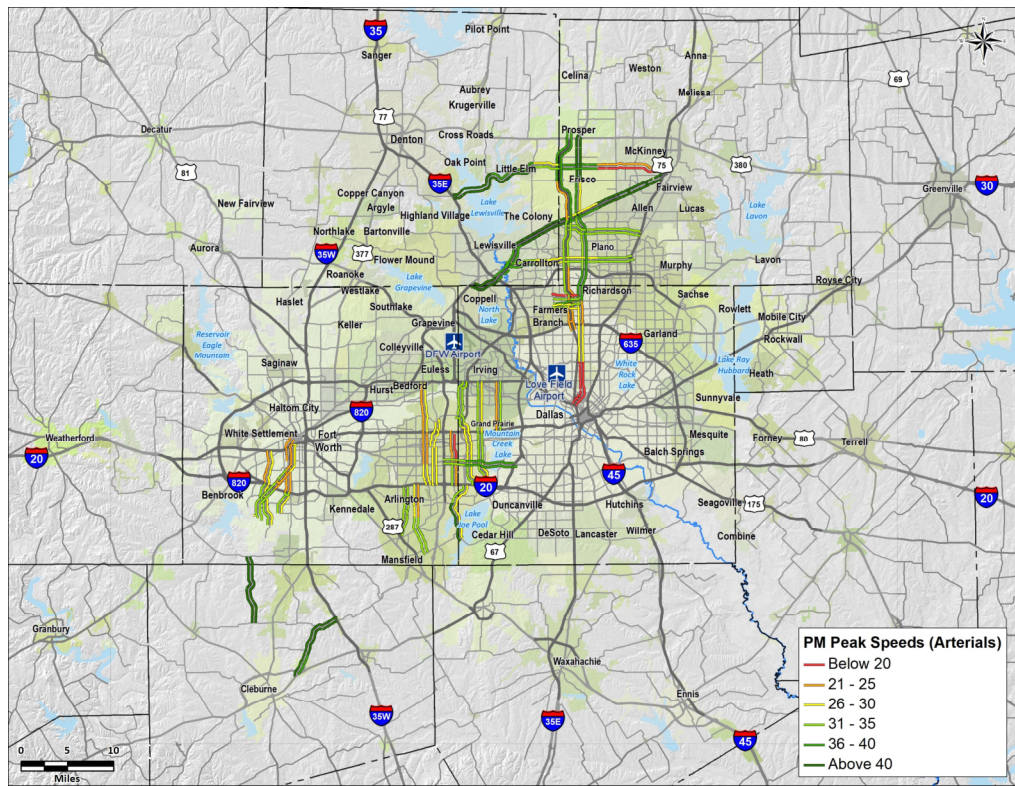


Figure 2-30.  
Travel Time Results: PM Peak Period (Highways)



**Figure 2-31.**  
**Travel Time Results: AM Peak Period (Arterials)**



**Figure 2-32.**  
**Travel Time Results: PM Peak Period (Arterials)**



## 2.8. Origin-Destination Data

The origin-destination (O-D) characteristics of the project area was analyzed to understand the travel patterns. The data was obtained from Streetlight Data, Inc, a traffic data company that maintains travel data and delivers unique insights into travel patterns across the country. The O-D data analyzed represents data collected for March 2022. **Figure 2-33** shows the locations of O-D zones. A total of 51 zones were identified that were in the area of influence of the NTTA System corridors; area of influence is defined as the buffer area around a corridor that attracts traffic onto the corridor. The summarized O-D data from the Streetlight was then compared with the 2018 trip table matrix received from NCTCOG. A total of 5,352 traffic survey zones (TSZ) in the NCTCOG trip table matrix, out of which 4,037 were in the area of influence, were aggregated into 51 zones, as identified in the Streetlight data.

The Streetlight data was then used to adjust the trip table matrix received from NCTCOG. Five percent absolute delta was established as a threshold for updating the trip table matrix; only if the absolute value of delta between the data collected and the O-D data from trip table varied by more than five percent, then O-D data was updated. **Figure 2-33** includes arrows that indicate trip adjustments between an O-D trip pair; arrow-end represents the origin zone and the arrowhead represents the destination zone. Out of the entire 2,550 interzonal trip pairs less than one percent of the interzonal trip pairs varied by more than five percent (assumed absolute threshold), and those were updated. This effort improved the validity of trip patterns in the model to reflect the empirical data (March 2022).

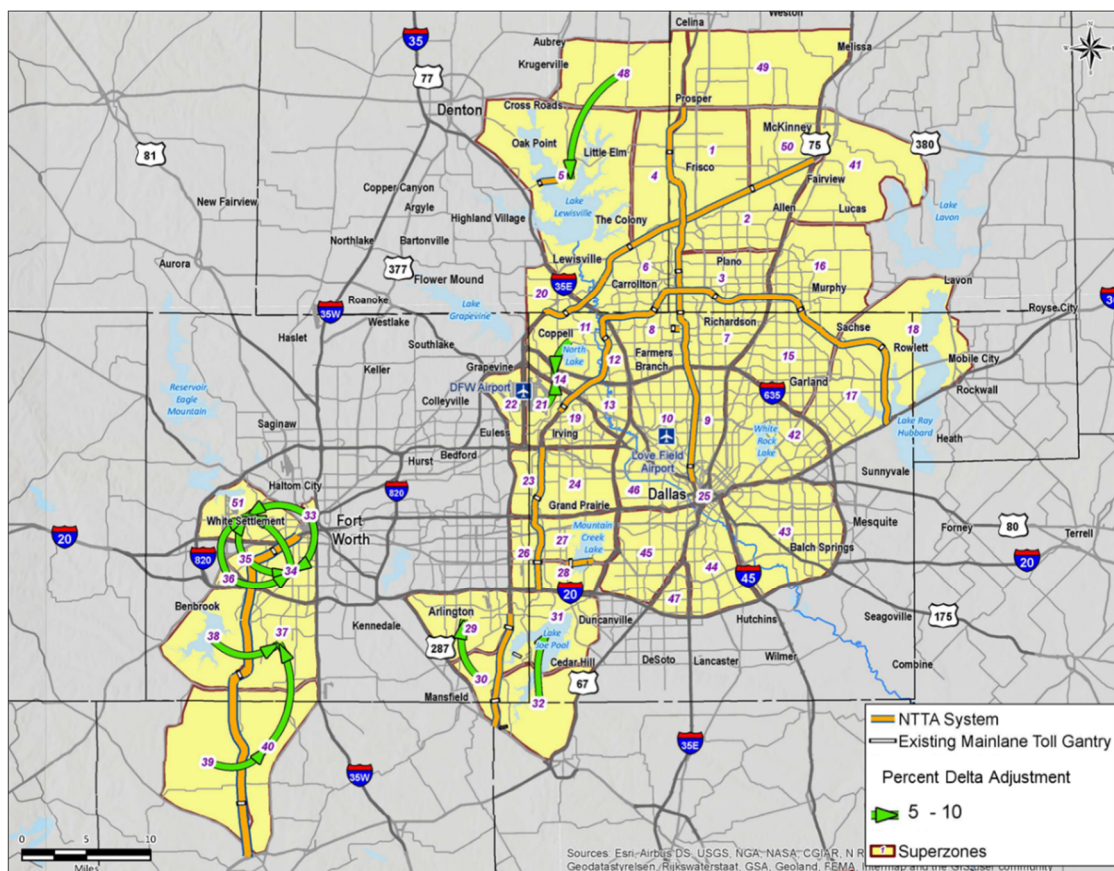


Figure 2-33. Origin-Destination Zones

## 2.9. Stated Preference Survey

In July 2022, CDM Smith conducted a stated preference (SP) survey of NTTA customers who used the NTTA toll network in the Dallas-Fort Worth Metroplex Region. The purpose of the survey was to estimate travelers' willingness to pay for travel time savings via the existing NTTA toll network. The survey collected data from current users of the network by asking respondents about a recent trip made using one of the five regional NTTA tollways and turnpikes and/or one of the three local toll bridges and tunnels. The estimates of toll price sensitivity and willingness to use the toll facilities was then incorporated into the travel demand model to support estimates of traffic and revenue.

The approach employed a dynamic online survey tool developed by CDM Smith. The SP survey was customized for each respondent by presenting questions with wording based on each respondent's previous answers. These dynamic survey features provided an accurate and efficient means of data collection and allowed for the presentation of realistic future conditions in the SP exercises that corresponded with each respondent's reported trip details. Respondents were recruited to the survey by email invitation. The NTTA customer base receives a monthly newsletter via email and the link to the NTTA Travel Survey was included in the July edition, encouraging customers to participate.

A total of 8,055 completed surveys were collected through this method. Data from the SP survey were analyzed using multinomial logit (MNL) models to estimate a distribution of value of time of travelers who use the study corridors.

### 2.9.1. Survey Analysis

Summary tabulation and statistics are presented here for select survey questions. The descriptive analysis of the survey responses is presented in three sections: trip detail questions, stated preference questions, and demographic questions.

Respondents were shown a series of questions that asked them to recount the details of their most recent trip using the NTTA system, beginning with their trip purpose. A plurality of respondents reported a work commute trip (30%), and an additional 10% reported a work-related trip. Social and recreational trips accounted for 25% of the total, followed by personal errand trips (12%) and airport trips (10%). **Figure 2-34** shows the distribution of primary trip purpose for all respondents.

Respondents were asked the departure time of their trip. Of the entire sample, 47% of all trips began during midday hours (9:00 a.m. to 3:59 p.m.), and just over one third (35%) began their trip during either the AM peak (7:00 a.m. to 8:59 a.m.) or PM peak (4:00 p.m. to 5:59 p.m.) (**Figure 2-35**). Among AM and PM peak hour travelers, 31% reported experiencing at least some delay while traveling on the NTTA system, compared to 14% of off-peak travelers. The median delay for peak hour travelers was 10 minutes, while median delay for off-peak travelers was 5 minutes.

Respondents were asked how often they made their reference trips (**Figure 2-36**). Among respondents who reported making a peak hour trip, nearly half (49%) said that the trip was made at least two times per week, with 31% reporting that the trip is made four times per week or more. By contrast, three-quarters of off-peak travelers (75%) make their trip once per week or less, with one quarter (25%) making their trip once per year or less.

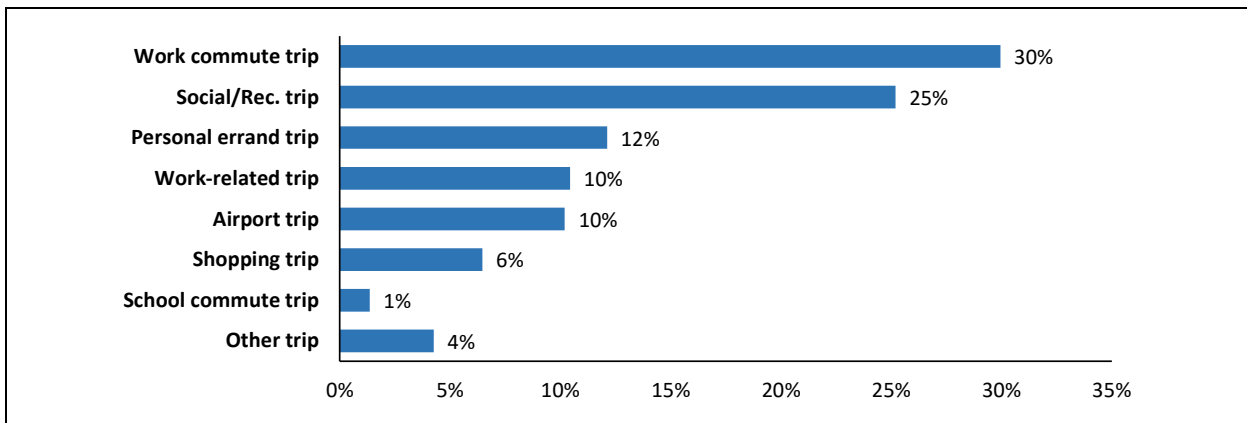


Figure 2-34. Trip Purpose

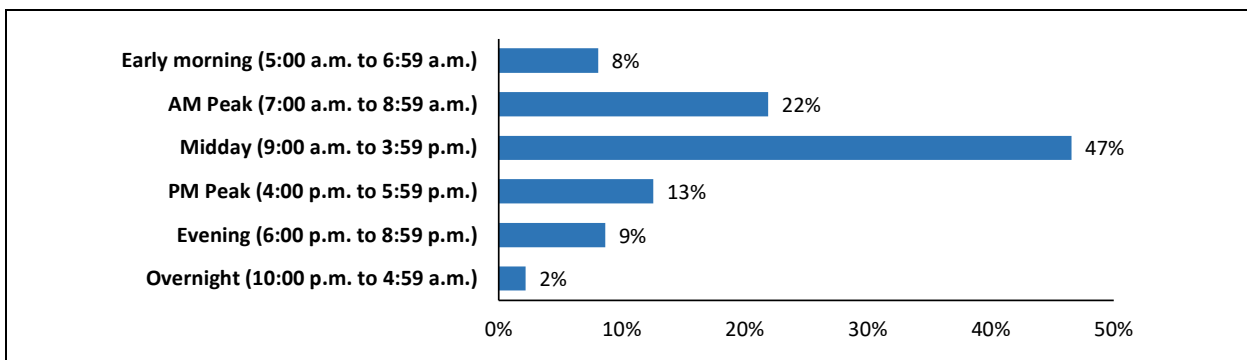


Figure 2-35. Trip Departure Time

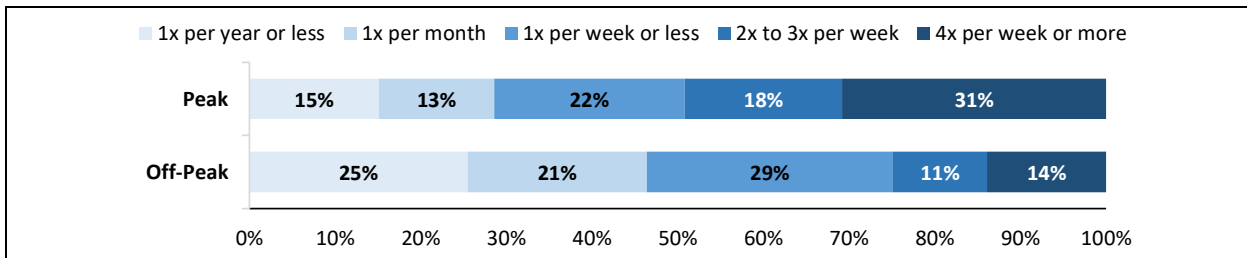


Figure 2-36. Trip Frequency by Trip Departure Time

The most commonly used NTTA facilities on respondents’ reference trips were the President George Bush Turnpike (used by 47% of respondents), the Dallas North Tollway (39%), and the Sam Rayburn Tollway (28%)<sup>1</sup>. The Chisholm Trail Parkway (11%) and 360 Tollway (8%) were selected less frequently, and the Lewisville Lake Toll Bridge, Addison Airport Toll Tunnel, and Mountain Creek Lake Toll Bridge were all used on fewer than 3% of reference trips.

Figure 2-37 shows survey respondents’ assessment of their overall use of the NTTA system compared to their pre-COVID (before March 2020) use. The plurality of respondents (36%) indicated that they use the NTTA system now about the same as they did prior to the COVID-19 pandemic, though 45% said that their usage has either somewhat increased or greatly increased.

<sup>1</sup> Note that the sum of these percentages is greater than 100% due to some respondents selecting more than one NTTA facility to use on their reference trip.

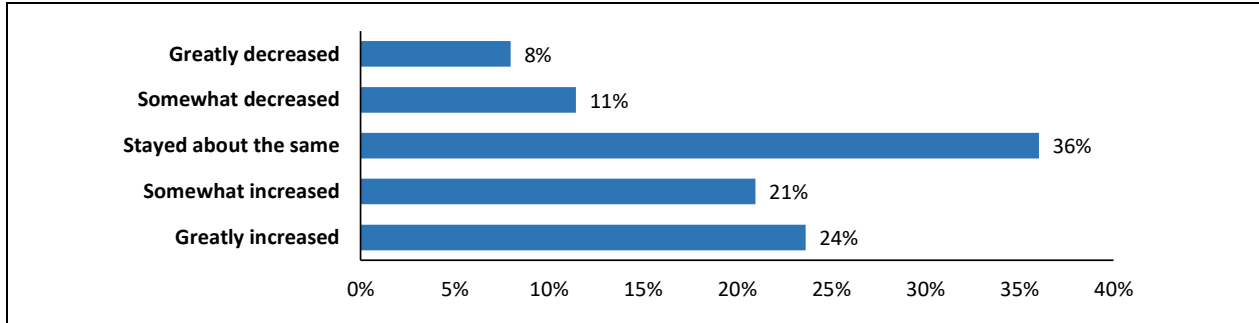


Figure 2-37. Current Use of the NTTA System Relative to Pre-COVID (Pre-March 2020) Use

Table 2-15 shows survey respondents’ most common trip origins and destinations by total trip ends (the sum of trips originating from and ending at each location). These locations were determined by geocoding the geographic coordinates of each user’s origin and destination from the Google Maps API integrated in the survey, and then spatially joining those points with U.S. Census ZIP Code Tabulation Areas (ZCTAs). The top six communities—Dallas, Fort Worth, Plano, Frisco, Irving, and Arlington—collectively accounted for 51% of total trip ends. Each of these communities either encompasses or is located directly along one or more NTTA toll corridors. Dallas County by itself accounted for one third (33%) of all trip origins and destinations, while 55% of trip ends originated or ended in either Tarrant, Collin, or Denton County.

Table 2-15. Top Origins and Destinations by Community and County

Community	Origins	Destinations	Total Trip Ends
Dallas (Dallas County)	16%	27%	22%
Fort Worth (Tarrant County)	9%	8%	8%
Plano (Collin County)	6%	10%	8%
Frisco (Collin County, Denton County)	5%	7%	6%
Irving (Dallas County)	3%	5%	4%
Arlington (Tarrant County)	3%	3%	3%
All others	57%	41%	49%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

After completing the trip characteristics portion of the survey, respondents were shown a set of eight SP trade-off questions, each tailored to their reported trips, and asked to choose between the two offered alternatives. Overall, respondents chose to pay a toll and save time by using an NTTA facility in the majority (60%) of SP scenarios. In 40% of scenarios, the toll-free option was chosen.

The toll route selection rate decreased with increasing toll cost shown, as would be expected (Figure 2-38). At \$1.00 or less, 86% of respondents chose the toll route, falling to 69% at \$3.00 or less. The rate fell again to 43% when tolls between \$3.01 and \$8.00 were shown, and fell to 33% at between \$8.01 and \$10.00. Above \$10.00, only 26% chose the toll route.

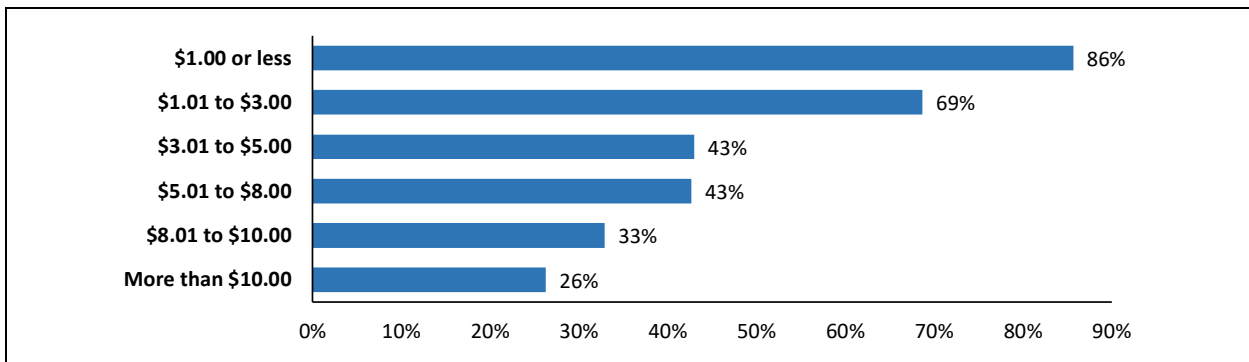


Figure 2-38. Toll Cost Shown and Propensity to Select the NTTA Toll Route Option

The final section of the survey collected demographic information to help confirm that the sample contained a diverse and representative cross section of the traveling population in the Dallas-Fort Worth study area. Respondents provided their home zip code at the end of the survey, which were then used to identify respondents’ home communities and home counties. **Table 2-16** gives the top four home counties—Dallas, Tarrant, Collin, and Denton—which together comprised 80% of all responses. Also given in **Table 2-16** are the median household incomes of survey respondents from each county compared with 2020 American Community Survey 5-Year estimates. The sampled populations have incomes largely similar to the Census estimates, though survey respondents from Tarrant County had somewhat higher incomes than what would be expected from the Census data.

Table 2-16. Median Annual Household Income of Survey Sample by Home County

Home County	Share of Survey Respondents	Survey Median Income	Census Median Income
Dallas County	25%	\$62,500	\$61,900
Tarrant County	19%	\$87,500	\$70,300
Collin County	19%	\$115,000	\$100,500
Denton County	16%	\$87,500	\$90,300
All others	20%	\$87,500	--

**Table 2-17** shows respondents’ employment status before and after the COVID-19 pandemic, which began in March 2020. Over three-quarters were employed full-time prior to the pandemic (77%) and roughly the same share remain full-time today (76%). The biggest shifts occurred in the student population, who presumably graduated and entered the workforce in the two years since the beginning of the pandemic, and among retirees, whose share of the population increased from 10% to 14%.

Table 2-17. Current and Pre-COVID (Pre-March 2020) Employment Status

Employment Status	Pre-COVID (Before March 2020)	Current (as of July 2022)
Employed full-time	77%	76%
Employed part-time	4%	3%
Retired	10%	14%
Student	4%	2%
Homemaker	2%	2%
Disabled	1%	1%
Unemployed	2%	2%

Currently employed survey takers were asked about their experience with remote work. They were asked about their work from home options prior to March 2020, their current options, and their expected future options. The compiled results of these questions are given in **Table 2-18**. Prior to the COVID-19 pandemic, most respondents (60%) reported having no work from home option, and only 17% reported working remotely full-time (four days per week or more). As of July 2022, however, a majority of respondents now report having the option to work remotely (57%), and the share of full-time remote workers has increased to 29%. In the future, some workers expect to return to the office full-time, though a slight majority (51%) still expect to be able to work from home at least some of the time.

**Table 2-18. Pre-COVID (Pre-March 2020), Current, and Expected Future Remote Work Status**

Remote Work Status	Pre-COVID (Before March 2020)	Current (as of July 2022)	Expected Future
No WFH option	60%	43%	49%
WFH less than 1 day per week	11%	8%	7%
WFH 1 to 3 days per week	12%	20%	22%
WFH 4 to 5 days per week	17%	29%	23%

### 2.9.2. Discrete Choice Model and Value of Time Results

The primary objective of the SP survey was to estimate the value of time (VOT) for passenger vehicle travelers who make trips in the Dallas-Fort Worth Metroplex Region. These value of time estimates are used as inputs to the travel demand models that are used to forecast traffic and toll revenue on the NTTA System.

The eight choice observations for each of the final 8,055 respondents were compiled into a dataset with 64,440 observations to be estimated by a set of multinomial logit (MNL) models. In addition to the model run using the dataset for the full sample, two additional models were run, which segmented the dataset by trip purpose (work and non-work) and trip departure time (peak hour and off-peak). Conventional maximum likelihood procedures were used in the MNL models to estimate travel time and toll cost coefficients, which were then used to calculate VOT.

VOTs for a full distribution of incomes for the full survey sample and the two market segment models are shown in **Table 2-19**. At the median values of household income (\$87,500) for the full survey sample, the MNL model produced a VOT of \$26.10/hour (in 2022 dollars). In the trip purpose market segment model, work and business travelers had VOTs 10% higher than non-work travelers (\$27.80 per hour compared to \$25.20 per hour). In the trip departure time model, no difference was observed between peak and off-peak travelers, however (\$26.20 per hour for both segments).

**Table 2-19. Market Segment VOTs (\$/Hour) at Household Median Income Levels**

Household Median Income	Full Sample	Trip Purpose		Trip Departure Time	
		Non-work	Work	Off-peak	Peak
\$20,000	\$17.50	\$16.90	\$18.60	\$17.60	\$17.60
\$60,000	\$23.90	\$23.00	\$25.40	\$24.00	\$24.00
\$87,500	\$26.10	\$25.20	\$27.80	\$26.20	\$26.20
\$100,000	\$26.80	\$25.90	\$28.60	\$27.00	\$27.00
\$150,000	\$29.20	\$28.20	\$31.10	\$29.40	\$29.40
\$200,000	\$30.90	\$29.80	\$32.90	\$31.10	\$31.10
\$250,000	\$32.20	\$31.10	\$34.30	\$32.40	\$32.40

## Section 3

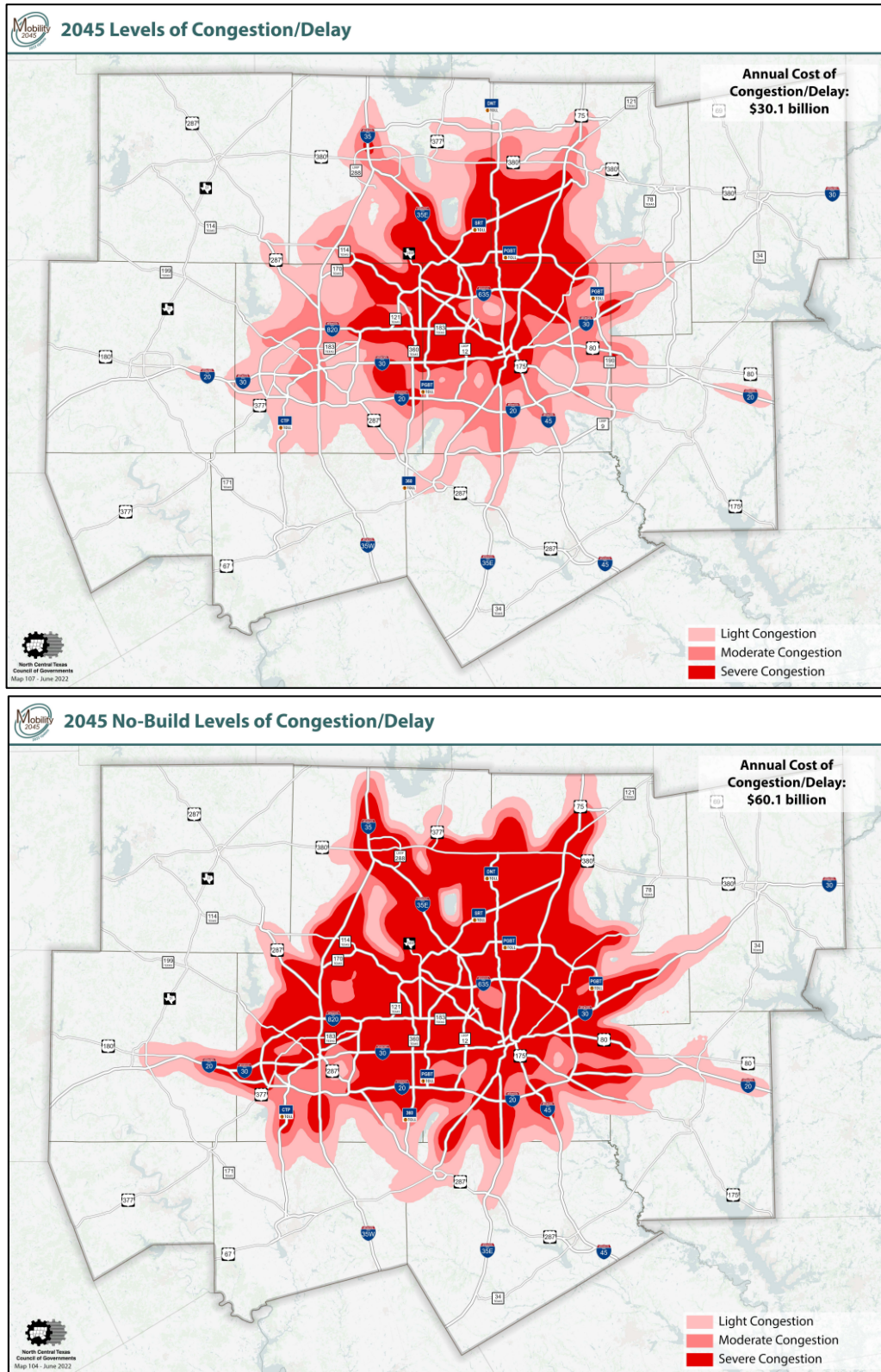
# Dallas-Fort Worth Area Transportation Characteristics

The purpose of this section is to provide background information on the existing and future transportation characteristics surrounding NTTA roadways in the DFW Metropolitan Area (DFWMA). To maintain consistency with regional transportation planning efforts, planned and programmed transportation improvements contained within *Mobility 2045 – 2022 Update*, the current Metropolitan Transportation Plan (MTP) for the DFWMA, are assumed as the regional foundation. The MTP is developed by the North Central Texas Council of Governments (NCTCOG) and adopted by the Regional Transportation Council (RTC), the metropolitan planning organization (MPO) policy body for the DFWMA. Information described in this section draws from the current MTP. As the MPO, NCTCOG is primarily responsible for conducting the multimodal long-range regional transportation planning for the DFWMA. More information about NCTCOG and RTC and the MTP process is provided in **Section 4**. The MTP for the DFWMA serves as a guideline for the region’s planned investment in the transportation infrastructure and services through 2045. It is a federal requirement that the MTP must be financially constrained and balanced to the region’s anticipated revenue streams over a minimum time horizon of twenty years. *Mobility 2045 – 2022 Update* was adopted by the RTC in June 2022. This was an update of the Mobility 2045 plan originally adopted in June 2018. The Mobility 2045 Update plan includes \$136.4 billion in major expenditures on recommended transportation improvement projects and programs expected to be implemented between now and the planning horizon year of 2045. The MTP outlines a \$53.6 billion investment in North Texas roadway infrastructure expansion, system improvements, and new roadway capacity.

According to the US Census, DFWMA is the fourth largest metropolitan area in the nation with a population of 7.7 million in 2020 and is projected to grow to 11.4 million residents by 2045. This growth represents a 48 percent increase in the population of North Texas over the next 25 years. Total employment is expected to increase 74 percent from 4.03 million in 2019 to 7.02 million by 2045. The DFWMA has one of the largest regional economies in Texas and is more populous than thirty-seven states. **Section 4** provides detailed information regarding the demographic growth characteristics of the region.

### 3.1. Traffic Congestion Trends

**Figure 3-1** provides an estimate of the 2045 congestion levels with both the currently planned transportation infrastructure and under a no-build scenario without any transportation improvements. Much of the area surrounding NTTA’s roadways will experience moderate to severe congestion by 2045. The *Mobility 2045 – 2022 Update* estimated that the region-wide annual cost of congestion in 2023 will be \$13.3 billion and could possibly reach about \$30.1 billion by 2045 with planned infrastructure improvements in place and \$60.1 billion with no transportation improvements. In 2023, the region is estimated to experience peak period travel times that are more than 37 percent above free-flow conditions due to congestion, and it is expected that this will increase to over 59 percent in 2045 even after implementation of all planned improvements.



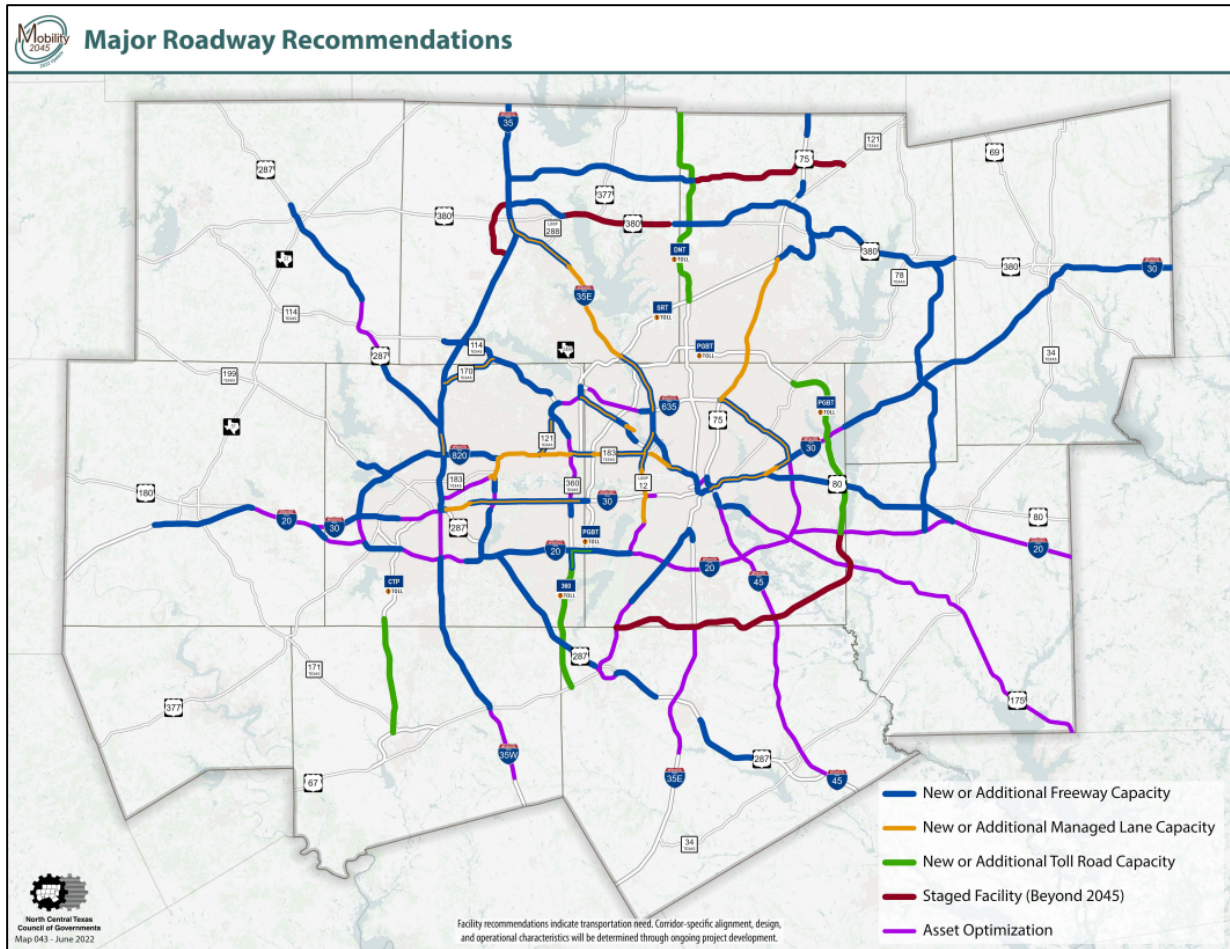
**Figure 3-1.**  
**2045 Levels of Congestion/Delay**

Source: North Central Texas Council of Governments Mobility 2045 – 2022 Update Metropolitan Transportation Plan



## 3.2. Freeway and Tollway System

**Figure 3-2** provides an illustration of the funded roadway improvement recommendations included in the *Mobility 2045 – Update Plan*, focusing on freeways, tollways, HOV/managed lanes, frontage roads and selected regionally significant arterials. The identification of these facilities is very important to this study because additional freeway and arterial improvements could materially impact NTTA System traffic and toll revenue. Facilities providing improved accessibility to NTTA System facilities could provide positive impacts to the NTTA System while competing/alternate routes could dampen its traffic and revenue potential.



**Figure 3-2.**  
**2045 Major Roadway Recommendations**

Source: North Central Texas Council of Governments Mobility 2045 – 2022 Update Metropolitan Transportation Plan

The following is a brief description of major freeways and managed lanes in the DFW region and their associated capacity expansions which are planned through 2045 as shown in **Figure 3-2**:

- **IH 35E** – Ultimate configuration for IH 35E between IH 35E/IH 35W interchange in Denton and Spur 482/Storey Lane in Dallas will be completed by 2045; ultimate configuration includes expansion of the general-purpose lanes and tolled managed lanes, and conversion from current reversible managed lanes to concurrent managed lanes. In which, a section between PGBT and IH 635 is already under construction and scheduled to open in January 2026.
- **US 75** – Improvements to US 75 between Grayson County line and CR 370 includes expansion of six lane general-purpose and estimated to complete by 2026. In addition, between Melissa Road and Sam Rayburn Tollway, in northern Collin County, includes the expansion of eight lane general-purpose and is estimated to be completed by 2036.
- **North Tarrant Express (NTE)** – Following projects are planned along NTE:
  - **Segment 1**: General-purpose lanes will expand from four to six lanes by 2026.
  - **Segment 2W**: Tolled managed lanes will expand from four to six lanes by 2026.
  - **Segment 3A**: Expansion from four to eight general-purpose lanes by 2036
  - **Segment 3B**: Tolled managed lanes between IH 820 and Basswood Boulevard along will expand from four to six lanes by 2036.
  - **Segment 3C**: Expansion from four to six general-purpose lanes by 2036.
- **IH 35W** – Following projects are planned along IH 35W:
  - IH 35W South will expand from ten to eleven lanes general-purpose between IH 20 and SH 174 (Tarrant County line), by 2036.
  - In addition, between SH 174 and Maple Avenue (CR 401) is expected to operate as a six-lane general-purpose, by 2036.
  - IH 35W North will be widened from four lanes to six general purpose lanes between IH 35E/35W and Eagle Parkway by 2036.
- **SH 360** – Following projects are planned along SH 360:
  - SH 360 expansion from four to six general purpose lanes between Stone Myers Parkway and Mid Cities Boulevard, by 2036
  - SH 360 expansion from six to eight general purpose lanes between IH 30 and IH 20, by 2045.
  - SH 360 expansion from four to six general purpose lanes between IH 20 and Sublett Road, by 2045
  - SH 360 expansion from four to eight general purpose lanes between Sublett Road and Debbie Lane, by 2045
  - SH 360 expansion from four to six general purpose lanes between Debbie Lane and US 67, by 2045
- **US 287** – Following projects are planned along US 287:
  - US 287 will be expanded from four to six lane general-purpose freeway between Lone Star Road and Sublett Road, by 2036

- US 287 expansion from four to six lane general-purpose freeway between IH 35W and South of Ramhorn Hill Road, by 2036
- US 287 will be reconstructed to full freeway standards between St Paul Road and Lampasas Road by 2036.
- **Midtown Express** –
  - SH 183 will be converted from four to six managed toll lanes between SH 121 and President George Bush Turnpike (PGBT) by 2045
  - SH 183 will be converted from two to four managed toll lanes between SH 114 and Empire Central by 2045
  - Similarly, SH 183 will be converted from two to six managed toll lanes between Empire Central and IH 35E, by 2045

Mobility 2045 includes several changes to planned projects from what was included in prior MTPs. Following is a list of major changes to the previously proposed roadway improvements introduced in the 2045 MTP:

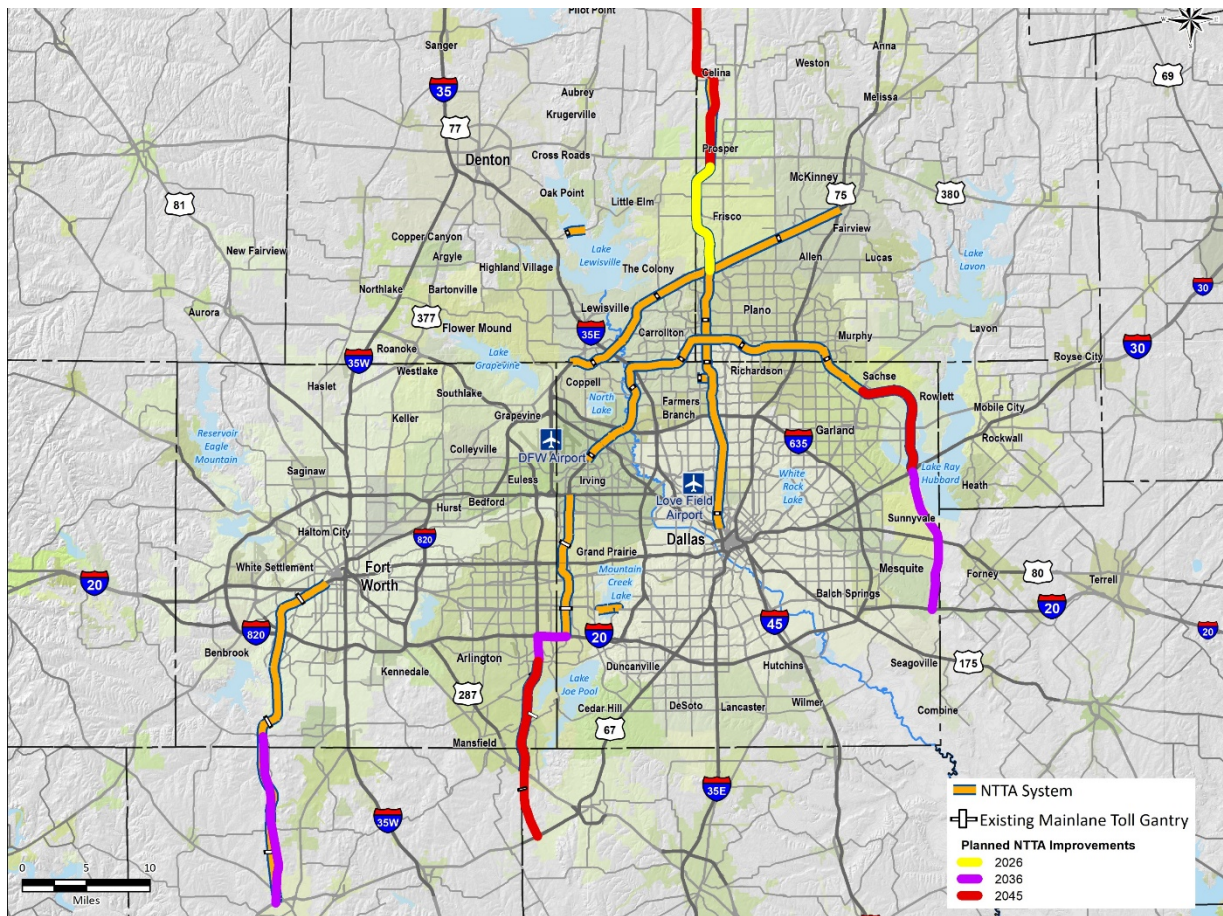
- **360 Tollway** – 360 Tollway between US 67 and US 287 is added in the year 2045.
- **360 Tollway** – Expansion of 360 Tollway between Sublett Road and US 287 from four lanes to six/eight lanes is delayed from 2036 to 2045.
- **DNT Phase 4B** – DNT Phase 4B is added in the year 2033
- **IH 35E** – IH 35E managed lanes expansion between IH 635 and Denton is delayed from 2036 to 2045. A section between PGBT and IH 635 is already under construction and scheduled to open in January 2026.
- **IH 35E** – The following projects are planned along IH 35E:
  - IH 35E expansion from ten to eleven lanes general-purpose between Oak Lawn Avenue and Woodall Rodgers Freeway/Spur 366, by 2036
  - Section between US 380 and IH 35W/IH 35E will be converted from zero to 4 managed toll lanes.
  - IH 35E will operate as eight lane freeway with two to four managed toll lanes between IH35W/IH 35E and Corinth Parkway, by 2045
  - Section between Corinth Parkway and IH 635 will be converted from two to four managed lanes, by 2045
  - IH 35E expansion from ten to twelve lanes between IH 635 and Loop 12, by 2045
  - IH 35E expansion from six to eight lanes between State Loop 12 and Spur 482/Storey Lane, by 2045
  - IH 35E expansion from six to eight lanes between Spur 482/Storey Lane to SH 183, by 2036
  - IH 35E expansion from ten to eleven lanes between SH 183 and Medical Center Boulevard with two managed toll lanes until Medical District Drive, by 2036 and ultimately section between SH 183 and Inwood Boulevard will have four to six managed toll lanes, by 2045

- IH 35E expansion from ten to twelve lanes between Market Center Boulevard and Oak Lawn Avenue, by 2036

Additional NTTA toll roads planned for the region through 2045 are shown in **Figure 3-3**, and their expected completion years are as follows:

- **SH 190** – SH 190 East Branch, from IH 30 to IH 20 planned to be completed by 2045.
- **360 Tollway and PGBT-WE Connector (the “Elbow”)** – SH 360 to PGBT-WE toll connector is planned to be completed by 2026.
- **DNT Phase 4A:** Construction of the DNT northern extension, from US 380 to FM 428 is planned to be completed by 2026.
- **DNT Phase 4B:** Construction of the DNT northern extension, from FM 428 to the Grayson County is planned to be completed by 2036.

**Figure 3-4** shows additional planned projects in the NTTA System area that are included in *Mobility 2045 – 2022 Update*.



**Figure 3-3.**  
NTTA Roadway Projects in Mobility 2045 – 2022 Update

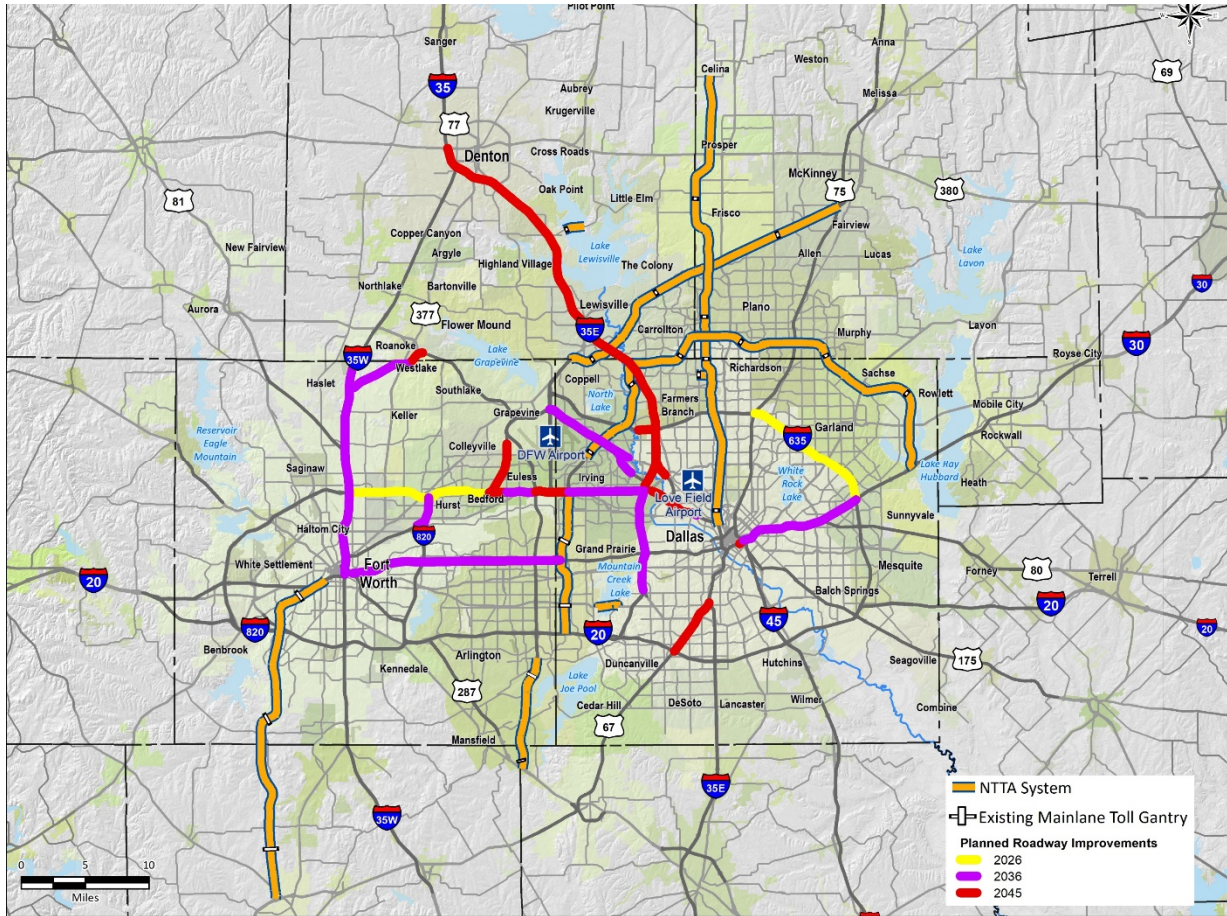


Figure 3-4.

**Expected Completion Years of Planned Projects in the NTTA System Area**

Source: North Central Texas Council of Governments (Mobility 2045 Metropolitan Transportation Plan) and North Texas Tollway Authority

NTTA provided CDM Smith a list of capacity improvement projects, along with the anticipated completion date for each. **Table 3-1** provides a list of future NTTA roadway improvement projects.

**Table 3-1. NTTA Capital Improvement Projects**

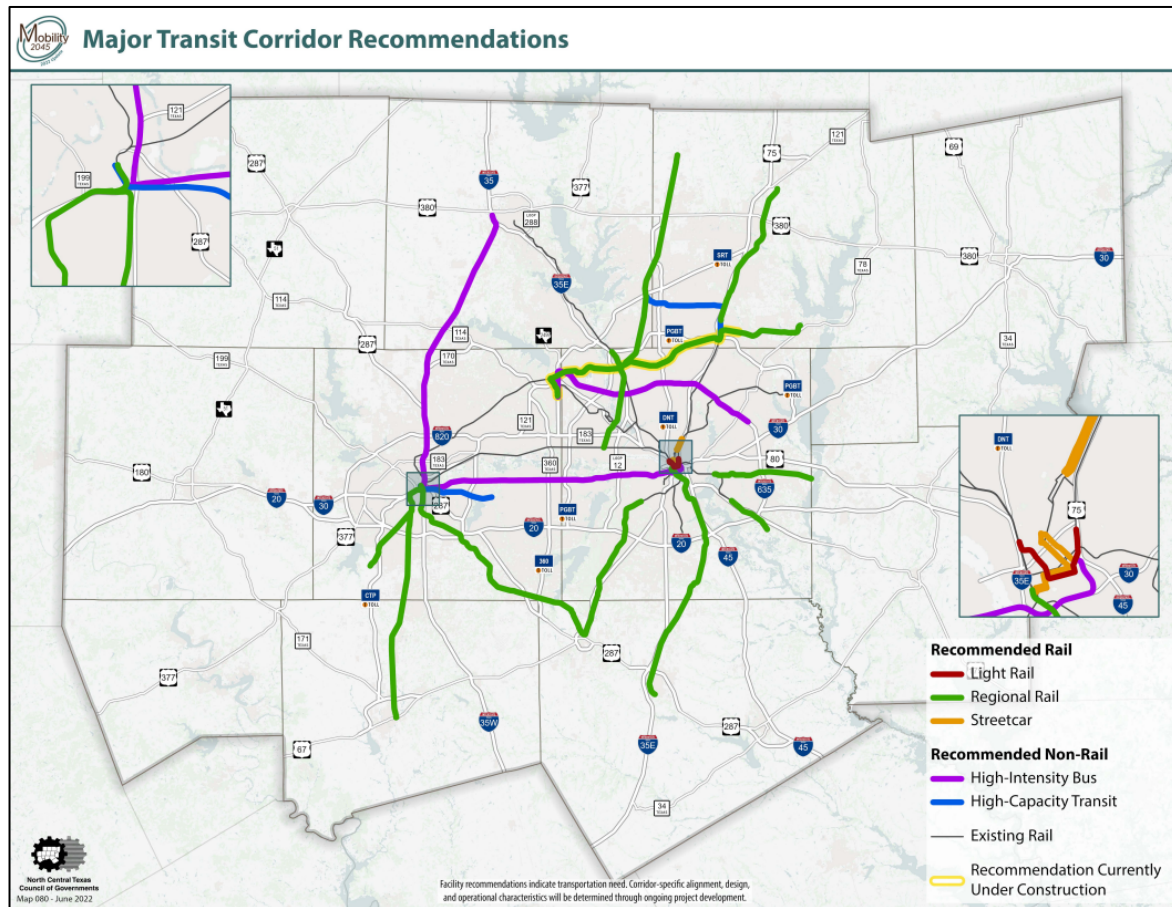
Project	Opening Date
DNT: Fields Parkway Toll Ramps	February 28, 2023
DNT: Extension from US 380 to First Street	February 28, 2023
DNT: Fourth Lane Expansion (SRT to US 380)	August 31, 2025
DNT 4A: Mainlane Extension from US 380 to FM 428	December 31, 2027
DNT 4B: Southbound Frontage Road (FM 428 to Grayson/Denton County line)	August 31, 2022
DNT 4B: Mainlane Extension from FM 428 to Grayson County Line	December 31, 2032
PGBT/360 "Elbow": Connection from PGBT-WE to SH 360	December 31, 2029
CTP: Expansion to four lanes from FM 1187 to US 67	December 31, 2028
East Branch: Six lane tollway between IH 30/PGBT-EE and IH 20/Loop 9	December 31, 2032



Trinity Metro is the operator of the bus system for the City of Fort Worth and the TEXRail running from downtown Fort Worth to the DFW Airport. Trinity Metro also partners with DART on the Trinity Railway Express (TRE), which offers commuter rail service between downtown Fort Worth and downtown Dallas with bus connections to DFW Airport.

The Denton County Transportation Authority (DCTA) is the transit authority that operates in Denton County, which is located northwest of Dallas County. Along with operating bus service in three cities within Denton County, DCTA runs the A-Train commuter rail, a regional rail line parallel to IH 35E that connects with the DART system at the Trinity Mills Station in Carrollton.

**Figure 3-6** illustrates the proposed rail system as developed by NCTCOG in cooperation with the transit agencies. As can be observed in the figure, there are proposed transit alignments included in *Mobility 2045 – 2022 Update*, which could potentially compete directly with NTTA System facilities.



**Figure 3-6.**  
**2045 Project Implementation: Passenger Rail**

Source: North Central Texas Council of Governments Mobility 2045 Metropolitan Transportation Plan

To summarize, the transportation system defined in the *Mobility 2045 – 2022 Update* and described above is reflected in the trip tables used to estimate the traffic and toll revenue for the NTTA System. The trip tables and networks were obtained from NCTCOG to reflect all the planned transportation infrastructure development included in *Mobility 2045 – 2022 Update*.

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## Section 4

# Regional Demographic and Economic Trends

As part of this NTTA System Comprehensive Traffic and Toll Revenue Study, historical and projected demographic characteristics used by the North Central Texas Council of Governments (NCTCOG) were reviewed to develop travel demand modeling trip tables. This section describes the major socioeconomic characteristics of the Dallas-Fort Worth Metropolitan Area (DFWMA), including both the regional trends and the specific trends near the NTTA System.

In June 2022, the Regional Transportation Council (RTC), the policy body for the DFWMA, adopted *Mobility 2045: The Metropolitan Transportation Plan for North Central Texas – 2022 Update*. The plan included new regional demographic forecasts, developed for the twelve counties that comprise the DFWMA: Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant and Wise. The demographic datasets from *Mobility 2045 – 2022 Update* were used as the baseline to generate future trip patterns in the DFWMA. The traffic and toll revenue estimates included in this report utilized the databases included in *Mobility 2045 – 2022 Update*.

This section first provides a description of the NCTCOG forecast process used to generate the base demographics followed by a discussion of the regional historical and future growth in the twelve-county area. This section also discusses the independent economic review, which was conducted by Research and Demographic Solutions (RDS), an independent economist.

The demographic information presented in this section forms the foundation that was used to develop the potential demand for NTTA System facilities. The demographic information is used as an input to the trip generation model to estimate total trips produced for the Dallas-Fort Worth (DFW) region within the travel demand model.

### 4.1. NCTCOG Demographic Forecast Process

As required by federal legislation, NCTCOG periodically develops future demographics based on county and regional control totals created by the Texas Demographic Center (TDC), formerly known as the Texas State Data Center (TSDC), and other independent sources. The TDC is part of the State Data Center System, a national network of 52 centers (all 50 states, Puerto Rico and the Virgin Islands) in charge of disseminating demographic information. The demographics adopted by NCTCOG are considered official demographics to support the metropolitan planning process and travel demand modeling within the DFW region.

The demographic forecast and trip table development process implemented by NCTCOG is divided into six steps as illustrated in **Figure 4-1**. In the first step, regional control totals of population and employment were developed in five-year increments from a base year through the forecast horizon year (2045). These regional totals were obtained from the TDC and were combined with forecasts developed by independent economists at the Perryman Group. The forecasts were developed in a coordinated effort between NCTCOG's Research and Information Services and Transportation departments.

The TDC population forecast process is a cohort-component forecast method which involves determination of several elements including fertility, mortality, and migration rates. The migration rate for 2010-2015 was used throughout the projection period.

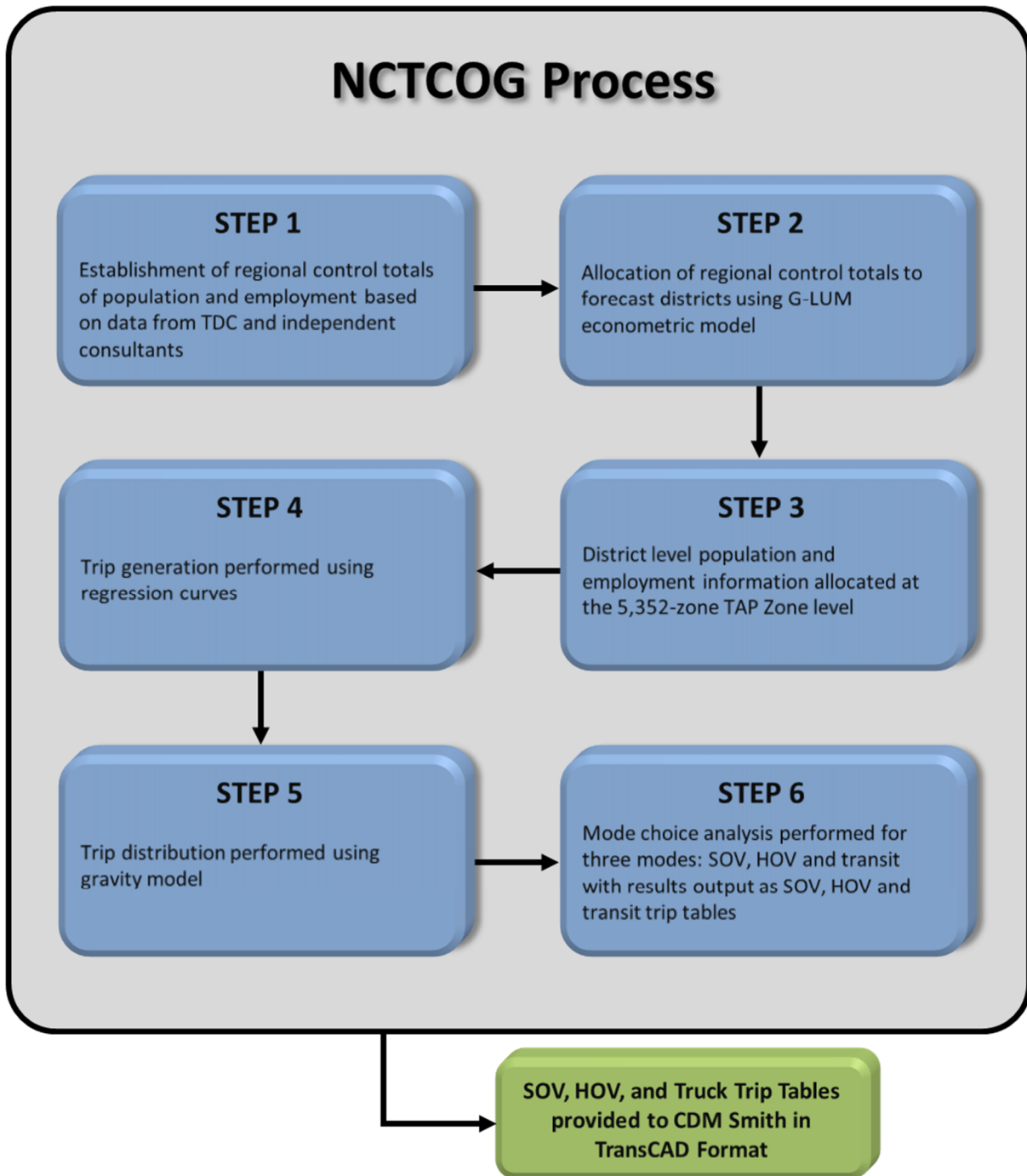


Figure 4-1.  
NCTCOG Forecast Process

**Table 4-1** shows the control totals that were considered during the forecasting process. The population totals adopted by NCTCOG for the region are shown in bold in **Table 4-1**.

Employment control totals were generated by NCTCOG with input from their Employment Estimates program, which monitors non-construction job counts by place of work for municipalities in the DFWMA. The employment totals seen in **Table 4-1** show that the total employment of the DFWMA is anticipated to increase from 5.4 million in 2020 to 8.1 million by 2045.

The second step in the forecasting process involves allocating the DFWMA regional control totals to 242 forecast districts for each five-year interval. The Gravity Land Use Model (G-LUM) was used for this process. In the third step, the district level information was disaggregated to the Transportation Analysis Process (TAP) zone level using a disaggregation model developed by NCTCOG. There are 5,252 TAP zones in the DFWMA area. The critical variables used in this process are district level household change, acres of vacant land, density of future residential development, and proximity to transportation infrastructure. Output from this process was closely reviewed by the member cities and approved by the Regional Demographic Task Force before being presented and approved by the NCTCOG Executive Board.

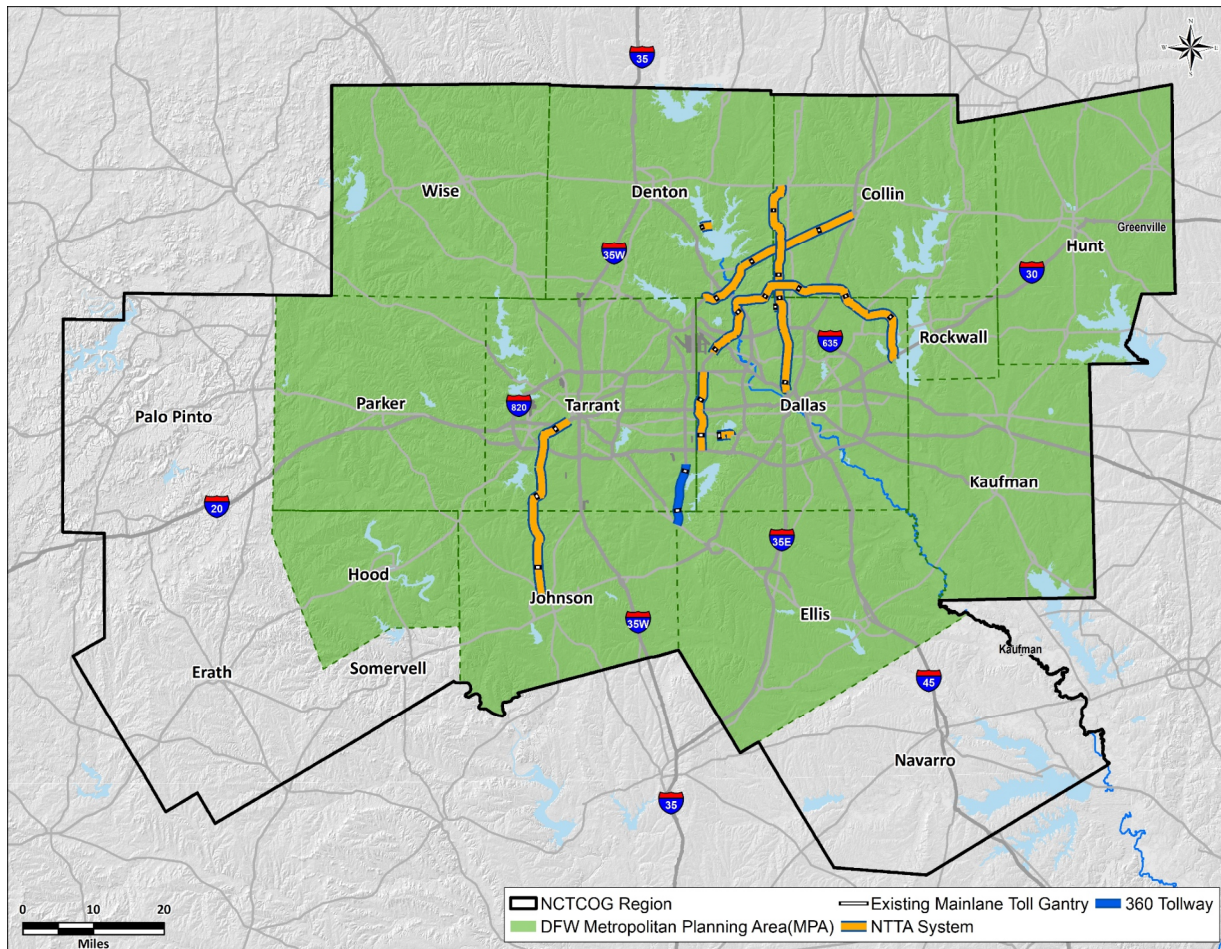
The fourth step involves performing trip generation using regression curves. This process estimates the total number of trips generated by and attracted to each Traffic Survey Zone (TSZ). In the fifth step, trip distribution is performed using the gravity model. In the sixth and final step, mode choice analysis is performed and subsequently trip tables are created for the single occupant vehicle (SOV), high occupancy vehicle (HOV), truck and transit modes. These final official tables were provided to CDM Smith by NCTCOG.

**Table 4-1. Population and Employment Forecast Totals**

Forecast	2020	2023	2026	2036	2045
TSDC Population	7,747,000	8,190,000	8,660,000	10,407,000	12,174,000
Mobility 2045 Population	7,699,000	8,130,077	8,683,644	9,901,269	11,370,218
Mobility 2045 Employment	5,350,000	5,698,914	6,038,141	7,140,436	8,089,638
** Estimated from 2019 BEA and 2045 NCTCOG estimated value					
Source: North Central Texas Council of Governments, Texas State Data Center, and 2020 Census					

## 4.2. Historical and Future Regional Growth

The sixteen counties served by NCTCOG include Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, and Wise. **Figure 4-2** illustrates the spatial relationship of these counties and highlights the twelve counties which cover the DFWMA travel demand model area. NTTA's facilities, which lie in five of the counties, are also represented on the map. The analysis of historical and future demographic growth from a regional perspective is based on information pertaining to population, employment, and income for these twelve counties.



**Figure 4-2.**  
DFW Metropolitan Planning Area

### 4.3. Historical Regional Population Trends

**Table 4-2** shows the historical population trends for the counties in the DFWMA travel demand model area as well as Texas and the United States. The total population in the twelve-county area has increased at an annual average rate of 2.2 percent from 1990 to 2020, resulting in 3.7 million additional residents. This regional population growth trend exceeded the state and national growth trends between 1990 and 2020 which were 1.8 percent and 1.0 percent per year, respectively.

Dallas County is the largest county in the region in terms of population with approximately 2.6 million residents in 2020. Its population increased at an average annual rate of 1.2 percent between 1990 and 2020, adding a total of about 760,700 people during the same period. Dallas County's population in 2020 represented approximately 33.9 percent of the total population of the twelve-county area.

Rockwall County and Collin County were the fastest growing counties in the region between 1990 and 2020. Rockwall County population increased from 25,600 in 1990 to 107,800 in 2020, corresponding to an average annual growth rate of 4.9 percent over the thirty-year period.

Rockwall County population growth rate between 1990 and 2020 has been significantly higher than the population increase experienced by the State of Texas and the United States.

The population in Collin County increased from 264,000 in 1990 to 1,064,500 in 2020, corresponding to an average annual growth rate of 4.8 percent. Tarrant County is the second largest county in the region in terms of population with approximately 2.1 million people in 2020. Its population increased at an average annual rate of 2.0 percent between 1990 and 2020, adding a total of 940,500 people during the same period. Denton County experienced a significant growth rate of 4.1 percent between 1990 and 2020, gaining 632,900 residents.

Majority of the population in the DFWMA is concentrated within the four core NCTA member counties (Collin, Dallas, Denton and Tarrant). In 2020, Collin, Dallas, Denton, and Tarrant Counties contained nearly 87 percent of the total population of the twelve-county area, as shown in **Table 4-2**.

An increase in migration to the state beginning in the 1990s has helped to boost the Texas economy. Since 2006, the state has led the nation in domestic migration from states such as California and New York. According to the U.S Census Bureau, one in six people living in Texas is an immigrant. Approximately 18 percent of DFW population is foreign born. The population of the DFW region grew more than any other metropolitan area in the country between 2010 and 2020, according to the U.S Census Bureau. The DFW region added 1.2 million people during that period.

## 4.4 Future Regional Population Growth

Also included in **Table 4-2** is NCTCOG's population forecast from the Mobility 2045 – 2022 Update. Population in the twelve-county area is expected to increase from 7.7 million in 2020 to approximately 11.4 million by 2045, corresponding to an annual average rate of 1.6 percent. Dallas County's population is expected to grow by an annual average rate of 1.3 percent between 2020 and 2045, from 2.6 million in 2020 to 3.6 million by 2045. The additional 0.96 million residents expected in Dallas County by 2045 would represent the second highest number of additional residents for any county in the twelve-county area during that period. Only Tarrant County is expected to add more residents by 2045.

Collin County population is expected to grow between 2020 and 2045 at an annual average rate of 1.9 percent, from about 1.1 million in 2010 to 1.7 million by 2045. Rockwall County population is expected to grow between 2020 and 2045 at an annual average rate of 1.2 percent, from 107,800 in 2020 to 145,500 by 2045. The year 2045 population distributions for each of the counties in the twelve-county area are also presented in **Table 4-2**. As in 2020, Dallas and Tarrant Counties would continue to comprise the largest population centers in the twelve-county area. Most of the growth is expected to be in the core counties of Dallas, Tarrant, Collin, Ellis, and Denton.

Table 4-2. County Population Trends and Projections (US Census Bureau and NCTCOG Forecast)

County	US Census Bureau				NCTCOG Demographic Forecast
	Year 1990	Year 2000	Year 2010	Year 2020	Year 2045
Collin	264,000	491,700	782,300	1,064,500	1,678,800
Dallas	1,852,800	2,218,900	2,368,100	2,613,500	3,570,900
Denton	273,500	433,000	662,600	906,400	1,268,300
Ellis	85,200	111,400	149,600	192,500	561,800
Hood	29,000	41,100	51,200	61,600	100,500
Hunt	64,300	76,600	86,100	100,000	140,400
Johnson	97,200	126,800	150,900	179,900	307,100
Kaufman	52,200	71,300	103,400	145,300	177,200
Parker	64,800	88,500	116,900	148,200	185,200
Rockwall	25,600	43,100	78,300	107,800	145,500
Tarrant	1,170,100	1,446,200	1,809,000	2,110,600	3,072,000
Wise	34,700	48,800	59,100	68,600	162,500
Twelve-County Area	4,013,400	5,197,400	6,417,500	7,698,900	11,370,200
State of Texas	16,986,500	20,851,800	25,145,600	29,145,500	-
United States	248,709,900	281,424,600	308,745,500	331,449,300	-
County	Annual Growth		Percent Population		Share of New Growth (2020-2045)
	1990-2020	2020-2045	2020	2045	
Collin	4.80%	1.80%	13.80%	14.80%	16.70%
Dallas	1.20%	1.30%	33.90%	31.40%	26.10%
Denton	4.10%	1.40%	11.80%	11.20%	9.90%
Ellis	2.80%	4.40%	2.50%	4.90%	10.10%
Hood	2.50%	2.00%	0.80%	0.90%	1.10%
Hunt	1.50%	1.40%	1.30%	1.20%	1.10%
Johnson	2.10%	2.20%	2.30%	2.70%	3.50%
Kaufman	3.50%	0.80%	1.90%	1.60%	0.90%
Parker	2.80%	0.90%	1.90%	1.60%	1.00%
Rockwall	4.90%	1.20%	1.40%	1.30%	1.00%
Tarrant	2.00%	1.50%	27.40%	27.00%	26.20%
Wise	2.30%	3.50%	0.90%	1.40%	2.60%
Twelve-County Area	2.20%	1.10%	100%	100%	100%
State of Texas	1.80%	N/A	N/A	N/A	N/A
United States	1.00%	N/A	N/A	N/A	N/A

## 4.5 Historical Regional Employment Trends

Employment statistics are used as relative indicators of trip attractions to an area. Intense employment growth in an area indicates the potential for an increase in the demand for transportation infrastructure. The countywide historical employment trends in the DFWMA are shown in **Table 4-3**. Between 1990 and 2010, employment in the twelve-county area increased at an annual rate of 3.3 percent, which was higher than the employment growth rate of both the state and the nation. Dallas County is the most prominent employment center in the twelve-county region and is home to many industrial and medical institutions such as AT&T, Bank of America, Southwest Airlines, Texas Instruments, Baylor University Medical Center, and Texas Health Presbyterian Hospital. According to figures presented by NCTCOG, Dallas County added 695,053 new jobs between 1990 and 2010 at an annual average rate of 2.2 percent. In 2010, jobs in Dallas County represented 48.5 percent of the total employment in the twelve-county area.

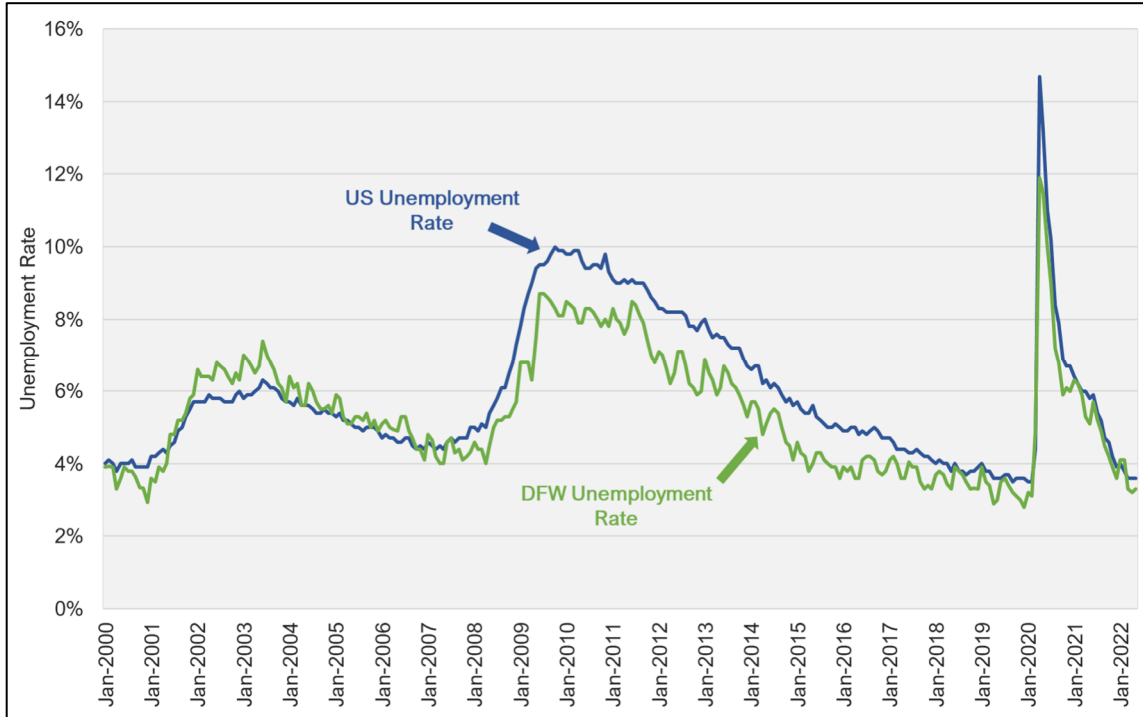
Approximately 342,261 new jobs were added to Collin County between 1990 and 2010 which corresponds to an annual average rate of 8.0 percent. Fourteen percent of the total jobs produced in the region from 1990 to 2010 were added to Collin County whose employment growth rate was the highest in the DFWMA during that period. Denton County experienced strong employment growth between 1990 and 2010; employment grew from 75,817 in 1990 to 244,358 in 2010, corresponding to an additional 168,541 jobs at an annual average rate of 5.5 percent. Tarrant County employment increased from 586,058 in 1990 to 1.05 million in 2010, adding 465,469 new jobs. During 2010, the total employment in Tarrant County represented 26 percent of the total employment in the DFWMA.

Employment distributions by county are also shown in **Table 4-3**. Dallas and Tarrant counties incorporate the bulk of the employment centers in the DFWMA, encompassing 74.7 percent of the region's total employment in 2010. **Figures 4-3** and **4-4** show historical unemployment and employment growth rates for DFW and the United States. As can be seen, the DFW area has been performing better than the rest of the nation in terms of unemployment rates and employment growth since 2008. There was a noticeable uptick in the unemployment rate from March 2020 through June 2020 due to economic slowdown because of the COVID-19 pandemic. Unemployment rates have since dropped back down to pre-pandemic levels.

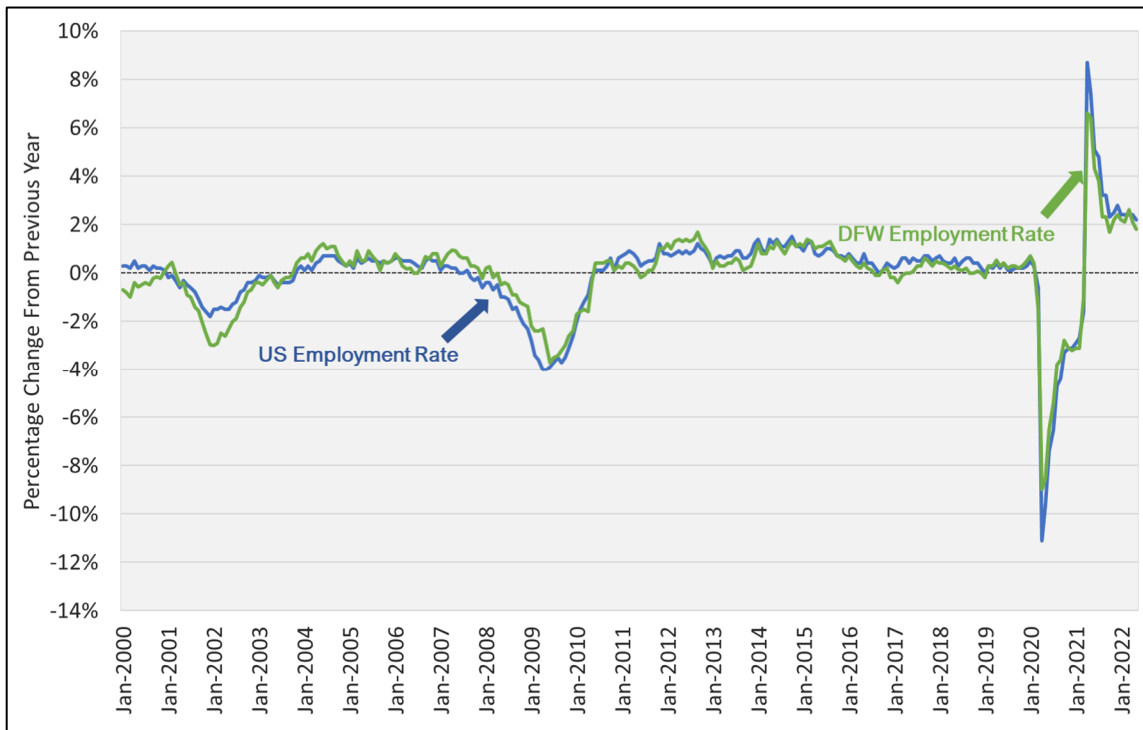
Table 4-3. Countywide Employment Trends and Projections (NCTCOG Forecast)

County	Historical Employment			NCTCOG Forecast	
	Year 1990	Year 2000	Year 2010	Year 2045	
Collin	93,700	204,100	436,000	973,800	
Dallas	1,255,000	1,745,100	1,950,000	3,480,800	
Denton	75,800	152,800	244,400	757,200	
Ellis	27,800	49,100	60,000	282,300	
Hood	N/A	N/A	18,600	42,600	
Hunt	N/A	N/A	41,800	73,800	
Johnson	26,200	45,100	66,000	125,600	
Kaufman	17,200	31,000	39,900	67,300	
Parker	16,200	29,800	52,100	89,700	
Rockwall	7,500	17,000	30,600	76,800	
Tarrant	586,100	864,400	1,051,500	2,056,600	
Wise	N/A	19,800	29,500	62,900	
Twelve-County Area*	2,105,400	3,138,400	4,020,500	8,089,400	
State of Texas	9,242,900	12,151,400	14,508,200		
United States	138,331,000	165,371,000	174,062,600		
County	Annual Growth		Employment		Percentage of New Employment (2010-2045)
	1990-2010	2010-2045	2010	2045	
Collin	8.00%	2.30%	10.80%	12.00%	13.20%
Dallas	2.20%	1.70%	48.50%	43.00%	37.60%
Denton	6.00%	3.30%	6.10%	9.40%	12.60%
Ellis	3.90%	4.50%	1.50%	3.50%	5.50%
Hood	N/A	2.40%	0.50%	0.50%	0.60%
Hunt	N/A	1.60%	1.00%	0.90%	0.80%
Johnson	4.70%	1.90%	1.60%	1.60%	1.50%
Kaufman	4.30%	1.50%	1.00%	0.80%	0.70%
Parker	6.00%	1.60%	1.30%	1.10%	0.90%
Rockwall	7.30%	2.70%	0.80%	0.90%	1.10%
Tarrant	3.00%	1.90%	26.20%	25.40%	24.70%
Wise	N/A	2.20%	0.70%	0.80%	0.80%
Twelve-County Area*	3.30%	2.00%	100%	100%	100%
State of Texas	2.30%	N/A	N/A	N/A	N/A
United States	1.20%	N/A	N/A	N/A	N/A





**Figure 4-3.**  
**Historical Unemployment Rates**  
 Source: Bureau of Labor Statistics



**Figure 4-4.**  
**Historical Employment Growth**  
 Source: Bureau of Labor Statistics

## 4.6 Future Regional Employment Growth

**Table 4-3** also shows the NCTCOG employment estimates for 2010 and forecasts for 2045. Dallas County will continue to be the major employment center in the region and is expected to add an additional 1.53 million jobs by 2045. Dallas County employment is expected to increase from 1.95 million in 2010 to 3.48 million in 2045 at an annual average rate of 1.7 percent. Dallas County is expected to house 37.6 percent of the total additional jobs in the twelve-county region. Collin County's employment is projected to increase from 436,000 in 2010 to 0.97 million in 2045 at an average annual average rate of 2.3 percent. Collin County is expected to gain 13.2 percent of the total regional employment growth. Denton County's employment is projected to increase from 244,400 in 2010 to 757,200 in 2045 at an annual average rate of 3.3 percent. Denton County is expected to gain 12.6 percent of the total regional employment growth.

Employment in Tarrant County is expected to reach 2.06 million in 2045, a 1.01 million increase from the 2010 employment of 1.05 million. This represents an annual average growth rate of 1.9 percent between 2010 and 2045. Tarrant County is expected to account for 24.7 percent of the total additional jobs in the twelve-county region. Between 2010 and 2045, 4.1 million additional jobs are expected to be added in the twelve-county region, at an annual average rate of 2.0 percent. **Table 4-3** also presents year 2045 employment distributions for the twelve-county region. The major employment concentrations are expected to continue to be located in Dallas and Tarrant Counties. However, the projections anticipate the migration of jobs from the major city centers to the suburban areas throughout the DFWMA.

## 4.7 Regional Median Household Income Trends

Travel demand, and specifically demand for toll roads, is sensitive to the amount of disposable income available within a household. A reliable indicator of a household's propensity for trip-making, and specifically a motorist's willingness to pay a toll, is median household income. Generally, households with higher incomes have a propensity to make more automobile trips than those with lower incomes due to their greater levels of disposable income. Value of time (VOT), a key factor in motorists' willingness to pay tolls, also tends to be higher in households with higher incomes.

A comparison of median household income for the twelve-county region is provided in **Table 4-4**. The most recent median household income data estimated by the U.S. Census Bureau for 2020 are provided for the twelve-county area, the state, and the nation. The median household income data presented in **Table 4-4** indicates that when reported in real 2020 dollars, income in the region, the state and the nation grew moderately between 1989 and 2000 but then grew significantly between 2000 and 2020. The 2020 median household income in Dallas County was slightly lower than the state and higher than the nation. However, several of the surrounding counties have median incomes much higher than the state and the nation. **Figure 4-5** represents the median household income from the 2018 American Community Survey Five-Year Estimates at the TAP zone level for the NTTA System area presented in constant 2018 dollars. Most of the zones with the highest median household incomes are in Collin and Denton counties near the PGBT, SRT and north DNT corridors.

Table 4-4. Median Household Income (in Real 2020 Dollars)

County	Year 1989	Year 2000	Year 2010	Year 2015	Year 2020	Average Annual Growth Rate				
						(1989-2000)	(1989-2010)	(1989-2015)	(1989-2020)	(2010-2020)
Collin County	\$89,700	\$104,800	\$89,200	\$88,500	\$101,600	1.4%	0.0%	-0.1%	0.4%	1.3%
Dallas County	\$57,100	\$59,100	\$53,200	\$53,200	\$65,800	0.3%	-0.3%	-0.3%	0.5%	2.1%
Denton County	\$69,800	\$83,300	\$78,200	\$77,700	\$90,900	1.6%	0.5%	0.4%	0.9%	1.5%
Ellis County	\$52,900	\$68,200	\$67,400	\$69,900	\$79,800	2.3%	1.2%	1.1%	1.3%	1.7%
Hood County	\$58,700	\$60,700	\$60,800	\$47,300	\$85,400	0.3%	0.2%	-0.8%	1.2%	3.5%
Hunt County	\$45,500	\$49,800	\$47,800	\$60,300	\$53,800	0.8%	0.2%	1.1%	0.5%	1.2%
Johnson County	\$55,100	\$60,200	\$60,900	\$59,700	\$67,400	0.8%	0.5%	0.3%	0.7%	1.0%
Kaufman County	\$47,000	\$59,800	\$64,900	\$68,800	\$76,400	2.2%	1.5%	1.5%	1.6%	1.6%
Parker County	\$56,700	\$63,300	\$68,000	\$93,400	\$88,600	1.0%	0.9%	1.9%	1.5%	2.7%
Rockwall County	\$76,600	\$90,800	\$86,500	\$62,400	\$106,200	1.6%	0.6%	-0.8%	1.1%	2.1%
Tarrant County	\$60,300	\$65,700	\$61,300	\$45,200	\$72,100	0.8%	0.1%	-1.1%	0.6%	1.6%
Wise County	\$49,900	\$58,600	\$61,200	\$58,500	\$71,600	1.5%	1.0%	0.6%	1.2%	1.6%
State of Texas	\$48,900	\$53,000	\$53,900	\$57,200	\$66,000	0.7%	0.5%	0.6%	1.0%	2.0%
United States	\$54,000	\$57,000	\$55,400	\$57,300	\$63,200	0.5%	0.1%	0.2%	0.5%	1.3%

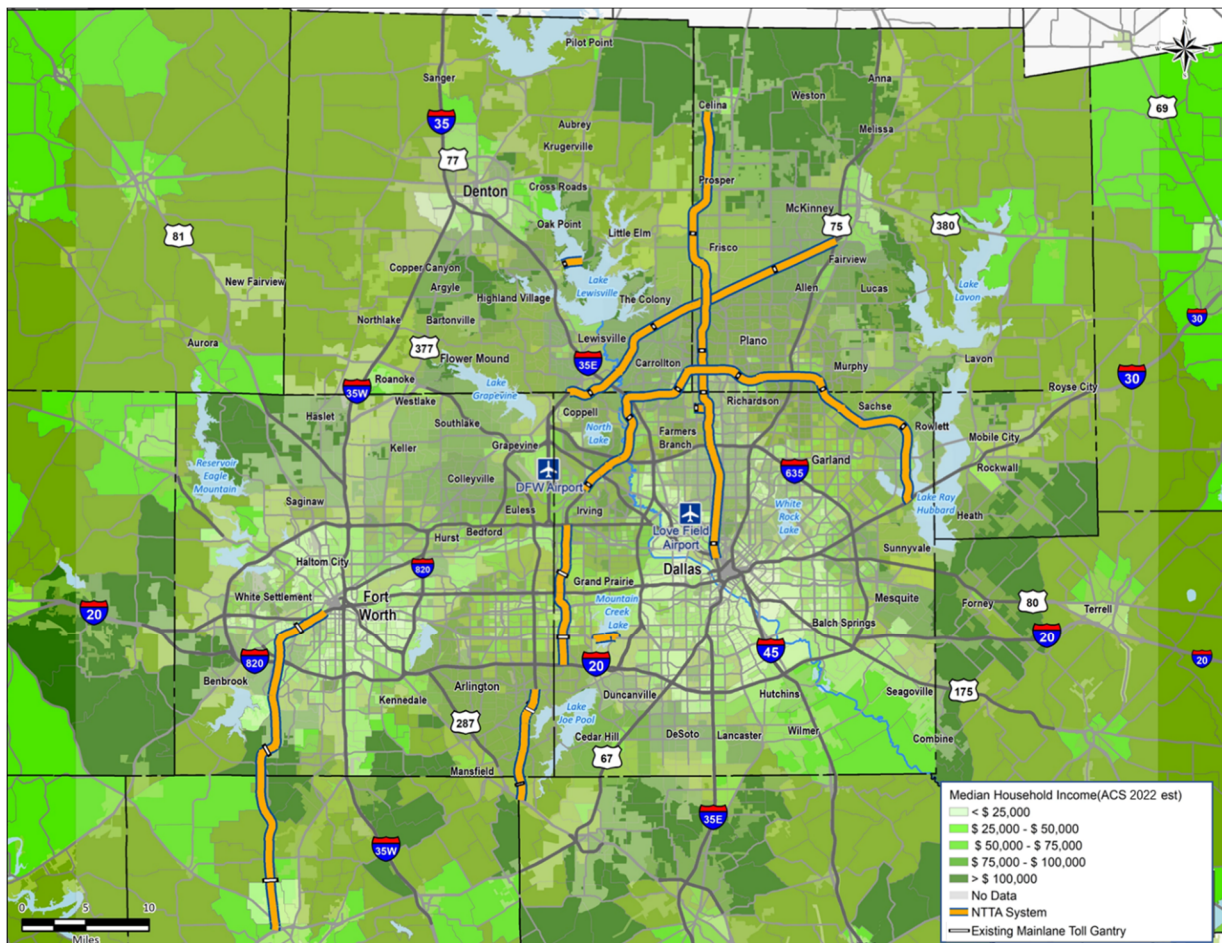


Figure 4-5. NTTA System - Median Household Income



### 4.8.2 Consumer Price Index

The consumer price index for all urban consumers (CPI-U) is the most widely used measure of inflation and serves as an economic indicator. The CPI-U determines the aggregate price-level of a specific market basket of goods and services that are consumed by typical urban households. This is done by calculating the average going price of each item in the market basket. Food, clothing, housing, transportation (including tolls) and entertainment are all included in the basket. Income taxes and investment items such as stocks and bonds are not included. The Bureau of Labor and Statistics (BLS) of the U.S. Department of Labor calculates the CPI-U every month.

The consumer price index for the base time frame (1982-1984) is 100. Inflation is determined by finding the percentage change in the CPI-U from one year to the next. **Table 4-5** gives the historical trends for CPI-U from 1985-2022 for DFW, the Southern Region (Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, Washington D.C., and West Virginia), and the United States. As indicated in **Table 4-5**, the CPI-U in DFW has continually increased at a similar rate to the CPI-U for both the Southern Region and the United States. This indicates that the inflation rate in DFW is consistent with the rate of inflation seen nationwide. Between 1989 and 2022, the CPI-U in DFW region has grown at an average annual rate of 2.5 percent per year, which is similar to the inflation rate experienced by the Southern Region and the nation during that time. Between 2009 and 2022, CPI-U grew at an annual average rate of 2.3 percent for DFW, 1.9 percent for the Southern Region, and 2.0 percent for the United States. It should also be noted that the CPI-U sharply increased between 2007 and 2008 and decreased between 2008 and 2009. The CPI-U also decreased for both DFW and the Southern Region between 2014 and 2015. A significant increase in CPI-U has been experienced in 2022 due to the recovery following the COVID-19 pandemic.

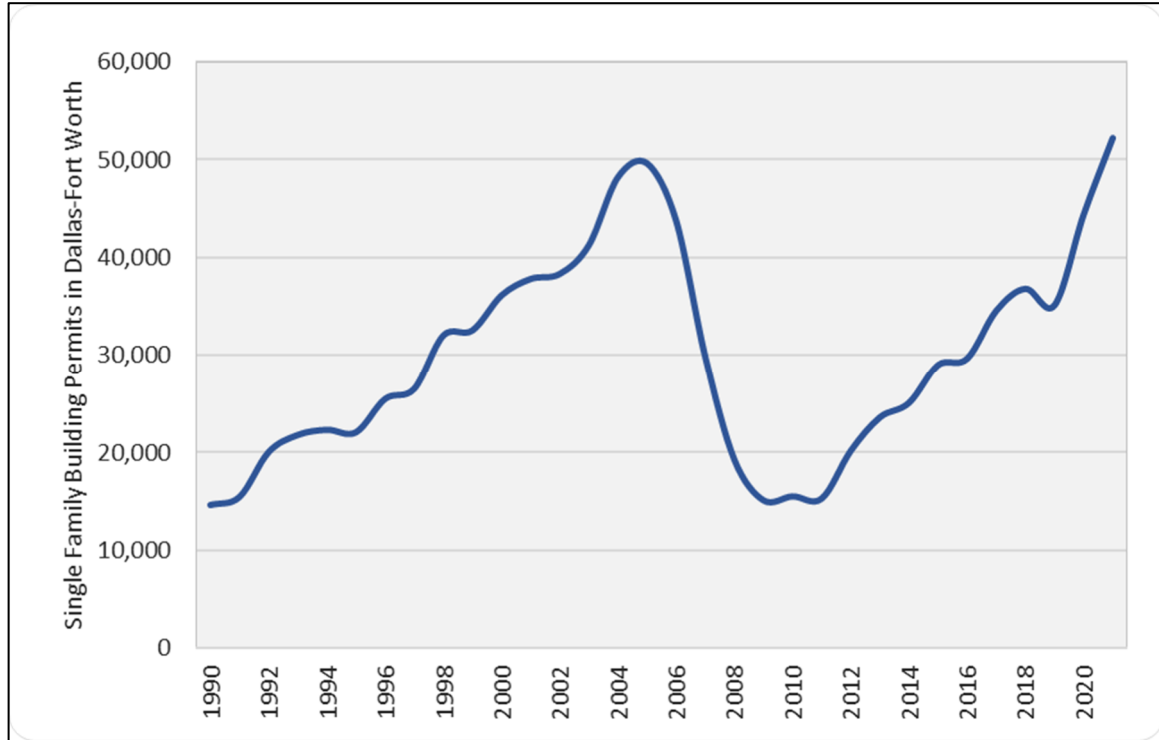
### 4.8.3 Trends in Building Permits

The housing industry accounts for a large percentage of investment spending. Building permits are leading economic indicators as they help predict where the economy is headed in the near future. Sustained declines in building permits slow the economy and can be indicative of a potential recession. Likewise, increases in this leading indicator can potentially indicate or trigger economic growth. The trends in single family residential building permits for the DFW region are presented in **Figure 4-7**. Single family building permits have generally continued to grow from year to year with some exceptions. Between 1988 and 2006, the total number of single-family building permits increased at annual average rate of 6.6 percent in the DFW region, however due to the recession, the number of building permits issued since 2006 dropped significantly. Between 2006 and 2009, the number of single-family building permits decreased at an annual average rate of more than 30 percent, however, there has been an increase in building permits since 2011, with a slight drop in building permit growth in 2020 due to the negative impacts of the COVID-19 pandemic.

Table 4-5. Consumer Price Index for All Urban Consumers (CPI-U: 1982-84 = 100)

Year	Dallas-Fort Worth	Growth	Southern Region	Growth	United States City Average	Growth
1984	104.3		103.8		103.9	
1985	108.2	3.7%	107.1	3.2%	107.6	3.5%
1986	109.9	1.6%	108.9	1.7%	109.6	1.9%
1987	112.9	2.7%	112.4	3.2%	113.6	3.7%
1988	116.1	2.8%	116.4	3.6%	118.3	4.1%
1989	119.5	2.9%	121.5	4.4%	124.0	4.8%
1990	125.1	4.7%	127.9	5.3%	130.7	5.4%
1991	130.8	4.6%	132.9	3.9%	136.2	4.2%
1992	133.9	2.4%	136.5	2.7%	140.3	3.0%
1993	137.3	2.5%	140.8	3.2%	144.5	3.0%
1994	141.2	2.8%	144.7	2.8%	148.2	2.6%
1995	144.9	2.6%	149	3.0%	152.4	2.8%
1996	148.8	2.7%	153.6	3.1%	156.9	2.9%
1997	151.4	1.7%	156.9	2.1%	160.5	2.3%
1998	153.6	1.5%	158.9	1.3%	163.0	1.6%
1999	158	2.9%	162	2.0%	166.6	2.2%
2000	164.7	4.2%	167.2	3.2%	172.2	3.4%
2001	170.4	3.5%	171.1	2.3%	177.1	2.8%
2002	172.7	1.3%	173.3	1.3%	179.9	1.6%
2003	176.2	2.0%	177.3	2.3%	184.0	2.3%
2004	178.7	1.4%	181.8	2.5%	188.9	2.7%
2005	184.7	3.4%	188.3	3.6%	195.3	3.4%
2006	190.1	2.9%	194.7	3.4%	201.6	3.2%
2007	193.2	1.7%	200.4	2.9%	207.3	2.9%
2008	201.8	4.4%	208.7	4.2%	215.3	3.8%
2009	200.5	-0.6%	207.8	-0.4%	214.5	-0.4%
2010	201.6	0.5%	211.3	1.7%	218.1	1.6%
2011	207.9	3.1%	218.6	3.4%	224.9	3.2%
2012	212.2	2.1%	223.2	2.1%	229.6	2.1%
2013	216.0	1.8%	226.7	1.6%	233.0	1.5%
2014	218.4	1.1%	230.6	1.7%	236.7	1.6%
2015	217.5	-0.4%	230.1	-0.2%	237.0	0.1%
2016	220.7	1.5%	232.7	1.1%	240.0	1.3%
2017	226.1	2.5%	237.5	2.0%	245.1	2.1%
2018	232.8	3.0%	242.7	2.2%	251.1	2.4%
2019	237.7	2.1%	246.3	1.5%	255.7	1.8%
2020	239.1	0.6%	248.6	1.0%	258.8	1.2%
2021	251.6	5.2%	261.3	5.1%	271.0	4.7%
2022	268.3	6.6%	277.6	6.3%	286.8	5.8%
<b>Compounded Annual Growth</b>						
(1989-2022)	-	2.5%	-	2.4%	-	2.5%
(2009-2022)	-	2.3%	-	1.9%	-	2.0%
(2019-2022*)	-	4.1%	-	3.0%	-	3.0%

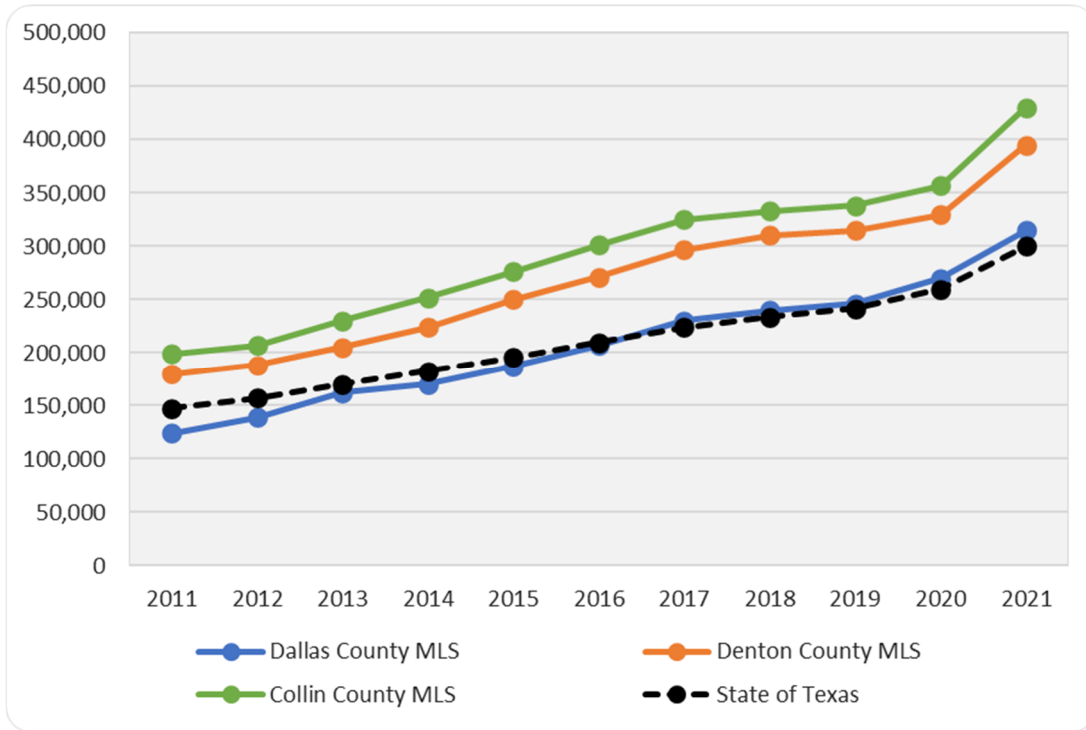
\*Data updated through May 2022



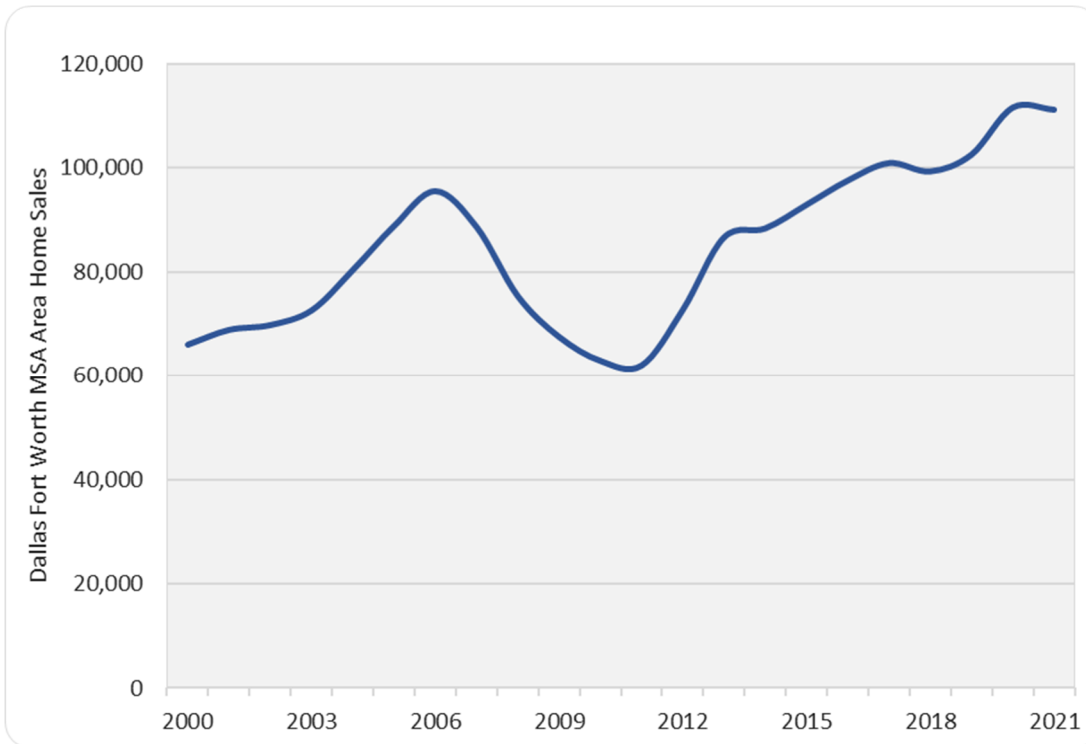
**Figure 4-7.**  
Trends in Single Family Building Permits in Dallas-Fort Worth Region

#### 4.8.4. Regional Home Sales

Trends in home prices and the number of sales can serve as a good indicator of the state of a local economy. Growth in the median sale price of area homes is presented for the Dallas multiple listing service (MLS), Collin County MLS, Denton County MLS and the State of Texas in **Figure 4-8**. The median price of homes sold has been steadily increasing in the DFW region and throughout the state since 2011. Dallas area home prices grew steadily through 2020 but began to sharply increase in 2021. As of May 2022, the median sale price of area homes for the State of Texas was \$362,200, with Collin County median sale price at approximately \$578,000. **Figure 4-9** shows the total number of homes sold in the Dallas Fort Worth MSA region annually since 2000. Home sales began dropping significantly in 2007 and reached a ten-year low in 2010. However, as of 2019 home sales have risen above pre-2008 recession levels and have been steadily increasing.



**Figure 4-8.**  
**Median Home Sale Prices**  
 (Source: Texas A&M Real Estate Center)



**Figure 4-9.**  
**Dallas Fort Worth MSA Area Home Sales**  
 (Source: Texas A&M Real Estate Center)



### 4.8.5. Gasoline Prices

**Figure 4-10** shows the average weekly gasoline price in Texas over the past nine years. Trends in gasoline prices in Texas fell sharply during the second half of 2014 and dropped below \$2.00 per gallon for the first time since early 2012. Prices during the month of April 2020 also depicted a sharp decline as the crude oil futures market briefly turned negative because of the decline in demand for oil due to the enforcement of various travel-related restrictions in several parts of the world to combat the COVID-19 pandemic. Throughout 2021 and through June 2022, gasoline prices have steadily increased, with an average price of \$4.58 per gallon in June 2022. However, transactions on the NTTA System have been relatively inelastic to fluctuations in gasoline price.



**Figure 4-10.**  
**Average Weekly Gasoline Prices in Texas**  
 Source: US Energy Information Administration

### 4.8.6. Independent Demographic Review

The Dallas/Fort Worth area is a dynamic and rapidly growing economic region of Texas. Given the high demographic growth in the DFW region, an independent demographic review was necessary for a more micro level review of the demographics along NTTA System facility corridors. To get a better estimate of the future employment and population within the study area, CDM Smith engaged Research and Demographic Solutions (RDS) to perform an independent demographic review and develop updated demographic data along the NTTA System corridors. The findings of the demographic review are included in **Appendix A**. RDS developed a new 2022 base year demographic set and a revised 2045 forecast using the NCTCOG official forecasts as a base. The qualifier “official” refers to the NCTCOG demographics datasets, which were prepared by NCTCOG

as part of *Mobility 2045 – 2022 Update*. The population and employment forecasts made by RDS to update the NCTCOG official demographics datasets along the NTTA System corridors are referred to as the “revised” demographic datasets. The earliest year in NCTCOG’s demographic dataset is 2023, and an interpolated “revised” 2023 demographic dataset was derived for the purposes of comparing to the NCTCOG 2023 population and employment numbers.

#### 4.8.7. Future Population and Employment along NTTA System Corridors

The revised population and employment growth between 2023 and 2045 for the NTTA System area of influence disaggregated at the TAP zone level is highlighted in **Figure 4-11** and **Figure 4-12**.

#### 4.8.8. Population Growth Estimates

**Figure 4-11** identifies the annual compounded growth rates for population in the revised demographic forecasts. Many of the zones in the NTTA System area show anticipated annual population growth rates of less than 3.0 percent between 2020 and 2045. However, although several zones are expected to generate small population growth by 2045, many of the zones with large, forecasted growth in population are located directly adjacent to NTTA System facilities. As seen in **Figure 4-11**, there are several high population growth zones along the DNT, CTP, and 360T corridors.

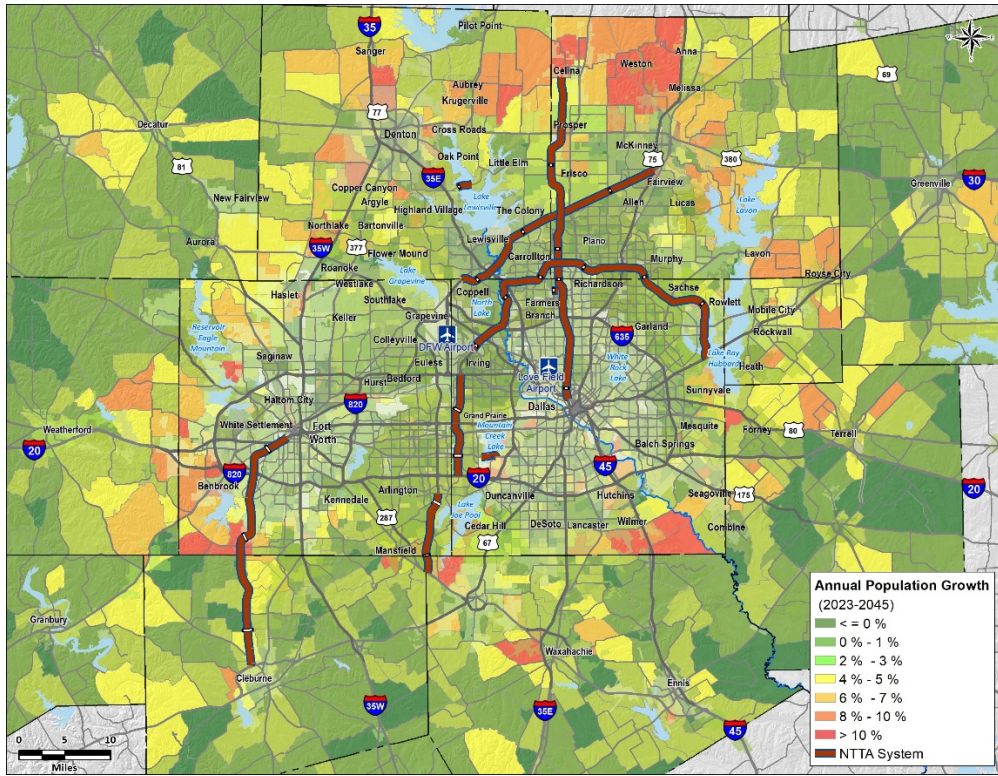
#### 4.8.9. Employment Growth Estimates

**Figure 4-12** identifies the average annual growth rates for employment in the NTTA System area. Many of the zones show anticipated annual employment growth rates of less than 3.0 percent between 2020 and 2045. Zones with higher projected employment growth are more concentrated in Collin County, Denton County, southwestern Dallas County and southern Tarrant County.

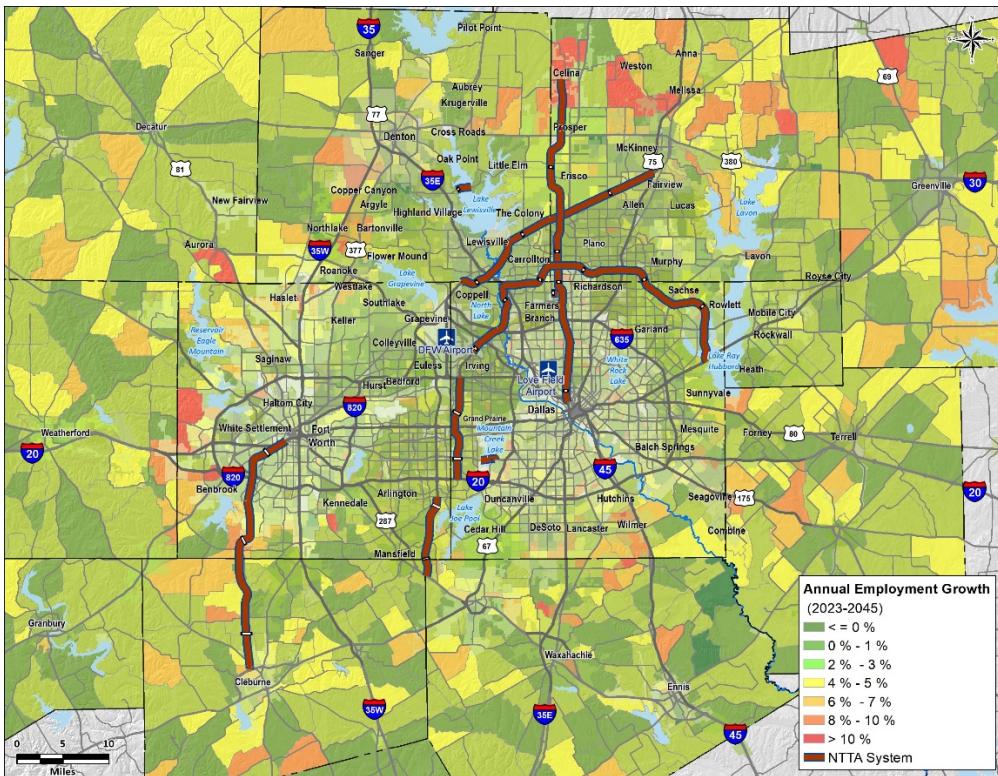
#### 4.8.10. Comparison of Official and Revised Demographics

**Tables 4-6** and **4-7** show a comparison of the official and revised demographics (population and total employment) projections for years 2023 and 2045. For both 2023 and 2045, the revised population estimates are lower than NCTCOG official demographics for Dallas and Tarrant counties but are higher for Collin and Denton counties. The total revised population for the region is slightly lower than the NCTCOG official forecast for both years. The revised regional employment forecasts are also lower for both 2023 and 2045. However, the revised employment is higher than official forecasts in Collin, Dallas, and Tarrant counties.

**Figures 4-13** and **4-14** show a comparison of NCTCOG’s official population and the revised population forecast near the NTTA System for the years 2023 and 2045. The overall revised population forecast is slightly lower than the NCTCOG forecast, but many zones through the NTTA System area are anticipated to exceed NCTCOG projections. **Figures 4-15** and **4-16** show a comparison of NCTCOG’s official employment and the revised employment forecast near the NTTA System for the years 2023 and 2045. As shown in the figures, the revised employment is generally higher than the NCTCOG forecast through the NTTA System area, with most of the reductions occurring in the out portions of the region.



**Figure 4-11.**  
Annual Average Population Growth: 2023-2045



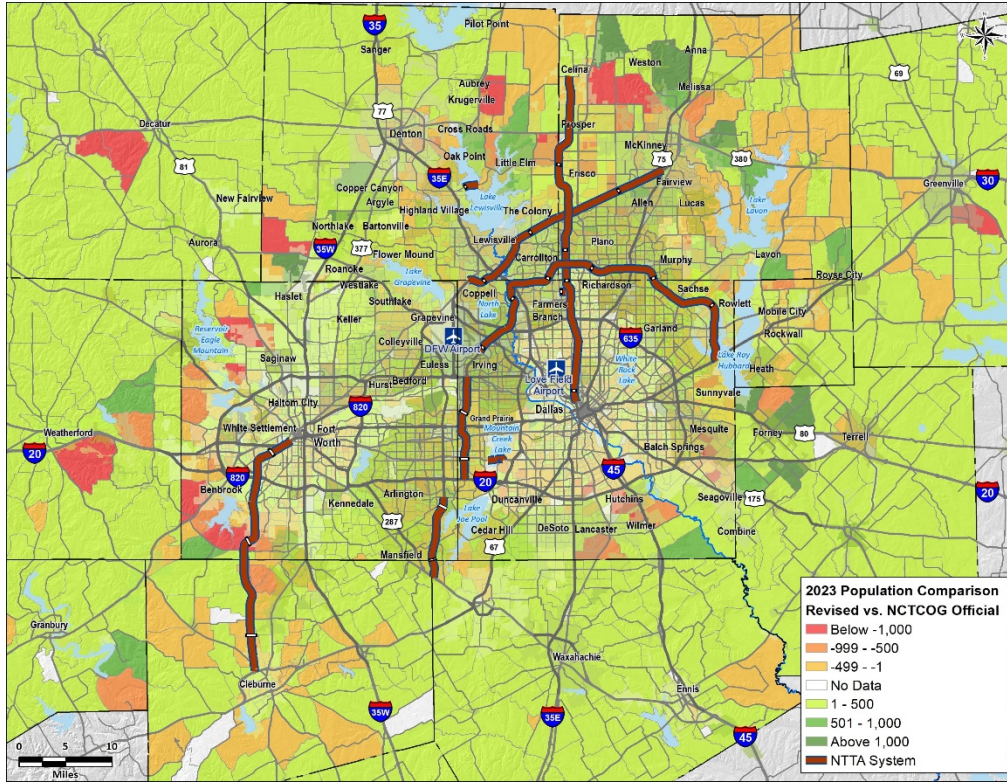
**Figure 4-12.**  
Annual Average Employment Growth: 2023-2045

Table 4-6. Population Forecast Comparisons

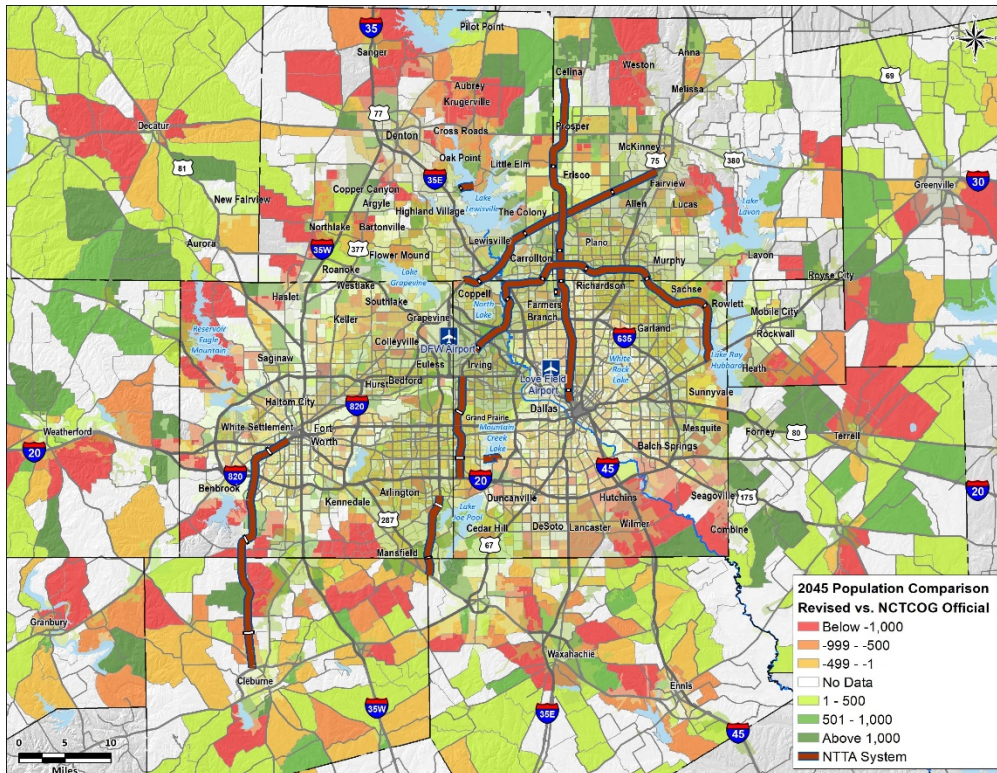
County	2023			2045		
	Official (000s)	Revised (000s)	Delta	Official (000s)	Revised (000s)	Delta
Wise	110	75	-32%	163	104	-36%
Denton	860	970	13%	1,268	1,495	18%
Collin	1,069	1,119	5%	1,679	1,876	12%
Rockwall	101	111	10%	145	186	28%
Dallas	2,771	2,688	-3%	3,571	3,340	-6%
Tarrant	2,272	2,198	-3%	3,072	2,887	-6%
Parker	124	161	30%	185	236	27%
Johnson	204	188	-8%	307	262	-15%
Ellis	321	213	-34%	562	313	-44%
Kaufman	119	164	37%	177	262	48%
Hood	73	66	-9%	101	85	-15%
Hunt	106	104	-1%	140	139	-1%
Hill	24	38	61%	38	46	23%
<b>Total</b>	<b>8,154</b>	<b>8,095</b>	<b>-0.7%</b>	<b>11,408</b>	<b>11,232</b>	<b>-1.5%</b>

Table 4-7. Employment Forecast Comparisons

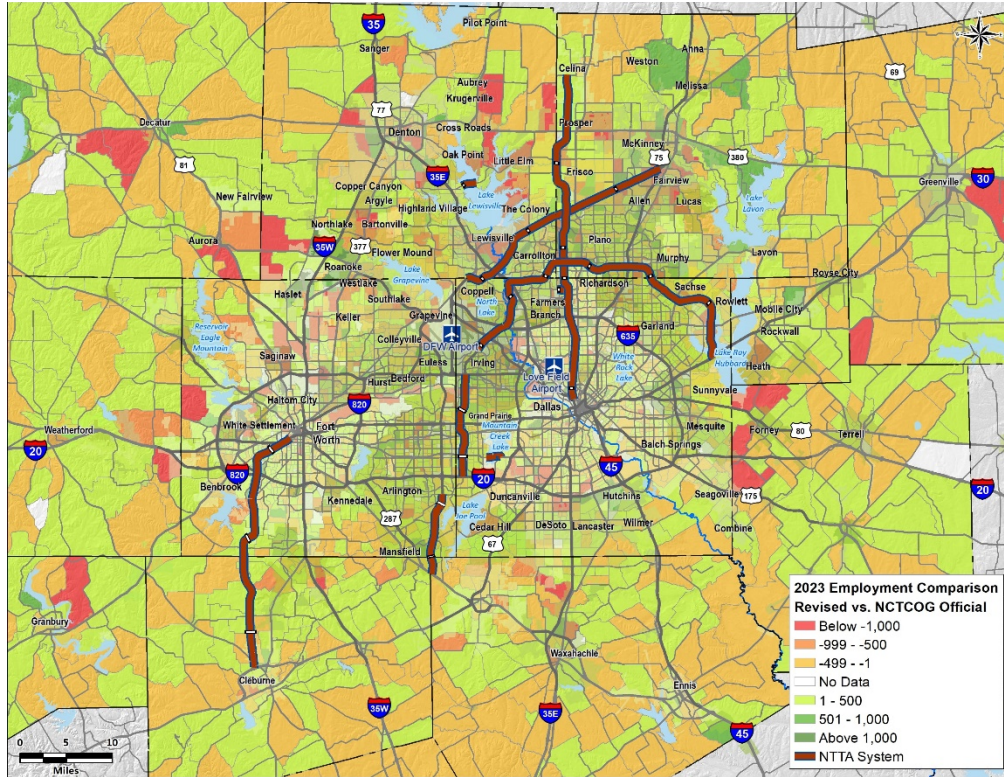
County	2023			2045		
	Official (000s)	Revised (000s)	Delta	Official (000s)	Revised (000s)	Delta
Wise	46	35	-23%	63	56	-12%
Denton	536	443	-17%	757	664	-12%
Collin	659	729	11%	974	1,062	9%
Rockwall	57	56	-2%	77	80	4%
Dallas	2,481	2,567	3%	3,481	3,533	2%
Tarrant	1,444	1,460	1%	2,057	2,121	3%
Parker	66	67	3%	90	107	19%
Johnson	91	85	-7%	126	131	4%
Ellis	179	85	-53%	282	124	-56%
Kaufman	49	56	12%	67	82	22%
Hood	34	33	-4%	43	43	2%
Hunt	58	45	-21%	74	78	6%
Hill	16	17	6%	23	21	-9%
<b>Total</b>	<b>5,715</b>	<b>5,679</b>	<b>-0.6%</b>	<b>8,113</b>	<b>8,103</b>	<b>-0.1%</b>



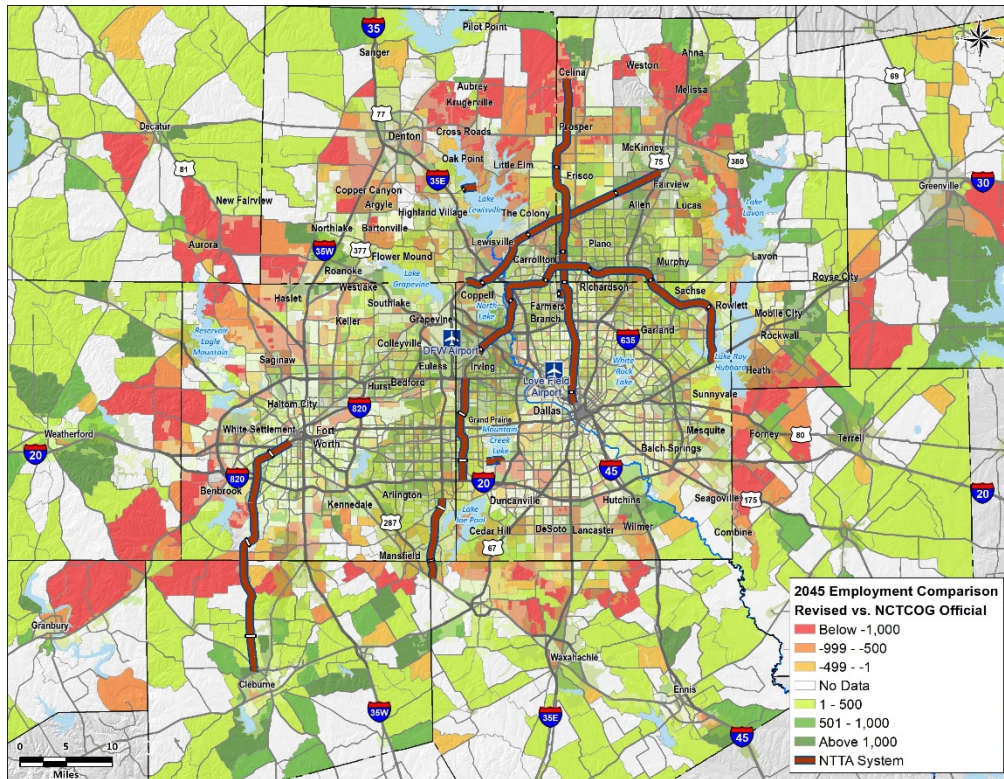
**Figure 4-13.**  
**2023 Population Comparison – Revised vs. NCTCOG Official**



**Figure 4-14.**  
**2045 Population Comparison – Revised vs. NCTCOG Official**



**Figure 4-15.**  
**2023 Employment Comparison – Revised vs. NCTCOG Official**



**Figure 4-16.**  
**2045 Employment Comparison – Revised vs. NCTCOG Official**

## Section 5

# Travel Demand Model Development

This section describes the travel demand model calibration process, including database modifications and updates to the TransCAD network and socio-economic characteristics in the vicinity of NTTA System roadways. **Figure 5-1** illustrates the travel demand process used by CDM Smith for developing the traffic and toll revenue forecasts. This methodology ensures that results are consistent with previous analyses done for NTTA by CDM Smith for toll facilities in the Dallas/Fort Worth (DFW) area.

### 5.1. NCTCOG Information

For this study, the latest travel demand model information was obtained from NCTCOG. This includes the latest official demographics used in the *Mobility 2045 – 2022 Update Plan*. The data included:

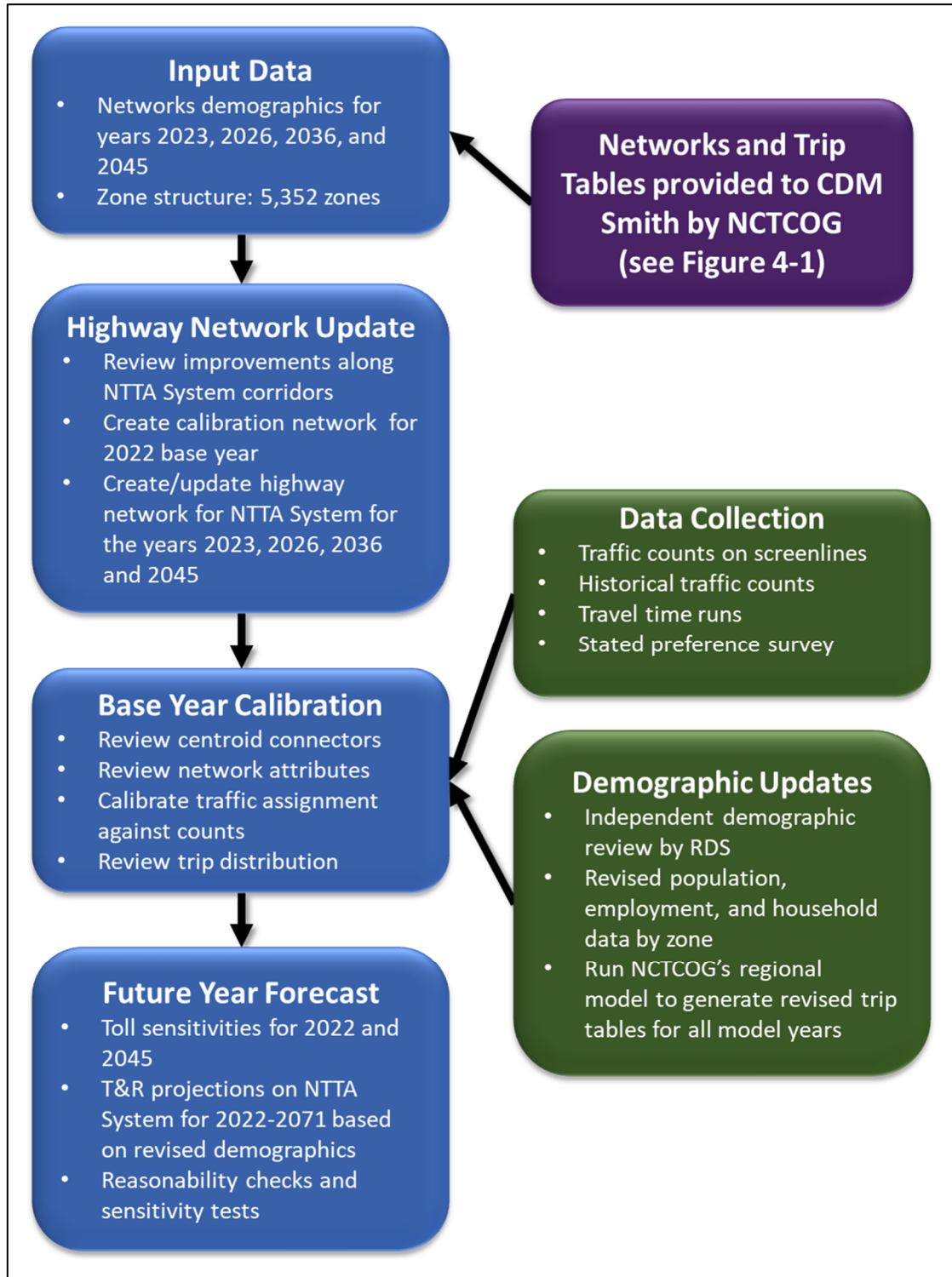
- NCTCOG 5,352-zone TransCAD network structure
- Highway network characteristics for the years 2023, 2026, 2036, and 2045 in TransCAD format
- Socioeconomic information at the 5,352 Transportation Analysis Process (TAP) zone level for the years 2023, 2026, 2036, and 2045
- Trip tables (zone-to-zone matrices) for years 2023, 2026, 2036, and 2045. These trip tables were provided for the AM peak (6:30 to 9:00 AM), PM peak (3:00 to 6:30 PM), and off-peak (9:00 AM to 3:00 PM and 6:30 PM to 6:30 AM) periods

### 5.2. Highway Network Update

NCTCOG's DFW highway model networks reflect the latest regional transportation improvements recommended in *Mobility 2045 – 2022 Update*. The networks incorporate all existing NTTA and TxDOT toll facilities and numerous other planned facilities in the DFWMA. Existing toll facilities were coded to reflect all current ramp and main lane toll charges.

The 2023, 2026, 2036 and 2045 networks provided by NCTCOG were reviewed for consistency and fine-tuned based on the travel time characteristics and traffic counts collected within the NTTA System corridors as described in **Section 2** of this report. This is the model network calibration process. The calibrated networks were then used to develop the forecasted NTTA System traffic and toll revenue streams. A 2022 network developed using NCTCOG's 2023 network was used as the base year for model calibration purposes.

The travel time data collected was used to adjust the free-flow speeds along NTTA System facilities and competing/parallel roadways. These adjustments accounted for geometric and operational characteristics of the major facilities that are typically not captured or reflected as part of a regional NCTCOG calibration process of travel time attributes. Some typical factors that can influence traffic flow in the corridor are intersection design constraints, traffic signal and stop sign impedances, narrow median design, and multiple entry point characteristics.



**Figure 5-1.**  
**NTTA System – Travel Demand Forecasting Process**



### 5.3. Model Calibration

The model calibration process involved comparing the 2022 traffic assignment output volumes based on the revised demographics (**Section 4**) against traffic counts obtained for this study (**Sections 2.5**) and toll transactions at all existing NTTA ramp and mainlane toll gantries (**Section 2.6**). Output travel times and speeds from the travel demand model were also compared to the actual travel time information (**Section 2.7**). This process was performed for each of the modeled time periods (AM peak, PM peak, and off-peak).

CDM Smith combined traffic count data collected in 2022 alongside the NTTA toll transaction data to calibrate the model and adjust the network characteristics where needed. A total of 27 screenlines were developed along the NTTA System corridors and at several strategic locations to analyze the total corridor traffic distribution and to ensure that the base model outputs reflect current traffic conditions along those corridors. Screenlines 1 through 4 analyzed traffic in the northbound and southbound directions running parallel to the DNT at each of its four mainlane toll gantries. Screenlines 5 through 10 analyzed traffic corresponding to the six mainlane gantries on the PGBT (including PGBT EE). Screenlines S1 through S3 correspond to the three mainlane gantries on the SRT in addition to the two-mile existing toll-free section of SRT northeast of the IH 35E/SRT interchange. On PGBT WE, three screenlines were analyzed (W1, W2 and W3), and five screenlines across the Chisholm Trail Parkway were used for the calibration effort (C1, C2, C3, C4, and C5). Five screenlines were evaluated for the 360 Tollway corridor. The locations of the 26 screenlines are shown in **Figures 5-2, 5-3** and **5-4**.

As part of the calibration process, trips between select origin/destination pairs included in the revised trip tables were adjusted using Streetlight OD data (**Section 2.8**) to better reflect observed traffic. **Table 5-1** shows a comparison of the model output volumes based on the revised demographics and the daily traffic count volumes for each of the 26 screenlines. The model output daily volumes matched the traffic count volumes closely. Additionally, the average speeds from the model output were compared to the observed speeds collected as part of the travel time runs, included in **Section 2.7**, to ensure that the model accurately reflects existing traffic conditions.

Travel demand modeling practitioners in the United States use “NCHRP 255: Highway Traffic Data for Urbanized Area Project Planning and Design,” published by the Transportation Research Board to check the reasonableness of model calibration. As shown in **Figure 5-5**, the percentage difference between the model volumes and traffic is generally within the acceptable range for each of the 27 screenlines according to this widely accepted model calibration standard.

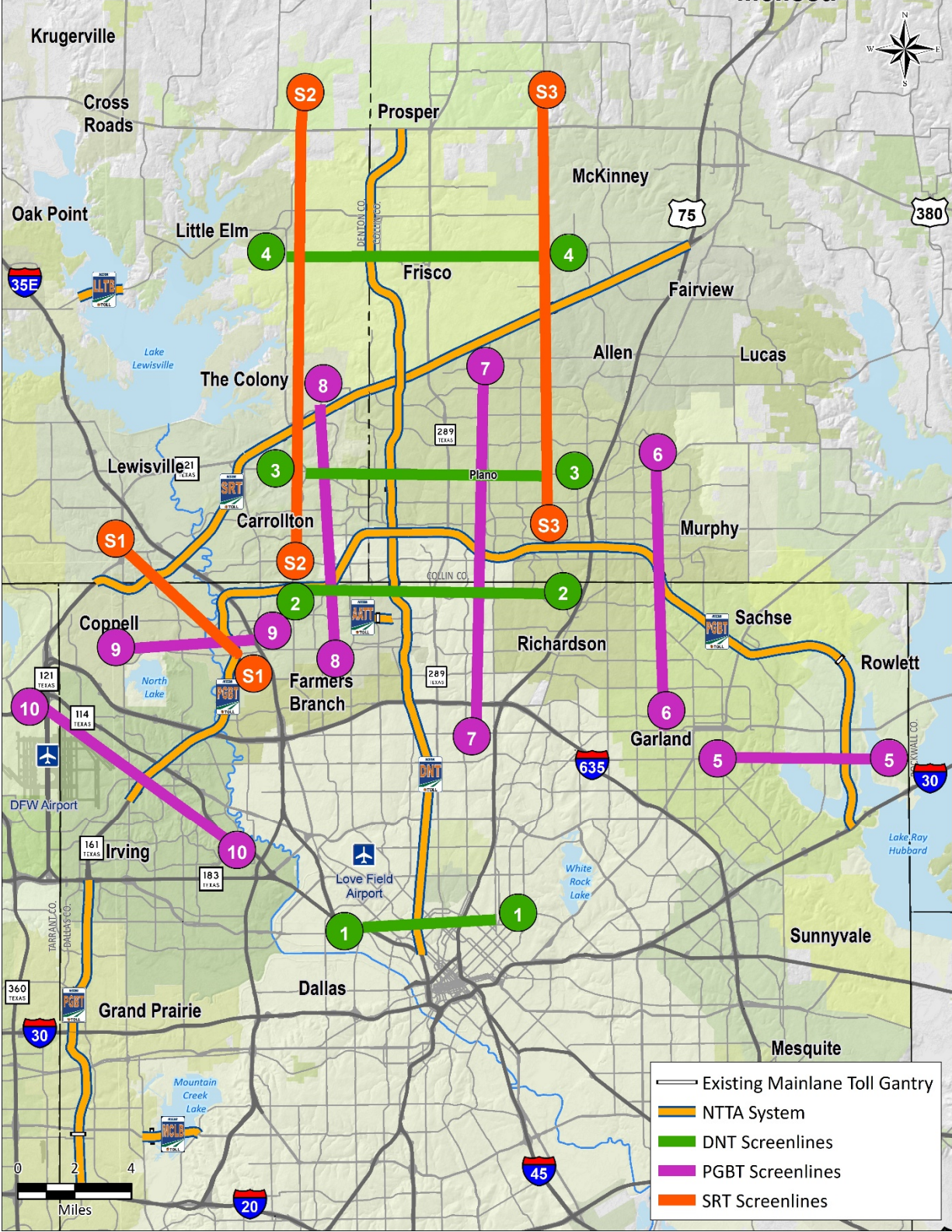


Figure 5-2. NTTA System Screenlines (DNT, PGBT, SRT)

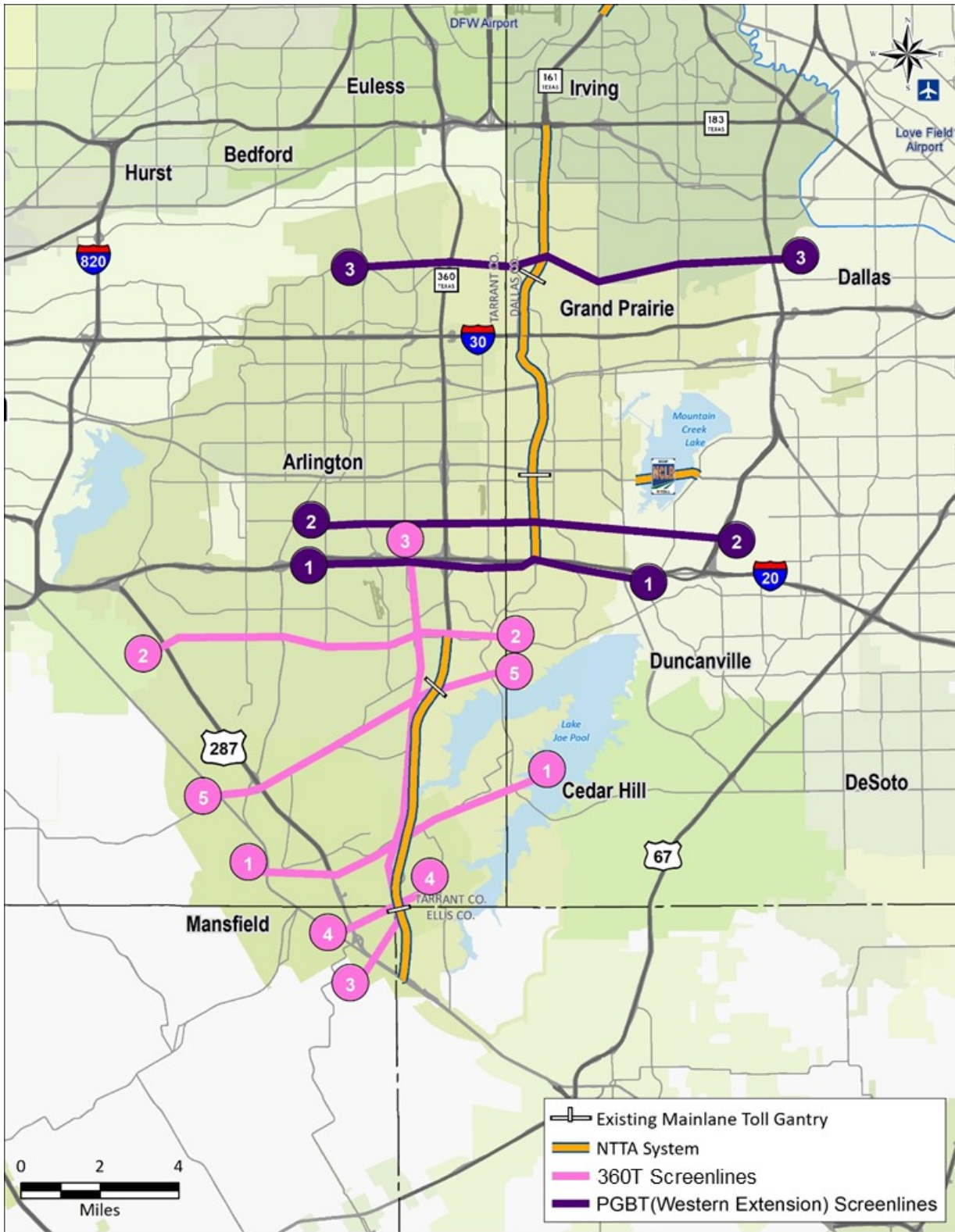


Figure 5-3.  
NTTA System Screenlines (PGBT WE and 360T)

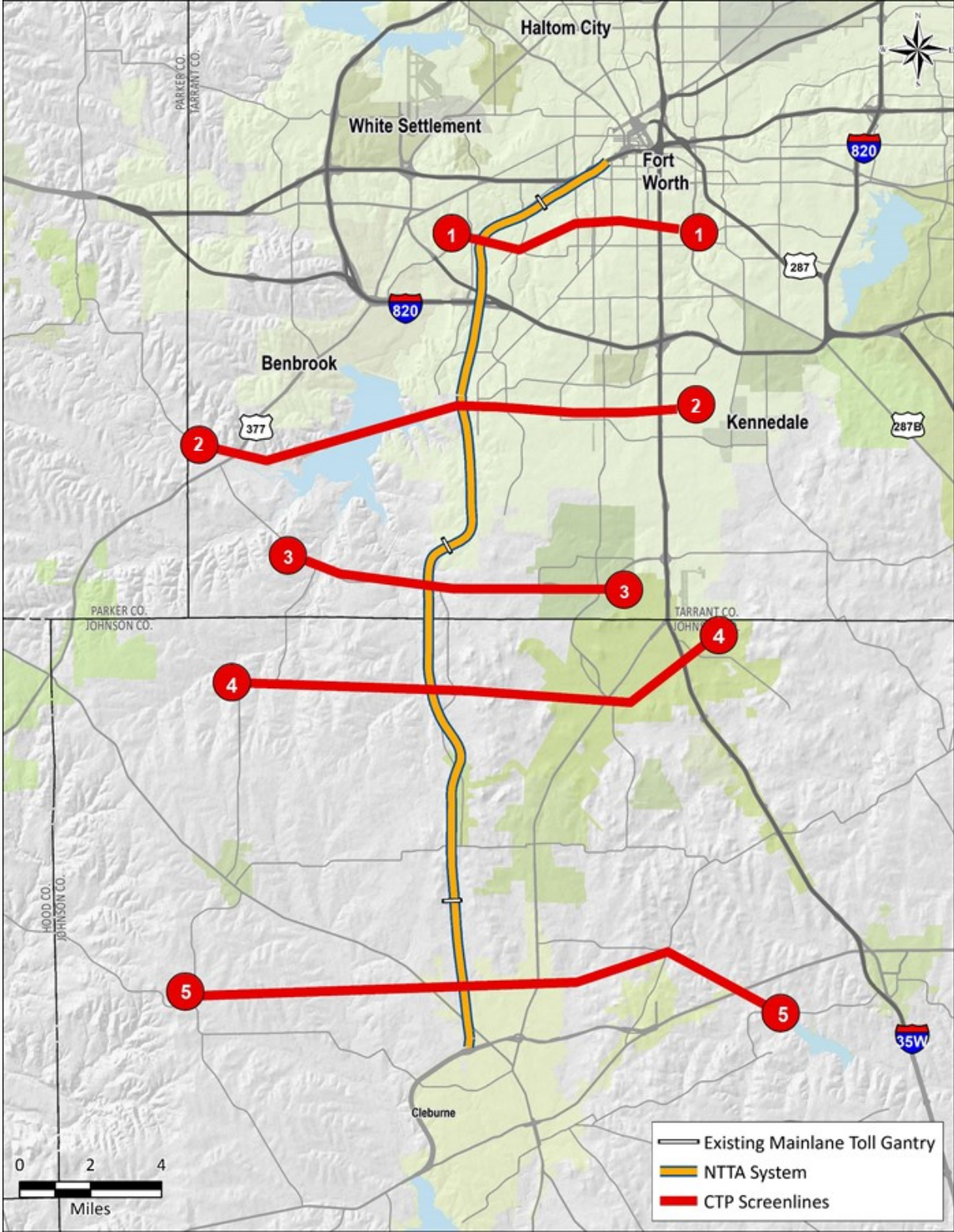


Figure 5-4. NTTA System Screenlines (CTP)

Table 5-1. Comparison of Traffic Counts and Model Output: Daily Total

Screenline Location	Screenline Totals		
	2022 Counts	2022 Model Volumes	Diff
<b>Dallas North Tollway</b>			
Screenline 1	793,800	857,500	8%
Screenline 2	646,600	721,000	12%
Screenline 3	399,900	453,800	13%
Screenline 4	322,100	301,500	-6%
<b>President George Bush Turnpike</b>			
Screenline 5	217,500	179,200	-18%
Screenline 6	373,800	338,800	-9%
Screenline 7	705,700	753,200	7%
Screenline 8	310,900	340,800	10%
Screenline 9	316,100	326,000	3%
Screenline 10	321,700	343,300	7%
<b>Sam Rayburn Tollway</b>			
Screenline S1	233,700	238,200	2%
Screenline S2	369,100	318,400	-14%
Screenline S3	440,600	377,600	-14%
<b>Chisholm Trail Parkway</b>			
Screenline C1	312,100	295,600	-5%
Screenline C2	295,600	262,600	-11%
Screenline C3	41,900	38,400	-8%
Screenline C4	155,800	144,700	-7%
Screenline C5	80,900	59,700	-26%
<b>President George Bush Turnpike - Western Extension</b>			
Screenline W1	383,600	404,500	5%
Screenline W2	237,700	227,500	-4%
Screenline W3	304,700	285,800	-6%
<b>360 Tollway</b>			
Screenline 360-1	155,500	152,800	-2%
Screenline 360-2	318,300	302,200	-5%
Screenline 360-3	380,700	352,300	-7%
Screenline 360-4	76,300	78,900	3%
Screenline 360-5	272,200	264,700	-3%

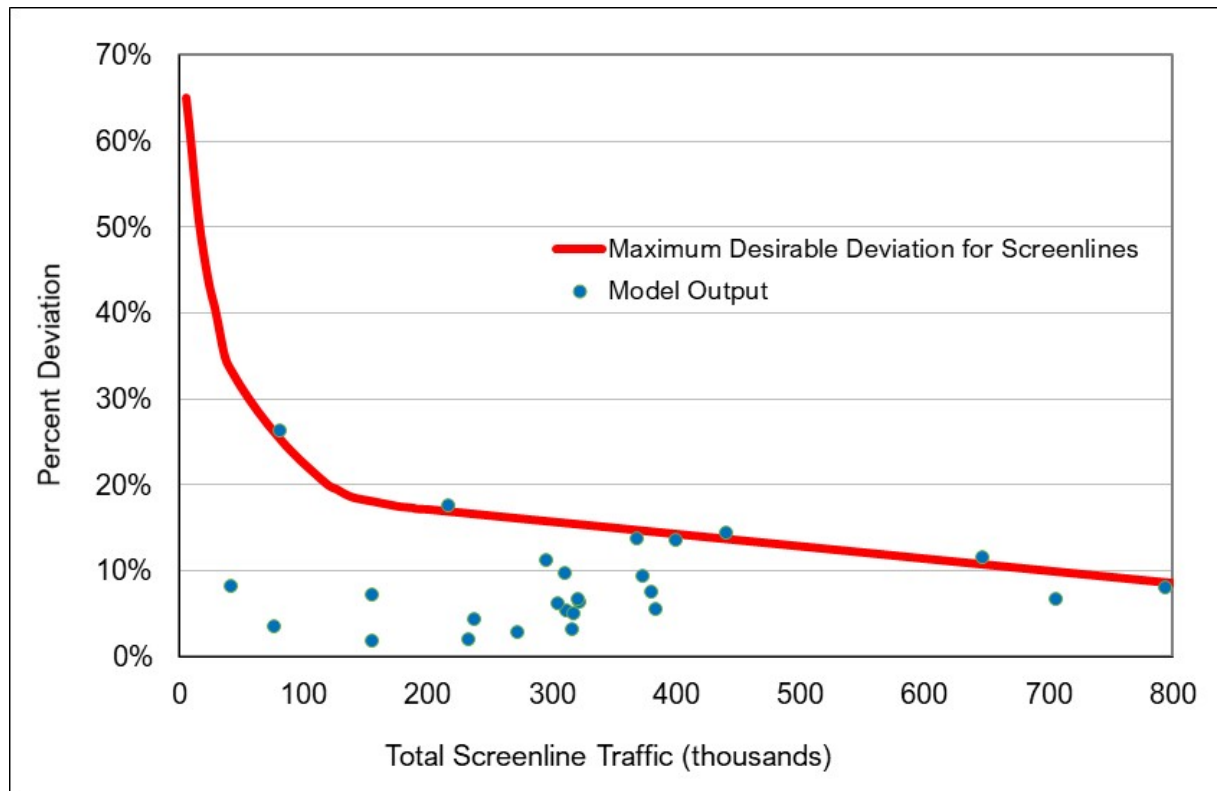


Figure 5-5.  
NTTA System - Screenline Traffic Calibration

## 5.4. Modeling Methodology

State-of-the-practice professional procedures were used in the development of the traffic and revenue forecasts for the NTTA System. The CDM Smith market share diversion routines designed specifically to emulate motorists' willingness to pay tolls at different toll levels and congestion conditions were used to test the toll sensitivities within the corridor for the base year 2022 and future model year 2045.

Traffic assignments using the toll diversion algorithm were performed to evaluate the toll traffic potential of the NTTA System facilities. In the traffic assignment process, the travel model builds two paths between each pair of zones: one that includes toll links and another path that excludes toll links. The travel cost associated with using both travel paths is computed, and the volume of trips using the toll facility is then estimated based on travel time savings between the two paths. This technique simulates the driver's decision to use a toll or toll-free route, which depends to a large extent on marginal differences in time and cost between the routes.

In addition to tolls, two other user costs are considered when calculating the total cost of a trip on the NTTA System: time cost and vehicle operating costs. The motorists' time cost is calculated using value of time estimates that are integrated into the modeling process. How travelers value their travel time helps them determine which route to use for a particular trip. The value of time parameter provides a measure to convert travel time into an equivalent monetary cost for inclusion

in the toll diversion process. Vehicle operating costs include a multitude of additional costs to travelers such as wear and tear, maintenance, tires, oil, fuel and other variable costs.

### 5.4.1 Value of Time (VOT)

The values of time used for this study were derived from the stated preference (SP) survey completed as part of this study and described in **Section 2.9**. The results of the survey were used to calculate values of time in the NTTA System study area and surrounding counties. The average values of time for the twelve counties in the model area are shown in **Table 5-2**.

**Table 5-2. Value of Time by Counties (2022 \$/Hour)**

County	VOT	County	VOT
Collin	\$27.32	Johnson	\$25.60
Dallas	\$25.20	Kaufman	\$25.46
Denton	\$26.38	Parker	\$25.39
Ellis	\$25.67	Rockwall	\$27.24
Hood	\$25.09	Tarrant	\$25.34
Hunt	\$24.47	Wise	\$24.96

### 5.4.2. Vehicle Operating Costs

The vehicle operating cost used in the analysis was calculated by taking into account the average per-mile costs of gasoline and oil and, to a lesser extent, the costs of ongoing maintenance for vehicles in the area. It was also assumed that fuel efficiency of vehicles will improve in future years. The average fuel efficiency of passenger cars is assumed to increase throughout the forecast period. Future average gasoline prices are assumed to continue to increase, though some reduction is expected in the short-term from record high prices in 2022. The resulting vehicle operating costs adopted for this study are shown in **Table 5-3**.

**Table 5-3. Vehicle Operating Costs (\$/mile)**

Year	Passenger Cars	Commercial Vehicles
2022	\$0.26	\$0.91
2025	\$0.25	\$0.98
2025	\$0.27	\$1.01
2035	\$0.32	\$1.34
2040	\$0.37	\$1.57

### 5.4.3. Revised Demographics and Trip Tables

Traffic and revenue estimates along NTTA System corridors that are presented in **Section 6** of this report are based on the revised demographic datasets developed by Research and Demographic Solutions (RDS), as described in **Section 4**. The updated demographic datasets were used as an input to the NCTCOG DFW Regional Travel Model (DFWRTM) to generate an alternate set of trip tables and are referred to as the “revised” trip tables. These revised trip tables, with adjustments to trips applied as part of the base year calibration process, were used to estimate the traffic and revenue along the NTTA System corridors.

## 5.5 General Assumptions

The forecasted traffic volumes and estimated toll revenues from this study are based on the following general assumptions, which CDM Smith believes are reasonable for the purposes of this study (a more detailed description of revenue estimation assumptions can be found in **Section 6**):

1. By August 31, 2022, DNT Phase 4B southbound frontage road from FM 428 to the Grayson/Denton County line will be open to traffic. The frontage road will open as a two lane two direction county road.
2. By February 28, 2023, tolled ramps (northbound entrance from Panther Creek Parkway and southbound exit to Panther Creek Parkway) will be open to traffic.
3. By February 28, 2023, DNT mainlanes over US 380 and the First Street ramps north of US 380 will be open to traffic.
4. By August 31, 2025, expansion of DNT from three lanes to four lanes, in both directions, between SRT and US 380 is assumed to be completed
5. By December 31, 2027, DNT Extension Phase 4A (US 380 to FM 428) is assumed to open to traffic.
6. By December 31, 2028, CTP between FM 1187 and US 67 will be expanded from two to four lanes.
7. By December 31, 2029, the PGBT WE/360 Tollway “Elbow” Connector is assumed to be completed and open to traffic
8. By December 31, 2032, DNT 4B mainlanes – six-lane tollway from FM 428 to Grayson County is assumed to open to traffic
9. By December 31, 2032, SH 190/East Branch, a proposed six-lane tollway from IH 30/PGBT EE to IH 20/Loop 9, is assumed to open to traffic.
10. It is assumed that construction required as part of the capacity improvements along NTTA facilities over the next several years will cause minimal disruptions to traffic on NTTA facilities (with weekend or overnight closures of lanes/ramps).
11. Alignment of all NTTA System facilities is to be as described in **Section 6** of this report.
12. Improvements to the present highway system in the vicinity of the NTTA System facilities are limited to those currently included in *Mobility 2045 – 2022 Update*. No additional competing limited-access highways will be constructed near the NTTA System corridors at any time during the forecast period. Opening dates of the regional transportation projects are assumed to be consistent with the assumptions in *Mobility 2045 – 2022 Update*, except as noted above.
13. No improvements to the DFW regional passenger rail network are assumed beyond those included in *Mobility 2045 – 2022 Update*.



14. Fully electronic toll collection system, and toll collection policies and rates for the NTTA System will be adopted as shown in **Section 6** of this report and toll rates are consistent with NTTA's current toll rate policy.
15. Toll rates on other regional toll roads are consistent with RTC's current toll policy.
16. In accordance with the existing practice of the NTTA, all NTTA System facilities will be well-maintained, efficiently operated, and effectively signed to encourage maximum usage.
17. Economic growth along NTTA System corridors will follow the forecasts described in **Section 4**.
18. Growth in vehicle operating costs (which include fuel, maintenance, and tires) will not significantly deviate from the assumed inflation rate.
19. No local, regional, or national emergency will arise which would abnormally restrict the use of motor vehicles.

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## Section 6

# Estimated Traffic and Revenue

This section presents the traffic and revenue (T&R) estimates for the North Texas Tollway Authority System (NTTA System) through 2070. The NTTA System facilities currently in operation are the Dallas North Tollway (DNT), President George Bush Turnpike (PGBT), President George Bush Turnpike Eastern Extension (PGBT EE), President George Bush Turnpike (PGBT WE), Sam Rayburn Tollway (SRT), Chisholm Trail Parkway (CTP), 360 Tollway (360T), Addison Airport Toll Tunnel (AATT), Mountain Creek Lake Bridge (MCLB), and Lewisville Lake Toll Bridge (LLTB). The long-term T&R forecasts are based on the modeling methodologies and background assumptions described in **Section 5** and other assumptions presented in this section. In addition, this section delineates the toll sensitivity analyses that were performed to estimate the revenue maximization toll rates and presents the results of various sensitivity tests to assess impacts on the T&R of key input variables. Finally, this section provides estimated average weekday traffic for model years 2022 and 2045 and the resulting estimates of transactions and toll revenue through 2070.

## 6.1. Traffic and Toll Revenue Estimation Assumptions

The traffic forecasts and toll revenue estimates for NTTA System facilities are predicated on the following assumptions, which are consistent with observed trends and are considered reasonable for the purposes of this study.

### 6.1.1. Toll Rate Assumptions

This subsection discusses the assumptions for future toll rate estimation.

#### DNT, PGBT, and 360 Tollway

- Automatic Vehicle Identification (AVI) toll for two-axle vehicles: \$0.20/mile starting July 1, 2021 with adjustments every two years at 2.75 percent per year, compounded.
- Video toll surcharge is the maximum of, a) 50 percent of the AVI rate or b) \$0.20 per transaction on July 1, 2009 inflated by 2.75 percent per year.
- Minimum toll charge is based on a trip length of 1.5 miles.
- Tolls charged to users are rounded to the next highest penny.

#### PGBT EE

- AVI toll for two-axle vehicles: \$0.20/mile on July 1, 2021 with adjustments every two years at 2.75 percent per year. This is the “unified toll”, which is the publicly announced toll, as defined in the PGBT EE Project Agreement between NTTA and the Texas Department of Transportation (TxDOT). The ratio between the NTTA toll and the unified toll remains constant at 80 percent.
- Video toll surcharge is the maximum of, a) 50 percent of the AVI rate or b) \$0.20 per transaction on July 1, 2009 inflated by 2.75 percent per year. This portion of the video toll constitutes the property and revenues of the NTTA only, and not of TxDOT.
- Minimum toll charge is based on a trip length of 1.5 miles.
- Tolls charged to users are rounded to the next highest penny.

**SRT and PGBT WE**

- AVI maximum base toll (MBT) for two-axle vehicles: \$0.20/mile starting July 1, 2019 with adjustments every two years at 2.75 percent per year.
- Video toll surcharge is the maximum of, a) 50 percent of the AVI rate or b) \$0.20 per transaction on July 1, 2009 inflated by 2.75 percent per year.
- Minimum toll charge is based on a trip length of 1.5 miles.
- Tolls charged to users are rounded to the next highest penny.
- MBT rounded to \$0.001/mile.

**CTP**

- Automatic Vehicle Identification (AVI) toll for two-axle vehicles: \$0.26/mile (IH 30 to Altamesa) and \$0.20/mile (Altamesa to US 67) starting July 1, 2021 with adjustments every two years at 2.75 percent per year.
- Video toll surcharge is the maximum of, a) 50 percent of the AVI rate or b) \$0.20 per transaction on July 1, 2009 inflated by 2.75 percent per year.
- Minimum toll charge is based on a trip length of 1.5 miles.
- Tolls charged to users are rounded to the next highest penny.

**AATT and MCLB:**

- AVI toll for two-axle vehicles: \$0.70 starting July 1, 2021 with adjustments every two years at 2.75 percent per year.
- Video toll surcharge is 50 percent of the AVI rate.
- Tolls charged to users are rounded to the next highest penny.

**LLTB:**

- AVI toll for two-axle vehicles: \$1.39 starting July 1, 2021 with adjustments every two years at 2.75 percent per year.
- Video toll surcharge is 50 percent of the AVI rate.
- Tolls charged to users are rounded to the next highest penny.

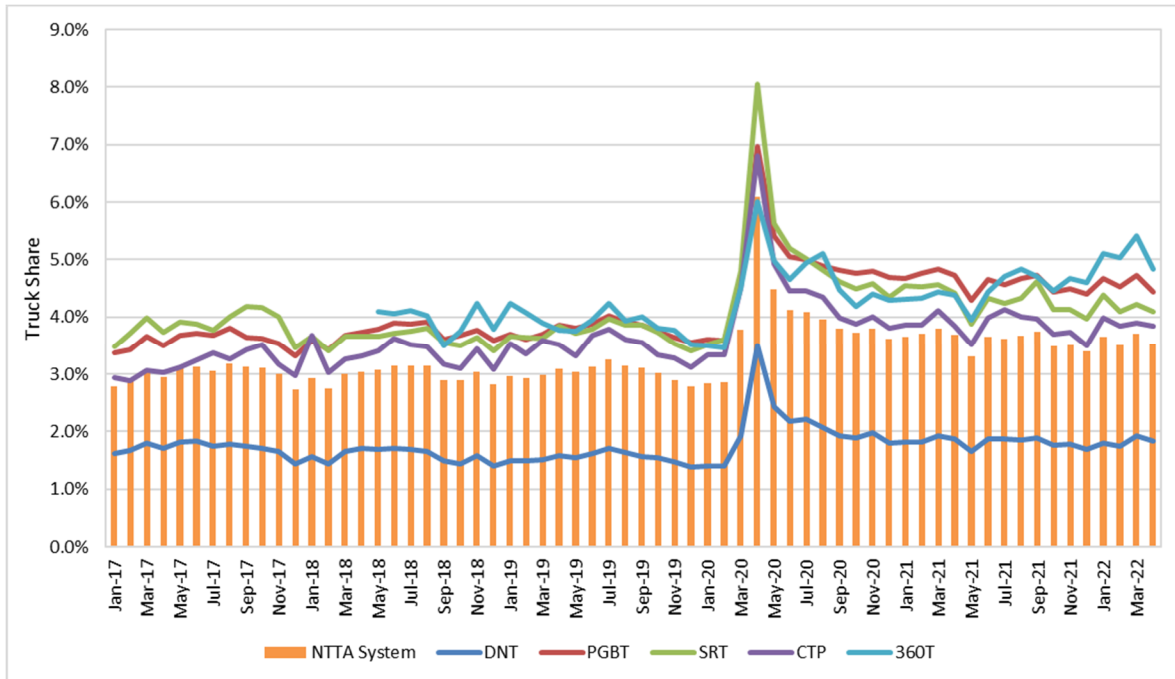
**6.1.2 Truck Traffic Shares/Truck Toll Assumptions****Truck Share**

Truck traffic (vehicles with greater than two axles) shares are applied on a gantry-by-gantry basis and the averages assumed for each facility are shown in **Table 6-1** below:

**Table 6-1. Truck Shares – 2022**

Facility	Truck Share	Facility	Truck Share
DNT	1.8%	MCLB	2.3%
PGBT (including EE)	3.8%	LLTB	3.5%
SRT	4.2%	PGBT WE	8.2%
360T	5.1%	CTP	3.9%
AATT	1.7%	<b>NTTA System</b>	<b>3.6%</b>

Truck traffic share rose sharply at the onset of the COVID-19 pandemic and has not yet returned fully to pre-COVID levels. During the course of the pandemic, the number of passenger cars declined on the NTTA system while the number of trucks has remained at the same levels, resulting in increased truck share, as shown in **Figure 6-1**. Truck share has continued to decline as passenger car traffic has grown on the system. Overall truck share for the NTTA System is assumed to continue declining over the next five years and ultimately return to pre-COVID levels.



**Figure 6-1.**  
**Monthly Truck Share Trends**

**Truck Toll Factor**

Tolls for vehicles with more than two axles are calculated based on “N-1” weighting, where “N” is the number of axles. For example, the toll paid by a five-axle vehicle would be four times the toll paid by a two-axle vehicle. Average truck toll factor is a ratio of the weighted average of the truck tolls charged to vehicles with greater than two-axles to the tolls charged to two-axle vehicles. For example, a high truck toll factor would mean a higher proportion of multi-axle vehicles on a toll facility. The average truck toll factor assumed for various facilities on the NTTA System are shown in **Table 6-2**. Truck toll factors have varied very little in the last decade across all NTTA System facilities. Therefore, CDM Smith assumed no changes in the truck toll factors as presented in **Table 6-2** throughout its forecast period.

**Table 6-2. Truck Toll Factors – 2022**

Facility	Truck Toll Factor	Facility	Truck Toll Factor
DNT	3.04	MCLB	3.38
PGBT	3.24	LLTB	2.99
SRT	3.28	PGBT WE	3.44
PGBT EE	3.14	CTP	3.34
AATT	2.93	360 Tollway	3.30

### 6.1.3. AVI/ZipCash Transaction Shares

AVI transaction shares are applied on a gantry-by-gantry basis and averages assumed in 2022 for each facility are shown below in **Table 6-3**.

**Table 6-3. AVI Share – 2022**

Facility	AVI Share	Facility	AVI Share
DNT	78.3%	MCLB	61.1%
PGBT	76.4%	LLTB	76.4%
SRT	78.2%	PGBTWE	70.0%
PGBT EE	76.9%	CTP	76.3%
AATT	77.3%	360 Tollway	70.2%

The above AVI transaction shares also include all transactions initially recorded as ZipCash transactions that may be later identified and reclassified as AVI transactions. These transactions are called "VToll" transactions. Over time, the AVI transaction shares are assumed to follow a logistic function, asymptotically increasing to an NTTA System average maximum of 80 percent.

### 6.1.4. Annual Revenue Days

"Annual revenue days" is a parameter used in the revenue estimation to convert the weekday transactions/revenue to annual transactions/revenue. Observed ratios of the weekend to weekday traffic on NTTA System facilities are used to estimate the annual revenue days. Annual revenue days are applied on a gantry-by-gantry basis and averages for each facility are shown below in **Table 6-4**.

**Table 6-4. Annual Revenue Days – 2022**

NTTA Facility	Annual Revenue Days	NTTA Facility	Annual Revenue Days
DNT	332	MCLB	336
PGBT	323	LLTB	330
PGBT EE	337	PGBT WE	320
SRT	334	CTP	323
AATT	307	360 Tollway	338

### 6.1.5. Revenue Recovery Assumptions

The revenue recovery rate for AVI transactions/revenue was assumed to be 99.5 percent for all years. **Table 6-5** describes the assumptions used for ZipCash transactions/revenue recovery. These assumptions are for ZipCash transactions and exclude VTolls, which are transactions captured by the ZipCash system whose license plate numbers are later matched to active transponder accounts. These recovery assumptions have been developed based on guidance from the NTTA staff regarding the NTTA's goals with respect to the non-pursuable and uncollectable ZipCash transactions.

**Table 6-5. ZipCash Assumptions**

Category	2022
ZipCash Revenue Recovered (After 3 months)	24%
ZipCash Revenue Recovered (After 12 months)	36%
ZipCash Revenue Recovered (After 24 months)	46%

## 6.2. NTTA Toll Collection Concept and Toll Structure

As described in **Section 2**, the NTTA System currently utilizes a mixed toll collection system that includes AVI and video tolling (known as “ZipCash”). Under ZipCash, users without transponders are identified through the license plate number and invoiced for the toll charge incurred. The ZipCash patrons are charged more than AVI customers per transaction. A majority of the VToll transactions, as described earlier, are charged the AVI rate, however, NTTA charges ZipCash rates for certain VToll transactions to recover the additional collection costs of VToll transactions and to discourage customer behavior related causes of VToll transactions. Tolls are collected at fixed tolling points at rates determined generally upon the influence distance using a per mile toll rate. Toll rates for ZipCash transactions are 50 percent higher than the rates for AVI transactions (with a minimum differential of \$0.28 in 2021 dollars). **Figures 6-2** through **6-8** show the 2022 AVI (TollTag) and ZipCash rates charged at the toll gantries on all NTTA roadways.

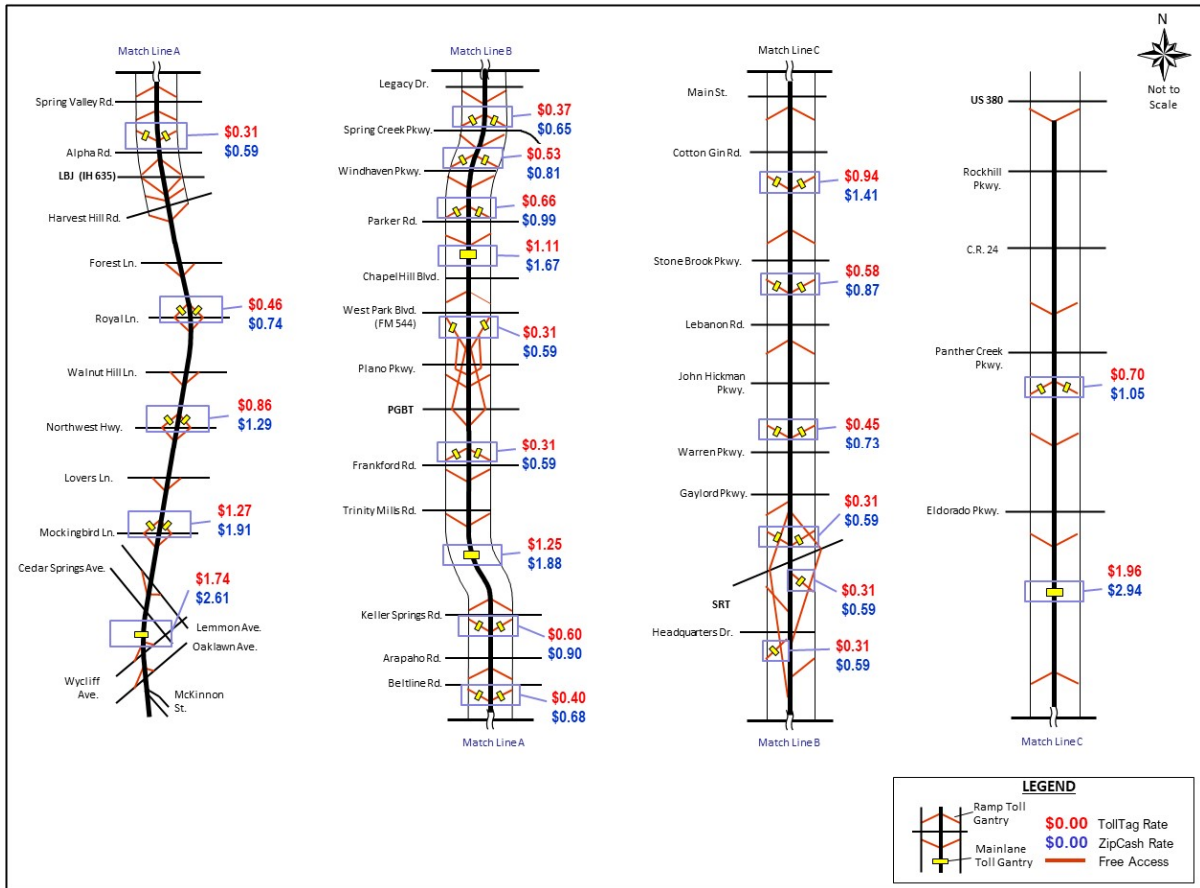
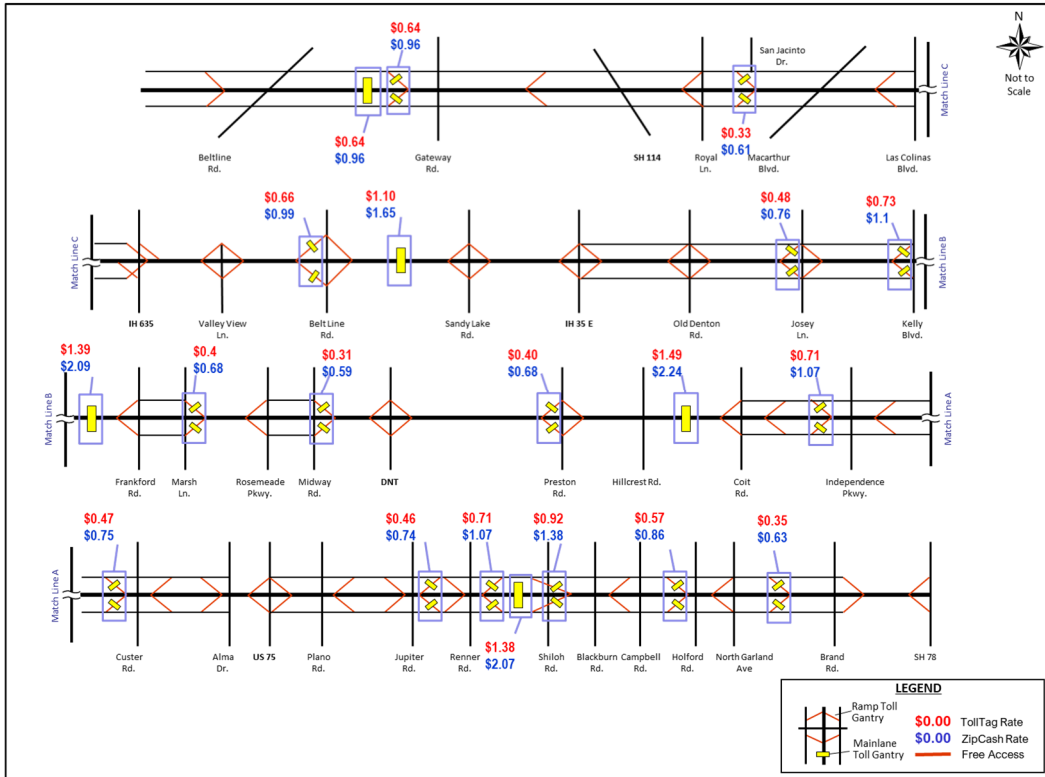
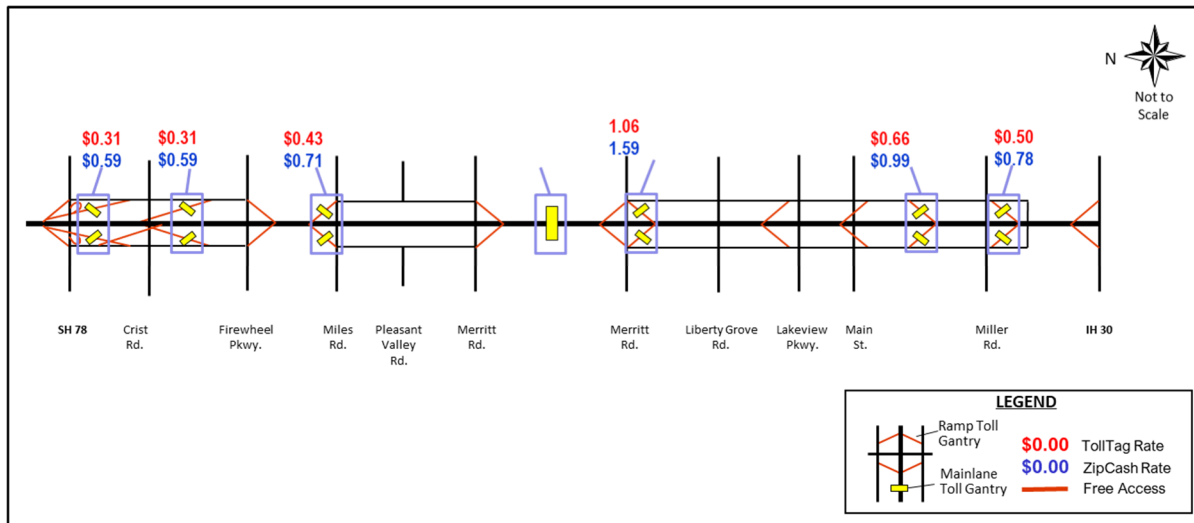


Figure 6-2. Current (2022) DNT Toll Collection System and Passenger Car Toll Rates



**Figure 6-3.**  
Current (2022) PGBT Toll Collection System and Passenger Car Toll Rates



**Figure 6-4.**  
Current (2022) PGBT EE Toll Collection System and Passenger Car Toll Rates



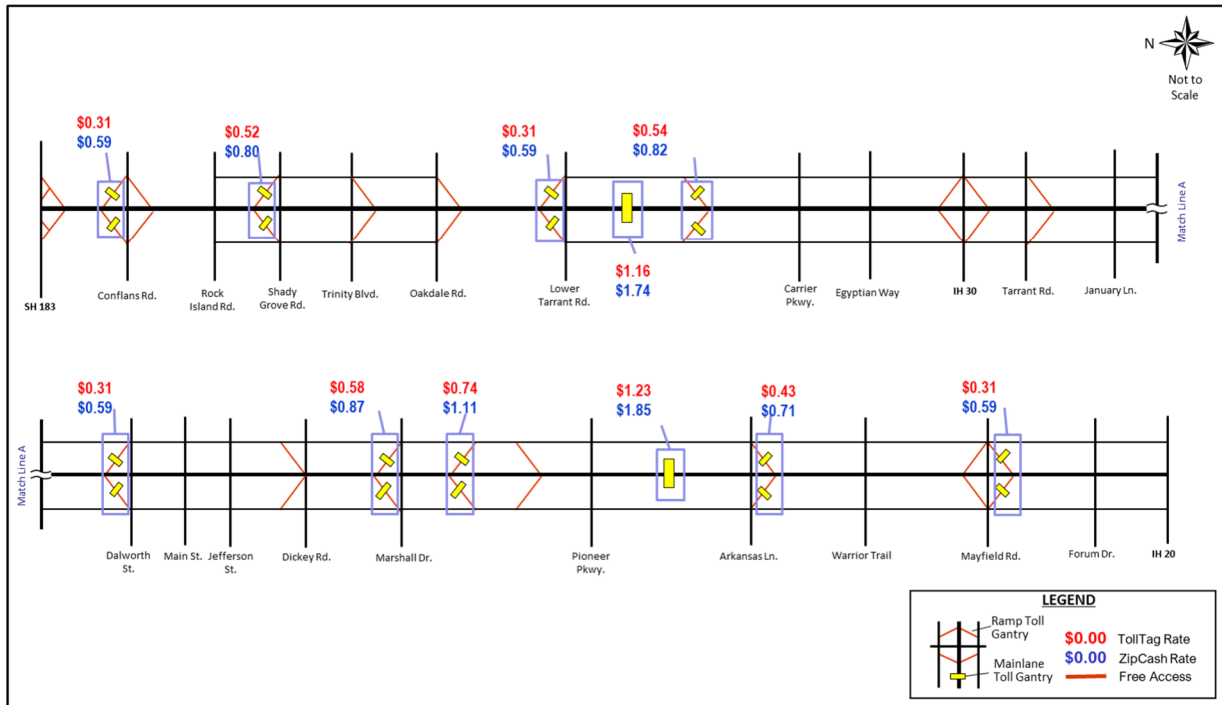


Figure 6-5. Current (2022) PGBT WE Toll Collection System and Passenger Car Toll Rates

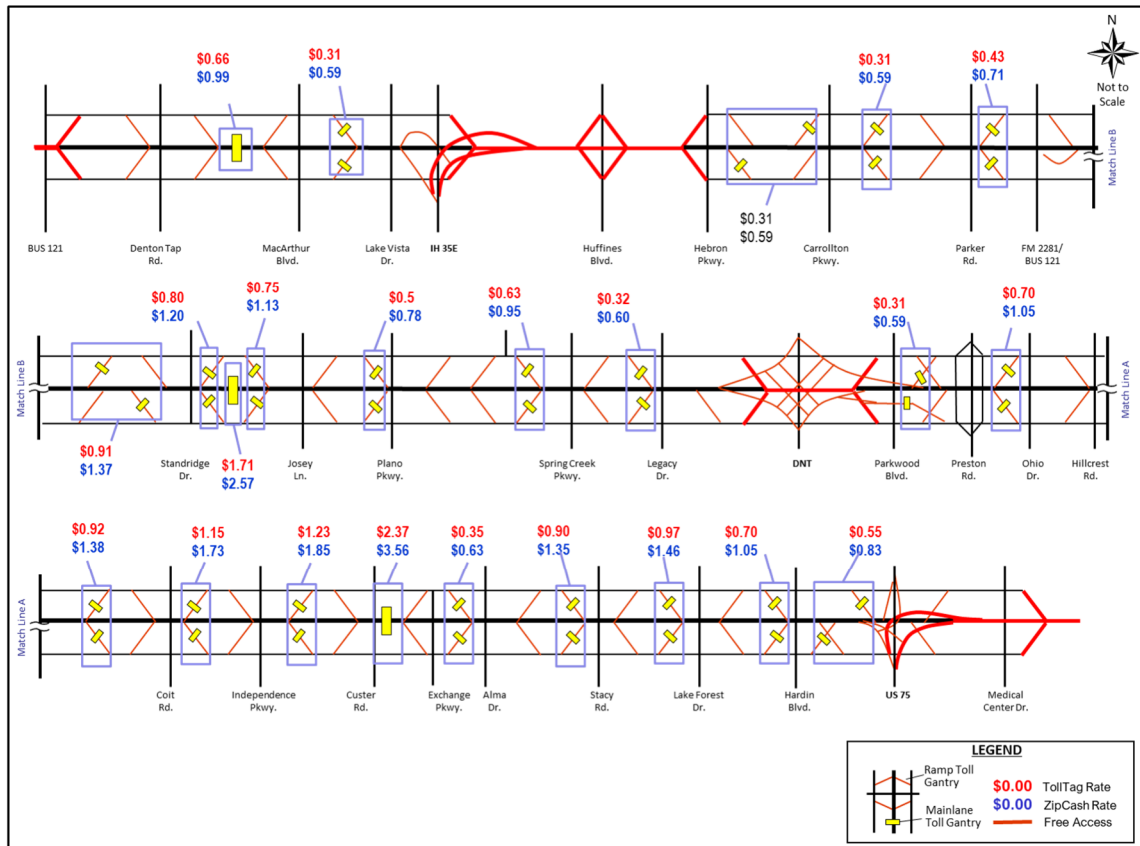


Figure 6-6. Current (2022) SRT Toll Collection System and Passenger Car Toll Rates

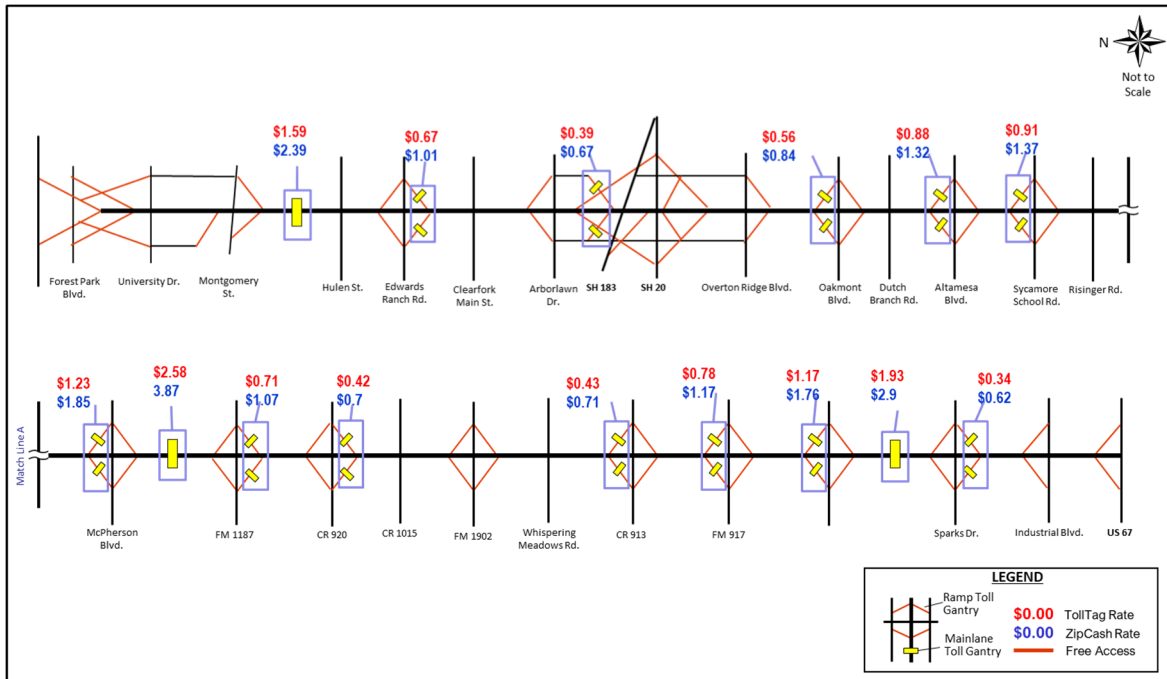


Figure 6-7.  
Current (2022) CTP Toll Collection System and Passenger Car Toll Rates

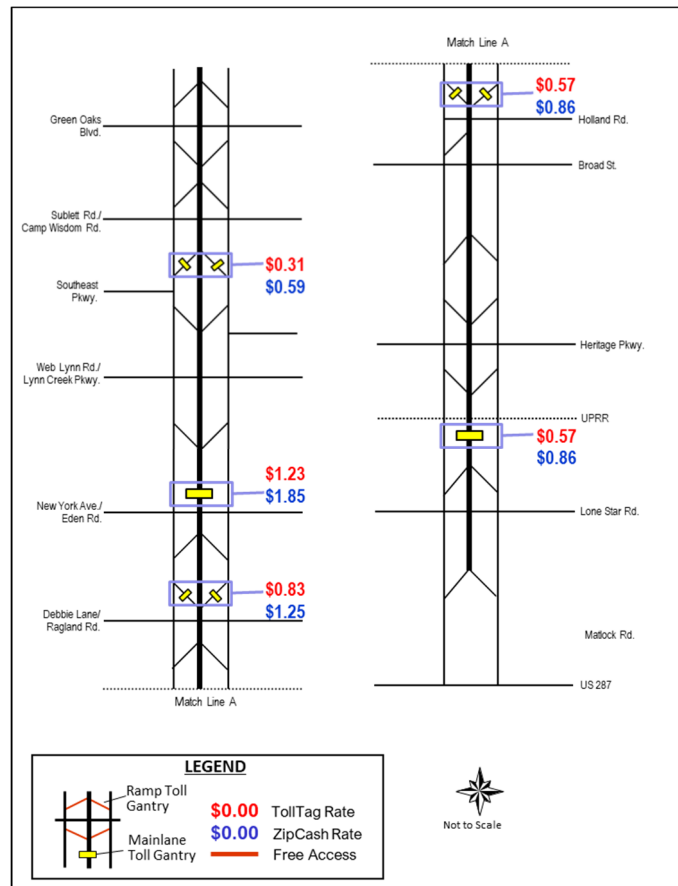
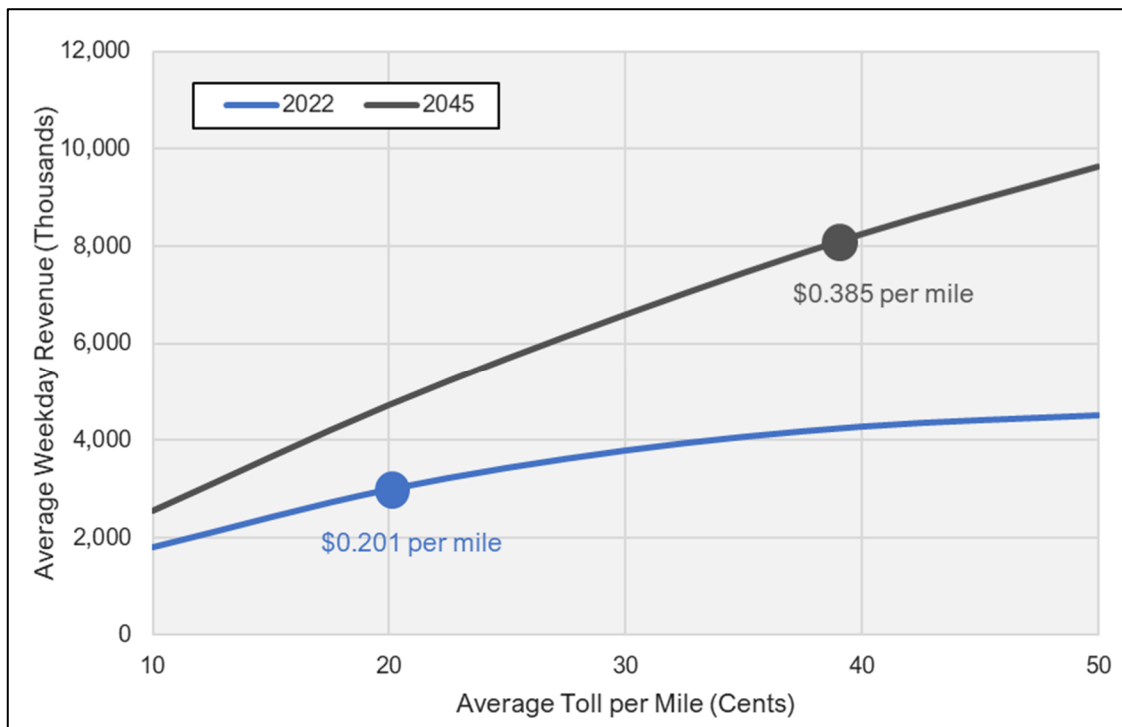


Figure 6-8.  
Current (2022) 360T Toll Collection System and Passenger Car Toll Rates

### 6.3. Toll Sensitivity Analysis

The toll sensitivity analysis was performed to test the impacts of changes to toll rates on the transactions and revenue from each of the NTTA System facilities and the NTTA System as a whole. It is advisable that the proposed toll rates on the NTTA System facilities be less than that required to maximize revenue as determined by the toll sensitivity analysis. Future flexibility should be maintained to increase tolls, if necessary, to generate additional revenue. Future year toll sensitivity curves are based on changes in traffic characteristics along the NTTA System such as congestion levels, values of time and attractiveness of competing facilities. These curves are essential in estimating the viability of future toll rate increases. In general, the toll sensitivity curve suggests that when the toll rate increases, a portion of travelers will leave the toll facility and choose other routes. Therefore, as toll rate increases, transactions decrease. However, as the toll rate increases, the toll revenue increases until it reaches the highest revenue point where an additional toll rate increment would reduce transactions enough to result in decreased toll revenue.

Toll sensitivity analyses were conducted for the NTTA System for the years 2022 and 2045, and **Figure 6-9** illustrates the daily toll sensitivity curves for the NTTA System. The curves were developed using the revised trip tables that incorporate base year calibration related adjustments, as described in **Section 5**, using toll rates ranging between \$0.10 per mile and \$0.50 per mile. The planned average two-axle vehicle AVI toll rates are included on each of the toll sensitivity curves for reference. The results indicate that the planned toll rates are below the revenue maximization points, demonstrating that, if needed, there is potential for revenue enhancement through toll increases above those assumed for traffic and revenue forecasting purposes.



**Figure 6-9.**  
Toll Sensitivity Curves – NTTA System

## 6.4. Estimated Average Weekday Traffic

An equilibrium diversion technique was used to carry out traffic assignment runs for three periods, AM peak, PM peak, and off-peak. The model runs were conducted for the years 2022, 2026, 2036 and 2045. Traffic volumes were estimated by using the revised demographics trip tables, which were adjusted based on the base year model calibration process, as described in **Section 5**.

As the NTTA System currently employs an AVI/ZipCash toll collection system, two separate traffic assignments, one with AVI toll charges and the other with ZipCash charges, were conducted for each model year. The traffic volumes obtained by the AVI toll charge assignment were factored by the assumed AVI transaction shares to get the AVI volumes and the traffic volumes obtained by the ZipCash toll charge assignment run were factored by the ZipCash transaction shares to get the ZipCash traffic volume. The sum of the AVI and ZipCash volumes provided the total traffic using the NTTA System. In this manner volume totals on the NTTA System facilities were estimated for each model year. All other years were interpolated or extrapolated between or beyond the modeled years to obtain the yearly traffic and revenue estimates. The traffic assignment results at each of the analysis years were reviewed for reasonableness and post-model adjustments were made as necessary. This included adjustments to reflect model validation results along the NTTA System corridors. **Figures 6-10 through 6-16** illustrate average 2022 and 2045 weekday volumes on each of the NTTA System roadways.

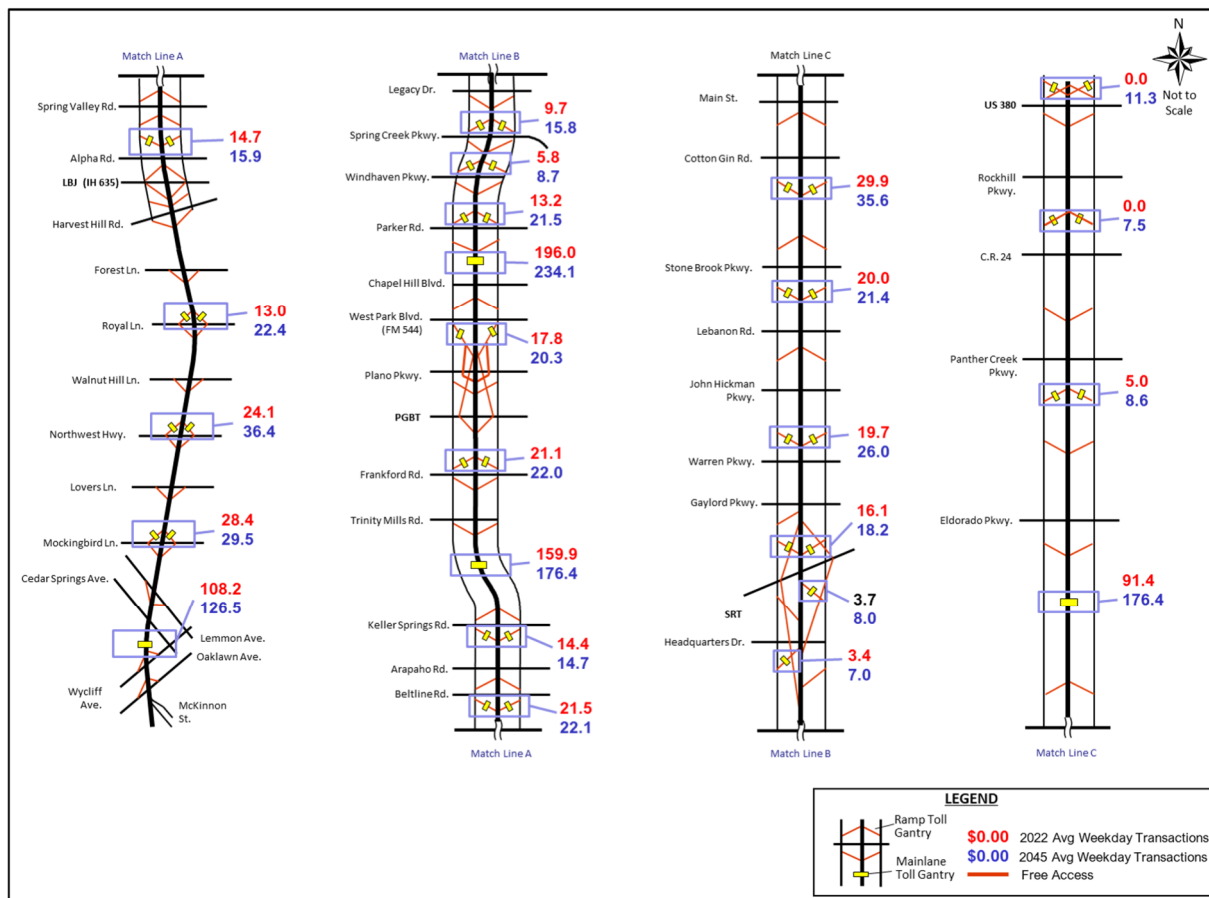


Figure 6-10. Estimated 2022 and 2045 Average Weekday Traffic Volumes (thousands) – DNT

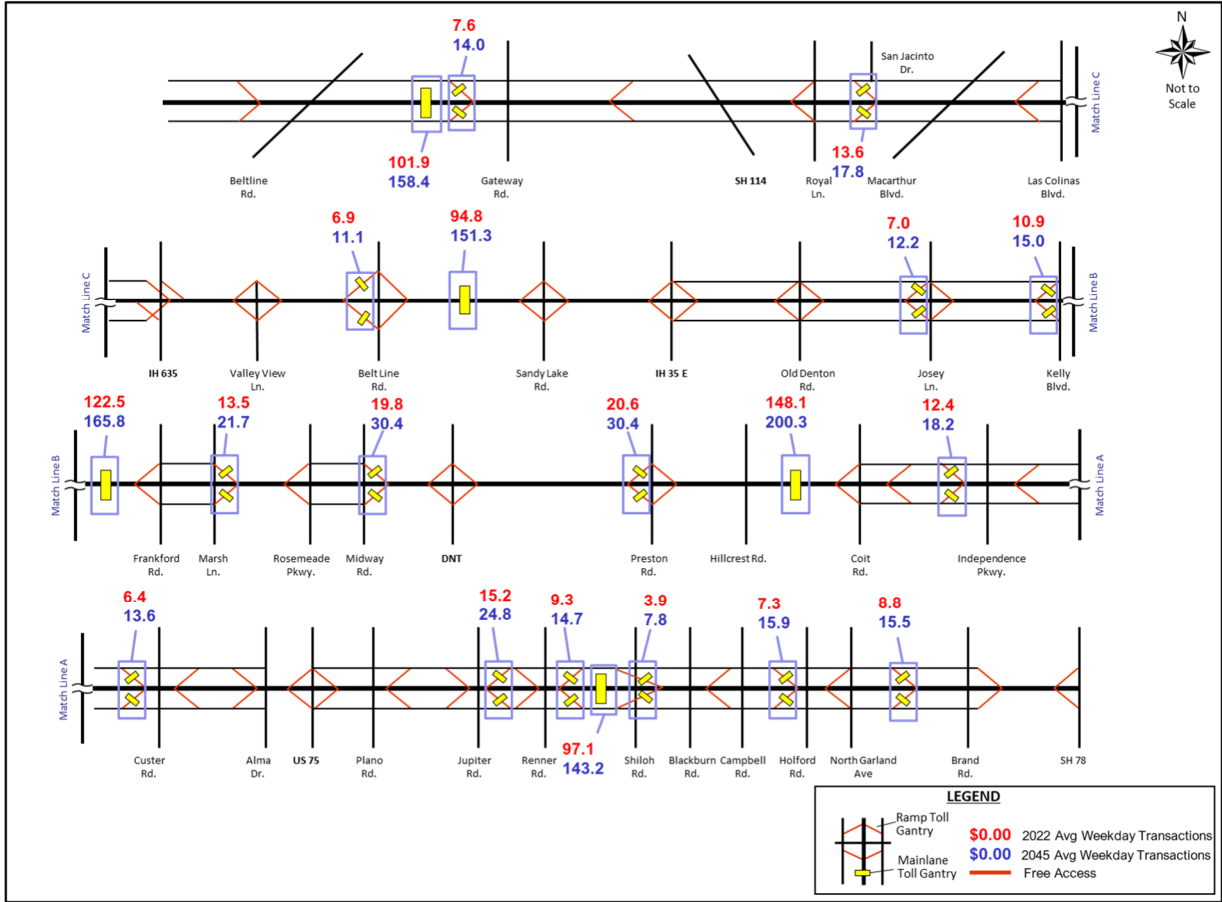


Figure 6-11. Estimated 2022 and 2045 Average Weekday Traffic Volumes (thousands) – PGBT

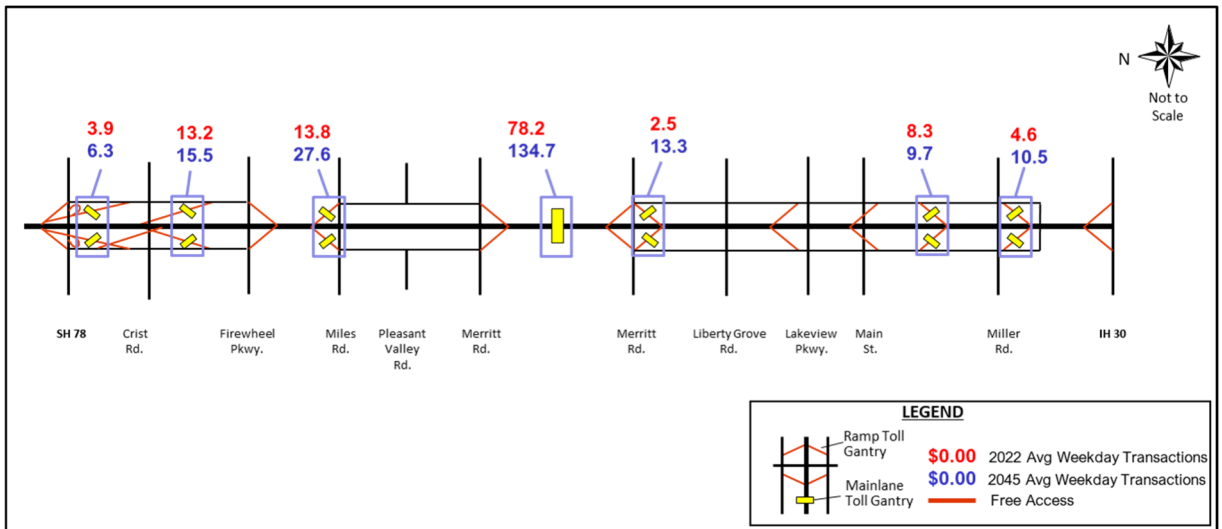
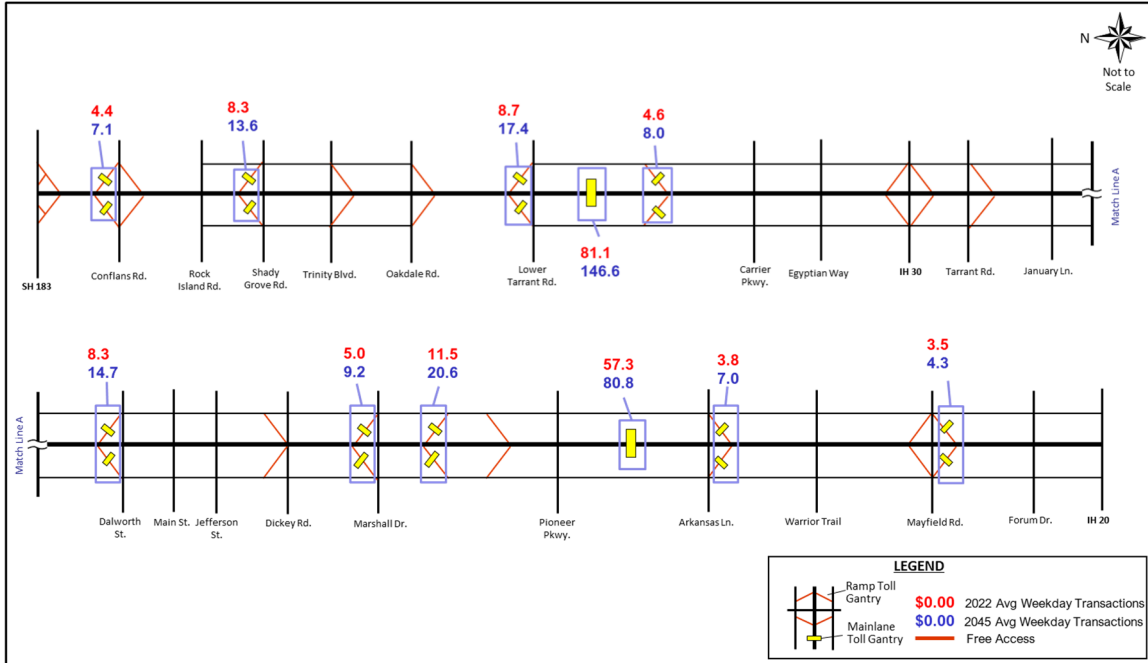
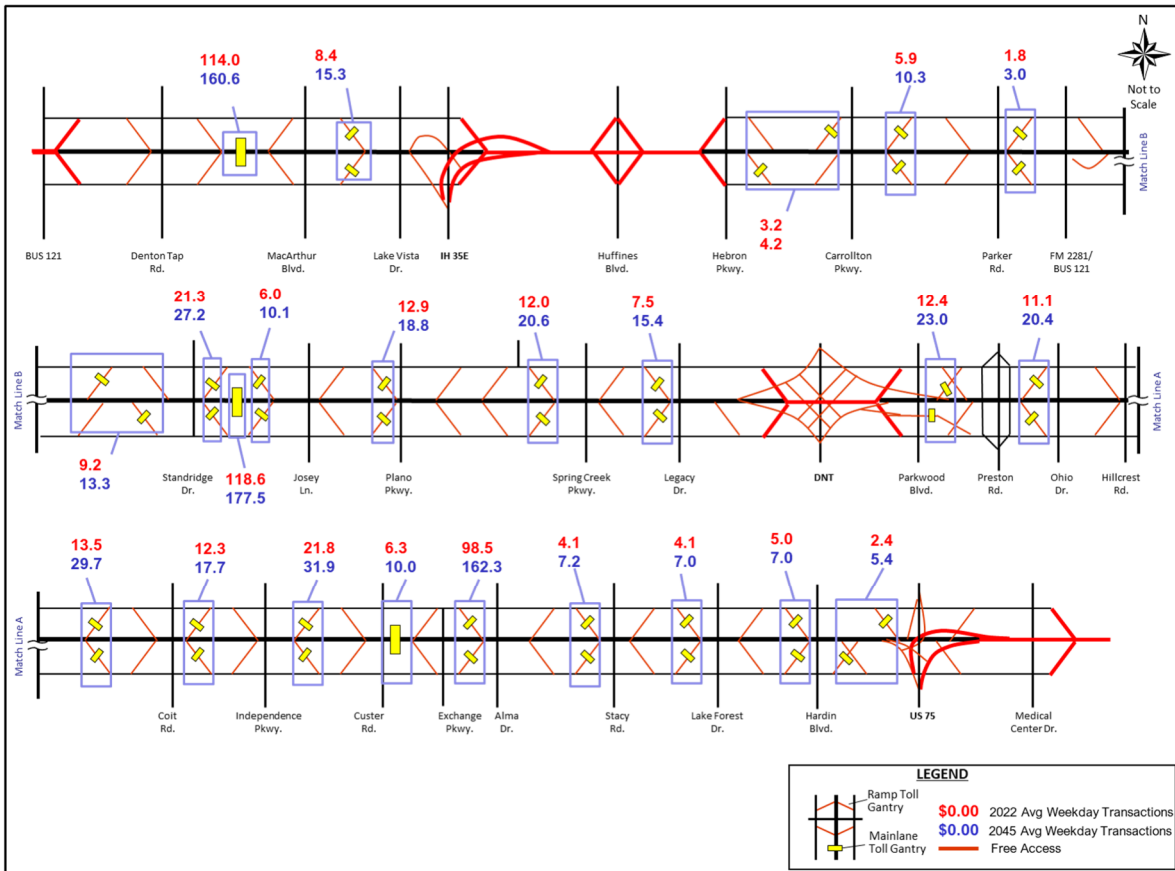


Figure 6-12. Estimated 2022 and 2045 Average Weekday Traffic Volumes (thousands) – PGBT EE



**Figure 6-13.**  
**Estimated 2022 and 2045 Average Weekday Traffic Volumes (thousands) – PGBT WE**



**Figure 6-14.**  
**Estimated 2022 and 2045 Average Weekday Traffic Volumes (thousands) – SRT**

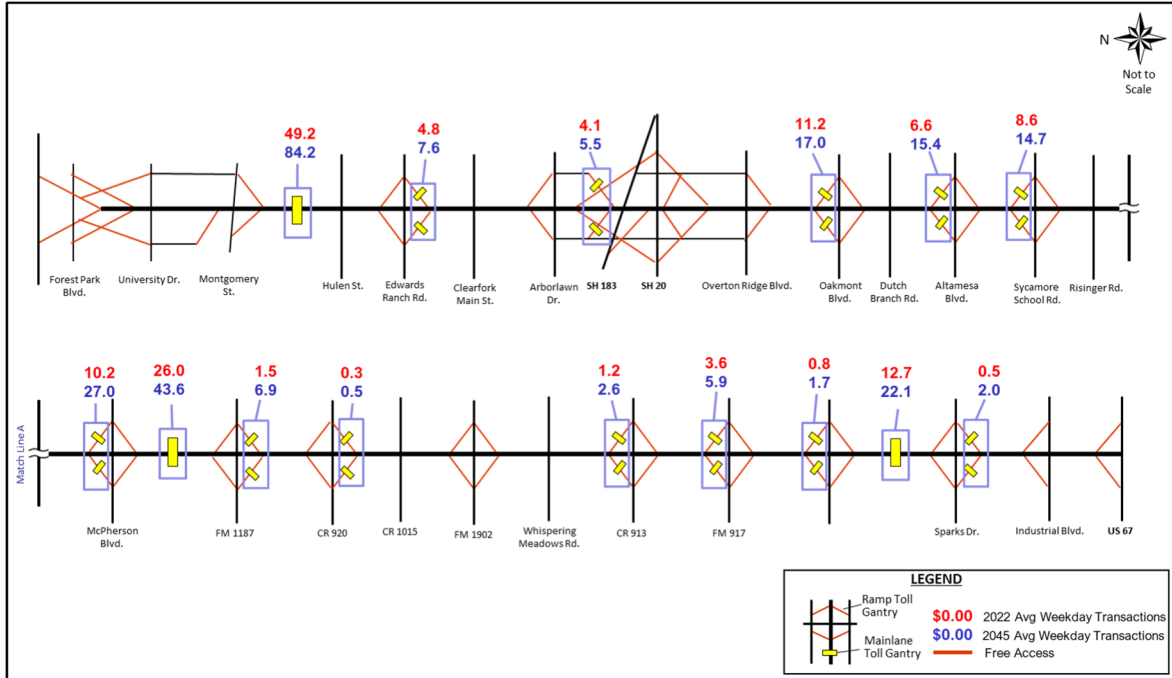


Figure 6-15. Estimated 2022 and 2045 Average Weekday Traffic Volumes (thousands) – CTP

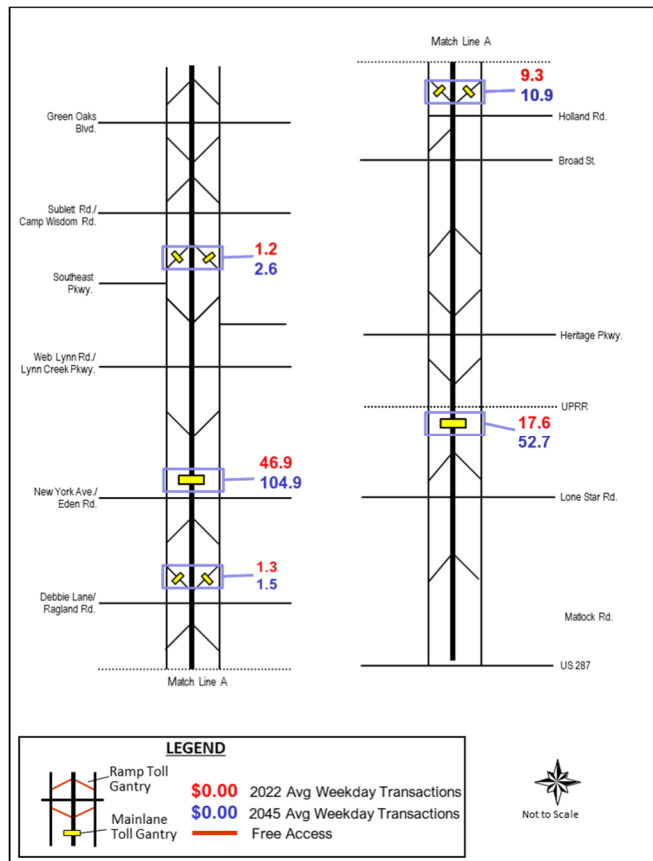


Figure 6-16. Estimated 2022 and 2045 Average Weekday Traffic Volumes (thousands) – 360T

## 6.5. Estimated Annual NTTA System Toll Revenue

Based on the traffic forecast at each toll gantry location, annual forecasts for each facility of the NTTA System were prepared through 2070. The projections extend from 2022 through 2070 and include the revenue forecasts for DNT, PGBT, PGBT EE, PGBT WE, SRT, CTP, 360T, AATT, MCLB, and LLTB. In each case, forecasts for each of the facilities are based on modeled traffic estimates at each toll collection location, through the year 2045. These modeled estimates were refined, using post-model adjustments, reflecting validation factors used to match observed 2022 traffic data and the baseline model year at each toll gantry location.

The average toll at each location was based on the current mix of passenger car and commercial vehicle traffic and the current average tolls, modified in future years to reflect changing assumptions in the proportion of AVI and ZipCash transaction shares. As presented in **Section 5**, passenger cars/commercial vehicles traffic shares have varied during the pandemic. Reasonable assumptions have been made to account for the variance in the short- and long-term impacts of the change in the shares. Further, toll rates for ZipCash transactions are 50 percent higher than the rates for AVI transactions (with a minimum differential of \$0.28 in 2022 dollars) in each case, as noted previously.

Estimates beyond year 2045 are based on nominal assumptions regarding future traffic growth, with assumed toll rate increases as noted previously. As shown in **Table 6-6**, the estimated annual revenue on the DNT is expected to increase from \$299.7 million in 2022 to \$427.5 million by 2030 and \$631.6 million by 2040. Revenue on the PGBT (excluding PGBT WE and PGBT EE) is expected to be \$250.3 million in 2022, increasing to \$370.6 million by 2030 and \$548.8 million by 2040. PGBT WE is anticipated to generate \$62.4 million in toll revenue in 2022, increasing to \$102.3 million and \$160.4 million by 2030 and 2040, respectively. NTTA's share of the revenue on the PGBT EE is expected to be \$47.1 million in 2022, increasing to \$71.8 million by 2030 and \$123.2 million by 2040.

Revenue on the SRT is expected to be \$209.5 million in 2022, increasing to \$324.3 million by 2030 and \$503.9 million by 2040. As fiscal year 2058 is the end of the fifty-year operational agreement of the SRT between NTTA and TxDOT, revenue from SRT is estimated through August 31, 2058, while the other facilities are assumed to generate revenue for NTTA in perpetuity. CTP is anticipated to generate \$70.3 million in toll revenue in 2022, increasing to \$116.5 million and \$194.8 million by 2030 and 2040, respectively.

The 360 Tollway is expected to generate \$23.7 million in toll revenue in 2022, increasing to \$41.1 million and \$75.2 million by 2030 and 2040, respectively. Revenue from the AATT, MCLB and LLTB combined is expected to be about \$14.3 million in 2022. By 2030, this is estimated to reach a combined \$20.4 million and increase in 2040 to \$31.3 million, still a very small share of total NTTA System revenue.

Total revenue on the existing NTTA System total revenue on the NTTA System is expected to increase from about \$977.4 million in 2022 to \$1.47 billion in 2030 and \$2.27 billion in 2040. Driven by nominal traffic growth and continued assumed modest inflationary adjustments in toll rates, annual revenue on the NTTA System is expected to reach more than \$3 billion per year by 2048.



Table 6-6. NTTA System Estimated Annual Toll Revenue (millions)

Year	DNT	PGBT	PGBT EE <sup>(1)</sup>	PGBT WE	SRT <sup>(2)</sup>	CTP	360T <sup>(3)</sup>	AATT-MCLB-LLTB	NTTA System
2022	\$299.7	\$250.3	\$47.1	\$62.4	\$209.5	\$70.3	\$23.7	\$14.3	\$977.4
2023	\$314.0	\$265.8	\$48.4	\$67.6	\$230.7	\$78.2	\$26.1	\$15.0	\$1,045.8
2024	\$330.6	\$284.4	\$52.5	\$78.7	\$247.5	\$82.5	\$27.7	\$15.8	\$1,119.6
2025	\$346.2	\$297.3	\$55.3	\$83.7	\$258.9	\$86.8	\$29.3	\$16.5	\$1,174.1
2026	\$363.0	\$310.9	\$58.3	\$88.7	\$270.9	\$92.4	\$31.1	\$17.2	\$1,232.5
2027	\$378.6	\$324.1	\$61.3	\$89.9	\$283.0	\$97.8	\$33.3	\$17.9	\$1,285.9
2028	\$393.3	\$338.3	\$64.5	\$91.8	\$295.8	\$103.5	\$35.8	\$18.6	\$1,341.6
2029	\$409.7	\$353.8	\$68.1	\$96.7	\$309.6	\$109.9	\$38.3	\$19.4	\$1,405.5
2030	\$427.5	\$370.6	\$71.8	\$102.3	\$324.3	\$116.5	\$41.1	\$20.4	\$1,474.5
2031	\$445.6	\$387.6	\$75.8	\$108.0	\$340.3	\$123.2	\$43.9	\$21.2	\$1,545.6
2032	\$465.0	\$403.4	\$79.8	\$113.0	\$356.0	\$129.5	\$47.0	\$22.1	\$1,615.8
2033	\$483.9	\$419.5	\$88.9	\$118.2	\$372.3	\$136.0	\$50.0	\$23.0	\$1,691.9
2034	\$504.1	\$436.6	\$93.7	\$123.8	\$389.5	\$142.9	\$53.3	\$24.1	\$1,768.0
2035	\$524.5	\$454.2	\$98.3	\$129.2	\$407.7	\$149.7	\$56.6	\$25.1	\$1,845.3
2036	\$546.3	\$473.1	\$103.1	\$135.1	\$426.8	\$157.1	\$60.2	\$26.3	\$1,928.0
2037	\$569.6	\$490.8	\$107.8	\$140.8	\$444.9	\$165.7	\$63.6	\$27.4	\$2,010.8
2038	\$590.1	\$509.4	\$112.8	\$147.1	\$464.0	\$175.1	\$67.2	\$28.6	\$2,094.4
2039	\$610.2	\$528.5	\$117.9	\$153.5	\$483.5	\$184.6	\$71.0	\$29.9	\$2,179.1
2040	\$631.6	\$548.8	\$123.2	\$160.4	\$503.9	\$194.8	\$75.2	\$31.3	\$2,269.0
2041	\$652.2	\$568.8	\$128.8	\$167.2	\$525.4	\$204.9	\$79.2	\$32.7	\$2,359.2
2042	\$674.1	\$590.2	\$134.6	\$174.6	\$548.1	\$215.8	\$83.5	\$34.2	\$2,455.1
2043	\$695.9	\$612.0	\$140.7	\$182.5	\$572.4	\$226.9	\$87.9	\$35.7	\$2,554.1
2044	\$719.4	\$635.5	\$147.1	\$191.1	\$598.1	\$239.0	\$92.7	\$37.2	\$2,660.1
2045	\$741.8	\$659.2	\$153.9	\$199.3	\$623.2	\$250.9	\$103.2	\$38.9	\$2,770.3
2046	\$764.6	\$681.5	\$159.8	\$206.6	\$645.0	\$261.1	\$108.2	\$40.3	\$2,867.0
2047	\$786.5	\$703.4	\$165.6	\$214.1	\$667.7	\$271.2	\$112.6	\$41.8	\$2,962.7
2048	\$809.7	\$726.7	\$171.5	\$222.2	\$691.5	\$282.0	\$117.5	\$43.3	\$3,064.5
2049	\$832.5	\$750.3	\$177.8	\$229.6	\$715.6	\$292.7	\$122.3	\$44.8	\$3,165.7
2050	\$857.0	\$775.8	\$184.3	\$237.6	\$741.0	\$304.4	\$63.8	\$46.4	\$3,210.3
2051	\$880.6	\$799.0	\$190.2	\$245.1	\$763.7	\$314.3	\$66.1	\$47.9	\$3,306.7
2052	\$905.7	\$823.4	\$196.2	\$253.1	\$787.1	\$324.9	\$68.5	\$49.5	\$3,408.4
2053	\$931.0	\$847.4	\$202.5	\$261.0	\$812.1	\$335.5	\$70.8	\$51.0	\$3,511.4
2054	\$958.2	\$873.2	\$209.0	\$269.6	\$838.5	\$347.1	\$73.2	\$52.6	\$3,621.5
2055	\$984.5	\$899.0	\$215.9	\$278.0	\$864.1	\$358.4	\$75.7	\$54.3	\$3,729.8
2056	\$1,012.7	\$926.8	\$222.9	\$287.1	\$890.9	\$370.8	\$78.4	\$56.1	\$3,845.7
2057	\$1,040.4	\$953.9	\$230.0	\$295.9	\$918.6	\$382.8	\$81.1	\$57.8	\$3,960.4
2058	\$1,070.4	\$983.3	\$237.4	\$305.4	\$627.5	\$396.1	\$84.1	\$59.7	\$3,763.9
2059	\$1,100.3	\$1,012.4	\$244.9	\$315.1	\$0.0	\$408.8	\$87.0	\$61.6	\$3,230.0
2060	\$1,132.4	\$1,043.6	\$252.6	\$325.6	\$0.0	\$422.7	\$90.1	\$63.6	\$3,330.6
2061	\$1,163.5	\$1,074.7	\$260.7	\$335.4	\$0.0	\$436.6	\$93.1	\$65.6	\$3,429.7
2062	\$1,196.7	\$1,107.7	\$269.0	\$346.0	\$0.0	\$451.7	\$96.5	\$67.6	\$3,535.2
2063	\$1,229.8	\$1,140.3	\$277.6	\$356.6	\$0.0	\$466.2	\$99.7	\$69.7	\$3,640.0
2064	\$1,265.4	\$1,175.2	\$286.5	\$368.3	\$0.0	\$482.2	\$103.2	\$72.0	\$3,752.8
2065	\$1,300.4	\$1,209.8	\$295.8	\$379.8	\$0.0	\$497.8	\$106.8	\$74.3	\$3,864.7
2066	\$1,338.0	\$1,247.1	\$305.3	\$392.3	\$0.0	\$514.9	\$110.7	\$76.7	\$3,984.9
2067	\$1,375.1	\$1,284.0	\$315.2	\$404.3	\$0.0	\$531.8	\$114.4	\$79.1	\$4,103.9
2068	\$1,414.4	\$1,322.9	\$325.2	\$417.2	\$0.0	\$550.1	\$118.5	\$81.7	\$4,230.0
2069	\$1,453.6	\$1,362.1	\$335.5	\$430.1	\$0.0	\$568.0	\$122.5	\$84.2	\$4,356.0
2070	\$1,495.6	\$1,404.0	\$346.1	\$444.0	\$0.0	\$587.5	\$126.9	\$87.0	\$4,491.1

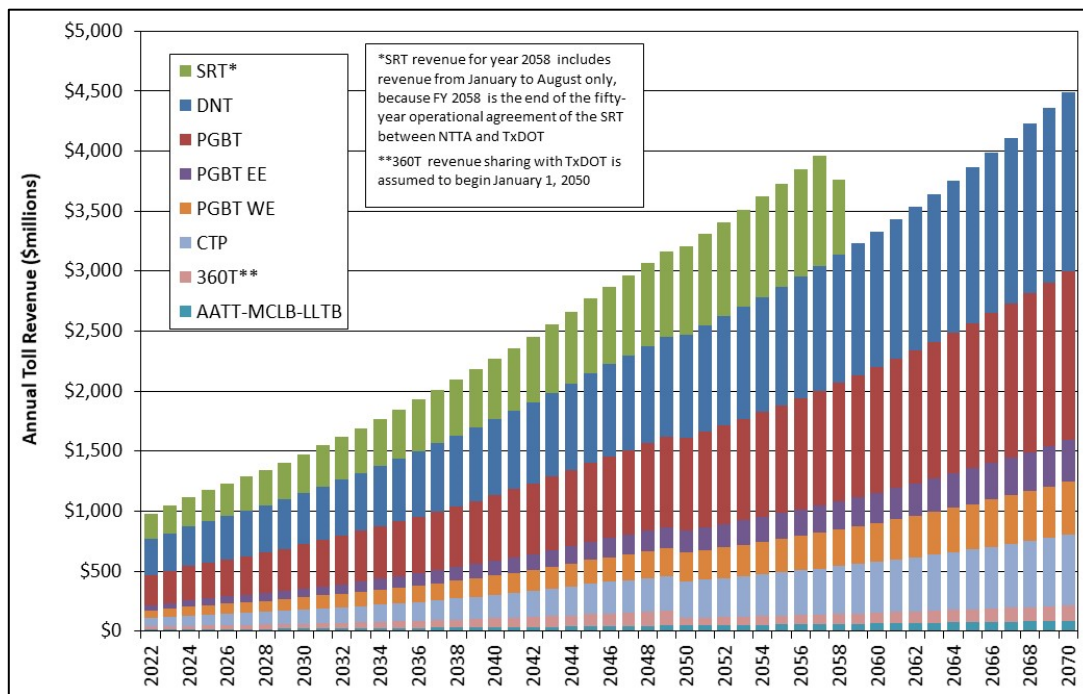
- 1) NTTA's share of the revenue collected from PGBT EE.
- 2) SRT revenue for year 2058 includes revenue from January to August only, because FY 2058 is the end of the fifty-year operational agreement of the SRT between NTTA and TxDOT
- 3) Revenue sharing agreement with TxDOT (50%/50%) is assumed to begin January 1, 2050

**Table 6-7** shows the projected annual transaction and revenue growth rates on the NTTA System. Annual transaction and revenue growth rates from 2022 through 2030 are projected to be 2.5 percent and 5.3 percent, respectively. During this period, the growth in transactions is driven mainly by the growth in the demographics along the NTTA System corridors, the opening of new ramps on DNT in 2023, and recently completed expansions on PGBT and SRT. The transaction growth rates progressively decrease to 1.6 percent between 2030 and 2040, and to 1.0 percent between 2040 and 2050. The corresponding growth rates in revenue are 4.4 percent and 3.5 percent, respectively, which incorporate the traffic growth and the assumed toll rate increases.

**Table 6-7. NTTA System Transactions and Revenue Annual Growth**

Period	Transactions Annual Growth (%)	Revenue Annual Growth (%)
2022-2030	2.5%	5.3%
2030-2040	1.6%	4.4%
2040-2050	1.0%	3.5%

**Figure 6-17** graphically displays the annual revenue forecasts shown previously in **Table 6-6** by facility. It is expected that the DNT, PGBT and SRT will continue to generate the vast majority of revenue on the NTTA System throughout the forecast period. The DNT will provide about 31 percent of all NTTA System revenue in 2022; this proportion decreases to 28 percent in 2045 as the SRT and CTP continue to mature. The PGBT (including EE and WE) will provide approximately 37 percent of all NTTA System revenue through 2045. The SRT will provide about 21 percent of all NTTA System revenue in 2022 and 22 percent by 2045. 360 Tollway is expected to generate two percent of overall revenue in 2022, but this share is projected to increase to four percent by 2045. The AATT, MCLB, and LLTB will contribute less than two percent of revenue through 2045.



**Figure 6-17.**

**NTTA System Estimated Annual Revenue by Facility**

Note: PGBT-EE toll revenue shown is the NTTA’s share of the toll revenue

## 6.6. Sensitivity Tests of Key Input Variables

The base case forecasts for the NTTA System shown above are based on several assumptions, as described previously. As any forecast of the future is subject to considerable uncertainty, most traffic and revenue forecasts to be used in support of project financing typically include sensitivity tests. In general, these are intended to provide a general measure of the potential impact on the revenue forecasts associated with hypothetical changes in certain basic assumptions. These sensitivity tests provide a comparison with the previously presented base case toll revenue forecasts. Each sensitivity test is described in more detail below.

### 6.6.1. Impacts of Value of Time

Values of time (VOT) assumed to produce the traffic and revenue forecast on the NTTA System are shown in **Table 6-8**. Two alternative scenarios with low VOT and high VOT were created to test the sensitivity of the traffic and revenue forecasts to the VOT. The two alternative VOTs were created by assuming a 15 percent decrease and increase to average VOT in the region. The scenarios were tested for years 2022 and 2045, and the traffic forecast and revenue comparison is shown in **Table 6-8**.

As shown in **Table 6-8**, for a 15 percent decrease in VOT in year 2022, revenue is expected to decrease by approximately 5.2 percent and transactions are expected to drop by 5.0 percent. In 2045, using a 15 percent decrease in VOT, revenue is expected to drop by 5.1 percent and transactions will decrease by 4.9 percent. In 2022, using a 15 percent increase in VOT, revenue is expected to increase by 4.2 percent and transactions will increase by 3.9 percent. In 2045, using a 15 percent increase in VOT, transactions and revenue are expected to increase by 4.1 and 4.0 percent, respectively.

**Table 6-8. Impacts of Value of Time**

Year	Revenue			Revenue Index		
	Base VOT	0.85 VOT	1.15 VOT	Base VOT	0.85 VOT	1.15 VOT
<b>2022</b>	\$977,372,300	\$926,257,900	\$1,018,124,800	100.0	94.8	104.2
<b>2045</b>	\$2,770,281,900	\$2,628,020,700	\$2,882,880,900	100.0	94.9	104.1
Year	Transactions			Transactions Index		
	Base VOT	0.85 VOT	1.15 VOT	Base VOT	0.85 VOT	1.15 VOT
<b>2022</b>	866,961,300	823,851,100	901,123,600	100.0	95.0	103.9
<b>2045</b>	1,316,176,300	1,251,311,200	1,369,284,200	100.0	95.1	104.0

### 6.6.2. Impacts of Severe Demographic Growth Stagnation

Traffic and revenue forecasts were tested under severe demographic growth stagnation scenarios. Demographic growth was assumed to lag by five and ten years behind the revised demographics used in the base forecast. For each alternative, the traffic and revenue estimates were evaluated for forecast year 2045. As can be seen in **Table 6-9**, the five-year lag demographics/trip tables result in a revenue and transactions decrease of 8.3 and 7.8 percent, respectively. In the case of a ten-year lag in demographic growth, revenue in 2045 would be 17.0 percent lower, and transactions would be 15.8 percent lower.

**Table 6-9. Impacts of Severe Demographic Growth Stagnation**

Year	2045 Revenue		2045 Revenue Index	
	Base	Alternative	Base	Alternative
<b>Five Year Lag</b>	\$2,770,281,900	\$2,539,800,300	100.0	91.7
<b>Ten Year Lag</b>	\$2,770,281,900	\$2,299,259,200	100.0	83.0
Year	2045 Transactions		2045 Transactions Index	
	Base	Alternative	Base	Alternative
<b>Five Year Lag</b>	1,316,176,300	1,213,086,800	100.0	92.2
<b>Ten Year Lag</b>	1,316,176,300	1,108,723,300	100.0	84.2

### 6.6.3. Impacts of AVI Share and Revenue Recovery Assumptions

The impacts on the revenue forecasts due to the current AVI share and revenue recovery assumption changes were tested for multiple years. For this test, it was assumed that there would be no change in the total transactions. As can be seen in **Table 6-10**, the estimated revenue would be approximately one percent lower by 2040 if the alternate AVI share assumptions (under which the AVI share drops to 75 percent) are used.

As shown in **Table 6-11**, if the ZipCash revenue recovery is assumed to be 10 percent lower than the base case in all forecast years, the revenue would be 1.4 percent lower in 2022 and 1.3 percent lower in 2045. If the ZipCash revenue recovery is assumed to be 10 percent higher than the base case in all forecast years, the revenue would be 1.4 percent higher in 2022 and 1.3 percent higher in 2045.

**Table 6-10. Impacts of AVI Participation**

Year	Revenue				Revenue Index	
	Base TollTag Share	Base Revenue	Alternate Toll Tag Share	Alternate Revenue	Base TollTag Share	Alternate Toll Tag Share
<b>2030</b>	<b>79.2%</b>	\$1,474,497,400	<b>77.2%</b>	\$1,462,233,400	100	99.2
<b>2040</b>	<b>79.7%</b>	\$2,269,017,200	<b>76.3%</b>	\$2,238,439,900	100	98.7
<b>2050</b>	<b>80.0%</b>	\$3,210,325,300	<b>75.8%</b>	\$3,158,290,200	100	98.4
<b>2060</b>	<b>80.1%</b>	\$3,330,649,100	<b>75.3%</b>	\$3,269,966,900	100	98.2
<b>2022-2070</b>		<b>\$133,170,594,500</b>		<b>\$131,271,142,400</b>	<b>100.0</b>	<b>98.6</b>

**Table 6-11. Impacts of ZipCash Revenue Recovery**

Year	Revenue			Revenue Index		
	Zip Cash Recovery			Zip Cash Recovery		
	Base	0.9	1.1	Base	0.9	1.1
<b>2022</b>	\$977,372,300	\$963,343,800	\$991,400,200	100	98.6	101.4
<b>2045</b>	\$2,770,281,900	\$2,733,569,200	\$2,806,993,800	100	98.7	101.3

#### 6.6.4. Impacts of Truck Traffic Shares

The impacts of lower truck traffic shares on NTTA System revenue are shown in **Table 6-12**. In this test, the total number of the transactions is assumed to remain the same as the base forecast. As shown, 2022 NTTA System revenue would be 3.6 percent lower when the truck traffic share is reduced by 50 percent at all toll gantries. In year 2045, the revenue would be 3.4 percent lower under a lower truck transaction share assumption.

**Table 6-12. Impacts of Truck Traffic Shares**

Year	Revenue		Revenue Index	
	Base	50% Drop in Truck Traffic Shares	Base	50% Drop in Truck Traffic Shares
<b>2022</b>	\$977,372,300	\$942,496,900	100	96.4
<b>2045</b>	\$2,770,281,900	\$2,675,163,300	100	96.6

#### 6.6.5. Impacts of Revenue Days

The impacts of revenue days on NTTA System revenue are shown in **Table 6-13**. In this test, the number of revenue days is decreased to reflect a reduction of ten percent in the weekend to weekday traffic ratio. As shown in **Table 6-13**, NTTA System revenue would be approximately 2.2 to 2.3 percent lower throughout the forecast period with the weekend to weekday traffic ratio reduced by 10 percent.

**Table 6-13. Impacts of Revenue Days**

Year	Revenue		Revenue Index	
	Base	10% Drop in Weekend Traffic	Base	10% Drop in Weekend Traffic
<b>2022</b>	\$977,372,300	\$956,115,100	100	97.8
<b>2030</b>	\$1,474,497,400	\$1,440,552,100	100	97.7
<b>2040</b>	\$2,269,017,200	\$2,216,957,800	100	97.7
<b>2050</b>	\$3,210,325,300	\$3,137,162,000	100	97.7
<b>2060</b>	\$3,330,649,100	\$3,257,258,500	100	97.8
<b>2022-2070</b>	<b>\$133,170,594,500</b>	<b>\$130,164,296,700</b>	<b>100</b>	<b>97.7</b>

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# Appendix A

## Independent Demographic Review

This appendix contains the documentation of the independent demographic review as provided by the subconsultant, Research and Demographic Solutions. This report was provided to CDM Smith in July 2022.

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# NTTA System Demographic Review and Update

July 2022



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## INTRODUCTION AND PURPOSE

Research and Demographic Solutions Group (RDS) was commissioned by CDM Smith to perform an independent socioeconomic analysis concerning household, population, and employment forecasts along the North Texas Tollway Authority (NTTA) System roadways. The NTTA System is defined as eight toll roads: the Dallas North Tollway (DNT), the President George Bush Turnpike (PGBT), the Sam Rayburn Tollway (SRT), the Chisholm Trail Parkway (CTP), the Addison Airport Toll Tunnel (AATT), the Mountain Creek Lake Bridge (MCLB), the Lewisville Lake Toll Bridge (LLTB) and the 360 Tollway. This report provides an independent socioeconomic analysis of selected areas in proximity of the NTTA System roadways in light of the current North Central Texas Council of Government's (NCTCOG) Metropolitan Transportation Plan, "Mobility 2045 Update", which was adopted by the Regional Transportation Council on June 9, 2022.

RDS evaluated the latest socioeconomic forecasts prepared by NCTCOG for accuracy and reasonableness, detailed to the level of Traffic Analysis Process (TAP) zones. While review was done for all 5,303 zones, focus was narrowed to 4,039 TAP zones directly affecting portions of the NTTA System. The RDS evaluation was completed for the years of 2022 and 2045.

RDS also identified and calculated major emerging economic trends which directly impact the level and distribution of future socioeconomic growth in the Dallas-Fort Worth Metropolitan Statistical Area (DFW MSA). Such trends include patterns in land use, transportation improvements, and major planned developments. RDS evaluated any factors that will likely change economic growth potential or the overall distribution of economic growth. Examples include, but are not limited to future rail stations and rail line extensions, infrastructure expansions and airport development.

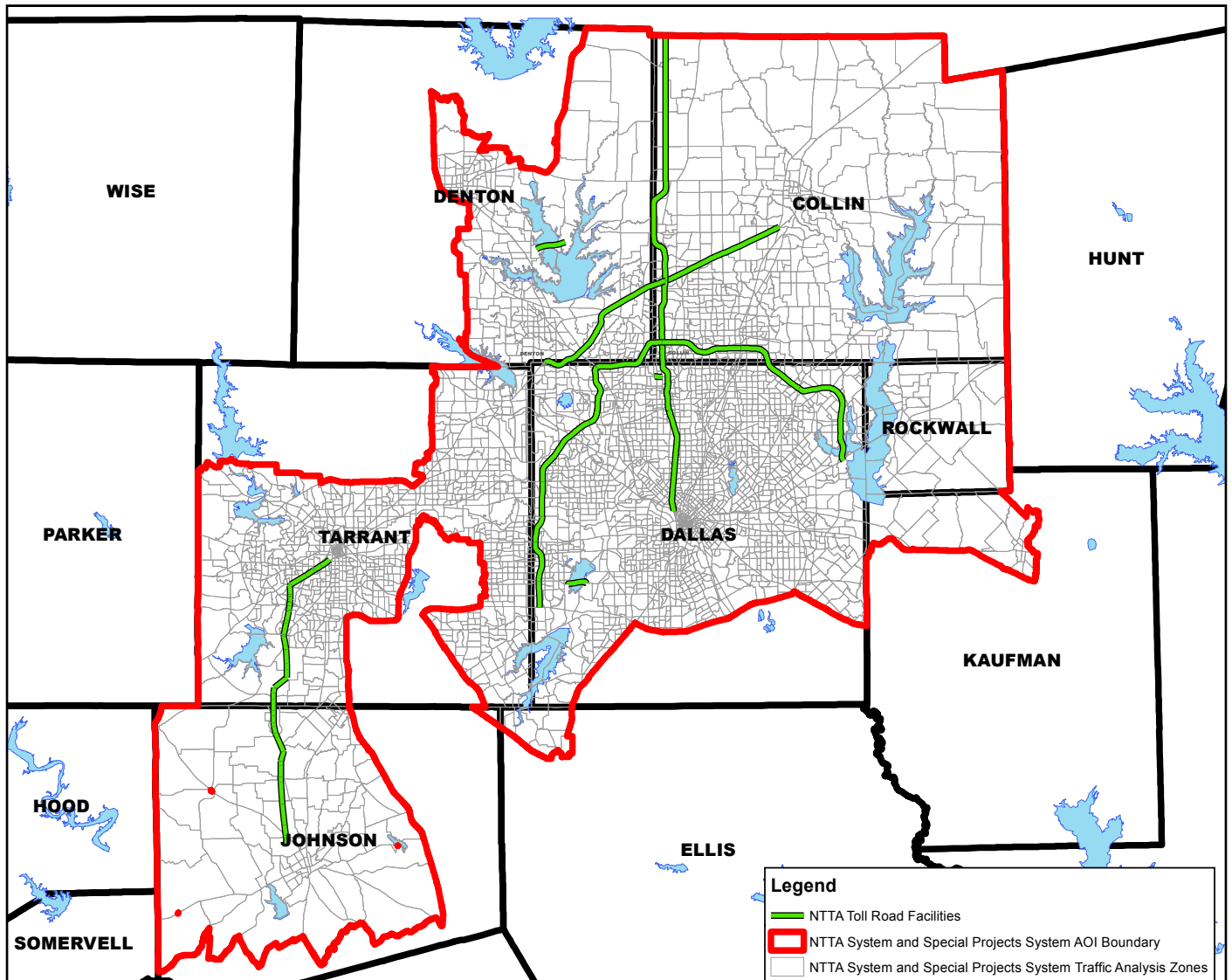
RDS review of the TAP zone-level forecast demographics was completed in June 2022.

Full citations are provided for methodologies, sources of development trends and projections, and narratives defining and detailing important issues affecting future socioeconomic growth in proximity of the NTTA System roadways.

### NTTA System Demographic Review Area of Interest Map

The Area of Interest (AOI) for this study includes all of Collin and Rockwall Counties, as well as portions of Dallas, Denton, Johnson, Kaufman and Tarrant Counties in proximity to the NTTA System facilities as shown in Figure 1. CDM Smith and RDS identified 4,039 TAP zones for initial review. Criteria, including residential and commercial construction databases, were established to select the most active TAP zones for review.

Figure 1: Area of Interest Map

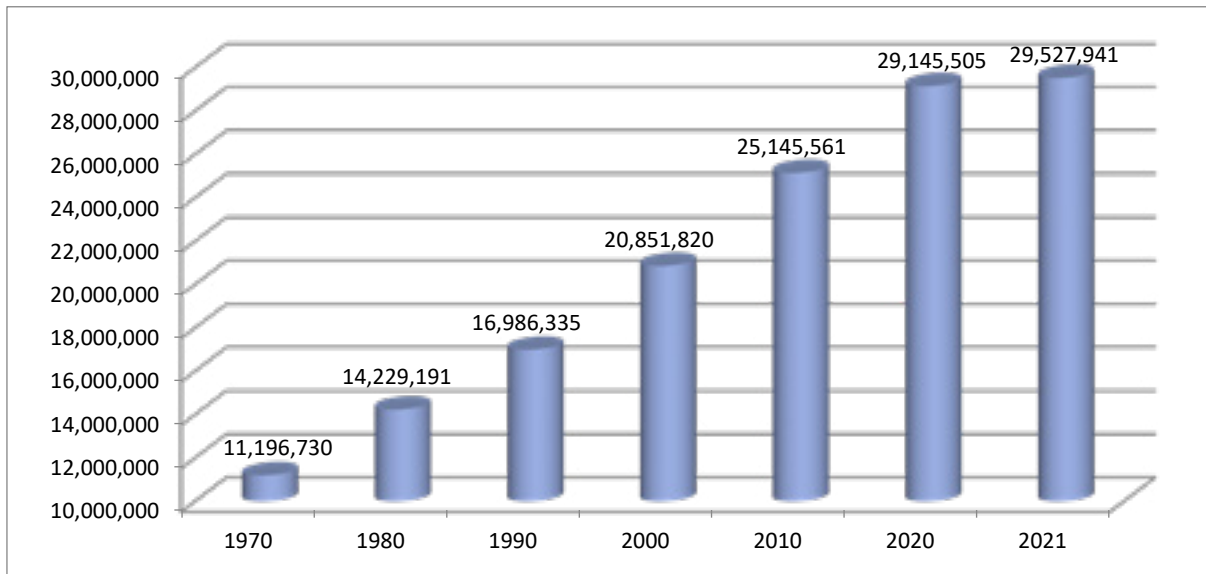


# POPULATION TRENDS AND PROJECTIONS

## State of Texas

Texas continues to be one of the fastest growing states in the US. After the decennial census, the Census Bureau reported that Texas added 4 million persons between 2010 and 2020, an almost 16 percent increase in total population. Texas’ high growth trend has continued, mainly due to the state’s high Hispanic migration and their accompanying birth rates.<sup>1</sup> As of 2021, the Hispanic population made up approximately 40.2 percent of Texas’ overall population and had grown by almost 2 million since 2010. Figure 2 shows the trend in Texas population from 1970 through 2021.

**Figure 2: Texas Total Population 1970 - 2021**



Source: US Census Bureau, 2021 Population Estimates

Texas’ future population growth is expected to be strong going forward. The state’s relatively low cost of living, attractive business climate, low tax rates, and diversified economy all should contribute to sizable future population gains. Utilizing rates of migration and natural increase from 2010 to 2015, the Texas Demographic Center (TDC) estimates that 47.3 million people will live in the state by 2050. Woods and Poole and the Texas Water Development Board forecast a robust 41.2 and 42.3 million 2050 Texas population respectively.

**Table 1: Texas Population Projections (in Millions)**

Scenarios	2010	2020	2030	2040	2050	2010-2050 Growth	Compound Annual Growth Rate 2010-2050
TDC 2010-2015	25.1	29.7	34.9	40.7	47.3	22.2	1.60%
Woods & Poole	25.2	29.3	33.1	37.0	41.2	16.0	1.24%
Texas Water Development Board	25.1	29.7	33.9	38.1	42.3	17.2	1.31%

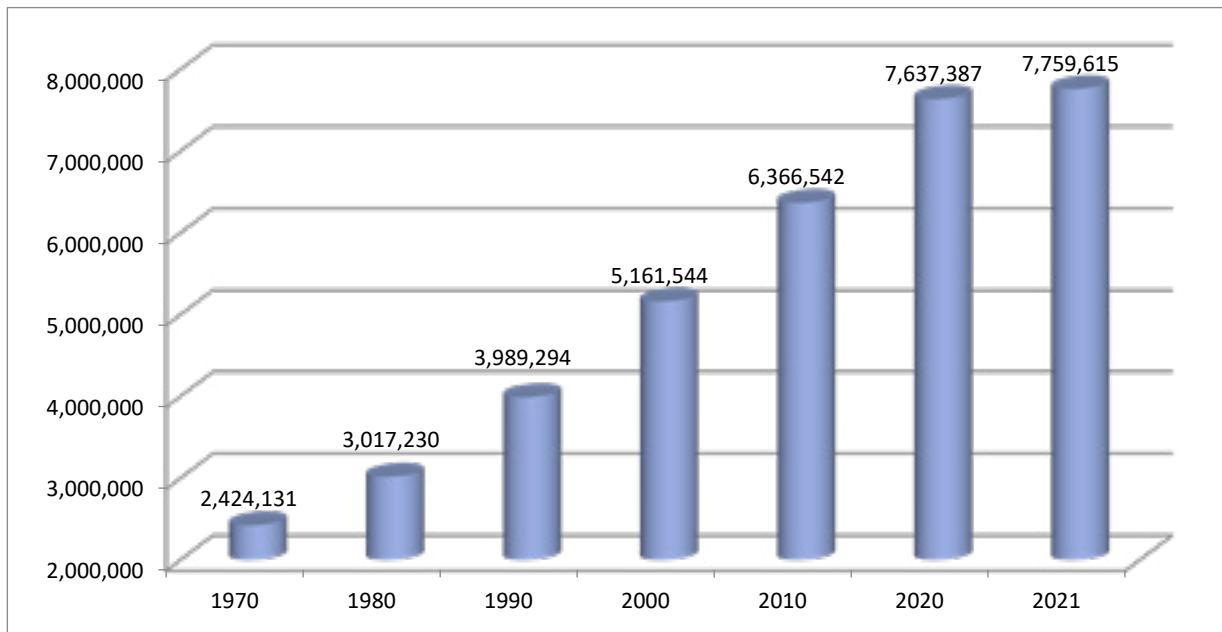
Source: 2018 Texas Demographic Center, 2021 Woods & Poole, 2022 Texas State Water Plan Population Projections

1. “Booming Texas population growth, demographic changes set stage for redistricting battle” Dallas Morning News 12 August, 2021.

## DFW Metropolitan Statistical Area

Between 2010 and 2021, the Dallas-Fort Worth-Arlington Metropolitan Statistical Area<sup>2</sup> experienced the largest MSA population gain in the US and now has almost 7.76 million residents, as shown in Figure 3. Overall, the MSA has added 2.6 million persons since 2000. To put this in perspective, the DFW MSA has added the total current population of the San Antonio MSA between 2000 to 2021. Furthermore, the DFW MSA growth averaged 5,000 more people per year from 2010-2021 than in the 2000-2010 period.

**Figure 3: Dallas-Fort Worth-Arlington MSA Population 1970 - 2021**



Source: U.S. Census Bureau, Decennial Censuses and 2021 Population Estimates.

Even though residential construction has slowed in many areas of the country, all forecasting agencies including the NCTCOG, the Texas Demographic Center, Woods & Poole, and the Texas Water Development Board agree that the region will continue to see very strong household and population growth through 2050. There are a myriad of attributes that contribute to the overall regional projections. These include a recent history of strong growth, affordable and available land with no limiting geographic boundaries such as an ocean or foreign border, the relatively low cost of doing business in the state and region, central geographic location in the U.S., favorable weather and amenities, etc.

### Historical Population Trends

Table 2 shows the historical populations of Dallas, Tarrant, Collin, Denton, Rockwall, Ellis, and Johnson Counties during the past 51 years. Collectively, the population of these seven counties grew by 5 million residents, from 2.28 million in 1970 to more than 7.27 million during 2021. Fifty-three percent of that population growth occurred in Dallas and Tarrant Counties. However, Collin County added over 1 million residents and experienced the most rapid rate of growth with a CAGR of 5.66 percent between 1970 and 2021. The CAGR's of Rockwall and Denton Counties increased by over 5 percent, respectively, during this same period. The population in the region's southern suburban counties grew more slowly, with Ellis County growing by 2.9 percent and Johnson County by 2.8.

<sup>2</sup> The DFWA MSA is comprised of Collin, Dallas, Delta, Denton, Ellis, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant and Wise Counties.



**Table 2: Historical Population for Select Counties in the Dallas-Fort Worth MSA, 1970-2021**

**Total Population**

	<b>Collin County</b>	<b>Dallas County</b>	<b>Denton County</b>	<b>Ellis County</b>	<b>Johnson County</b>	<b>Rockwall County</b>	<b>Tarrant County</b>	<b>Total</b>
1970	66,920	1,327,321	75,633	46,638	45,769	7,046	716,317	2,285,644
1980	144,576	1,556,390	143,126	59,743	67,649	14,528	860,880	2,846,892
1990	264,036	1,852,810	273,525	85,167	97,165	25,604	1,170,103	3,768,410
2000	491,272	2,216,808	433,065	111,415	126,622	43,023	1,449,290	4,871,495
2010	782,341	2,368,139	662,614	149,610	150,934	78,337	1,809,034	6,001,009
2020	1,064,465	2,613,539	906,422	192,455	179,927	107,819	2,110,640	7,175,267
2021	1,109,462	2,586,050	941,647	202,678	187,280	116,381	2,126,477	7,269,975

**Total Population Change**

	<b>Collin County</b>	<b>Dallas County</b>	<b>Denton County</b>	<b>Ellis County</b>	<b>Johnson County</b>	<b>Rockwall County</b>	<b>Tarrant County</b>	<b>Total</b>
1970-1980	77,656	229,069	67,493	13,105	21,880	7,482	144,563	561,248
1980-1990	119,460	296,420	130,399	25,424	29,516	11,076	309,223	921,518
1990-2000	227,236	363,998	159,540	26,248	29,457	17,419	279,187	1,103,085
2000-2010	291,069	151,331	229,549	38,195	24,312	35,314	359,744	1,129,514
2010-2021	327,121	217,911	279,033	53,068	36,346	38,044	317,443	1,268,966
<b>1970-2021</b>	<b>1,042,542</b>	<b>1,258,729</b>	<b>866,014</b>	<b>156,040</b>	<b>141,511</b>	<b>109,335</b>	<b>1,410,160</b>	<b>4,984,331</b>

**Compound Annual Growth Rate**

	<b>Collin County</b>	<b>Dallas County</b>	<b>Denton County</b>	<b>Ellis County</b>	<b>Johnson County</b>	<b>Rockwall County</b>	<b>Tarrant County</b>	<b>Total</b>
1970-1980	8.01%	1.60%	6.59%	2.51%	3.98%	7.50%	1.86%	2.22%
1980-1990	6.21%	1.76%	6.69%	3.61%	3.69%	5.83%	3.12%	2.84%
1990-2000	6.41%	1.81%	4.70%	2.72%	2.68%	5.33%	2.16%	2.60%
2000-2010	4.76%	0.66%	4.34%	2.99%	1.77%	6.18%	2.24%	2.11%
2010-2021	3.23%	0.80%	3.25%	2.80%	1.98%	3.66%	1.48%	1.76%
<b>1970-2021</b>	<b>5.66%</b>	<b>1.32%</b>	<b>5.07%</b>	<b>2.92%</b>	<b>2.80%</b>	<b>5.65%</b>	<b>2.16%</b>	<b>2.29%</b>

Source: U.S. Census Bureau, Decennial Censuses and 2021 Population Estimates.

**Recent Population Trends**

Table 3 shows the populations of the ten largest metropolitan statistical areas (MSAs) in the United States. The largest MSAs in the United States during the U.S. Census Bureau's 2021 population estimates were the New York-Newark-Jersey City, NY-NJ-PA MSA (19.7 million residents), the Los Angeles-Long Beach-Anaheim, CA MSA (13 million residents), and the Chicago-Naperville-Elgin, IL MSA (9.5 million residents). In 2021, the DFW MSA was ranked as the fourth largest MSA in the United States followed by the Houston-The Woodlands-Sugar Land MSA in fifth. The Houston MSA's CAGR was just slightly smaller than DFW's from 2010 to 2021, but these two MSA's were the fastest growing in the Top 10.

**Table 3: Largest Metropolitan Statistical Areas in the United States, 2010-2021**

Rank	MSA	Total Population			Total Change	Average Annual Change	CAGR
		2010	2020	2021	2010 to 2021	2010 to 2021	2010 to 2021
1	New York-Newark-Jersey City, NY-NJ-PA MSA	18,897,109	20,140,470	19,768,458	871,349	79,214	0.41%
2	Los Angeles-Long Beach-Anaheim, CA MSA	12,828,837	13,200,998	12,997,353	168,516	15,320	0.12%
3	Chicago-Naperville-Elgin, IL-IN-WI MSA	9,461,105	9,618,502	9,509,934	48,829	4,439	0.05%
4	Dallas-Fort Worth-Arlington, TX MSA	6,366,542	7,637,387	7,759,615	1,393,073	126,643	1.82%
5	Houston-The Woodlands-Sugar Land, TX MSA	5,920,416	7,122,240	7,206,841	1,286,425	116,948	1.80%
6	Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	5,649,540	6,385,162	6,356,434	706,894	64,263	1.08%
7	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	5,965,343	6,245,051	6,228,601	263,258	23,933	0.39%
8	Atlanta-Sandy Springs-Roswell, GA MSA	5,286,728	6,089,815	6,144,050	857,322	77,938	1.38%
9	Miami-Fort Lauderdale-West Palm Beach, FL MSA	5,564,635	6,138,333	6,091,747	527,112	47,919	0.83%
10	Phoenix-Mesa-Chandler, AZ MSA	4,192,887	4,845,832	4,946,145	753,258	68,478	1.51%

Source: U.S. Census Bureau, Decennial Censuses and 2021 Population Estimates.

Since 2010, Texas has led the way with the population growth of its two largest metropolitan statistical areas. On an average annualized basis, the Dallas-Fort Worth and Houston-The Woodlands-Sugar Land, TX MSAs grew by an average of 127,000 and 117,000 residents each year between 2010 and 2021. When ordered by total population growth between the 2010 decennial Census and the Census Bureau’s 2021 population estimates, the DFW MSA had the largest overall population growth of 1.39 million persons, while the Houston MSA added 1.29 million. Third in 2010 to 2021 growth, the Atlanta-Sandy Springs-Alpharetta, GA MSA gained 857,000 new residents. Rounding out the top five in total growth, the Phoenix-Mesa-Chandler MSA and the Washington-Arlington-Alexandria, DC-VA-MD-WV MSA each added over 700,00 new residents from 2010 to 2021.

**Table 4: Fastest Growing Metropolitan Statistical Areas in the United States, 2010-2021**

RANK	MSA	Total Population			Total Change	Average Annual Change	CAGR
		2010	2020	2021	2010 to 2021	2010 to 2021	2010 to 2021
1	Dallas-Fort Worth-Arlington, TX MSA	6,366,542	7,637,387	7,759,615	1,393,073	126,643	1.82%
2	Houston-The Woodlands-Sugar Land, TX MSA	5,920,416	7,122,240	7,206,841	1,286,425	116,948	1.80%
3	Atlanta-Sandy Springs-Alpharetta, GA MSA	5,286,728	6,089,815	6,144,050	857,322	77,938	1.38%
4	Phoenix-Mesa-Chandler, AZ MSA	4,192,887	4,845,832	4,946,145	753,258	68,478	1.51%
5	Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	5,649,540	6,385,162	6,356,434	706,894	64,263	1.08%
6	Seattle-Tacoma-Bellevue, WA MSA	3,439,809	4,018,762	4,011,553	571,744	51,977	1.41%
7	Miami-Fort Lauderdale-West Palm Beach, FL MSA	5,564,635	6,138,333	6,091,747	527,112	47,919	0.83%
8	Tampa-St. Petersburg-Clearwater, FL MSA	2,783,243	3,175,275	3,219,514	436,271	39,661	1.33%
9	Denver-Aurora-Lakewood, CO MSA	2,543,482	2,963,821	2,972,566	429,084	39,008	1.43%
10	Riverside-San Bernardino-Ontario, CA MSA	4,224,851	4,599,839	4,653,105	428,254	38,932	0.88%

Source: U.S. Census Bureau, Decennial Censuses and 2021 Population Estimates.

**Population Projections**

Table 5 shows three population projection scenarios from the Texas Demographic Center (TDC), Woods and Poole, and the Texas Water Development Board (TWDB) for the Dallas-Fort Worth MSA. These entities project MSA population to be between almost 11.1 million and almost 13.2 million residents by 2050. The most conservative scenario is the latest data from Woods and Poole, a firm that specializes in long-term county demographic projections. The Texas Water Development Board’s population projections are created to assist in determining water demand for counties and other user groups throughout Texas. TWDB’s 2050 total of almost 11.5 million is very similar to Woods and Poole’s. The Texas Demographic Center’s 13.2 million total is easily the most optimistic scenario. These projections implement the latest migration rates during that 5-year span. The historical growth rate of the population for the Dallas-Fort Worth MSA implies that the region’s population will likely grow at a rate between the TWDB’s and the 2010-15 migration scenarios.

**Table 5: Population Projections for the Dallas-Fort Worth MSA, 2010-2050**

Year	TDC	Woods and Poole	TWDB
<b>Total Population</b>			
2010	6,366,542	6,392,065	6,366,542
2015	7,007,291	7,042,566	6,866,675
2020	7,688,739	7,662,556	7,551,677
2025	8,437,621	8,203,615	8,170,139
2030	9,263,558	8,761,187	8,788,601
2035	10,152,233	9,329,689	9,447,007
2040	11,094,305	9,901,037	10,105,412
2045	12,096,161	10,490,033	10,801,118
2050	13,186,434	11,119,007	11,496,824
<b>Average Annual Growth</b>			
2010-2015	128,150	130,100	100,027
2015-2020	136,290	123,998	137,000
2020-2025	149,776	108,212	123,692
2025-2030	165,187	111,514	123,692
2030-2035	177,735	113,700	131,681
2035-2040	188,414	114,270	131,681
2040-2045	200,371	117,799	139,141
2045-2050	218,055	125,795	139,141
<b>Compounded Annual Growth Rate</b>			
2010-2015	1.94%	1.96%	1.52%
2015-2020	1.87%	1.70%	1.92%
2020-2025	1.88%	1.37%	1.59%
2025-2030	1.89%	1.32%	1.47%
2030-2035	1.85%	1.27%	1.46%
2035-2040	1.79%	1.20%	1.36%
2040-2045	1.74%	1.16%	1.34%
2045-2050	1.74%	1.17%	1.26%

Source: Texas Demographic Center 2018, Woods and Poole 2021, Texas Water Development Board 2022

Table 6 illustrates population projections for the seven most populous counties in the Dallas-Fort Worth MSA. This local data supports the conclusions that most of the State’s growth from 2020 to 2050 is projected to take place in the large urban core counties along with the surrounding suburban ring counties. The urban core of Dallas and Tarrant Counties will see significant continued population growth while the suburban counties of Collin and Denton are projected to grow at the fastest rates during this period.

**Table 6: Population Projections for Select Counties in the Dallas-Fort Worth MSA, 2020-2050**

Texas Demographic Center 2010-2015 Migration Scenario							
	Collin County	Dallas County	Denton County	Ellis County	Johnson County	Rockwall County	Tarrant County
2020	1,039,369	2,734,111	897,953	177,721	171,701	102,243	2,143,755
2025	1,199,276	2,920,069	1,048,765	193,386	182,787	116,952	2,322,418
2030	1,391,461	3,106,298	1,234,110	209,581	194,098	134,114	2,507,170
2035	1,615,166	3,291,862	1,454,915	225,187	204,870	152,805	2,689,000
2040	1,866,586	3,481,006	1,708,302	239,960	215,366	171,936	2,862,672
2045	2,144,545	3,674,038	1,996,378	254,173	226,440	191,380	3,030,318
2050	2,456,914	3,869,605	2,332,629	268,580	238,332	211,966	3,196,603
Woods and Poole Scenario							
	Collin County	Dallas County	Denton County	Ellis County	Johnson County	Rockwall County	Tarrant County
2020	1,058,199	2,648,914	905,654	187,299	177,569	107,721	2,123,422
2025	1,194,911	2,742,495	1,013,247	202,054	188,350	122,916	2,252,106
2030	1,344,117	2,828,504	1,129,279	217,136	199,020	140,254	2,379,438
2035	1,505,445	2,890,384	1,253,182	232,339	209,390	160,038	2,503,149
2040	1,677,838	2,968,172	1,383,834	247,383	219,216	182,613	2,620,330
2045	1,864,215	3,023,741	1,523,403	262,590	228,796	208,372	2,734,551
2050	2,069,467	3,077,633	1,675,568	278,486	238,584	237,765	2,851,234
Texas Water Development Board Scenario							
	Collin County	Dallas County	Denton County	Ellis County	Johnson County	Rockwall County	Tarrant County
2020	1,050,506	2,566,134	901,645	183,814	173,835	104,887	2,006,473
2025	1,144,905	2,718,898	1,008,382	212,796	187,204	132,601	2,142,793
2030	1,239,303	2,871,662	1,115,119	241,778	200,573	160,315	2,279,113
2035	1,368,612	3,026,096	1,222,335	261,262	214,367	186,967	2,429,719
2040	1,497,921	3,180,529	1,329,551	280,745	228,160	213,619	2,580,325
2045	1,652,600	3,305,156	1,456,783	320,665	243,287	230,279	2,689,726
2050	1,807,279	3,429,783	1,584,015	360,584	258,414	246,938	2,799,127

Source: Texas Demographic Center 2018, Woods and Poole 2021, Texas Water Development Board 2022  
 Note: Table 6 only provides population projections for 7 of the 12 counties in the Dallas-Fort Worth-Arlington MSA.

## NTTA System Demographic Review City-Level Population Trends

Many cities within the NTTA System Demographic Review's AOI have seen tremendous growth over the past forty-nine years, but the "second ring" suburbs have seen the fastest growth since 2000. Overall, the City of Fort Worth saw the most absolute growth by adding more than 550,000 residents from 1980 to 2021. Dallas' population boom saw it grow by 384,000 persons, though 74 percent of this growth was from 1980 to 2000. In Rockwall County, the city of Fate has been the fastest-growing city since 2000, averaging a CAGR of 19.5 percent. Collin County contains many suburbs that have averaged double-digit CAGR's since 2000, including Anna, Celina, Melissa, and Prosper. Also in Collin County, both Frisco and McKinney now have more than 200,000 persons each, adding over 177 and 148 thousand since 2000 respectively.

**Table 7: Historical City Population 1970 - 2021**

City	1970	1980	1990	2000	2010	2021	Compound Annual Growth Rate 1970-2000	Compound Annual Growth Rate 2000-2021
Addison	593	5,553	8,783	14,166	13,056	17,012	11.16%	0.88%
Allen	1,940	8,314	18,309	43,554	84,246	106,874	10.93%	4.37%
Anna	736	855	904	1,225	8,249	20,243	1.71%	14.29%
Arlington	90,643	160,113	261,721	332,969	365,438	392,786	4.43%	0.79%
Balch Springs	10,464	13,746	17,406	19,375	23,728	27,160	2.07%	1.62%
Bedford	10,049	20,821	43,762	47,152	46,979	49,187	5.29%	0.20%
Benbrook	8,169	13,579	19,564	20,208	21,234	24,605	3.07%	0.94%
Burleson	7,713	11,734	16,113	20,976	36,690	51,618	3.39%	4.38%
Carrollton	13,855	40,595	82,169	109,576	119,097	133,251	7.14%	0.94%
Celina	1,272	1,520	1,737	1,861	6,028	23,811	1.28%	12.91%
Cleburne	16,015	19,218	22,205	26,005	29,337	31,999	1.63%	0.99%
Cockrell Hill	3,515	3,262	3,746	4,443	4,193	3,820	0.78%	-0.72%
Colleyville	3,342	6,700	12,724	19,636	22,807	25,986	6.08%	1.34%
Coppell	1,728	3,826	16,881	35,958	38,659	42,221	10.65%	0.77%
Corinth	461	1,264	3,944	11,325	19,935	22,690	11.26%	3.36%
Crowley	2,662	5,852	6,974	7,467	12,838	19,333	3.50%	4.63%
Dallas	844,401	904,078	1,006,877	1,188,580	1,197,816	1,288,457	1.15%	0.38%
Duncanville	14,105	27,781	35,748	36,081	38,524	39,797	3.18%	0.47%
Euless	19,316	24,002	38,149	46,005	51,277	60,500	2.93%	1.31%
Fairview	463	893	1,554	2,644	7,248	10,683	5.98%	6.88%
Farmers Branch	27,492	24,863	24,250	27,508	28,616	36,442	0.00%	1.35%

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City	1970	1980	1990	2000	2010	2021	Compound Annual Growth Rate 1970-2000	Compound Annual Growth Rate 2000-2021
Fate	329	263	475	497	6,357	21,013	1.38%	19.52%
Flower Mound	1,685	4,402	15,527	50,702	64,669	77,243	12.02%	2.02%
Forney	1,745	2,483	4,070	5,588	14,661	27,256	3.96%	7.84%
Fort Worth	393,476	385,164	447,619	534,697	741,206	935,508	1.03%	2.70%
Frisco	1,845	3,420	6,138	33,714	116,989	210,719	10.17%	9.12%
Garland	81,437	138,857	180,650	215,768	226,876	242,035	3.30%	0.55%
Grand Prairie	50,904	71,462	99,616	127,427	175,396	197,347	3.11%	2.10%
Grapevine	7,049	11,801	29,202	42,059	46,334	50,872	6.13%	0.91%
Haltom City	28,127	29,014	32,856	39,018	42,409	45,746	1.10%	0.76%
Hickory Creek	218	1,422	1,893	2,078	3,247	5,244	7.81%	4.51%
Highland Park	10,133	8,909	8,739	8,842	8,564	8,747	-0.45%	-0.05%
Highland Village	516	3,246	7,027	12,173	15,056	15,952	11.11%	1.30%
Hurst	27,215	31,420	33,574	36,273	37,337	40,055	0.96%	0.47%
Irving	97,260	109,943	155,037	191,615	216,290	254,198	2.29%	1.35%
Joshua	924	1,470	3,821	5,031	6,088	8,098	5.81%	2.29%
Lake Dallas	1,431	3,177	3,656	6,166	7,105	7,722	4.99%	1.08%
Lewisville	9,264	24,273	46,521	77,737	95,290	112,944	7.35%	1.79%
Little Elm	363	926	1,255	3,646	25,898	51,042	7.99%	13.39%
Lucas	540	1,371	2,205	2,890	5,166	8,029	5.75%	4.99%
Mansfield	3,658	8,102	15,607	28,031	56,368	74,368	7.02%	4.76%
McKinney	15,193	16,249	21,283	54,369	131,117	202,690	4.34%	6.47%
Melissa	504	604	557	1,350	4,695	16,983	3.34%	12.81%
Mesquite	55,131	67,053	101,484	124,523	139,824	147,691	2.75%	0.82%
Murphy	261	1,150	1,547	3,099	17,708	21,219	8.60%	9.59%
North Richland Hills	16,514	30,592	45,895	55,635	63,343	70,209	4.13%	1.11%
Plano	17,872	72,331	128,713	222,030	259,841	288,253	8.76%	1.25%
Princeton	1,105	3,408	2,321	3,477	6,807	20,046	3.90%	8.70%
Prosper	501	675	1,018	2,097	9,423	34,136	4.89%	14.21%
Richardson	48,405	72,496	74,840	91,802	99,223	116,382	2.16%	1.14%
Richland Hills	8,865	7,977	7,978	8,132	7,801	8,484	-0.29%	0.20%

## POPULATION TRENDS AND PROJECTIONS

City	1970	1980	1990	2000	2010	2021	Compound Annual Growth Rate 1970-2000	Compound Annual Growth Rate 2000-2021
River Oaks	8,193	6,890	6,580	6,985	7,427	7,524	-0.53%	0.35%
Rockwall	3,121	5,939	10,486	17,976	37,490	49,669	6.01%	4.96%
Rowlett	2,243	7,522	23,260	44,503	56,199	63,671	10.47%	1.72%
Royse City	1,535	1,566	2,206	2,957	9,349	15,978	2.21%	8.37%
Sachse	777	1,640	5,346	9,751	20,329	29,042	8.80%	5.33%
Seagoville	4,390	7,304	8,969	10,823	14,835	18,805	3.05%	2.67%
Southlake	2,031	2,808	7,065	21,519	26,575	31,105	8.19%	1.77%
Sunnyvale	995	1,404	2,228	2,693	5,130	8,062	3.37%	5.36%
Terrell	14,182	13,169	12,490	13,606	15,816	18,567	-0.14%	1.49%
The Colony	N/A	11,586	22,113	26,531	36,328	45,000	N/A	2.55%
University Park	23,498	22,254	22,259	23,324	23,068	24,849	-0.02%	0.30%
Wylie	2,675	3,152	8,716	15,132	41,427	59,394	5.95%	6.73%

Source: U.S. Census Bureau, Decennial Censuses and 2021 Population Estimates.

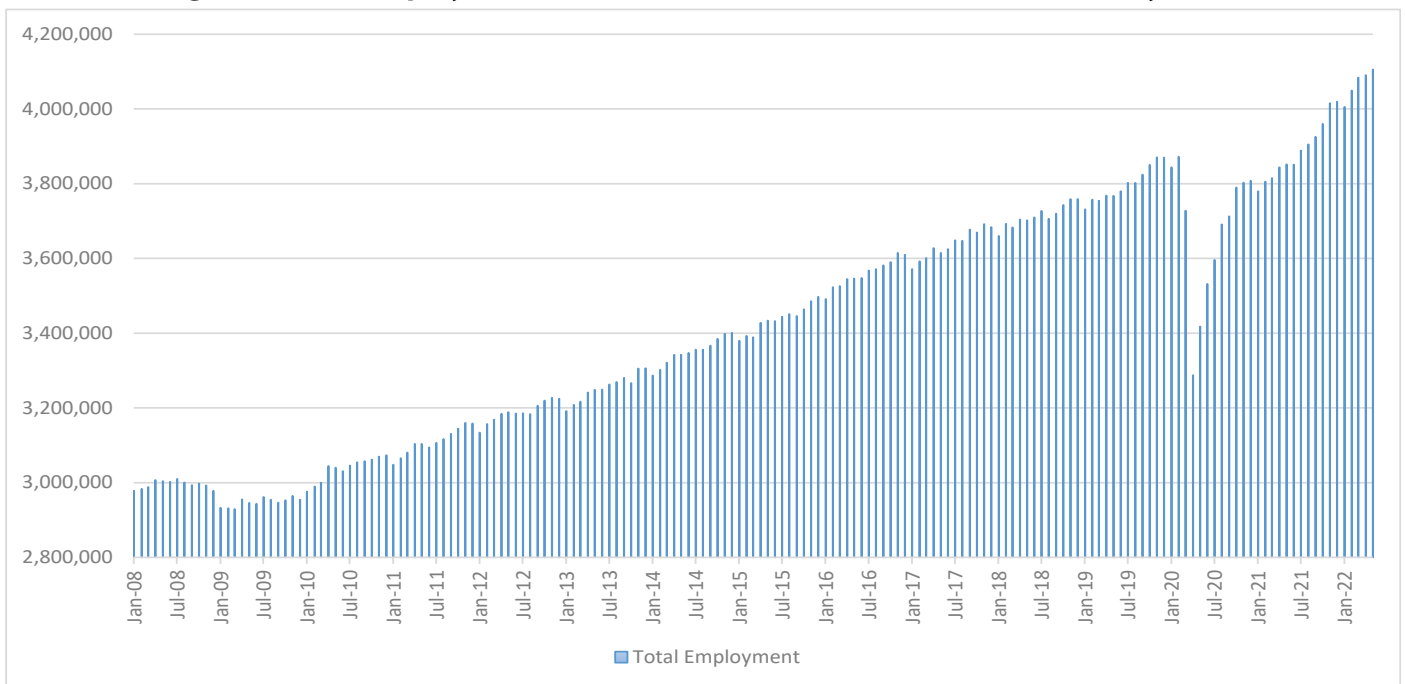


# EMPLOYMENT TRENDS AND PROJECTIONS

## Regional and County

In the past, a downturn in the oil industry meant a downturn in the Dallas-Fort Worth job market. Recently, the diversity of the region’s economy has helped it weather these downturns due to well-represented job strength in the service industries - specifically professional and business services, education and health services and leisure and hospitality. Prior to the region’s steady employment growth, the workforce in the Dallas-Fort Worth MSA fared comparatively well during the 2008-2009 national recession. While there were substantial job losses, over the past decade, those losses have been replaced with new jobs and the local economy had more workers at the end of 2012 than it did before the recession began. This accomplishment eluded the national economy. Figure 4 shows the total employment in the Dallas-Fort Worth MSA between January 2008 and May 2022 based upon the Texas Workforce Commission’s Local Area Unemployment Statistics (LAUS) data. The overall trend for the region has been positive, although not consistently so. The region had approximately 2.88 million jobs in January 2008, growing to a peak of 2.95 million jobs in June later that year. After that point, the region’s employment began to slowly decline with a sharp contraction occurring in December 2008. During that month, employment in the Dallas-Fort Worth MSA dropped by almost 100,000 jobs. While a decline in the number of workers between December and January is typical, since it is a period of seasonal employment, the lack of recovery during subsequent months demonstrates that these job cuts were indeed permanent. The region’s total employment fell to its lowest level during January 2010, when it reached 2.74 million jobs. Since then, barring seasonal fluctuations, total employment has steadily risen in the Dallas-Fort Worth MSA topping out in February 2020 at 3.87 million jobs. The COVID-19 Pandemic and the subsequent loss of 584,000 DFW jobs in March and April 2020 took fifteen months to regain, but the region’s economic resiliency has allowed it to bounce back strongly and see steady employment growth into the present.

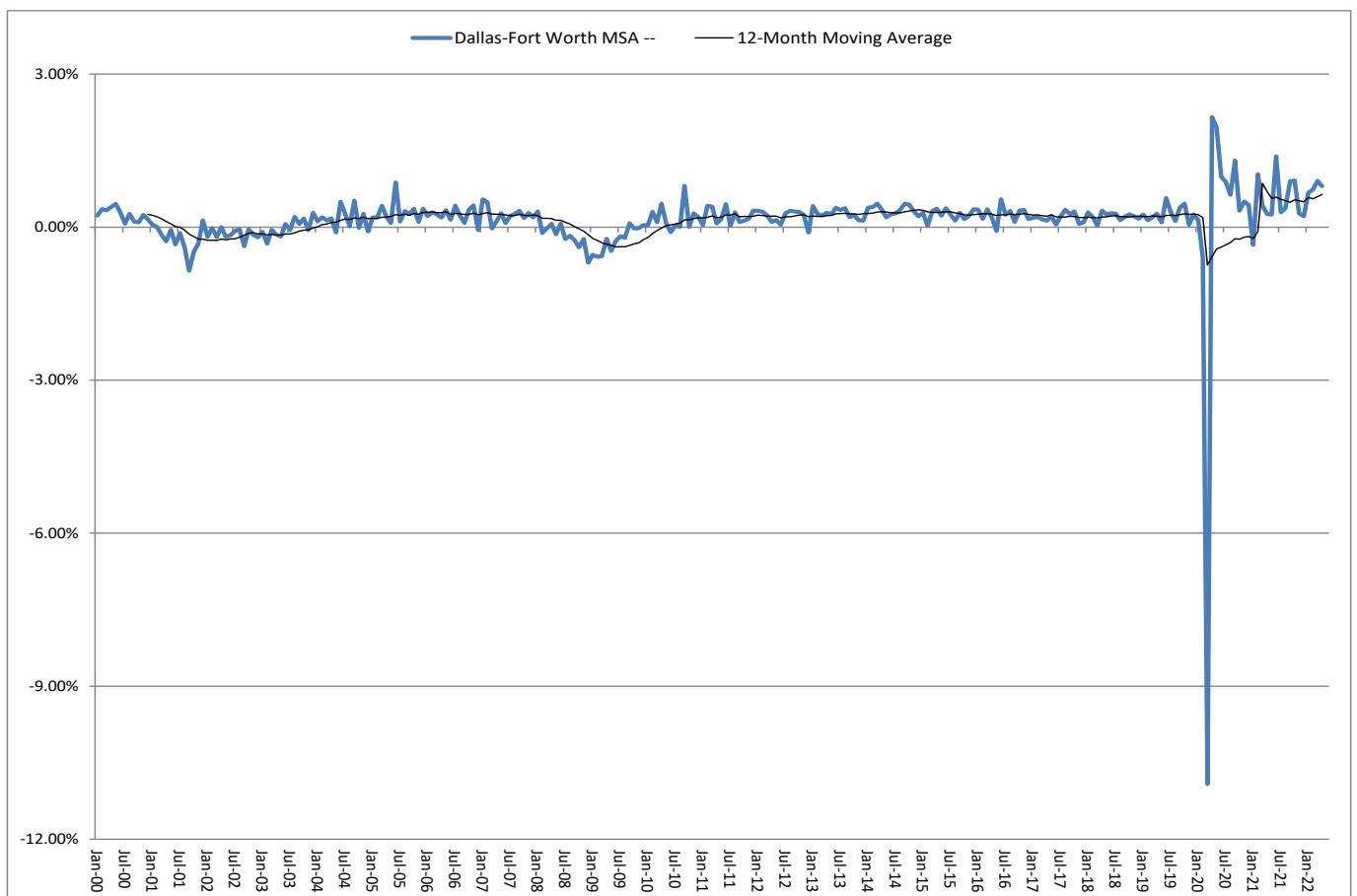
**Figure 4: Total Employment in the Dallas-Fort Worth MSA, Jan 2008 - May 2022**



Source: Texas Workforce Commission - Texas Labor Market Information website. Local Area Unemployment Statistics, July 2022.

Figure 5 shows a longer period of employment data using the Texas Workforce Commission’s Current Employment Estimates (CES) data. The CES data differ from the LAUS data, since they are based upon surveys of employers rather than the actual count of employees. Nonetheless, the discrepancies between the actual and estimated employment numbers tend to be relatively consistent, so the CES data can provide a reasonable resource for understanding employment trends when longer term LAUS data are not available. The data in Figure 5 show the percentage month-on-month employment change between January 2000 and May 2022. The unadjusted employment change shows considerable volatility, due to seasonal and academic employment. However, by adding a trend line showing the 12-month moving average, this volatility can be smoothed and the trends can be discerned. The 12-month moving average trend line shows that the Dallas-Fort Worth region suffered a prolonged period of job loss between 2001 and 2003, due to the downturn in the computer and telecommunications industries, in addition to the recessionary effects of the September 11, 2001 terrorist attacks. The region’s economy recovered by early 2004 and enjoyed a period of sustained employment growth until 2008, when the national recession took hold. Although the job loss of the 2008-2009 Great Recession occurred over a shorter period than the previous recession, the job losses were steeper. Since mid-2010, the Dallas-Fort Worth MSA had experienced another sustained period of employment growth longer than the consistent period seen in the mid-2000s until the shutdowns from the COVID-19 dropped employment by almost 11 percent in April 2020. Since then, the region has averaged a healthy .73 percent per month for the last 25 months.

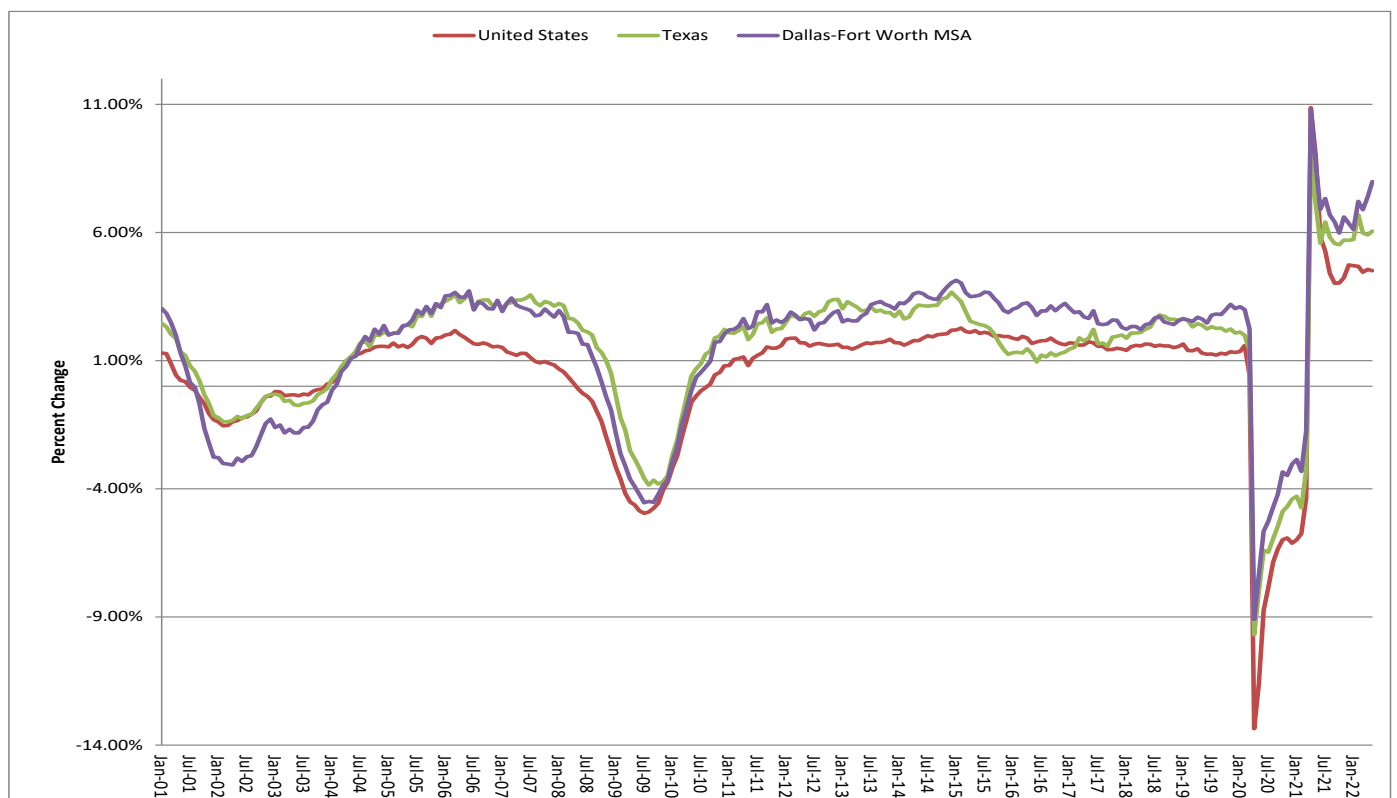
**Figure 5: Month-on-Month Employment Change for Dallas-Fort Worth MSA, Jan 2000 to May 2022**



Source: Texas Workforce Commission - Texas Labor Market Information website. Current Employment Statistics, July 2022.

Figure 6 shows the year-on-year employment change for the United States, Texas, and the Dallas-Fort Worth MSA. These data show that the recession which began in 2001 had a more significant effect on the Dallas-Fort Worth region, than it did on the United States or Texas. After recovering, the region's employment grew more quickly through the mid-2000s than it did in the nation overall, with a rate of growth that was very similar to Texas'. In fact, employment change in the Dallas-Fort Worth region has outperformed the overall rate for the United States through January 2020, even during periods when total employment was contracting. Although it did not decouple from the Texas economy, the region underperformed against the Texas economy, starting in early 2007, and continued to do so until early 2011. Over the last ten years,, the Dallas-Fort Worth MSA had outperformed the State since November 2012, but in August through November 2018, Texas' employment grew faster than the MSA. The sharp job losses from COVID-19 and the quick recovery explain the volatility in 2020 -21. During this time, the DFW MSA employment market never shrunk as much as the United States and Texas markets, and moreover, has outperformed them for the last 12 months.

**Figure 6: Year-on-Year Employment Change for the United States, Texas, and the Dallas-Fort Worth MSA, January 2001 to May 2022**



Source: Texas Workforce Commission - Texas Labor Market Information website. Current Employment Statistics, July 2022.

Table 8 shows more detailed employment data for the four largest MSAs in Texas during the period between 2012 through May of 2022. During this time, the Dallas-Fort Worth MSA had a net employment increase of over 916,000 jobs, which was the highest overall job growth of the four MSAs and more than twice than the Houston MSA, that added 438,000 new jobs. The Austin MSA had the highest CAGR at 3.16 percent, adding 379,000 new jobs. While the Dallas-Fort Worth region has had very robust population growth over the past decade, only until recently has it's employment growth outgrown other regions of the state.

**Table 8: Total Employment in Largest Texas MSAs, 2012-May 2022**

**TOTAL EMPLOYMENT**

Year	Austin MSA	Dallas-Fort Worth MSA	Houston MSA	San Antonio MSA
2012	929,711	3,188,765	2,900,976	1,050,691
2013	964,166	3,253,995	2,983,316	1,070,576
2014	1,001,470	3,350,325	3,072,718	1,087,371
2015	1,036,980	3,437,008	3,107,962	1,106,351
2016	1,082,392	3,559,384	3,125,997	1,143,008
2017	1,113,688	3,637,295	3,142,202	1,159,970
2018	1,153,410	3,713,687	3,202,853	1,176,738
2019	1,191,264	3,798,180	3,257,564	1,188,077
2020	1,159,288	3,673,336	3,091,352	1,183,338
2021	1,253,061	3,888,279	3,205,107	1,208,907
May-22	1,309,017	4,105,273	3,339,143	1,225,815

**TOTAL EMPLOYMENT CHANGE**

Year	Austin MSA	Dallas-Fort Worth MSA	Houston MSA	San Antonio MSA
2012-2013	34,455	65,230	82,340	19,885
2013-2014	37,304	96,330	89,402	16,795
2014-2015	35,510	86,683	35,244	18,980
2015-2016	45,412	122,376	18,035	36,657
2016-2017	31,296	77,911	16,205	16,962
2017-2018	39,722	76,392	60,651	16,768
2018-2019	37,854	84,493	54,711	11,339
2019-2020	-31,976	-124,844	-166,212	-4,739
2020-2021	93,773	214,943	113,755	25,569
2021-2022	55,956	216,994	134,036	16,908
Total 2012-May22	379,306	916,508	438,167	175,124

**COMPOUNDED ANNUAL GROWTH RATE**

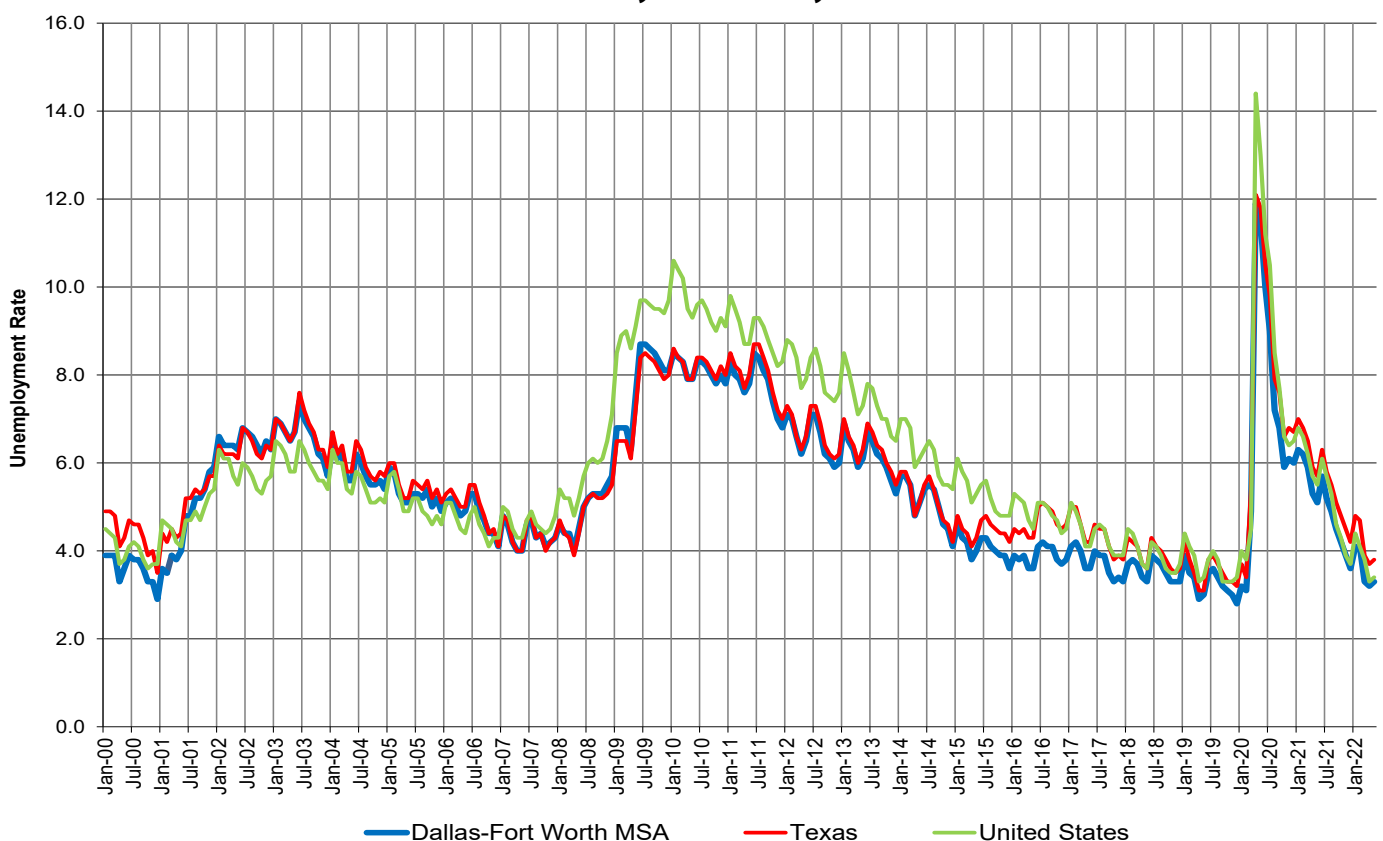
Year	Austin MSA	Dallas-Fort Worth MSA	Houston MSA	San Antonio MSA
2012-2013	3.71%	2.05%	2.84%	1.89%
2013-2014	3.87%	2.96%	3.00%	1.57%
2014-2015	3.55%	2.59%	1.15%	1.75%
2015-2016	4.38%	3.56%	0.58%	3.31%
2016-2017	2.89%	2.19%	0.52%	1.48%
2017-2018	3.57%	2.10%	1.93%	1.45%
2018-2019	3.28%	2.28%	1.71%	0.96%
2019-2020	-2.68%	-3.29%	-5.10%	-0.40%
2020-2021	8.09%	5.85%	3.68%	2.16%
2021-2022	4.47%	5.58%	4.18%	1.40%
2012-May 2022	3.16%	2.32%	1.29%	1.41%

Source: Texas Workforce Commission - Texas Labor Market Information website. Local Area Unemployment Statistics, July 2022.

## Unemployment

Figure 7 shows the unemployment rates for the United States, Texas, and the Dallas-Fort Worth MSA. These data show the unemployment rate in the region has closely tracked the overall unemployment rate in Texas during most of the period between January 2000 and May 2022. The Dallas-Fort Worth MSA experienced its lowest unemployment rate during April 2019, when it fell to 2.9 percent. During the recession that began in 2001, the regional unemployment rate peaked at 7.5 percent in June 2003. As the regional and national economy recovered and employment expanded during the mid-2000s, the regional unemployment rate fell to approximately 4.0 percent before increasing rapidly during 2008 and 2009. During the 2008-2009 Recession, the regional unemployment rate reached 8.5 percent in June 2009 and sustained that general level for the next two years. From 2011 to 2018, the regional unemployment rate followed a downward trend until January 2015, and until COVID-19-related job losses began in March 2020, it had averaged 3.67 percent. While the national unemployment rate peaked at 14.4 percent in April 2020, Texas and the DFW MSA only reached 12 percent. All three unemployment rate trends have continued downward since April 2020 and the most recent data from May 2022 report a sub-3.8 percent unemployment rate for all.

**Figure 7: Unemployment Rate of Dallas-Fort Worth MSA, Texas and the United States, January 2000 to May 2022**



Note: The unemployment rate data in Figure 7 are based upon seasonally unadjusted unemployment rates. The unadjusted figures were used to maintain consistency between the three geographies of the United States, Texas, and the Dallas Fort-Worth MSA. While seasonally adjusted data are available from the Texas Workforce Commission for the United States and Texas, they are not available for Texas's MSAs.

Source: Texas Workforce Commission - Texas Labor Market Information website. Local Area Unemployment Statistics, July 2022.

## REAL ESTATE TRENDS

Relocations of over 176 major corporate headquarters since 2010<sup>3</sup> has spurred strong growth in both residential and commercial construction throughout the Dallas-Fort Worth region. Domestic and international investment in DFW remains strong and will likely assure supply increases in almost all facets of the real estate markets for some time to come. Like almost every metropolitan area in the United States, the 2008-2009 Recession had a profound impact on the regional housing market, as well as commercial real estate. The near collapse of the nation's financial system and the severe curtailment of demand due to the subsequent recession led to a sharp reduction in the number of new single-family homes built after 2006. Multifamily construction was also severely impacted by the recession, although it later benefited because fewer households were able to secure the financing to purchase new homes. Similarly, all aspects of commercial real estate were affected by the recession, either due to tight credit markets or financially stressed tenants. Fortunately, the nation's commercial real estate market did not experience the same collapse as the residential market (a real and significant threat at the time) and in spite of the COVID-19 Pandemic, it has steadily become one of the strongest in the U.S. over the past decade.

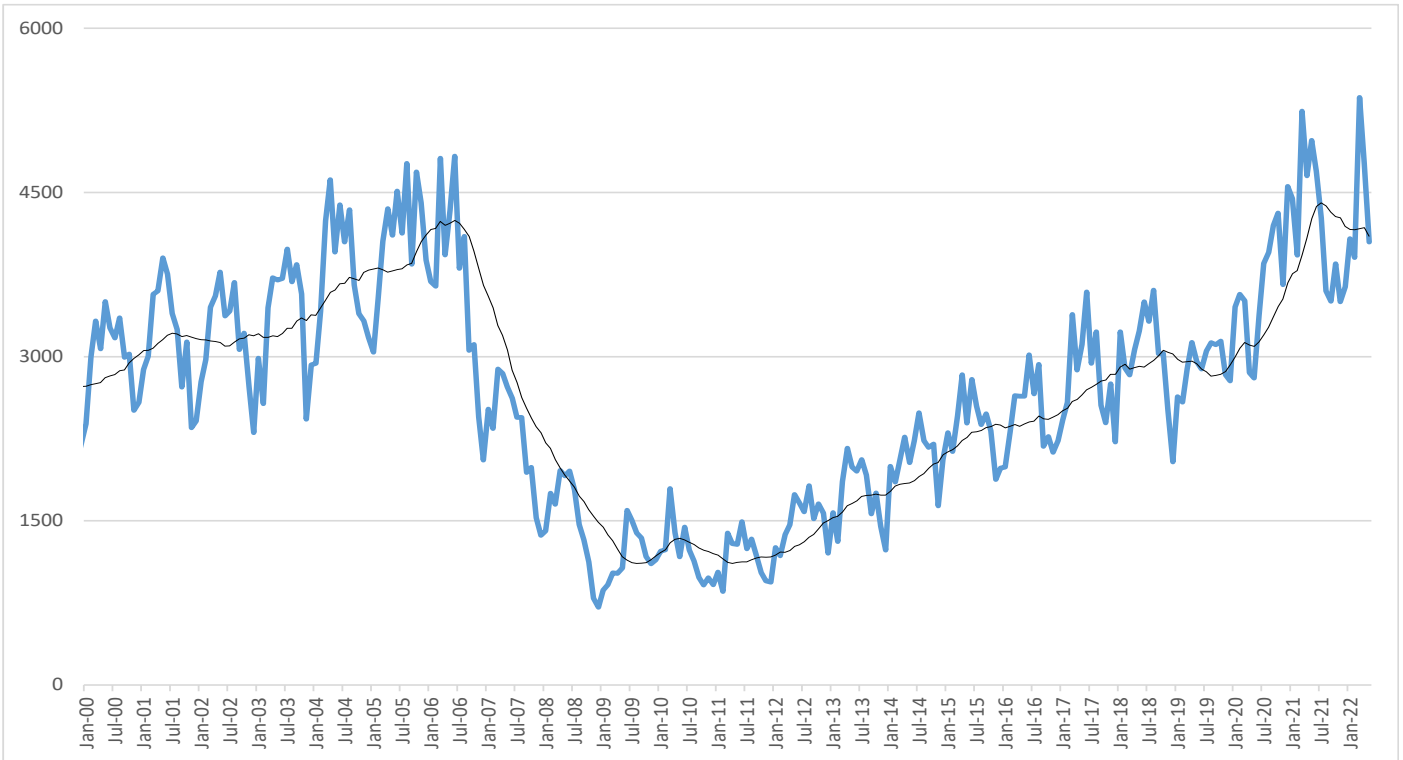
### *Residential Trends*

Figure 8 shows the U.S. Census Bureau's single-family building permit data from Real Estate Center at Texas A&M University, which reports the number of monthly single-family building permits issued in the Dallas-Fort Worth-Arlington MSA. In this 22-year time frame, historical single family building permit activity in the Metroplex showed relatively steady growth until the housing bubble burst in Fall of 2006. After bottoming out in January 2009, the region has seen - barring a few hiccups - steady, sustained single-family growth. From January 2020 to the most current May 2022 figures, the region has, on average, issued 132 single family building permits per day. In December 2018, only 2,039 permits were issued, the lowest monthly total since December 2015. The region quickly rebounded and has remained over 2,500 permits every month since. Even with recent interest rate hikes, job growth, pent-up demand and low supply will likely result in the region's single family construction rates to continue to remain substantial in the foreseeable future, but attention to new data will be essential to determine if the market may be leveling off.

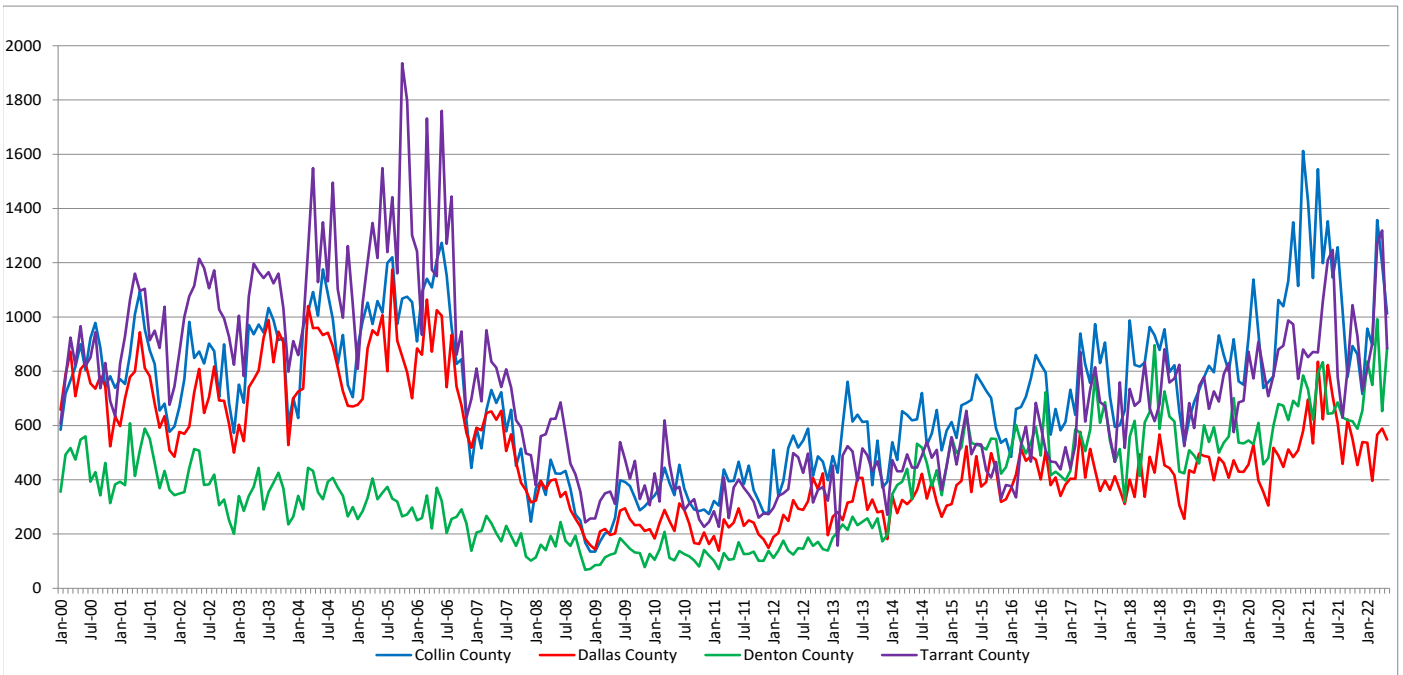
Figure 9 illustrates the number of single-family building permits issued in Collin, Dallas, Denton and Tarrant Counties since 2000. The data show that building permit activity was especially robust in Tarrant County through 2006, reaching almost 2,000 permits during October 2005, then dropped sharply thereafter to less than 500 single-family permits per month through April 2013. Denton County, on the other hand, was a less active market throughout this period and the number of single-family building permits issued actually began declining during 2002. Overall, monthly building permit activity during 2012 and early 2013 was lower than that in early 2000. Since January 2013, all counties have experienced a significant upswing in residential construction. Since January 2020, the four core counties have averaged 3,200 permits issued per month. Even during COVID-19 shutdowns, total permits never fell below 2,250 monthly. A decrease in total permits issued from March to May 2022 indicate that the single family market may be cooling slightly in DFW.

3. Hethcock, Bill "There's a lull of corporate relocations to Texas this year, but pipeline as big as it's ever been." *Dallas Business Journal*, Mar 26, 2022

**Figure 8: New Private Building Permits: 1-Unit Structures for Dallas-Fort Worth-Arlington, TX MSA  
January 2000-May 2022**



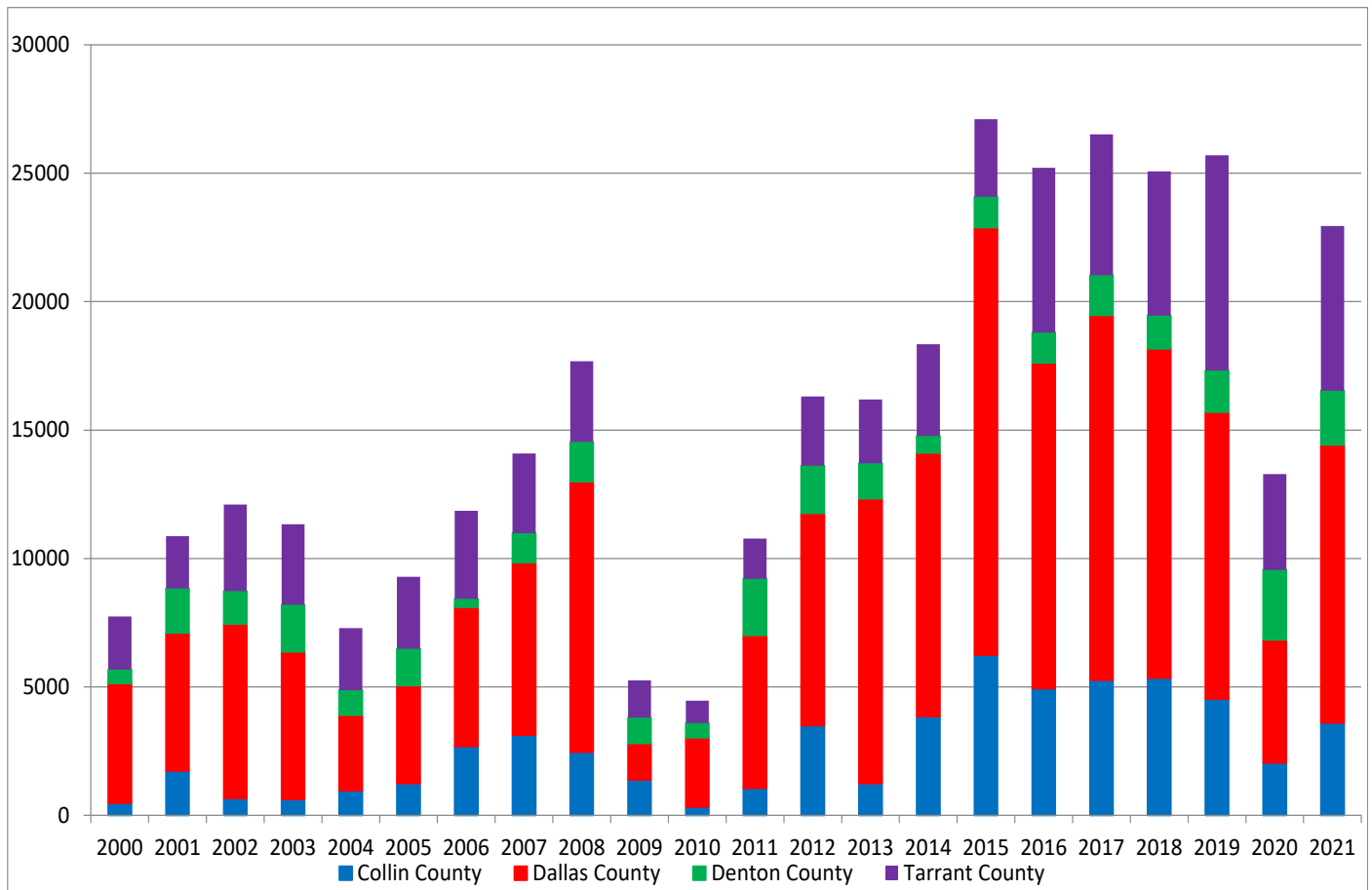
**Figure 9: Single-Family Building Permits Issued in Dallas, Tarrant, Collin and Denton Counties  
January 2000 to May 2022**



Sources: Texas A&M Real Estate Research Center, Building Permits, July 2022.

As shown in Figure 10, the number of permitted multifamily units in Dallas, Tarrant, Collin, and Denton Counties has varied substantially between 2000 and 2021. The number of permitted units was higher during the region's downturn from 2001 to 2003. As the single-family housing market began to grow, apartment construction slowed during 2004, before increasing again in 2005 and continuing through 2008. However, during 2009, the number of units permitted fell by roughly two-thirds to 5,250 units and the 2010 total was even lower. However, as the region's population has continued to grow strongly and single-family homes became difficult for some segments of the population to purchase, the number of permitted multifamily units has increased dramatically. 2012 through 2014 saw 16,000 or more permits issued for the four counties, while in 2015 a historic 27,000 permits were confirmed, over 16,000 of these in Dallas County alone. In the five-year span from 2015 to 2019, the four core counties added 130,000 new units, an average of almost 26,000 per year. In COVID-19- affected 2020, multifamily permits were down more than 50 percent in Collin, Denton and Tarrant Counties, however 2021 saw a quick return to pre-2020 levels.

**Figure 10: Multifamily Units Permitted in Dallas, Tarrant, Collin, and Denton Counties  
2000 - 2021**



Source: Texas A&M Real Estate Research Center, Building Permits, July 2022.



Table 9 shows the conditions of multifamily housing market within the various submarkets in the Dallas-Fort Worth region for the first quarter of 2022. According to the real estate research firm Berkadia, the region had an all-time high occupancy rate of 97.4 percent during 1Q2022, up from 97.1 in 4Q21. Year-over-year, rents have increased by double-digit percentages in every submarket except three, for an overall regional increase of 17.9 percent or from \$1,211 to \$1,428 per unit. Currently, the highest multifamily occupancy rates are in rural Kaufman and Ellis Counties and the affordable Northwest Dallas submarkets. The highest effective monthly rents are in the Oak Lawn/Park Cities and the Intown Dallas submarkets at \$2,186 and \$1,956 respectively. With over 38,500 units currently under construction, the near future will determine if demand can keep up with supply and if rents will moderate over the next three quarters of the year.

**Table 9: Overview of the Dallas-Fort Worth Apartment Market during the First Quarter 2022**

Submarket	Occupancy	Effective Rent (\$ per unit)			YOY Percent Change	Delivered Units	UC Units
	1Q22	1Q21	1Q22	YOY Change		1Q22	
Addison/Bent Tree	97.4%	\$1,234	\$1,482	\$248	20.1%	99	0
Allen/McKinney	97.3%	\$1,294	\$1,601	\$307	23.7%	734	4,102
Burleson/Johnson County	97.6%	\$1,162	\$1,290	\$128	11.0%	81	904
Carrollton/Farmers Branch	98.0%	\$1,242	\$1,497	\$255	20.5%	0	1,009
Central Arlington	97.4%	\$1,040	\$1,193	\$153	14.7%	0	376
Central/East Plano	97.5%	\$1,254	\$1,551	\$297	23.7%	0	1,650
Denton	98.2%	\$1,127	\$1,290	\$163	14.5%	307	989
East Dallas	97.4%	\$1,351	\$1,649	\$298	22.1%	0	682
East Fort Worth	96.9%	\$946	\$1,040	\$94	9.9%	0	0
Ellis County	98.3%	\$1,137	\$1,277	\$140	12.3%	80	492
Far East Dallas	97.1%	\$956	\$1,089	\$133	13.9%	87	0
Far North Dallas	98.0%	\$1,048	\$1,310	\$262	25.0%	0	0
Frisco	97.8%	\$1,398	\$1,694	\$296	21.2%	708	6,219
Garland	97.0%	\$1,093	\$1,282	\$189	17.3%	46	406
Grand Prairie	96.9%	\$1,193	\$1,371	\$178	14.9%	321	1,964
Grapevine/Southlake	97.2%	\$1,363	\$1,632	\$269	19.7%	0	599
Haltom City/Meacham	97.2%	\$1,056	\$1,229	\$173	16.4%	129	657
Hunt County	96.3%	\$872	\$976	\$104	11.9%	0	152
Hurst/Euless/Bedford	97.6%	\$1,110	\$1,326	\$216	19.5%	0	343
Intown Dallas	96.7%	\$1,691	\$1,956	\$265	15.7%	375	1,284
Intown Fort Worth/University	96.3%	\$1,339	\$1,547	\$208	15.5%	69	877
Kaufman County	99.0%	\$1,192	\$1,309	\$117	9.8%	90	60
Las Colinas/Coppell	97.7%	\$1,365	\$1,669	\$304	22.3%	242	592
Lewisville/Flower Mound	97.2%	\$1,212	\$1,493	\$281	23.2%	0	781
Love Field/Medical District	97.6%	\$1,244	\$1,470	\$226	18.2%	52	326
Mesquite	97.5%	\$1,012	\$1,147	\$135	13.3%	0	0
North Arlington	96.4%	\$1,054	\$1,217	\$163	15.5%	96	487
North Dallas	97.9%	\$1,149	\$1,333	\$184	16.0%	0	499
North Fort Worth/Keller	98.3%	\$1,322	\$1,578	\$256	19.4%	24	2,252
North Irving	97.6%	\$1,110	\$1,317	\$207	18.6%	0	0
North Oak Cliff/West Dallas	97.1%	\$1,253	\$1,427	\$174	13.9%	24	1,658
Northeast Dallas	96.8%	\$984	\$1,142	\$158	16.1%	0	622
Northeast Fort Worth/NRH	97.4%	\$1,195	\$1,428	\$233	19.5%	72	677
Northwest Dallas	98.7%	\$970	\$1,072	\$102	10.5%	0	0
Oak Lawn/Park Cities	96.9%	\$1,883	\$2,186	\$303	16.1%	129	627

**Overview of the Dallas-Fort Worth Apartment Market during the First Quarter 2022 (cont'd)**

Submarket	Occupancy	Effective Rent (\$ per unit)			YOY Percent Change	Delivered Units	UC Units
	1Q22	1Q21	1Q22	YOY Change		1Q22	
Richardson	97.4%	\$1,360	\$1,622	\$262	19.3%	0	711
Rockwall/Rowlett/Wylie	97.4%	\$1,328	\$1,539	\$211	15.9%	180	1,976
South Arlington/Mansfield	96.6%	\$1,230	\$1,394	\$164	13.3%	558	1,781
South Fort Worth	97.6%	\$962	\$1,104	\$142	14.8%	37	0
South Irving	98.2%	\$1,022	\$1,168	\$146	14.3%	0	325
Southeast Dallas	97.7%	\$896	\$990	\$94	10.5%	0	24
Southern Dallas County	97.8%	\$1,135	\$1,273	\$138	12.2%	0	0
Southwest Dallas	97.1%	\$978	\$1,062	\$84	8.6%	0	0
Southwest Fort Worth	96.6%	\$1,006	\$1,147	\$141	14.0%	109	0
The Colony/Far North Carrollton	97.0%	\$1,357	\$1,644	\$287	21.1%	0	300
West Fort Worth/Parker County	97.1%	\$1,074	\$1,250	\$176	16.4%	33	288
West Plano	97.4%	\$1,376	\$1,699	\$323	23.5%	0	0
Zang Triangle/Cedars/Fair Park	97.0%	\$1,149	\$1,367	\$218	19.0%	0	1,885
<b>Totals</b>	<b>97.4%</b>	<b>\$1,211</b>	<b>\$1,428</b>	<b>\$217</b>	<b>17.9%</b>	<b>4,682</b>	<b>38,576</b>

Source: Berkadia DFW Multifamily Report, 1Q2022

**Office Trends**

Due to the influx of corporate headquarters to the region, the formation of new businesses and the growth of pre-existing ones, the office market in Dallas-Fort Worth continued to recover from the COVID-19 downturn with over 6 million square feet (MSF) under construction during 1Q22. According to the real estate firm Transwestern, the Dallas area Class A office market had an overall vacancy rate of 18.9 percent during 1Q22, which is still 4 percent higher than pre-pandemic levels. The Fort Worth area Class A office market had an eight year low vacancy rate of 10.5 percent. Overall, the Dallas area market contained 246 MSF of rentable space while the Fort Worth area market had 43 MSF. Geographically, the largest concentrations of office space in the DFW region are in the the Upper Tollway/West Plano, Dallas Central Business District and the Lower Tollway submarkets, which together account for almost 91 MSF. The highest vacancy rates during 1Q22 were found in the Grand Prairie (84.9 percent) and the Lewisville submarkets(30 percent). The Dallas CBD, with a vacancy rate of 26.4 percent, is slowly improving, but is challenged by the popularity of uptown office properties.

**Table 10: Overview of the Dallas Area Office Market during the First Quarter 2022**

Submarket	Inventory	Total Vacancy SF	Class A Vacancy Rate	Class B Vacancy Rate	Under Construction	Class A Gross Rents	Class B Gross Rents
Uptown/Turtle Creek	16,100,843	2,557,564	15.3%	19.5%	834,076	\$58.04	\$37.57
Dallas CBD	31,413,825	7,729,182	26.4%	18.1%	0	\$31.03	\$23.05
Stemmons Freeway	11,492,444	2,219,564	15.1%	23.5%	0	\$23.11	\$20.21
Preston Center	6,124,088	606,514	9.5%	11.5%	318,632	\$53.33	\$32.27
Central Expressway	15,713,698	2,770,698	18.6%	15.3%	0	\$35.99	\$28.34
Deep Ellum/East Dallas	1,675,509	256,116	5.8%	20.7%	472,496	\$55.55	\$24.76
West LBJ Freeway	4,096,637	822,194	18.8%	21.1%	0	\$21.05	\$18.14
East LBJ Freeway	6,958,857	2,066,376	21.9%	32.1%	0	\$18.93	\$21.10

**Overview of the Dallas Area Office Market during the First Quarter 2022 (cont'd)**

Submarket	Inventory	Total Vacancy SF	Class A Vacancy Rate	Class B Vacancy Rate	Under Construction	Class A Gross Rents	Class B Gross Rents
Lower Tollway	27,687,231	5,132,573	17.1%	20.8%	0	\$35.25	\$23.01
Upper Tollway/ West Plano	31,831,521	6,811,830	22.3%	17.7%	794,109	\$42.81	\$29.45
Upper Tollway/Frisco	5,865,964	671,764	12.7%	6.8%	846,006	\$49.34	\$33.18
Richardson	20,269,798	3,274,433	14.5%	18.0%	0	\$28.02	\$21.35
Plano	5,732,655	564,133	9.2%	10.2%	180,000	\$27.03	\$21.79
Allen/McKinney	5,740,149	521,849	9.5%	8.9%	542,430	\$36.15	\$26.19
Las Colinas/Urban Center	9,438,352	1,829,052	19.6%	18.3%	512,269	\$34.76	\$21.91
Las Colinas/Office Center	16,181,112	2,123,893	12.4%	14.3%	0	\$30.86	\$21.93
DFW Freeport	15,015,473	2,662,206	12.2%	22.1%	1,128,877	\$33.21	\$24.21
South Irving	1,106,730	171,084	0.0%	15.5%	21,750	\$0.00	\$18.45
Lewisville	4,383,992	781,584	29.2%	16.4%	24,000	\$29.88	\$25.75
Denton	1,204,040	106,936	0.0%	8.9%	0	\$0.00	\$25.16
Garland	679,772	169,529	0.0%	24.9%	0	\$0.00	\$15.69
Rockwall	362,314	10,364	2.7%	3.1%	0	\$35.55	\$24.26
Mesquite/Terrell/Forney	428,505	19,964	5.2%	4.6%	0	\$0.00	\$16.50
Southeast Dallas	515,931	23,440	0.0%	4.5%	0	\$0.00	\$19.94
Oak Cliff	2,058,788	415,941	6.1%	22.8%	0	\$0.00	\$20.81
Grand Prairie	3,821,950	1,489,408	84.9%	8.1%	0	\$27.59	\$20.70
TOTAL - DALLAS	245,900,178	45,808,191	18.9%	18.2%	5,674,645	\$37.22	\$23.36

Source: Transwestern DFW Office Market Report, 1Q 2022

**Table 11: Overview of the Fort Worth Area Office Market during the First Quarter 2022**

Submarket	Inventory	Total Vacancy SF	Class A Vacancy Rate	Class B Vacancy Rate	Under Construction	Class A Gross Rents	Class B Gross Rents
Fort Worth CBD	8,867,060	1,304,308	13.2%	16.8%	0	\$32.82	\$24.47
Southwest Fort Worth	4,518,105	559,466	13.7%	11.6%	30,000	\$29.59	\$23.54
West Fort Worth	1,916,058	210,733	13.9%	9.4%	0	\$31.54	\$24.00
Northwest Fort Worth	282,611	80,863	27.4%	30.2%	0	\$16.84	\$24.54
Alliance	2,933,165	147,613	4.4%	5.4%	189,000	\$32.33	\$24.67
Westlake/Grapevine	8,495,930	854,646	10.4%	9.4%	90,192	\$31.91	\$27.09
HEB/Mid-Cities	5,623,241	377,967	2.2%	9.3%	0	\$20.56	\$18.59
Northeast Fort Worth	3,397,858	252,675	0.0%	8.5%	0	\$0.00	\$20.26
Arlington/Mansfield	6,169,730	852,435	14.8%	13.2%	61,500	\$23.45	\$19.65
Southeast Fort Worth	1,006,398	106,868	0.0%	23.0%	0	\$0.00	\$16.95
TOTAL - FORT WORTH	43,210,156	4,747,574	10.5%	11.4%	370,692	\$30.18	\$22.42

Source: Transwestern DFW Office Market Report, 1Q 2022

## Industrial/Warehousing Trends

As one of the primary distribution centers in the United States and after a record-breaking year in industrial construction, the Dallas-Fort Worth region has an enormous amount of industrial/warehouse inventory totaling 855 million square feet as of the first quarter of 2022. Industrial warehouse distribution accounts for 88 percent of the total industrial market and with 58.5 MSF currently under construction, accounts for 99 percent of DFW’s total construction. In 1Q2022, 5.4 MSF of net absorption during the quarter pushed the industrial/warehousing vacancy rate up slightly to 5.6 percent. Strong demand helped generate 38.9. MSF in net absorption over the past year and more than 15 MSF is expected to deliver during the second and third quarters of 2022 .

Table 13 illustrates that over 58.5 MSF of industrial properties are under construction in Dallas-Fort Worth at the end of 1Q22. Three submarkets - South Dallas, North Fort Worth and East Dallas - account for two-thirds of the total construction in the region.

**Table 12: Overview of the Dallas-Fort Worth Industrial Market during the First Quarter 2022**

Submarket	Inventory	Vacant - SF	Total Vacancy Rate 1Q2022	Available SF (includes construction)	Available %	Under Construction	12-Month Total Net Absorption
Flex/High-Tech	98,756,389	5,036,442	5.1%	6,166,998	6.2%	334,553	1,371,239
Industrial	756,024,531	42,231,903	5.6%	91,970,138	12.1%	58,185,832	37,571,050
Total DFW Metroplex	854,780,920	47,268,345	5.5%	98,137,136	11.5%	58,520,385	38,942,289

Source: Transwestern 1Q DFW Industrial Market Report, 2022

**Table 13: Industrial Submarkets Under Construction Dallas-Fort Worth Metro 1Q2022**

SUBMARKET	SQFT
South Dallas	21,235,266
North Fort Worth	11,258,432
East Dallas	6,285,709
Northwest Dallas	5,290,619
DFW Airport	4,280,754
South Fort Worth	4,225,533
Great Southwest	2,502,162
South Stemmons	1,864,611
Northeast Dallas	1,242,746
<b>Total DFW</b>	<b>58,185,832</b>

Source: Transwestern 1Q DFW Industrial Market Report, 2022

## Retail Trends

Even with many retail brick and mortar store closings due to the rise in e-commerce and exacerbated by COVID -19, occupancy rates remained near all-time high levels in the Dallas-Fort Worth retail market during 2022. According to CBRE’s 2Q22 Marketview report, the DFW retail market now contains almost 309 million square feet. Regionally, total absorption is trending up considerably this year with 2.9 MSF through the first two quarters. The top three submarkets, West Frisco, North Carrollton and East Dallas, delivered almost 369 thousand SF thus far during 2022. Occupancy rates for retail were slightly higher in the Dallas area (94.9 percent) than in Fort Worth (93.6 percent). Both of the Dallas and the Fort Worth market occupancy rates are up 1.1 percent from last year.

**Table 14: Overview of the Dallas-Fort Worth Retail Market 2018 - 2Q2022**

MARKET		2018	2019	2020	2021	2022 YTD
<b>Dallas Total</b>	Absorption	1,165,413	2,095,695	-1,191,039	2,626,123	1,966,432
	Delivered Construction	1,427,163	1,128,430	1,599,521	1,327,655	601,069
	Rentable Building Area	194,074,656	194,902,258	197,560,139	201,036,290	201,466,870
	Occupancy Rate	94.4%	94.6%	93.1%	93.8%	94.9%
<b>Fort Worth Total</b>	Absorption	302,895	1,509,629	-177,590	941,882	935,028
	Delivered Construction	932,137	670,471	782,502	613,852	112,062
	Rentable Building Area	104,173,420	104,593,444	104,774,824	106,782,008	107,282,259
	Occupancy Rate	94.4%	94.2%	92.4%	92.5%	93.6%
<b>DFW Market Total</b>	Absorption	1,468,308	3,605,324	-1,368,629	3,568,005	2,901,460
	Delivered Construction	2,359,300	1,798,901	2,382,023	1,941,507	713,131
	Rentable Building Area	298,248,076	299,495,702	302,334,963	307,818,298	308,749,129
	Occupancy Rate	94.4%	94.5%	92.8%	94.6%	94.5%

Source: CBRE Marketview DFW Retail , 2Q2022

## RDS FORECAST REVIEW AND RESULTS

RDS was retained to review the latest socioeconomic forecasts for the NCTCOG System Demographic Review AOI for accuracy and reasonableness. For the purpose of this study, CDM Smith provided RDS with households, population, and employment data from the demographic data that were used to develop the Mobility 2045 Update at the TAP zone level. The data was provided by NCTCOG in four intervals, 2023, 2026, 2036 and 2045. It was determined that for the purposes of this study, RDS would create a 2022 baseline data file using recent Census data and the 2023 NCTCOG data as guidance, which was then reviewed for accuracy at the zonal level.

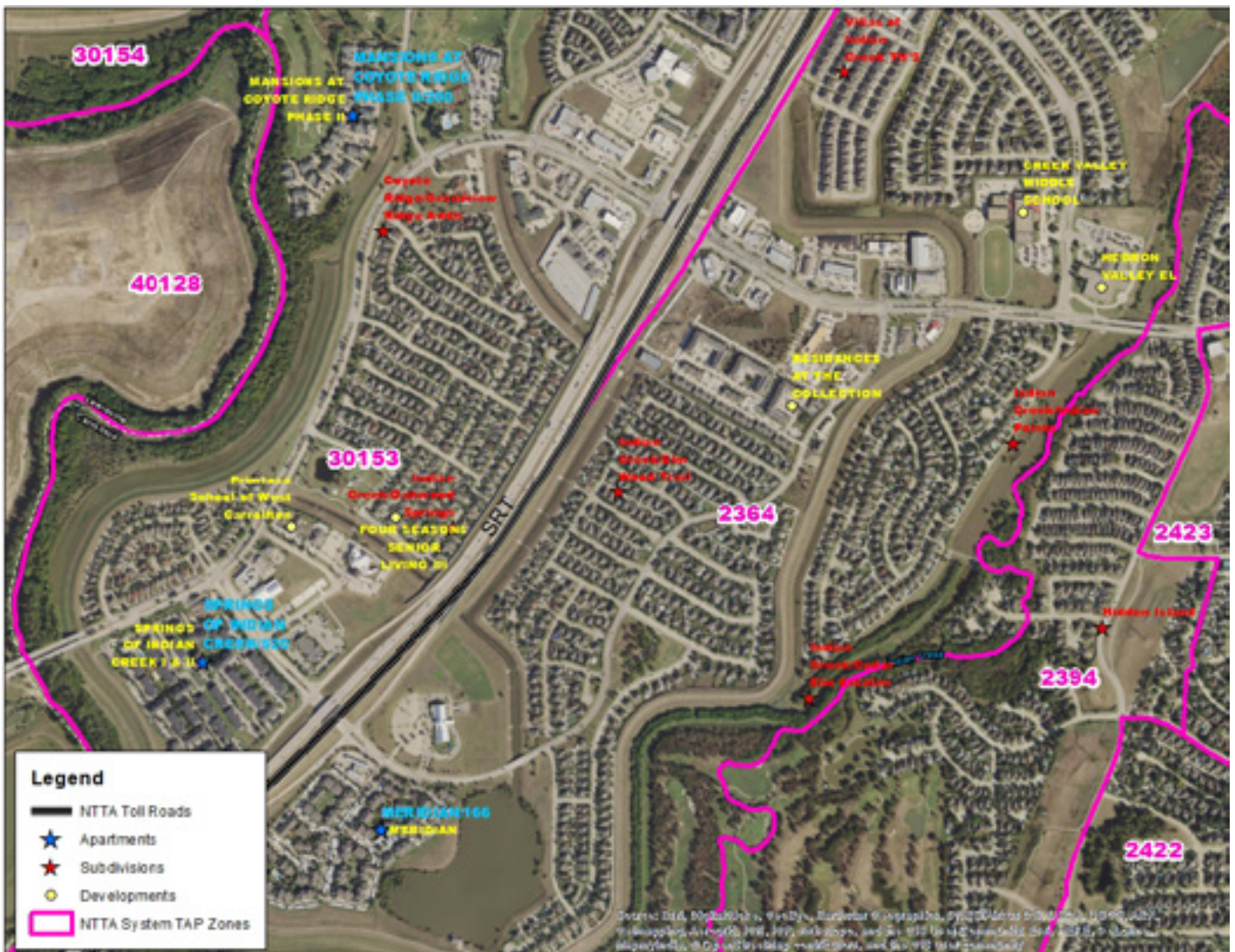
Passed in June 2022 by the Regional Transportation Council, the NCTCOG 2045 Demographic Forecast Update stands as the official demographic projection for the current mobility plan, the Mobility 2045 Update.

In 2020, NCTCOG began using a new regional travel demand model to create their most recent projections called the Transportation Analytical Forecasting Tool, or TAFT. According to NCTCOG's staff, the projection processes started with preparation of a temporally dense time series of "built" footprints based on LANDSAT and other remote sensing data. Staff then use a more categorically detailed "ground truth" land use set to further categorize the binary footprints from step one and count the pixels in each category and year in the time series. They then used linear regression to relate the time series of pixel quantities of various land uses to estimates of households, population, and employment. After that, NCTCOG establishes regional household and employment control totals for the forecast years. These control totals were based on projections purchased from Dr. Ray Perryman, who has developed models for forecasting economic and demographic factors. After small-area demographic allocations, densities are calculated and comparisons are made to the control totals. After numerous model runs, recalculations and allocations, TAP zone demographics were then sent to the respective cities for review and comment.

**GIS Review:** RDS relied heavily on geographic information system (GIS) technology during the comprehensive review process. RDS gathered multiple years of aerial photography, zoning and future land use maps, parcel boundaries and development databases for GIS analysis. Using GIS, RDS determined TAP zones where new development was likely to occur. RDS also acquired current housing data information from Zonda, one of the nation's leading new home research consultants. This data was also converted to a GIS dataset and mapped during the review process. Through the use of GIS, multiple datasets were displayed side-by-side. This allowed staff to review all model years of the NCTCOG Forecast simultaneously.

**Households/Population:** Original data from NCTCOG was provided to RDS by CDM Smith for the years 2023, 2026, 2036 and 2045. After accounting for growth discrepancies between 2023 and 2045 in the original data, specific attention was given to areas that were projected to see significant household growth. The housing data was plotted and future and vacant lot inventories were reviewed for inclusion. The development dataset also included residential projects and was mapped and reviewed along with Zonda data (See Figure 11 for a sample map). Specific attention was also given to areas with the greatest potential of redevelopment. For example, the City of Plano provided RDS a future land use shapefile that included their "Transit Village" designation. These villages are small geographic areas zoned for dense, multi-use development that is mass-transit and pedestrian friendly. Specific attention was given to areas like these, as well as future potential commuter rail stations or other land use or zoning areas that cities place focus on future development.

**Figure 11: Sample Development Monitoring Map**



**Employment:** RDS staff reviewed the data with specific attention to zones that showed significant growth during the forecast years. The development database was very important, as many of the points of interest included building square footages and future projects. RDS also used consistent employees per square footage data (see Appendix B) for estimating job potential. The future year review also used data and information gathered from many of the cities within the AOI, as well as NCTCOG’s Development Monitoring database that contains information concerning commercial developments that were under construction, future, or conceptual. Employment clusters around current and future rail stations and highway frontage were also reviewed for potential growth or redevelopment.

**Initial NCTCOG Data Adjustments:** During preliminary analysis of NCTCOG’s 2045 demographic data, RDS discovered that 952 of the 5,303 TAP zones showed decreases in households from 2023 to 2045. Similarly, NCTCOG’s data showed decreases in employment in 1,624 zones during the same time period. RDS reached out to NCTCOG’s modeling team and was told that their 2023 data was derived using a different methodology than their future iteration totals. The team explained that 2023 zonal totals are based on observed data and will be naturally jagged in small

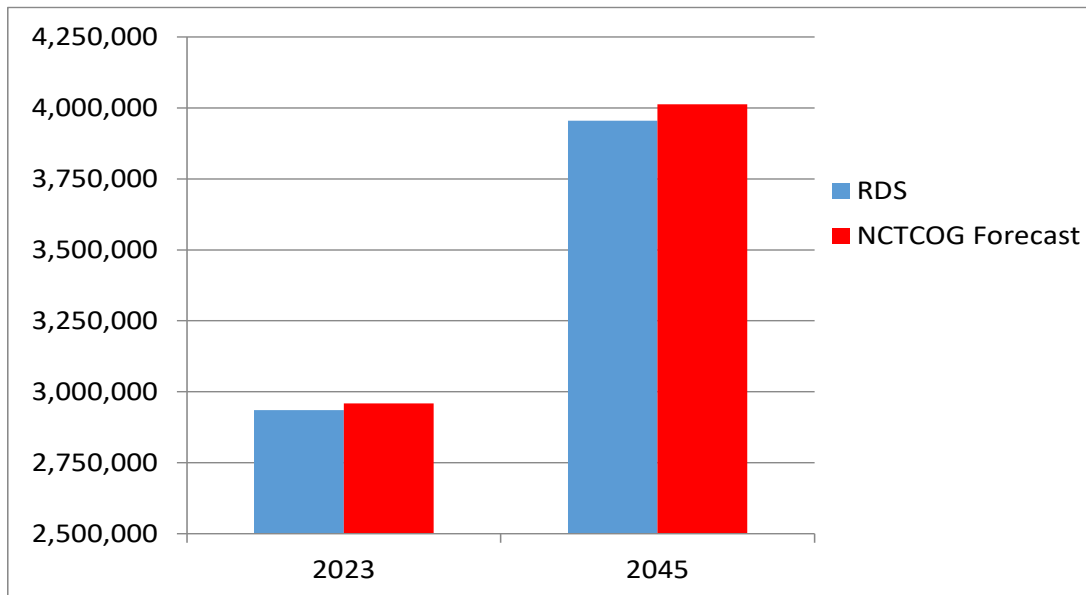
geographies while the later data assume a smooth transition from one iteration to another.

In order for RDS to derive baseline 2023 TAP zone household data that was, in most cases, less than NCTCOG’s 2023 totals, RDS used 2010 Census data and NCTCOG’s 2023 households to interpolate new 2022 household figures. Each TAP zone was then reviewed for accuracy.

Establishing 2023 zonal totals where NCTCOG’s employment figures decreased between 2023 and 2045 was more problematic because of the lack of an independent “official” count, especially at a small geography. Therefore, RDS used the most recent data from previous reviews and Longitudinal Employer-Household Dynamics (LEHD) TAP zone totals as a guide during review as well. As with households, all TAP zones in the AOI were reviewed by RDS staff for accuracy to establish 2022 employment totals needed for this project.

**RDS 2022-2045 Review:** Using GIS, Census data, new home reports, commercial development datasets and current year Appraisal District data for each individual TAP zone, 2022 and 2045 were reviewed for growth and reasonableness. RDS staff established totals for each. Household sizes were calculated using sizes established by the NCTCOG data to calculate population. In order for proper comparison for this report, RDS interpolated 2023 totals for the following charts. Figures 12, 13, and 14 illustrate this growth from 2023 to 2045 and compare them by absolute, percentage and the compound annual growth rate (CAGR) seen in RDS’ and NCTCOG’s forecasts.

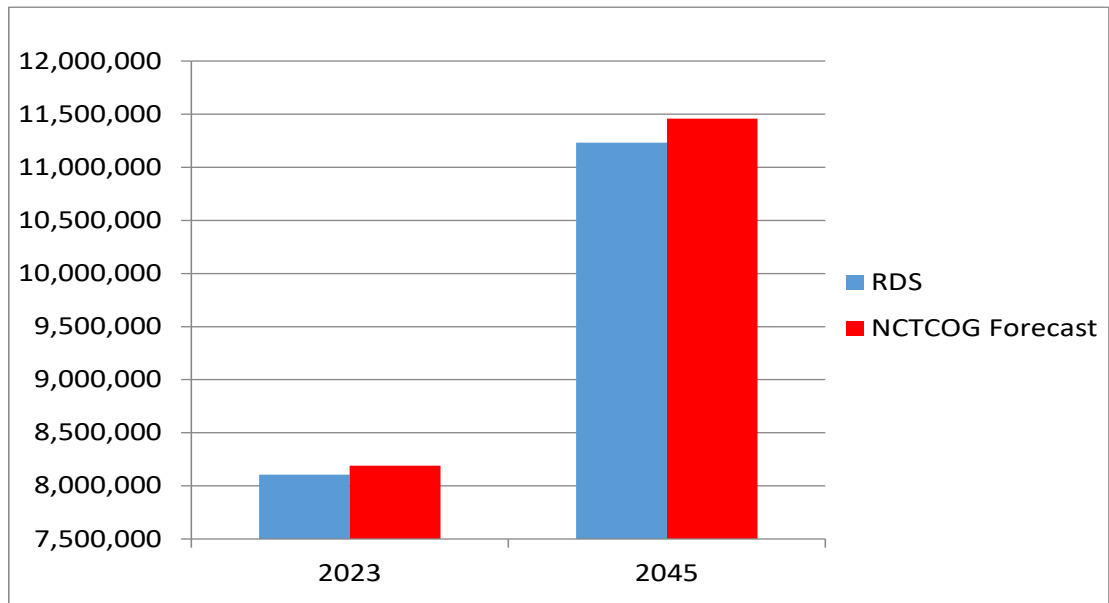
**Figure 12: RDS vs. NCTCOG Forecast Households**



	2023-2045 Absolute Change	2023-2045 Percentage Change	2023-2045 CAGR
RDS Forecast	1,019,569	34.7%	1.36%
NCTCOG Forecast	1,053,452	35.6%	1.39%

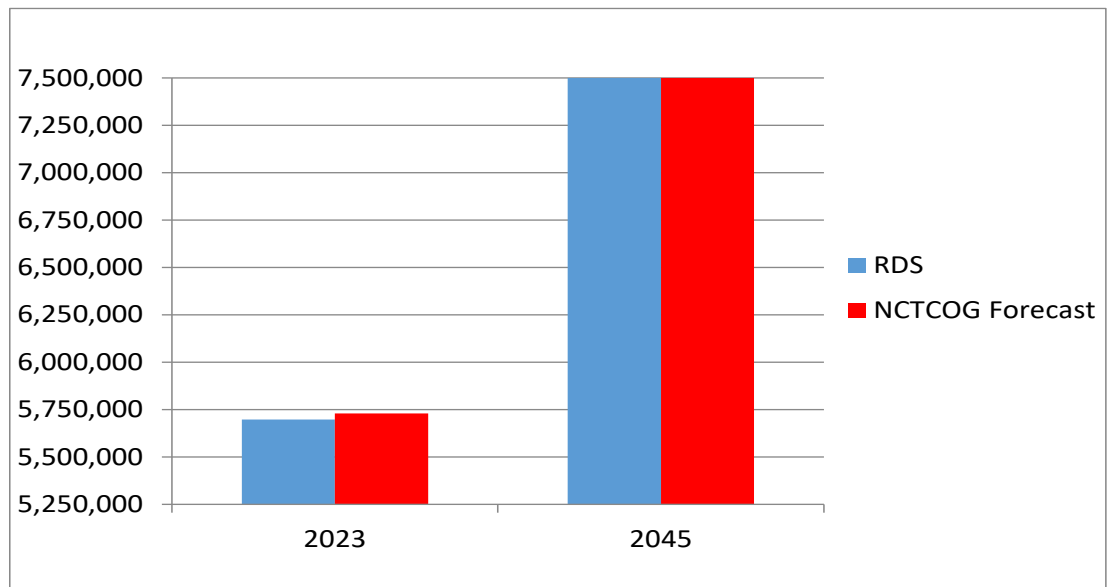


**Figure 13: RDS vs. NCTCOG Forecast Population**



	2023-2045 Absolute Change	2023-2045 Percentage Change	2023-2045 CAGR
RDS Forecast	3,126,066	38.6%	1.49%
NCTCOG Forecast	3,266,919	39.9%	1.54%

**Figure 14: RDS vs. NCTCOG Forecast Employment**



	2023-2045 Absolute Change	2023-2045 Percentage Change	2023-2045 CAGR
RDS Forecast	2,405,347	42.2%	1.61%
NCTCOG Forecast	2,401,872	41.9%	1.60%

Table 15 illustrates NCTCOG’s adopted and RDS’ post-review regional totals for households, population and employment for 2023 and 2045. In order for proper year-to-year comparison, RDS’ 2023 total was interpolated after 2022 review was completed for the purposes of this study.

**Table 15: RDS and NCTCOG AOI Statistics**

	2023			2045		
	HH	POP	EMP	HH	POP	EMP
RDS	2,935,427	8,105,683	5,697,812	3,954,996	11,231,749	8,103,159
NCTCOG	2,959,258	8,191,566	5,730,190	4,012,710	11,458,485	8,132,062

For review of each model year’s basic, service, and retail employment breakdowns, RDS used each iteration’s shares provided by NCTCOG. RDS staff then reviewed these totals and adjusted the data over time using quantitative theory and individual review. Overall, RDS’ recommended shares are very close to the shares proposed by NCTCOG, as shown in Table 16. Looking forward, the service sector is expected to gain in overall share of total employment, while the basic and retail sectors will likely see a small decline.

**Table 16: NCTCOG and RDS (2022 - 2045) NCTCOG and RDS (2022 - 2045)**

Percentage of Employment by Sector in AOI						
Year	RDS			NCTCOG		
	Basic	Retail	Service	Basic	Retail	Service
2022	24.0%	9.2%	66.8%	24.1%	8.9%	67.0%
2045	23.1%	8.7%	68.2%	22.6%	8.4%	69.0%

Figures 15 and 16 illustrate RDS' total household and employment growth by TAP zone in the 13-county region from 2023 to 2045.

**Figure 15: RDS Household Growth 2023-2045**

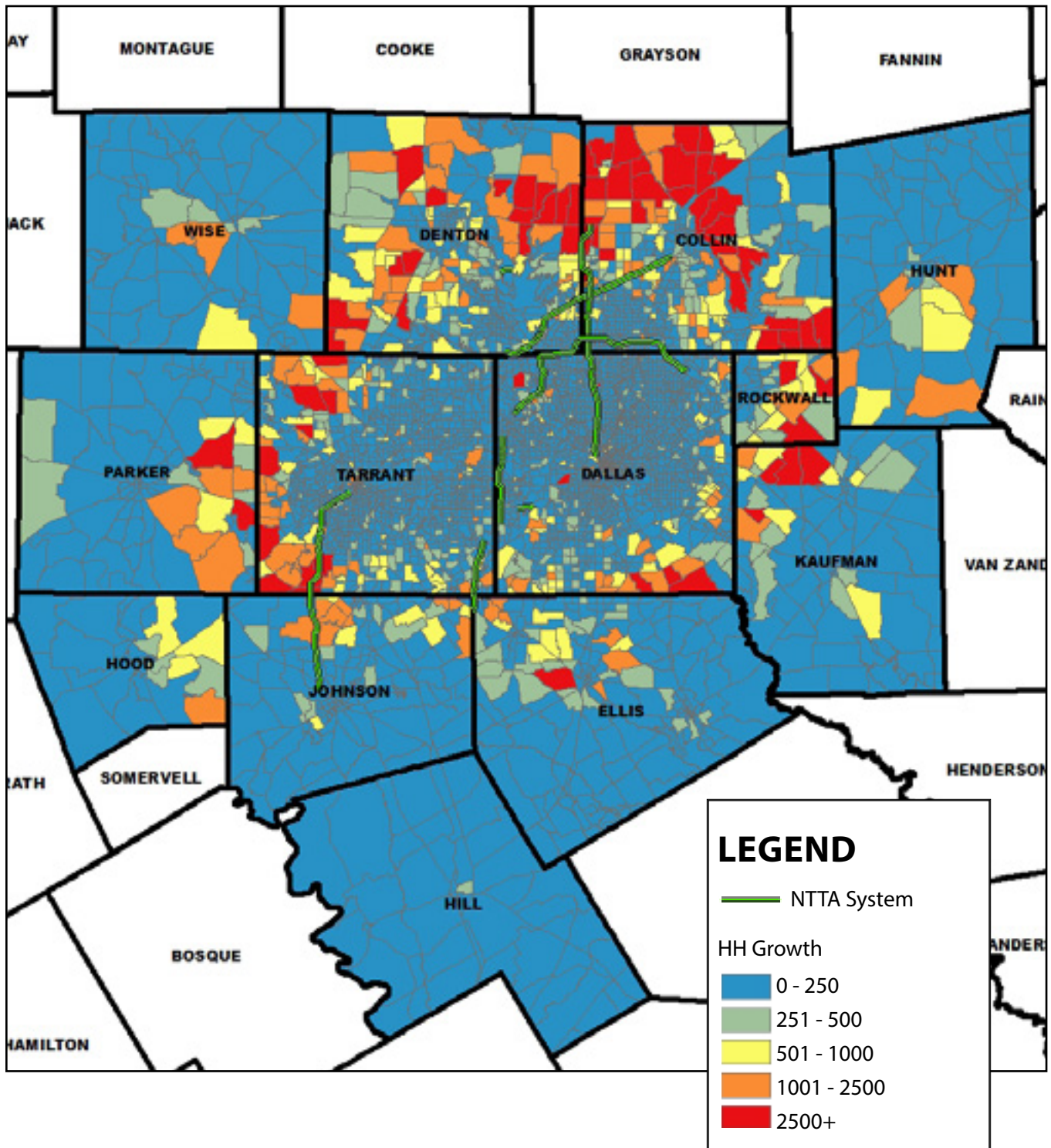
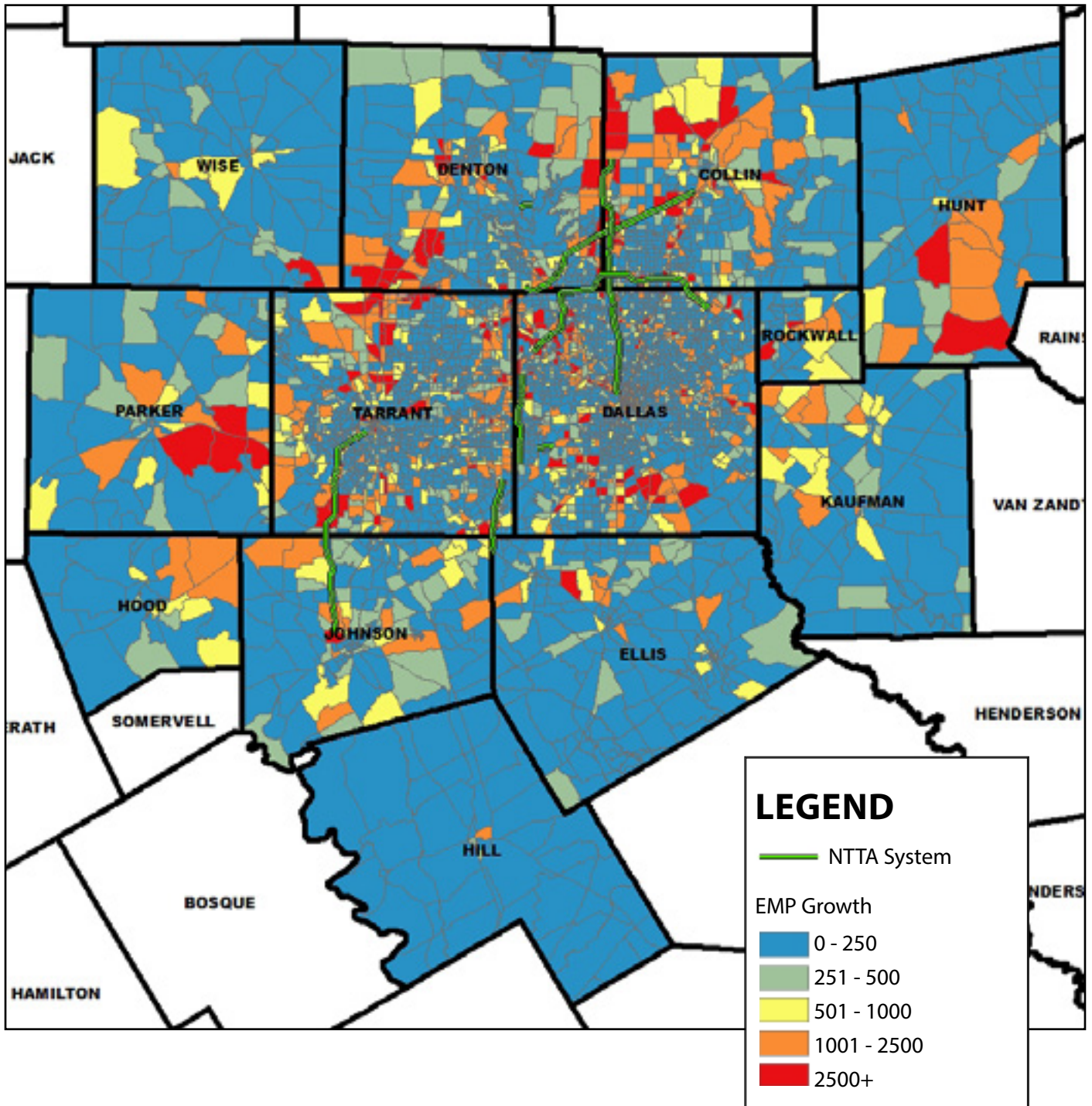


Figure 16: RDS Employment Growth 2023-2045

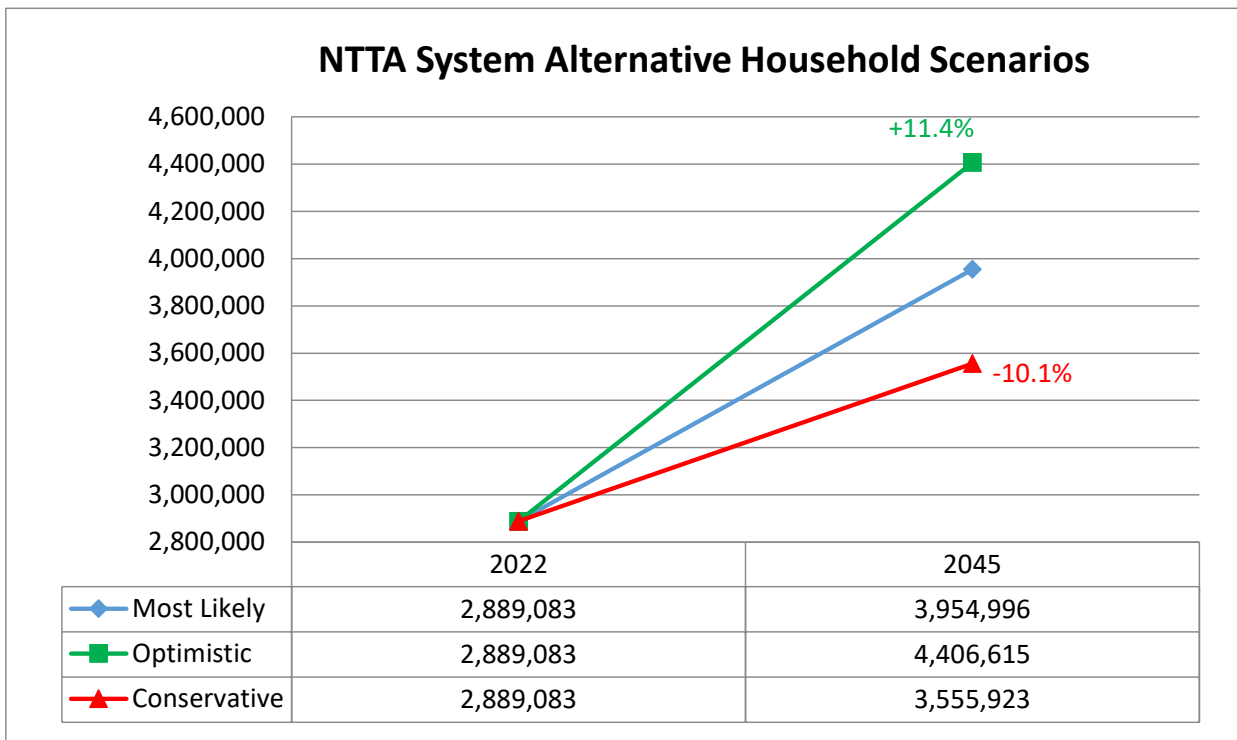


## REGIONAL ECONOMIC CYCLES - ALTERNATIVE SCENARIOS

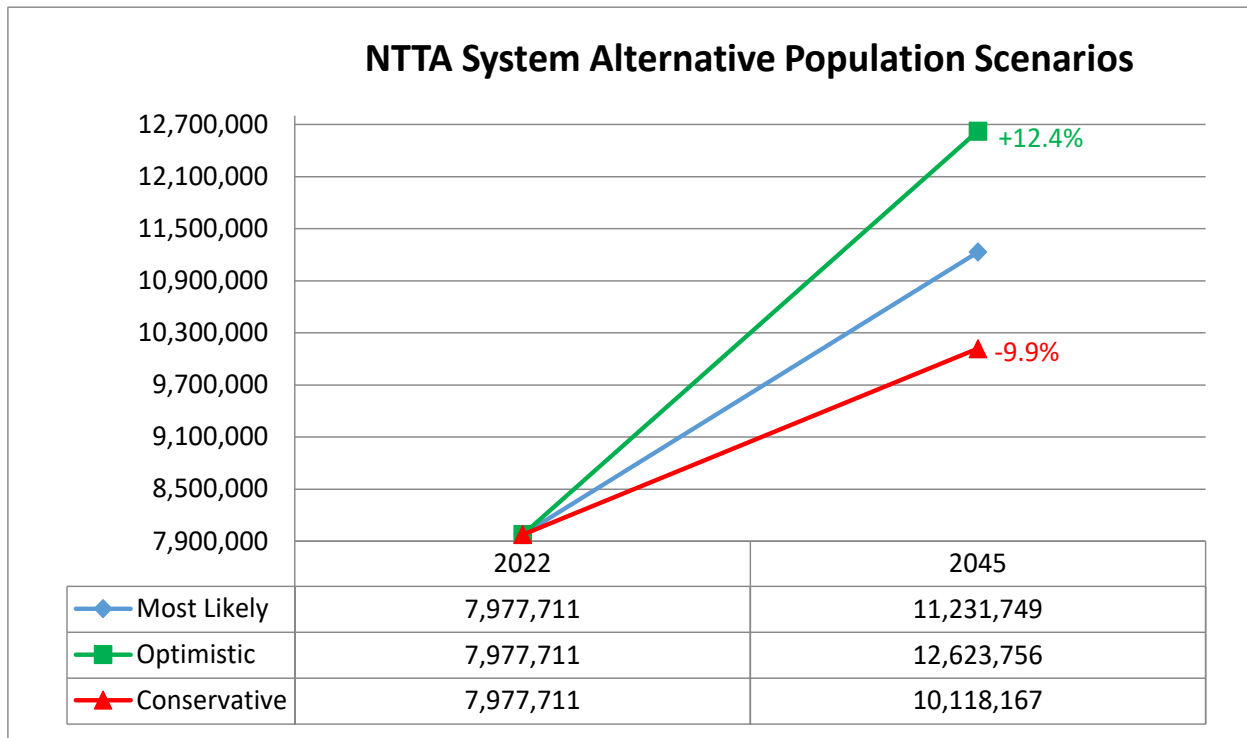
RDS’ conservative and optimistic demographic scenarios were created by varying rates and magnitudes of growth due to geographical and economic factors that could possibly influence residential and commercial development in the future.

Using GIS as a tool, RDS estimated potential household and employment growth impacts due to proximity to existing land uses, as well as potential plans for new construction or redevelopment opportunity. Examples include rail stations, highways, special zoning districts, and the NTTA System itself. Where individual TAP zone review was not done, global factors were applied and the base (Most-likely) RDS forecasts were adjusted accordingly.

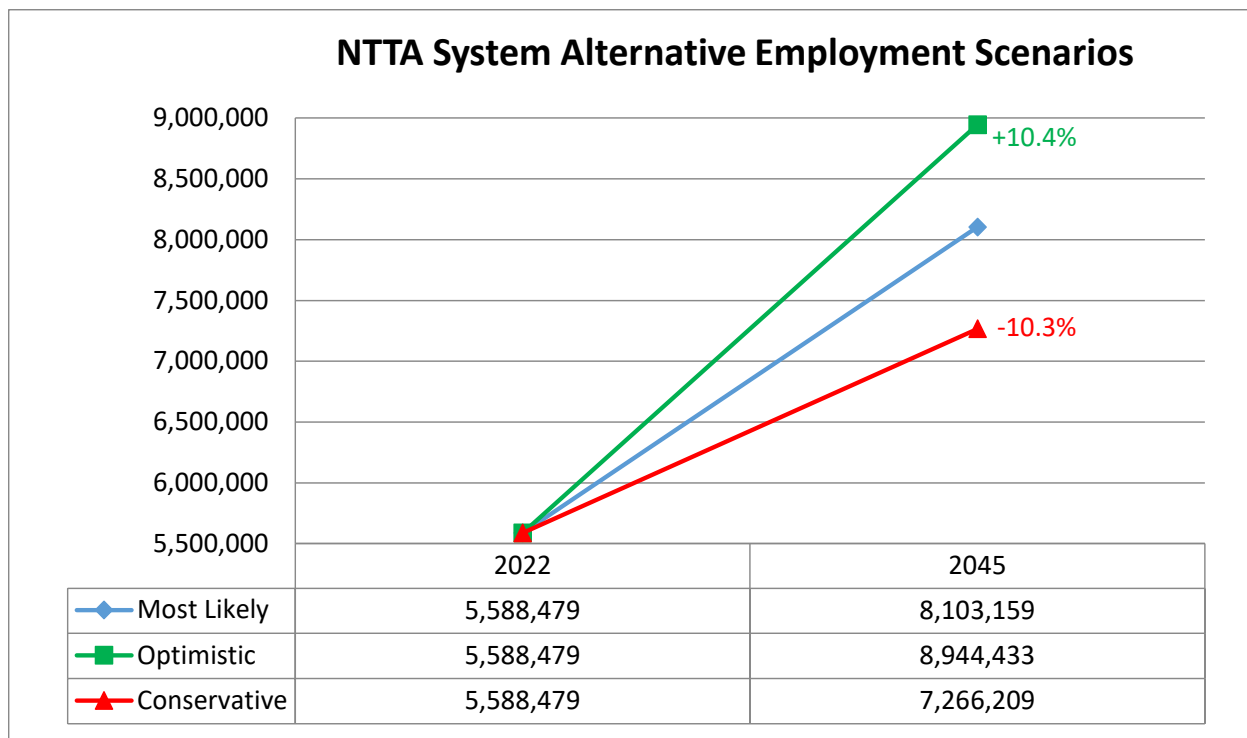
**Figure 17: Household Comparison by Scenario 2022-2045**



**Figure 18: Population Comparison by Scenario 2022-2045**



**Figure 19: Employment Comparison by Scenario 2022-2045**



## APPENDIX A - SPECIAL GENERATORS

Special generators are employers with unique traffic patterns that generate high traffic volumes on a consistent or event-driven basis. Most of these special generators are universities, hospitals, and malls. NCTCOG examines each of these to ensure correct geographical location and then assigns each an accurate employment total. Here is a list of special generators located within the region. Each of these was taken into account when TAP zone totals were calculated to ensure proper traffic volumes.

Special Generator	Type
DFW Airport	Airport
Love Field Airport	Airport
Walls Regional Hospital	Hospital
Medical Center of Lewisville	Hospital
Trinity Medical Center	Hospital
Presbyterian Hospital of Plano	Hospital
Baylor Regional Medical Center at Plano	Hospital
Medical Center of Plano	Hospital
Kindred Hospital Fort Worth (Southwest)	Hospital
Harris Methodist Southwest Hospital	Hospital
John Peter Smith Hospital	Hospital
UNT Health Science Center	Hospital
Osteopathic Med. Ctr. Of Texas	Hospital
Plaza Medical Center	Hospital
Baylor All Saints Episcopal Hospital	Hospital
Harris Methodist Fort Worth & Cook Chil	Hospital
D/FW Medical Center	Hospital
Northeast Community Hospital	Hospital
Harris Methodist HEB Hospital	Hospital
North Hills Hospital	Hospital
Baylor University Medical Center at Gra	Hospital
Denton Community Hospital	Hospital
Doctors Hospital	Hospital
Richardson Regional Medical Center	Hospital
Plano Rehabilitation Hospital	Hospital
Veterans Admin. Medical Center	Hospital
Methodist Medical Center	Hospital
Las Colinas Medical Center	Hospital
RHD Memorial Medical Center	Hospital
Healthsouth Medical Center	Hospital
St. Paul Medical Center	Hospital
Baylor Health Center at Irving	Hospital
UT SW MedCtr & Children's MedCtr of Dal	Hospital
Texas Scottish Rite Hospital	Hospital
Texas A&M HSC/Baylor Collg Dent	Hospital
Baylor Institute for Rehabilitation	Hospital
Baylor University Medical Center	Hospital
Presbyterian Hospital (in Dallas)	Hospital
Medical City Dallas Hospital	Hospital
Garland Community Hospital	Hospital
The Medical Center of Mesquite	Hospital

Special Generator	Type
Lake Pointe Medical Center	Hospital
Mesquite Community Hospital	Hospital
Baylor Medical Center of Garland	Hospital
Medical Center of Mckinney	Hospital
Columbia Medical Center of Mckinney	Hospital
Vista Ridge Mall	Regional Shopping Mall
Irving Mall	Regional Shopping Mall
The Shops at Willowbend	Regional Shopping Mall
Hulen Mall	Regional Shopping Mall
Ridgmar Mall	Regional Shopping Mall
La Gran Plaza De Fort Worth	Regional Shopping Mall
Six Flags Mall	Regional Shopping Mall
Northeast Mall	Regional Shopping Mall
Grapevine Mills Mall	Regional Shopping Mall
Golden Triangle Mall	Regional Shopping Mall
Collin Creek Mall	Regional Shopping Mall
Southwest Center	Regional Shopping Mall
Northpark Center	Regional Shopping Mall
Galleria Mall	Regional Shopping Mall
Fire Wheel Mall	Regional Shopping Mall
Town East Mall	Regional Shopping Mall
Richardson Square Mall	Regional Shopping Mall
Stonebriar Mall	Regional Shopping Mall
Texas Christian University	University/College
Texas Woman's University	University/College
University Of North Texas	University/College
Southern Methodist University	University/College
Spring Creek Campus	University/College
Southwest Baptist Theological Sem.	University/College
TCC--South Campus	University/College
Texas Wesleyan University	University/College
TCC--Northwest Campus	University/College
TCC--Southeast Campus	University/College
TCC--Northeast Campus	University/College
Univ. of Texas at Dallas	University/College
Richland College	University/College
Dallas Baptist University	University/College
Mountain View College	University/College
University of Dallas	University/College
North Lake Junior College	University/College
El Centro College	University/College
Brookhaven Junior College	University/College
Eastfield College	University/College
The Mesquite Metroplex Center	University/College
CCCC - Preston Ridge Campus	University/College
CCCC - Central Park Campus	University/College



## APPENDIX B - ESTIMATED SQUARE FEET PER EMPLOYEE

The following chart represents employee coefficients that were used as a guide when reviewing and estimating employment in commercial properties.

Land Use Category	Estimated Square Feet per Employee
Office	275
Retail	300
Hotel/Motel	.75 Emp per Room
Institutional	800
Industrial	1250



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