

ELECTRIFICATION OF GENERAL AVIATION FLEET



North Central Texas
Council of Governments

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STUDY GOALS

- Requirements for electrification
- Lifecycle Cost
- Cost Benefit Analyses
- Introduction of survey

CHECKLIST FOR ELECTRIFICATION

1. Electric aircraft: Electric motors, Reliability, Flying time, Efficiency of power distribution, Battery (energy density and power density), Design life
2. Operational needs: Schedule, Turnaround time
3. Charging infrastructure: Battery, Charging capacity, Charging time, Cost, Usage, Design life

...CONTINUATION

4. Grid capacity and Power requirements: Power capacity, Increased load from electrification, Possibilities of grid upgrade
5. Alternate energy resources: Solar Photovoltaic, Battery storage, Integrating distributed energy resources
6. Regulatory framework: Airworthiness standards: aircraft engines (14 CFR Part 33)
7. Financial considerations

FOSSIL FUEL AIRCRAFT EMISSIONS

EMISSIONS

- CO₂ and water vapor
- Nitrogen oxides (NO_x)
- Unburned hydrocarbons
- Carbon monoxide (CO)
- Sulphur oxides
- Traces of hydroxyl family and nitrogen compounds
- Small amounts of soot particles

HEALTH IMPACTS

- Morbidity
- Mortality
- Cancers
- Acute Exposure Mortality
- Acute Respiratory Symptoms Days
- Adult Chronic Bronchitis
- Asthma

HEALTH IMPACT FACTOR

- Cost of health damage due to air pollutant emissions
- \$ Conversion factors from a 2016 study (Alrafea et al., 2016)

CO	NO ₂	PM _{2.5}	SO ₂
0.64	73.85	83.36	24.50

- 2016 to 2023 health care inflation rate: 22%

AlRafea, Kamal, Ali Elkamel, and Sabah A. Abdul-Wahab. "Cost-analysis of health impacts associated with emissions from combined cycle power plant." *Journal of cleaner production* 139 (2016): 1408-1424.

ELECTRIC AIRCRAFT

- Emerging research and development
- Manufacturers: Airbus, Boeing, Pipistrel, Lilium, Joby Aviation, Eviation Aircraft, Electra Aero, Beta Technologies
- First electric aircraft: Pipistrel Alpha electro 2-seater
- Velis Electro by Pipistrel is certified to use in 30 countries
- Pricing: \$140,000

Charging Infrastructure

- Similar to electric vehicle charging infrastructure.
- Requires higher power outputs and fast charging
- High power demand
- High-power chargers capable of delivering a large amount of electricity in a short period are crucial.
- Advanced cooling systems
- Manufacturers: **Green motion & Pipistrel, Beta Technologies, Chargepoint, Boeing, Siemens**

BENEFIT

- Reduced emissions: CO, NO₂, PM_{2.5}
- Fossil fuel cost
- Lower maintenance costs

COST

- Electric Aircraft cost
- Infrastructure investments
- Electricity costs

- All costs and benefits are annualized based on interest rates

LIMITATIONS AND ASSUMPTIONS

- Factors like fuel flowage fees, land leases, hanger rentals are not considered in this study.
 - Aircraft based costs like maintenance costs and yearly depreciation are also not considered.
 - Installation of charging infrastructure depends on airport layout plan and supporting electrical work. The cost associated with installation is airport dependent.
 - Charging equipment cost is \$200k/charger
 - Fossil Fuel cost is \$5.40/gallon²
 - Fuel costs are calculated assuming one flight hour per one takeoff and landing^{1,2}
 - Electrical charging costs are \$5 for one hour of flight time³
-
1. Aircraft cost calculator (ACC); <https://www.aircraftcostcalculator.com/AircraftOperatingCosts>
 2. Planephd data model; <https://planephd.com/wizard/manufacturers/>
 3. Windy app blog: Meet the main electric planes companies; <https://windy.app/blog/electric-planes-companies.html>

ELECTRIFICATION SCENARIOS

Flight schools

- Only flight school aircraft converted to electric

- All operations are electric
- 50% of operations are electric
- 25% of operations are electric
- 10% of operations are electric

Entire Airport

- All aircraft based at airport converted to electric

- All operations are electric
- 90% of operations are electric
- 80% of operations are electric
- 65% of operations are electric

Airport	100% flight school electrification		50% flight school electrification		25% flight school electrification		10% flight school electrification	
	min	max	min	max	min	max	min	max
Arlington Municipal (GKY)	7.96	8.44	7.52	8.44	6.38	7.82	5.24	8.44
Grand Prairie Municipal (GPM)	9.44	9.48	9.40	9.48	9.33	9.48	9.77	10.16
Fort Worth Spinks (FWS)	6.84	7.89	5.97	7.78	4.99	8.19	2.96	6.99
Fort Worth Meacham	7.46	7.63	6.74	7.04	5.66	6.09	3.83	4.33
Fort Worth Alliance (Perot Field)	3.90	4.14	3.78	4.28	3.39	4.28	2.70	4.57
Addison	8.49	8.49	8.49	8.49	9.02	9.02	9.61	9.61
Dallas Executive	6.41	6.72	5.93	6.48	4.66	5.39	3.22	4.19
Denton Enterprise	6.63	6.92	5.81	6.26	4.55	5.14	2.95	3.62
Lancaster Regional	1.29	1.29	1.27	1.27	1.23	1.23	1.04	1.04
McKinney National	8.75	8.75	8.75	8.75	8.75	8.75	7.96	7.96
Mesquite Metro	7.15	7.16	7.14	7.16	7.11	7.16	7.54	7.68
Bridgeport Municipal	1.30	1.30	1.49	1.49	1.09	1.09	1.85	1.85
Caddo Mills Municipal	4.16	4.16	3.41	3.41	3.17	3.17	1.57	1.57
Cleburne Regional	5.21	5.21	4.27	4.27	3.14	3.14	1.96	1.96
Decatur Municipal	1.28	1.28	1.21	1.21	1.08	1.08	1.06	1.06
Gainesville Municipal	5.20	5.20	4.97	4.97	3.24	3.24	2.47	2.47
Granbury Regional	4.99	4.99	3.91	3.91	2.57	2.57	1.35	1.35
Mid-Way Regional	4.97	4.97	4.62	4.62	4.52	4.52	2.57	2.57
Mineral Wells	7.21	8.52	6.84	9.65	4.41	7.06	3.28	10.87
North Texas Regional	8.78	9.88	8.18	10.31	8.36	14.44	6.64	40.62
Rockwall Municipal	6.34	7.10	5.60	6.90	4.53	6.53	3.40	7.96
Terrell Municipal	6.92	6.92	6.09	6.09	4.91	4.91	3.70	3.70
Aero Country	2.51	2.51	1.39	1.39	0.73	0.73	0.89	0.89
Bourland Field	7.36	7.36	7.85	7.85	5.41	5.41	5.82	5.82
Hicks Airfield	7.03	7.03	6.32	6.32	5.27	5.27	3.62	3.62
Northwest Regional	10.62	10.62	9.17	9.17	7.21	7.21	5.13	5.13
Parker County	9.01	9.01	8.17	8.17	7.59	7.59	4.15	4.15
Sycamore Strip	0.76	0.76	0.39	0.39	0.20	0.20	0.13	0.13

Benefit-Cost Ratios for Electrification of Flight schools

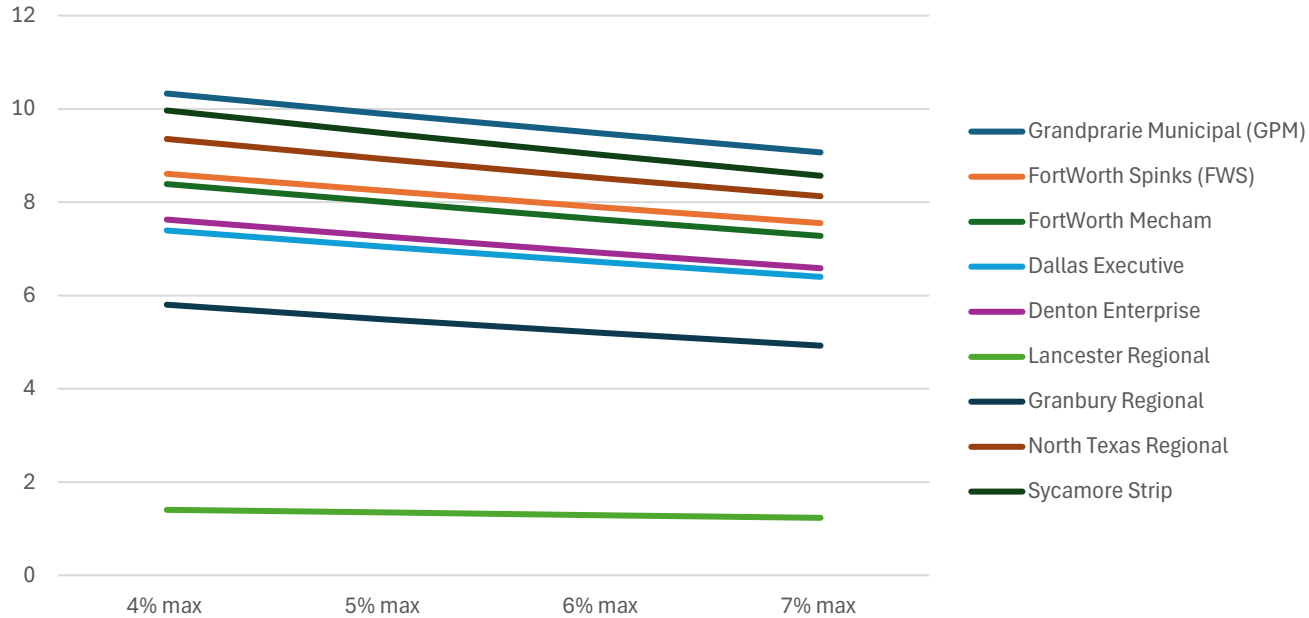
Airport	100% entire airport electrification		90% entire airport electrification		80% entire airport electrification		65% entire airport electrification	
	min	max	min	max	min	max	min	max
Arlington Municipal (GKY)	4.00	8.44	3.78	8.44	3.53	8.44	2.82	8.93
Grand Prairie Municipal (GPM)	8.62	9.48	8.86	9.77	8.62	9.72	8.43	10.06
Fort Worth Spinks (FWS)	2.44	6.71	2.44	6.59	2.08	6.45	1.56	6.21
Fort Worth Meacham	2.40	2.84	2.40	2.64	2.04	2.44	1.50	1.83
Fort Worth Alliance (Perot Field)	3.77	4.14	3.85	4.24	3.74	4.21	3.58	4.25
Addison	8.49	8.49	8.66	8.66	8.56	8.56	8.99	8.99
Dallas Executive	1.40	2.07	1.40	1.92	1.16	1.76	0.85	1.32
Denton Enterprise	2.49	3.11	2.49	2.91	2.12	2.69	1.60	2.09
Lancaster Regional	1.30	1.30	1.32	1.32	1.33	1.33	1.64	1.64
McKinney National	8.75	8.75	8.61	8.61	8.69	8.69	9.24	9.24
Mesquite Metro	6.92	7.16	6.87	7.11	7.03	7.35	7.17	7.67
Bridgeport Municipal	1.30	1.30	1.47	1.47	1.40	1.40	1.88	1.88
Caddo Mills Municipal	1.42	1.42	1.50	1.38	1.25	1.25	0.91	0.91
Cleburne Regional	1.16	1.16	1.17	1.07	0.97	0.97	0.69	0.69
Decatur Municipal	1.33	1.33	1.28	1.28	1.36	1.36	1.64	1.64
Gainesville Municipal	1.15	1.15	1.14	1.05	0.97	0.97	0.72	0.72
Granbury Regional	2.25	2.25	2.28	2.12	1.92	1.92	1.47	1.47
Mid-Way Regional	1.52	1.52	1.53	1.42	1.28	1.28	0.98	0.98
Mineral Wells	1.85	6.19	1.90	6.50	1.57	6.06	1.15	5.61
North Texas Regional	4.88	9.07	4.89	9.11	4.40	9.16	3.54	9.23
Rockwall Municipal	2.52	5.34	2.49	5.03	2.18	5.08	1.67	4.57
Terrell Municipal	2.22	2.22	2.26	2.09	1.89	1.89	1.39	1.39
Aero Country	0.14	0.14	0.14	0.13	0.12	0.12	0.08	0.08
Bourland Field	2.63	2.63	2.73	2.54	2.30	2.30	1.76	1.76
Hicks Airfield	1.41	1.41	1.41	1.29	1.17	1.17	0.85	0.85
Northwest Regional	0.82	0.82	0.82	0.74	0.66	0.66	0.50	0.50
Parker County	4.49	4.49	4.56	4.29	3.92	3.92	3.09	3.09
Sycamore Strip	0.19	0.19	0.19	0.17	0.15	0.15	0.11	0.11

Benefit-Cost Ratios for Electrification of Entire airport

Airport	100% enitre airport electrification	90% enitre airport electrification	80% enitre airport electrification	65% enitre airport electrification
Arlington Municipal (GKY)	1.29	1.18	1.06	0.75
Grand Prairie Muncipial (GPM)	1.20	1.10	0.99	0.70
Fort Worth Spinks (FWS)	0.90	0.82	0.74	0.52
Fort Worth Meacham	1.41	1.29	1.17	0.83
Fort Worth Alliance (Perot Field)	3.43	3.43	3.33	3.05
Addison	0.63	0.57	0.51	0.36
Dallas Executive	0.70	0.64	0.57	0.41
Denton Enterprise	1.23	1.13	1.02	0.73
Lancaster Regional	1.29	1.30	1.32	1.61
McKinney National	1.94	1.78	1.62	1.17
Mesquite Metro	1.34	1.22	1.11	0.81
Bridgeport Muncipal	1.22	1.36	1.29	1.64
Caddo Mills Muncipal	0.95	0.90	0.81	0.58
Cleburne Regional	0.70	0.64	0.58	0.40
Decatur Municipal	1.33	1.28	1.36	1.64
Gainesville Municipal	0.63	0.57	0.52	0.37
Granbury Regional	1.26	1.16	1.04	0.76
Mid-Way Regional	0.98	0.91	0.81	0.60
Mineral Wells	0.88	0.81	0.72	0.51
North Texas Regional	1.53	1.40	1.27	0.90
Rockwall Municipal	1.43	1.30	1.19	0.87
Terrell Municipal	1.15	1.06	0.95	0.67
Aero Country	0.03	0.02	0.02	0.01
Bourland Field	0.57	0.52	0.47	0.33
Hicks Airfield	0.66	0.60	0.54	0.38
Northwest Regional	0.27	0.25	0.22	0.17
Parker County	1.96	1.81	1.63	1.17
Sycamore Strip	0.11	0.10	0.09	0.06

Benefit-Cost Ratios
for Replacement of
fossil fuel aircraft
with electric aircraft
at full price

SENSITIVITY ANALYSIS



Benefit-Cost analysis for electrification of flight schools at different interest rates

KEY FINDINGS

- Even if only 10% of total operations are with electric powered aircraft, converting the flight school aircraft fleets appears promising at most airports
- With 100% of the flight operations electrified
 - Average BCA for converting the flight school fleets in the NCTCOG region is around 6 to 6.2.
 - Average BCA for converting all aircraft in the NCTCOG region is around 2.92 to 3.34.
 - Regional BCA reduces to 1.11 when all fossil fuel aircraft are replaced with electric aircraft at full price.
 - This reduces to 0.78 when only 65% of flight operations are electric aircraft.
- Sensitivity analysis of the BCA at different interest rates shows that the B/C ratios decrease an increase in interest rates.
- Aero country and Sycamore strip are the only airports with $B/C < 1$ even at 4% rates.

SURVEY INTRODUCTION

- Awareness and Perception: Technology and development
- Purchase Intent: cost, charging time, safety, flying time, availability of models
- Incentives and Motivation: tax credits, direct rebates, environmental concerns
- Usage Patterns: type of trips, flying time
- Knowledge level: understanding the technology, evolving market
- Comparative Perception: reliability, overall value, maintenance, operation
- Factors influencing purchase: initial cost, battery range, resale value
- Decision Triggers: Test drives, demo
- Barriers to Adoption: single charge flying time, batteries & its degradation, infrastructure concerns
- Transition from Gasoline: gas & electricity price

FUTURE RESEARCH

- Launching the survey with IRB approval.
- Additional sensitivity analysis can be performed with respect to fuel costs and charging infrastructure installations.
- Contacting each airport in NCTCOG region to gather fleet specifications and operations data (by aircraft/engine type)

QUESTIONS?

THANK YOU!



PLANEPASS[®]
by VECTOR

Supporting Airports and AAM

 **VECTOR**

Vector Background

- 19-years in business
- PLANEPASS aircraft fee billing/collection service – helping airports fund projects, support infrastructure costs (i.e., AAM investments), fill revenue gaps
- 100% PLANEPASS client retention
- 99.6% collection success rate
- 40 in-house staff – virtual-first and a DC-metro area office (Herndon, VA)
- CRITICAL MASS – will surpass 100 PLANEPASS airports in 2024
- Collaborative/ consultative relationship with airports

Sample PLANE PASS Clients

Top US GA Jet Airports

- KBED – Bedford, MA
- KBFI – Boeing Field, WA
- **KDAL – Dallas Love Field, TX**

Vacation/Destination Airports

- KAPC – Napa, CA
- KASE – Aspen, CO
- KBZN – Bozeman, MT
- KGLI – Glacier Park, ID
- KHYA – Cape Cod, MA
- KMVY – Martha's Vineyard, MA
- KSUN – Sun Valley, ID
- KTRK – Truckee, CA

Small Hub Airports

- **KCRP – Corpus Christi, TX**
- KPWM – Portland, ME
- KTLH – Tallahassee, FL

Other Airports

- KAGC – Allegheny County, PA
- KISP – Islip, NY
- KPTK – Oakland County, MI
- KRYY – Cobb County, GA
- KSAF – Santa Fe, NM
- KSBA – Santa Barbara, CA
- KSMO – Santa Monica, CA
- KTOA – Torrance, CA

Texas PLANEPASS Clients

Texas PLANEPASS Airports

- DAL – Dallas Love Field, TX
- LRD – Laredo Intl, TX
- MAF - Midland Air & Space Port, TX
- CRP - Corpus Christi Intl, TX
- ACT - Waco Regional Airport, TX
- 5C1 - Boerne Stage Airfield, TX
- BRO – Brownsville South Padre Island Airport, TX
- MDD - Midland Airpark, TX

Pending Texas PLANEPASS Airports

- 11 in various stages from discovery to contracting

PLANE PASS BY THE NUMBERS

\$40M+

Annual Aircraft
Fees Billed

99.6%

Collection
Success Rate

60K+

Aircraft Operator
Paying Relationships

75+

Client
Airports

How PLANEPASS Supports AAM

- When will AAM (eVTOLS/air taxis) have substantial impact? FAA estimates 2028 (source: “FAA Innovate28 plan”)
- Airports are spending money now on AAM but timing, traffic, revenue streams are uncertain
- AAM most likely use-case = small airports to large hubs
- AAM will most likely start at existing airports vs. new vertiports *
 - Aviation land use already established
 - Parking/Passenger service infrastructure already in place
 - Other transport modes already connected to airport
 - Some ground vehicle electric charging in place – starting point for eVTOL charging
 - Air traffic control and airspace systems/routes already in place
 - Existing community relationships and noise abatement – faster than establishing at new vertiport facility
- PLANEPASS can help preparing existing airports to support AAM operations and infrastructure

* https://wisk.aero/wp-content/uploads/2021/09/Wisk_AirportsForAAM_Whitepaper_final.pdf

What is PLANEPASS?

PLANEPASS provides airports with a new revenue stream or maximizes existing fee revenues. Implemented in a month with no airport capital, no airport labor, all at no risk to the airport.

PLANEPASS is Vector's turn-key, technology-driven service for billing & collecting aircraft fee revenue. The PLANEPASS system and team do all the work, requiring no time or effort from airport or FBO staff.

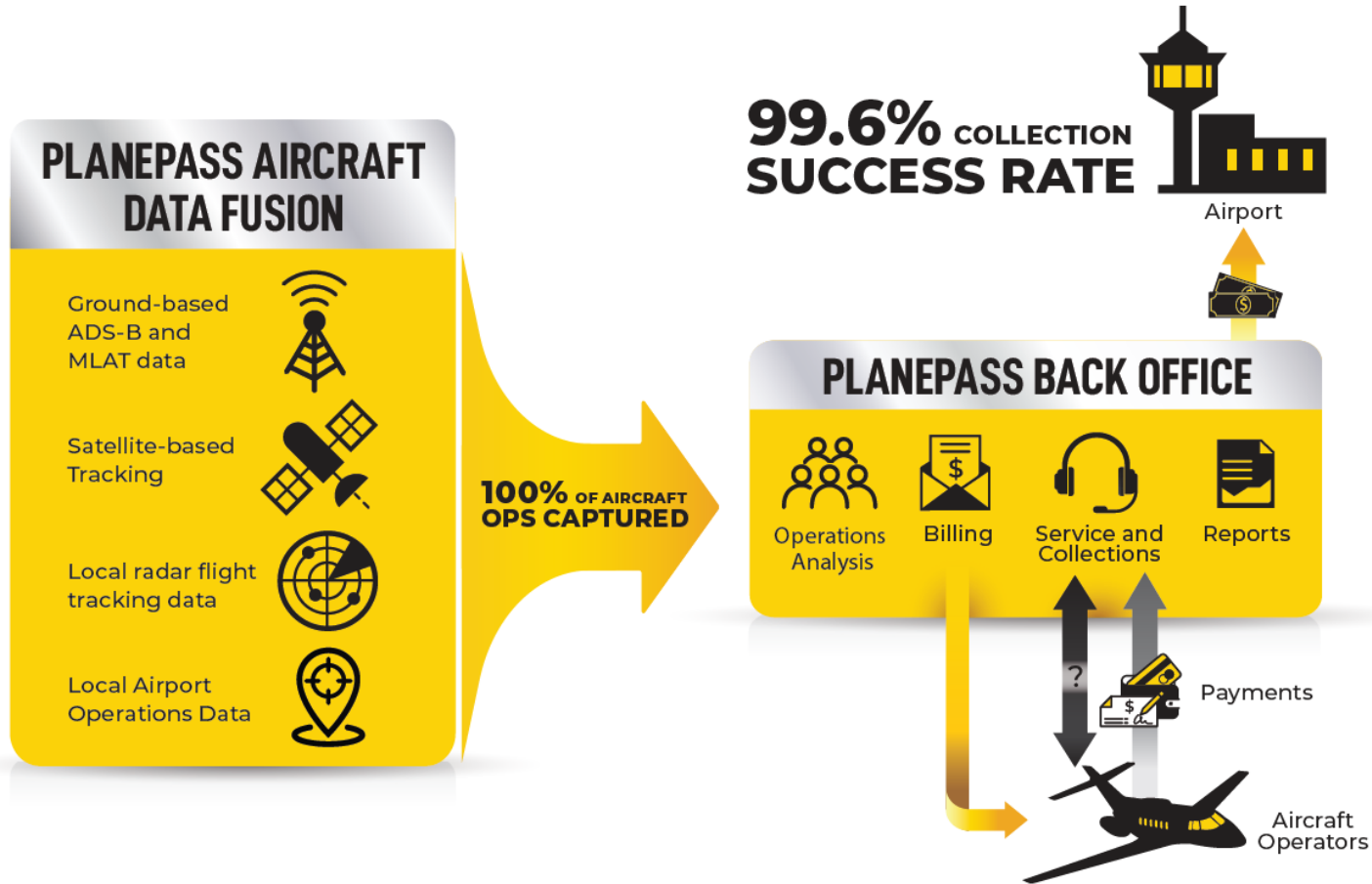
FEES BILLED INCLUDE :

- ✓ Landing
- ✓ Security
- ✓ Overflight
- ✓ Parking
- ✓ Customs
- ✓ After hours

PLANEPASS Benefits:

- **MORE REVENUE** - Typical annual fee revenue increases of 20%+ when existing fee in place
- **COMPLETE** - 100% of aircraft operations captured and a 99.6% collection success rate
- **CONVENIENT** - Operators prefer paying through PLANEPASS via one monthly payment with transparent accounting
- **NO AIRPORT LABOR** - Relieves operational and collections burden from airport/FBO staff
- **TRANSPARENCY** – of aircraft operations and billings/collections for airport
- **NO CAPITAL** - No upfront cost or implementation charge to airport

The PLANEPASS Process



- Track/Identify all aircraft including eVTOLs
- Fee Rules and Billing
- Live customer service
- Payment processing
- Active collections – 99.6% success
- Accounting and reporting
- Centralized operation for multiple airports

Live Customer Service/Collection Team

Our U.S. In-House Staff Handles It All

- ▶ Researches Aircraft Operator, Model, and Weight
- ▶ Processes Payments and Monthly Remittance to Airport
- ▶ Delivers Invoices and Statements to Aircraft Operators
- ▶ Actively Collects Fees with 99.6% Success Rate
- ▶ Automatically Applies Airport Fee Rules
- ▶ Handles All Customer Service



- **Dedicated Live Operator Customer Service Team** - In-house US-based
 - Prompt, responsive live customer service
 - Effective but professional active collections team
- **Highly Trained Team** - extensive aviation training with ongoing quality control

Operator Payment Portal

Operator Payment Portal provides:

- Online payments, invoice download, statement download, contact updates, etc.
- All activity logged in PLANEPASS Back-office CRM

PLANEPASS Payment Portal

My Account | Payment | Airport Info | Vector FAQ

Make a Payment

Outstanding Invoices
Click "Add" to select an invoice to pay. Invoice(s) and amounts for each invoice will appear in "Payment Summary" section. To adjust payment amount, enter desired amount in "Amount to Pay" and select "Update."
All amounts are shown, and will be paid, in the national currency of the airport you are paying

#	Invoice ID	Airport	Invoice Period End	Amount Owed	Credit Card Payment Pending	Net Balance Due	Add	Amount To Pay
1	600067	KMYY	6/30/2023	\$600.00	\$0.00	\$600.00	Add->	
2	600068	KBED	6/30/2023	\$697.50	\$0.00	\$697.50	Add->	
3	603090	KMYY	7/31/2023	\$300.00	\$0.00	\$300.00	Add->	
4	604341	KBFI	7/31/2023	\$112.95	\$0.00	\$112.95	Add->	

Payment Summary
No Invoices Added.

Billing Information
Billing Address
Please enter the following information as it is on your credit card statement.
First name *
Middle name
Last name *
Country *
Address line 1 *
Address line 2
City *
State/Province *
Zip/Postal Code *
Phone *
Email Address *
I would like to receive all future invoices via paperless billing

Payment Information
Card Type *
Number *
Card Verification Number *
Expiration date *
Total Charged to Credit Card \$0.00

PLANEPASS Payment Portal

My Account | Payment | Airport Info | Vector FAQ | Go Paperless!

Operator Information [Change Billing/Contact Information](#)

Operator ID: 128305
SMGM Holdings Pte. Ltd
8 MARINA VIEW #07-04
ASIA SQUARE TOWER 1 018960

Contact Name:
Email Address:
Phone Number:

Account Summary
KBED Invoices & Payments [Statement](#) [Airport Info](#) — Amounts shown in airport's national currency

Invoices							Payments						
Invoice ID	Airport	Invoice Period End	Date Created	Invoice Total	Payment ID	Date Paid	Check No.	Notes	Payment Total	Balance Due/ (Overpaid)	Credits/ Pending		
Email This	Excel Export	600068	KBED	6/30/2023	7/16/2023	\$697.50				\$697.50	\$0.00		
Subtotal Invoiced					Subtotal Payments					\$0.00	\$697.50	\$0.00	

KBFI Invoices & Payments [Statement](#) [Airport Info](#) — Amounts shown in airport's national currency

Invoices							Payments						
Invoice ID	Airport	Invoice Period End	Date Created	Invoice Total	Payment ID	Date Paid	Check No.	Notes	Payment Total	Balance Due/ (Overpaid)	Credits/ Pending		
Email This	Excel Export	604341	KBFI	7/31/2023	8/7/2023	\$112.95				\$112.95	\$0.00		
Subtotal Invoiced					Subtotal Payments					\$0.00	\$112.95	\$0.00	

KMYY Invoices & Payments [Statement](#) [Airport Info](#) — Amounts shown in airport's national currency

Invoices							Payments						
Invoice ID	Airport	Invoice Period End	Date Created	Invoice Total	Payment ID	Date Paid	Check No.	Notes	Payment Total	Balance Due/ (Overpaid)	Credits/ Pending		
Email This	Excel Export	600067	KMYY	6/30/2023	7/16/2023	\$600.00				\$600.00			
Email This	Excel Export	603090	KMYY	7/31/2023	8/7/2023	\$300.00				\$300.00			
Subtotal Invoiced					Subtotal Payments					\$0.00	\$900.00	\$0.00	

My Account My Account
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Transparency Through Reporting

- Monthly Billed Detail
- Monthly Billing Adjustments
- Monthly Collection Report
- Accounts Receivable Aging
- PLANE PASS Performance Summary

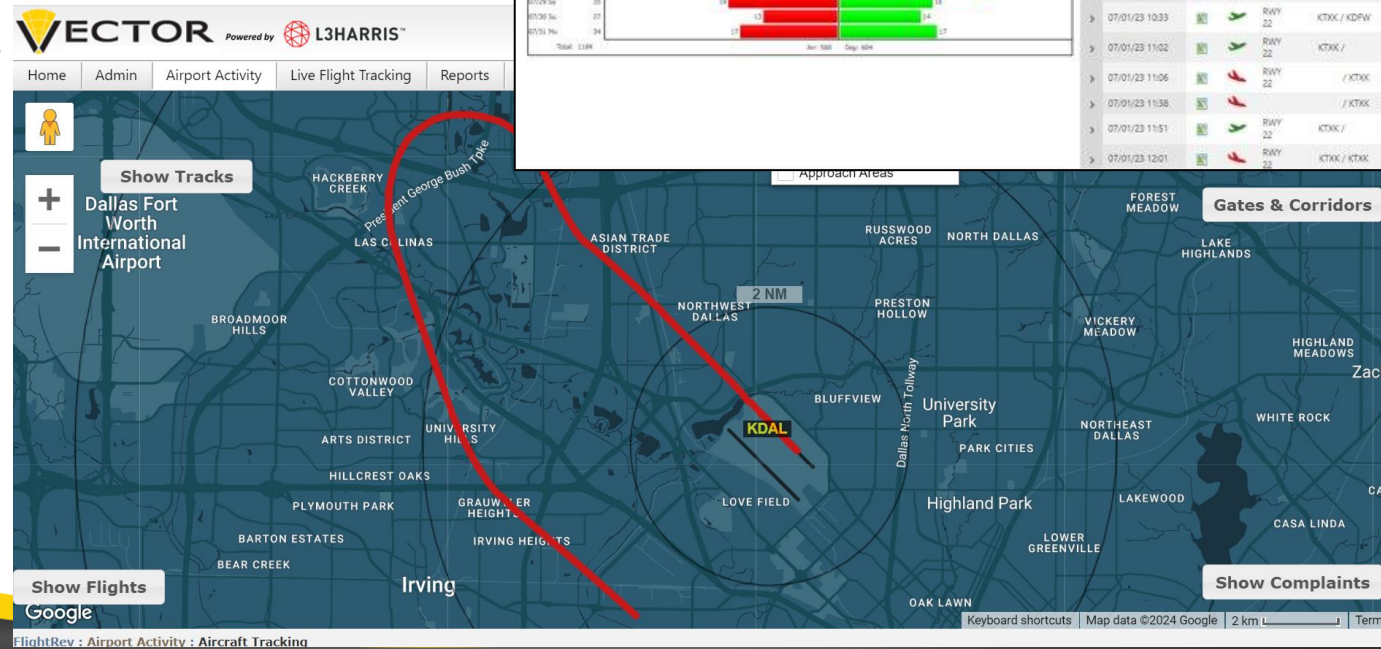
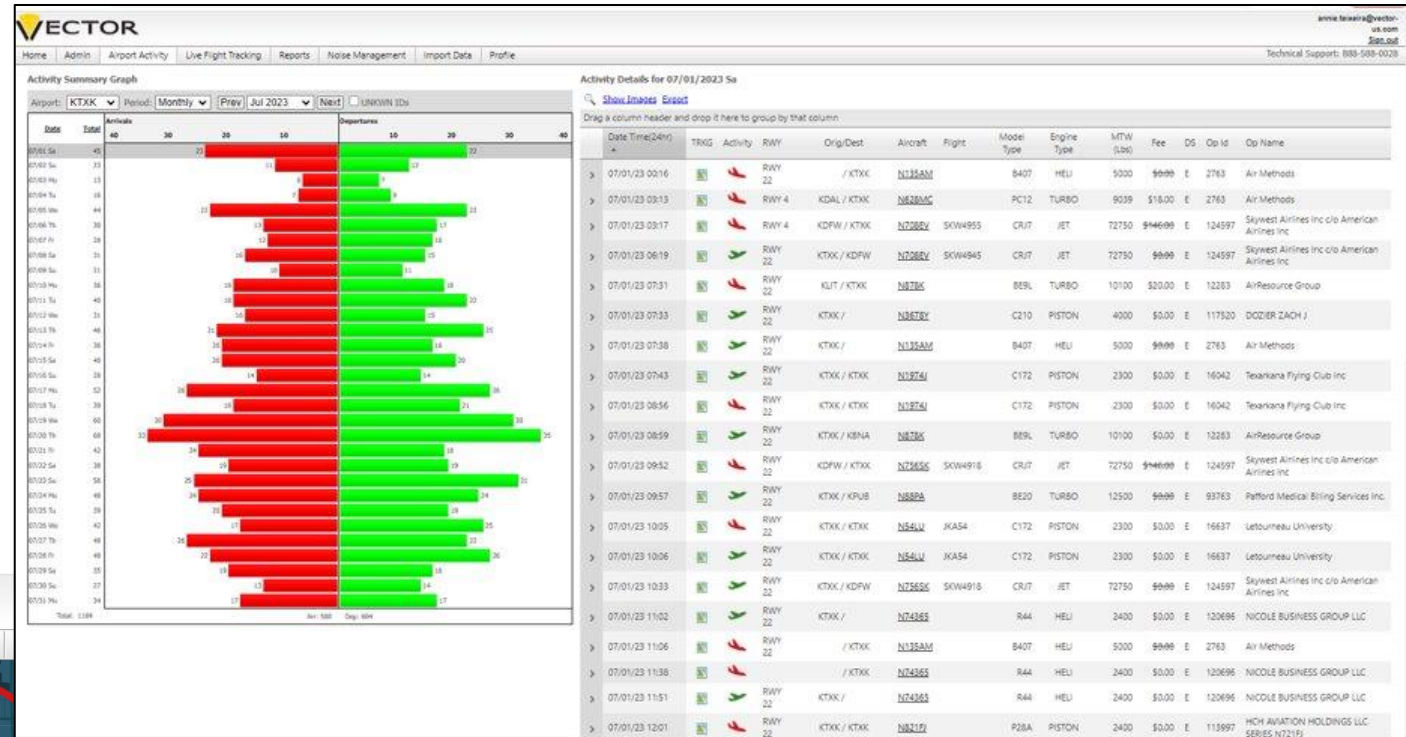
PlanePass Billing & Collection Performance Summary

Invoice Airport:
 Invoice Start Month:
 4/1/2020 - 5/31/2021

Invoice Start Month	Invoice Count	% Change	Billed Activities	% Change	Original Billed	Adjustments	Adj %	Adjusted Billed	% Change	Paid	Paid %	AR
April 2020	346	-69%	1048	-72%	\$139,530	(\$2,818)	2.0%	\$136,712	-73%	\$135,553	99.2%	\$1,159
May 2020	614	-42%	1960	-44%	\$263,610	(\$2,033)	0.8%	\$261,578	-46%	\$260,193	99.5%	\$1,385
June 2020	790	-26%	2700	-21%	\$373,215	(\$3,696)	1.0%	\$369,520	-17%	\$364,466	98.6%	\$5,054
July 2020	685	-25%	2858	-6%	\$418,991	(\$2,571)	0.6%	\$416,420	4%	\$411,623	98.8%	\$4,796
August 2020	871	-11%	3213	1%	\$460,777	(\$5,657)	1.2%	\$455,120	5%	\$453,669	99.7%	\$1,451
September 2020	913	-13%	3356	-3%	\$483,169	(\$5,325)	1.1%	\$477,843	3%	\$469,501	98.3%	\$8,342
October 2020	992	-16%	3689	-5%	\$527,377	(\$2,903)	0.6%	\$524,475	1%	\$511,447	97.5%	\$13,028
November 2020	937	-16%	3436	-9%	\$511,700	(\$4,633)	0.9%	\$507,067	-1%	\$494,144	97.5%	\$12,923
December 2020	963	-13%	3494	-5%	\$567,016	(\$5,815)	1.0%	\$561,201	9%	\$533,114	95.0%	\$28,087
January 2021	916	-9%	3513	2%	\$580,667	(\$9,361)	1.6%	\$571,306	14%	\$525,883	92.0%	\$45,423
February 2021	849	-13%	3097	-8%	\$513,813	(\$5,032)	1.0%	\$508,781	-7%	\$397,289	78.1%	\$111,492
March 2021	1145	46%	4433	70%	\$791,823	(\$16,420)	2.1%	\$775,403	92%	\$471,357	60.8%	\$304,046
April 2021	1135	234%	4456	325%	\$746,396	(\$5,204)	0.7%	\$741,192	442%	\$272,691	36.8%	\$468,502
Total	11156	-12%	41253	-2%	\$6,378,084	(\$71,467)	1.1%	\$6,306,617	7%	\$5,300,930	84.1%	\$1,005,687

PLANE PASS Airport Portal

- Aircraft operations and details
- Drill downs for aircraft and operations data
- Aircraft flight tracks correlated to operations
- Data is searchable/sortable/exportable
- Operations Reports including:
 - Graphical Activity Report
 - Operator Report
 - Activity Detail Search Report
- Access to Financial Reports



Why Airports Choose PLANEPASS

Fully automated aircraft capture and identification

- Solution requires no manual inputs or tracking from Airport or FBO
- Fully automated aircraft identification and tracking system
- 24/7/365 aircraft identification and operations capture

Overlapping aircraft tracking and identification technologies

- Ensure redundancy and gap filling – 100% aircraft operations capture including eVTOLS (same equipage as other aircraft)
- Fusion of multiple sources of surveillance, flight plan, and ADS-B data provides comprehensive coverage
- Consolidates multiple data sources into single, cohesive database of billable operations

Accurate and Streamlined billing process

- Applies fee rules consistently based on regulations. Does not waive fees based on fuel sales or as favors
- Most accurate aircraft owner/operator database – 200,000+ active aircraft and 65,000+ active aircraft operators
- In-house, U.S.-based customer service staff achieve a 99.6% fee collection success rate

Easy reporting process

- Web-based portal allows online data visualization with secure access
- Exportable reports show all operations and accounting information

What Airports Say about PLANEPASS

“ Vector is more than just an outside contractor, they are part of our Airport team.”

Jim Brundige
Airport Manager
East Hampton Airport (HTO)

“ Vector’s PLANEPASS® service more than pays for itself in increased revenue and cost savings at the airport.”

Mark Duebner
Director of Aviation
Dallas Love Field Airport (DAL)

“ In the last 10 months, Vector has enabled us to collect up to twice as much landing fee revenue compared to the same time period last year.”

John Stout
Airport Manager
Sonoma Country Airport (STS)

“ Vector’s system has made the billing and collections process very streamlined and much more transparent.”

Chris Padilla
Airport Controller
Aspen-Pitkin County Airport (ASE)

DAL Love Field – GA Fee Case Study

Dallas Love Field (DAL) - 3rd busiest private jet airport in the world.

PROBLEM: DAL had no way to automatically detect all aircraft operations and needed a way to generate revenue from commercial non-signatory aircraft, from numerous private jet operations, and to detect and bill aircraft using the Customs facility.

SOLUTION: In 2015 Vector's PLANE PASS was found by DAL staff to be the ONLY solution available. Vector implemented several technologies including automated aircraft ID cameras, flight tracking sensors, and a Customs facility detection system to detect all billable aircraft operations. The PLANE PASS service now reliably delivers an additional \$10m USD annually for DAL with NO effort required by DAL staff.

“Outsourcing Love Field's aircraft fee billing process to Vector allows the airport staff to focus more on our mission of keeping the airport safe and operating smoothly. Vector's PlanePass service more than pays for itself in increased revenue and cost savings at the airport.”

- Mark Duebner - Director of Aviation - Dallas Love Field Airport (DAL), Dallas, TX, USA

“Vector's customer service to DAL's staff and customers is top-notch. Their high level of customer management makes our collection reconciliation smooth and provides us with detailed documentation for audits”

- Sheneice Hughes - Assistant Director - Dallas Love Field Airport (DAL), Dallas, TX, USA

The DAL PLANE PASS project was featured in *Airport Improvement Magazine* - the most prominent airport industry magazine in the US: <https://airportimprovement.com/article/high-tech-billing-system-helps-love-field-collect-new-landing-fees>

What does the FAA say about Landing Fees?

Grant Assurance 24: *Airport Fees and Rents. The airport shall maintain a fee and rental structure for the facilities and services at the airport which will **make the airport as self-sustaining as possible** under the circumstances existing at the particular airport.*

2013 Policy Regarding Airport Rates and Charges: Airport proprietors must employ a reasonable, consistent, and 'transparent' (i.e., clear and fully justified) method of establishing the rate base and adjusting the rate base on a timely and predictable schedule.

*In establishing new fees, and generating revenues from all sources, airport owners and operators should **not seek to create revenue surpluses that exceed the amounts to be used for airport system purposes** and for other purposes for which airport revenues may be spent under 49 U.S.C. 47107(b)(1), **including reasonable reserves** and other funds to facilitate financing and to cover contingencies.*



Mobility 2050

The Metropolitan Transportation Plan for North Central Texas

Air Transportation Advisory Committee
August 1, 2024

#PlanInProgress



Long-Range Metropolitan Transportation Plan

NCTCOG is federally required to maintain a performance-based, multimodal transportation plan that guides the spending of federal investments and serves as a blueprint for the region's transportation network. The plan includes policies, programs, and projects that aim to **#ConnectNorthTexas**



Must adopt plan within 4 years



Must have a 20-year horizon (expires end of 2025)



Must include financial plan



Consistency with Transportation Improvement Program and other documents

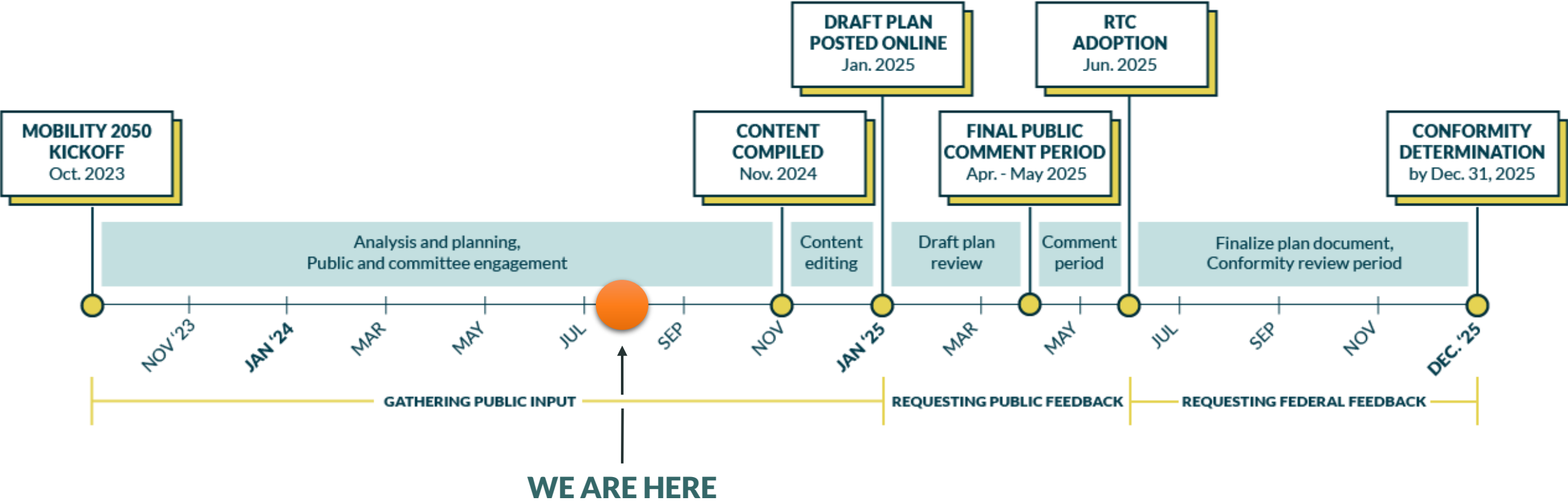


Public Involvement



Air Quality Conformity

Plan Timeline



What's in a Plan: Recommendation Types



What's Changing?

	Mobility 2045 Update	Mobility 2050
Years in plan	2023-2045 (22 years)	2026 -2050 (24 years)
Demographic forecast	11.4 million population forecast 8.1 million employment forecast	New forecast to be developed
Policies, programs, projects	Minor policy, program updates, limited project updates	Comprehensive update to policies, programs, projects
Financial plan	\$148 billion total plan	New forecast being developed
Performance measures and goals	New performance measures relative to plan goals	Continue performance measures; assess goals for public need, policy need, and technology
Format	PDF, print versions	PDF, print, and online versions

Current Highlighted Efforts

- Technical analysis and forecasting, policy, program, and project review and development
- Public engagement continues through 2024; working to summarize insights received to-date
- Financial plan development

Draft Population Forecast - 2050

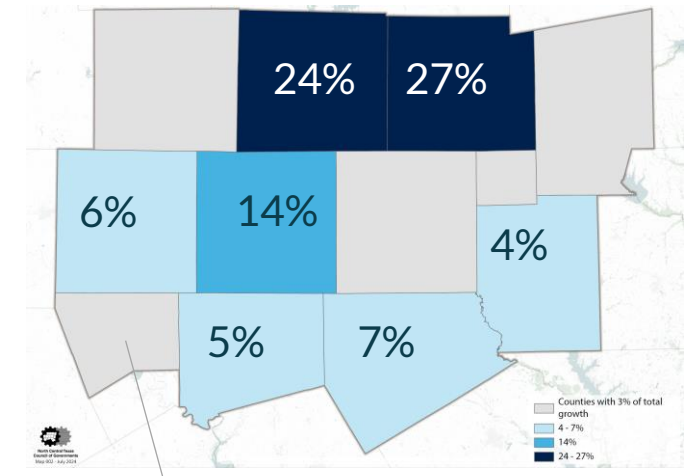
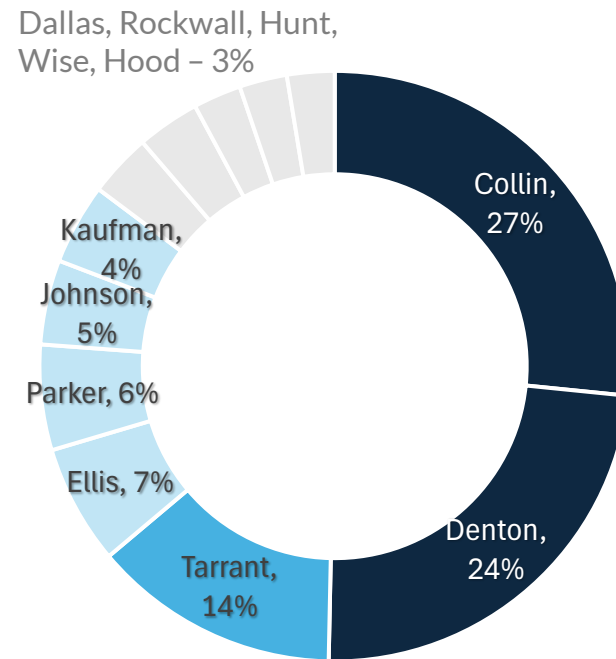
COUNTY FORECAST TARGETS – POPULATION

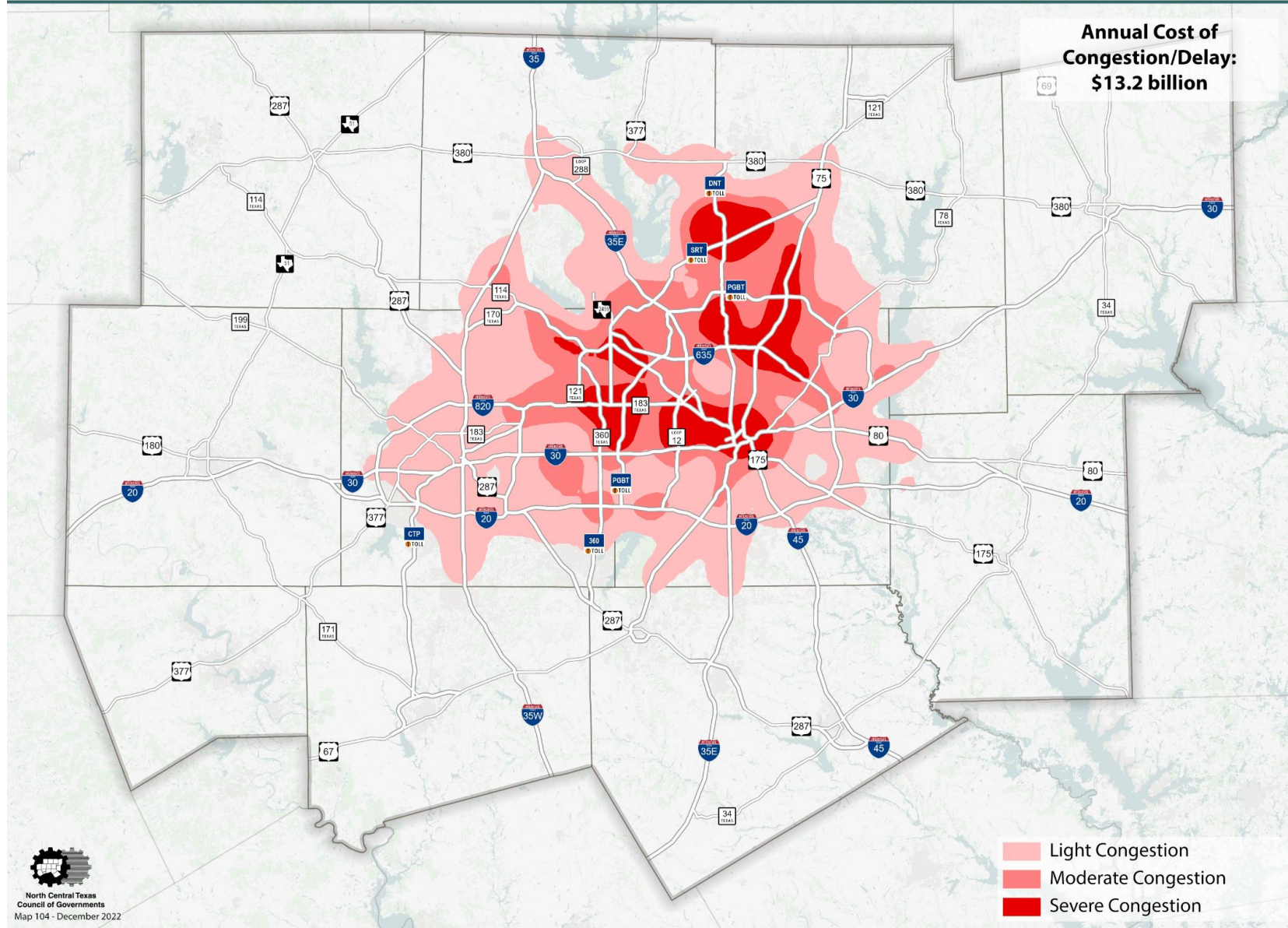
County	2019	2035	2050	2019 – 2050 Change	2019 – 2050 Percent Change	2019 – 2050 Compound Annual Growth Rate
Collin	1,036,595	1,613,969	2,158,340	1,121,745	108.2%	2.4%
Dallas	2,563,285	2,835,539	3,094,330	531,045	20.7%	0.6%
Denton	879,286	1,390,052	1,872,385	993,099	112.9%	2.5%
Ellis	187,453	324,747	452,132	264,679	141.2%	2.9%
Hood	59,934	112,725	162,845	102,911	171.7%	3.3%
Hunt	96,015	152,527	205,848	109,833	114.4%	2.5%
Johnson	174,456	275,089	368,962	194,506	111.5%	2.4%
Kaufman	140,490	234,441	321,673	181,183	129.0%	2.7%
Parker	144,367	263,189	374,523	230,156	159.4%	3.1%
Rockwall	104,942	177,129	245,395	140,453	133.8%	2.8%
Tarrant	2,061,041	2,484,544	2,877,012	815,972	39.6%	1.1%
Wise	67,174	120,815	171,552	104,378	155.4%	3.1%
MPA	7,515,038	9,984,765	12,304,997	4,789,959	63.7%	1.6%

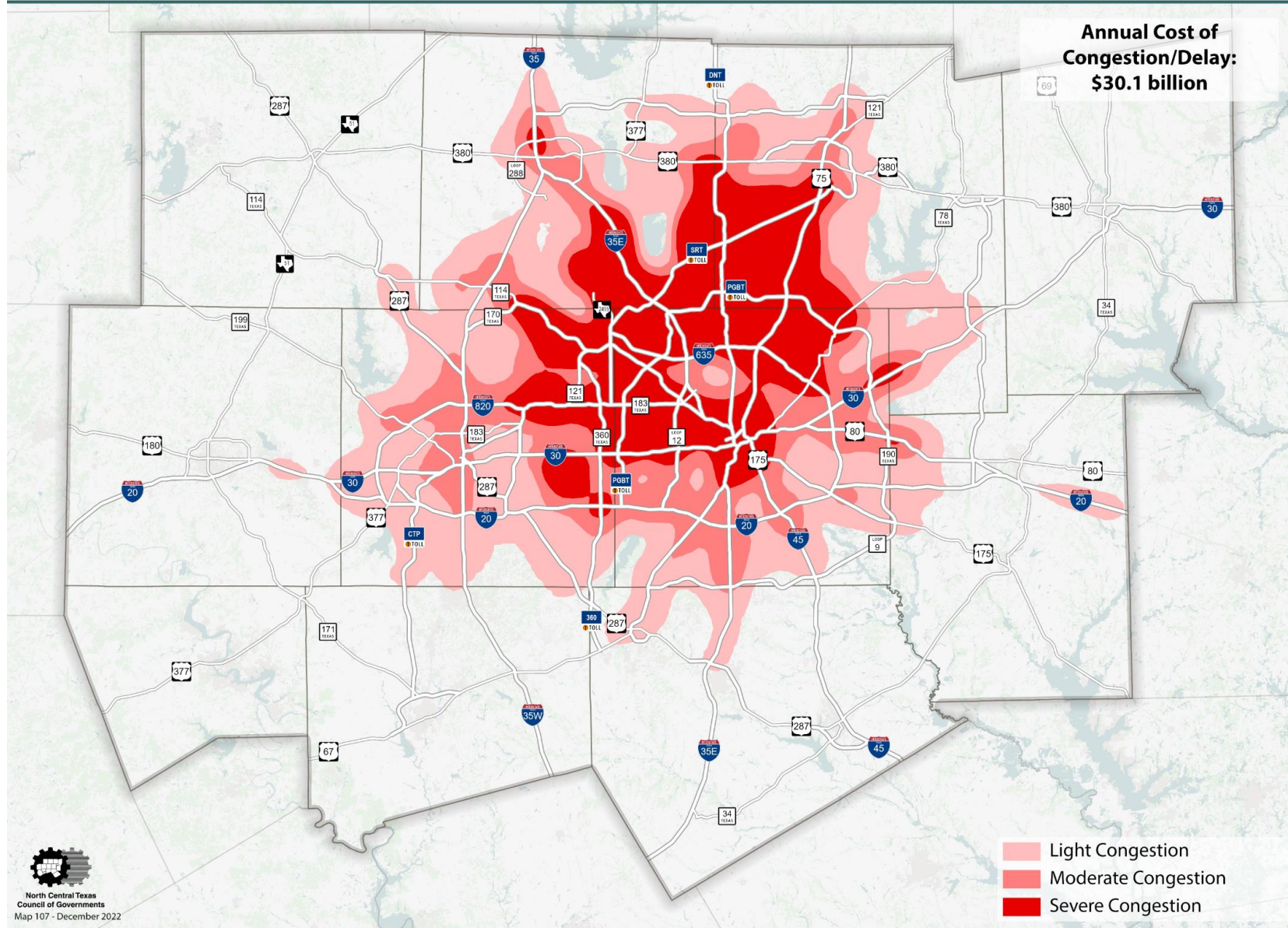
Outward expansion fueled by Dallas and Tarrant counties approaching holding capacity for low-density development.

Collin and Denton counties comprise 50% of growth; counties nearest to core see higher growth

County	Absolute Growth	% of Total	Cumulative Total	Core vs Outer
Collin	+935,046	27%	27%	Urbanizing
Denton	+833,980	24%	50%	Urbanizing
Tarrant	+475,932	14%	64%	Core
Ellis	+229,865	7%	70%	Outer
Parker	+202,942	6%	76%	Outer
Johnson	+162,981	5%	81%	Outer
Kaufman	+155,371	4%	85%	Outer
Dallas	+122,104	3%	89%	Core
Rockwall	+121,088	3%	92%	Outer
Hunt	+92,433	3%	95%	Outer
Wise	+91,756	3%	97%	Outer
Hood	+91,507	3%	100%	Outer
Total	+3,515,004	100%		

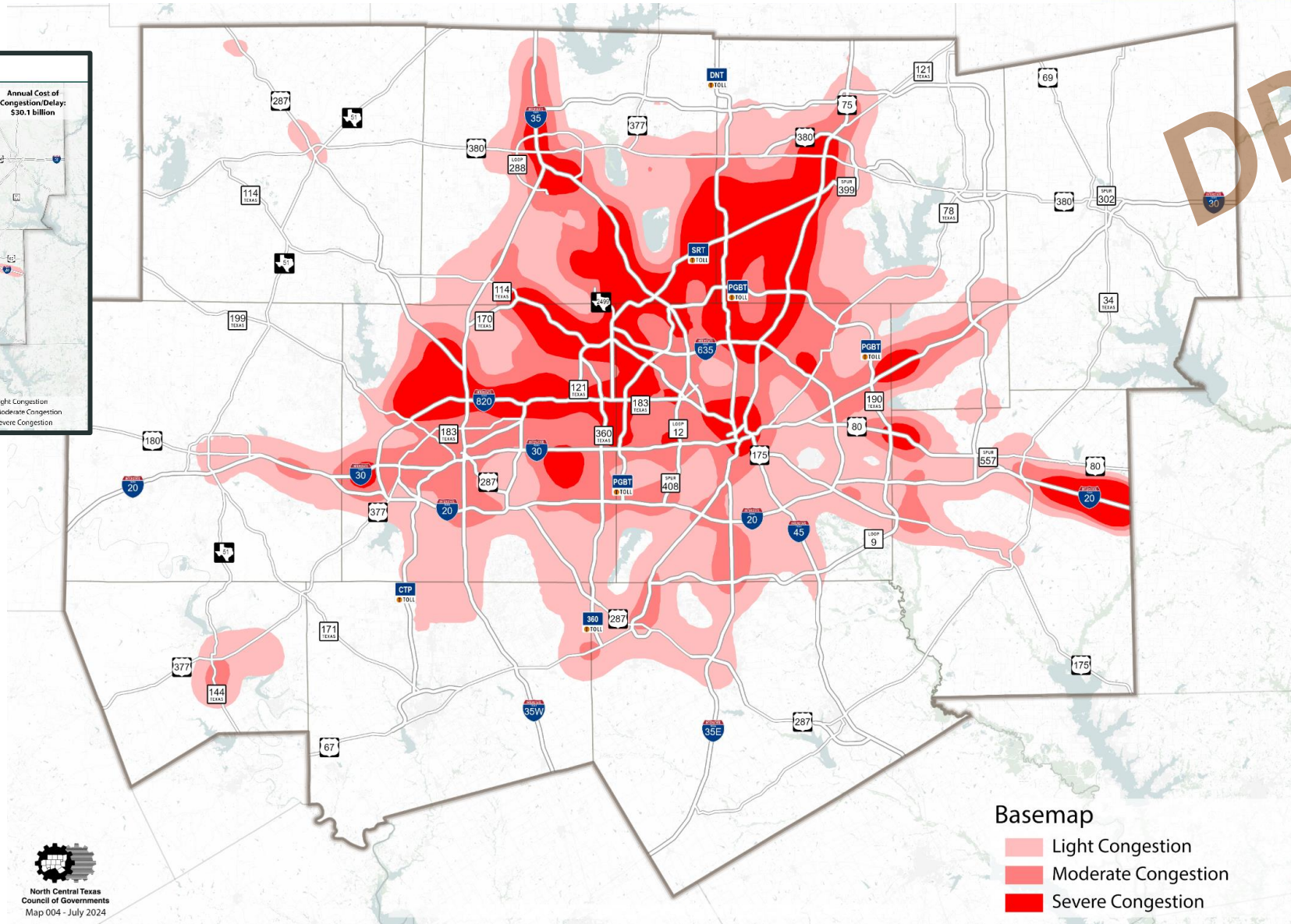
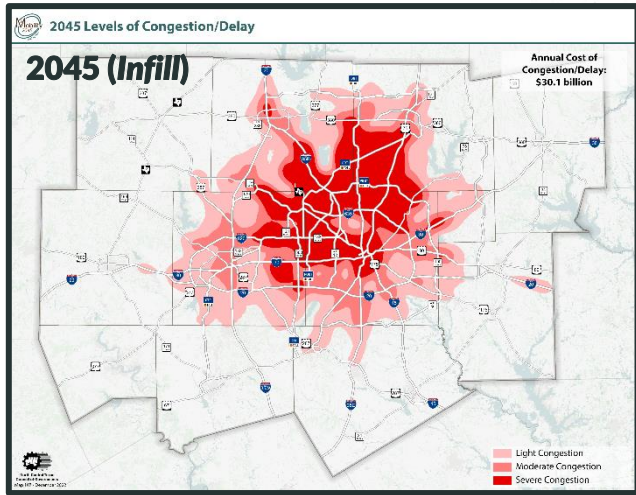






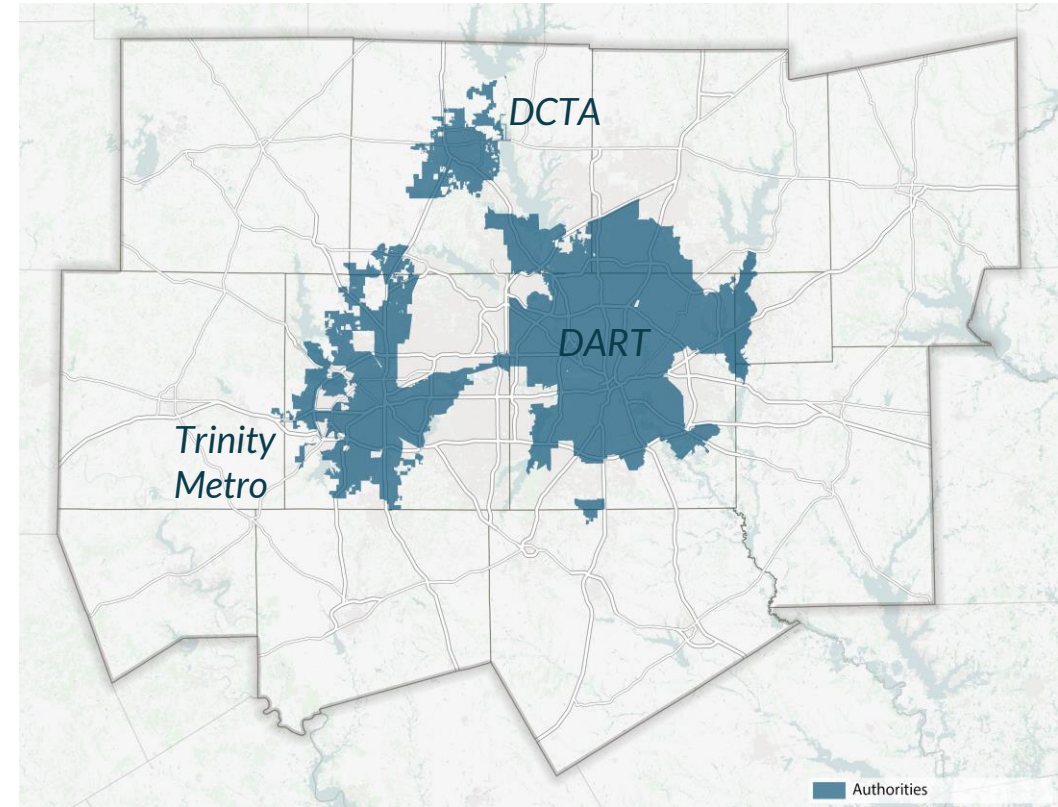
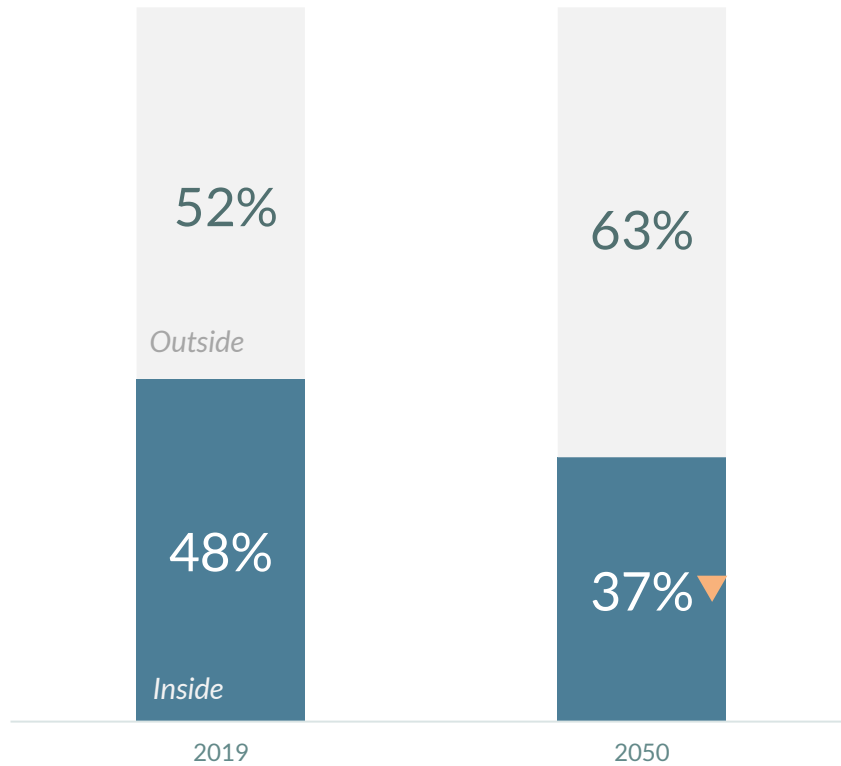
2050 Level of Congestion/Delay (New Baseline Forecast)

DRAFT



North Central Texas
Council of Governments
Map 004 - July 2024

The population living inside a transit authority service area is expected to fall from 48% in 2019 to only 37% by 2050.

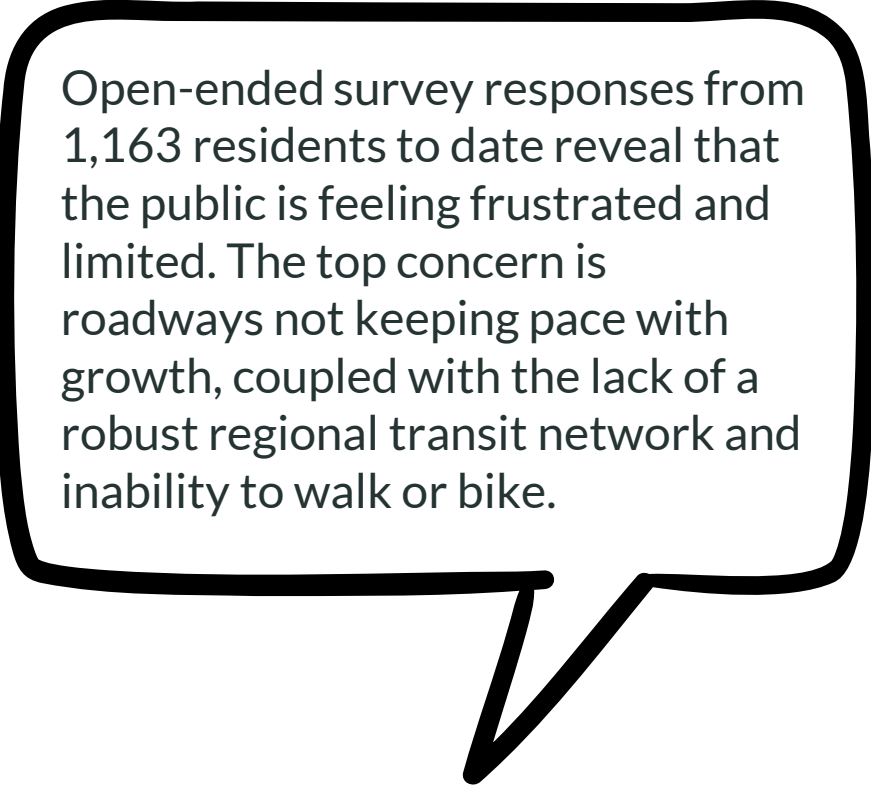


Public input reflects awareness of the population growth and its impacts.

2,000+ Survey responses through June 2024

1,100+ Open-ended responses collected through June 2024

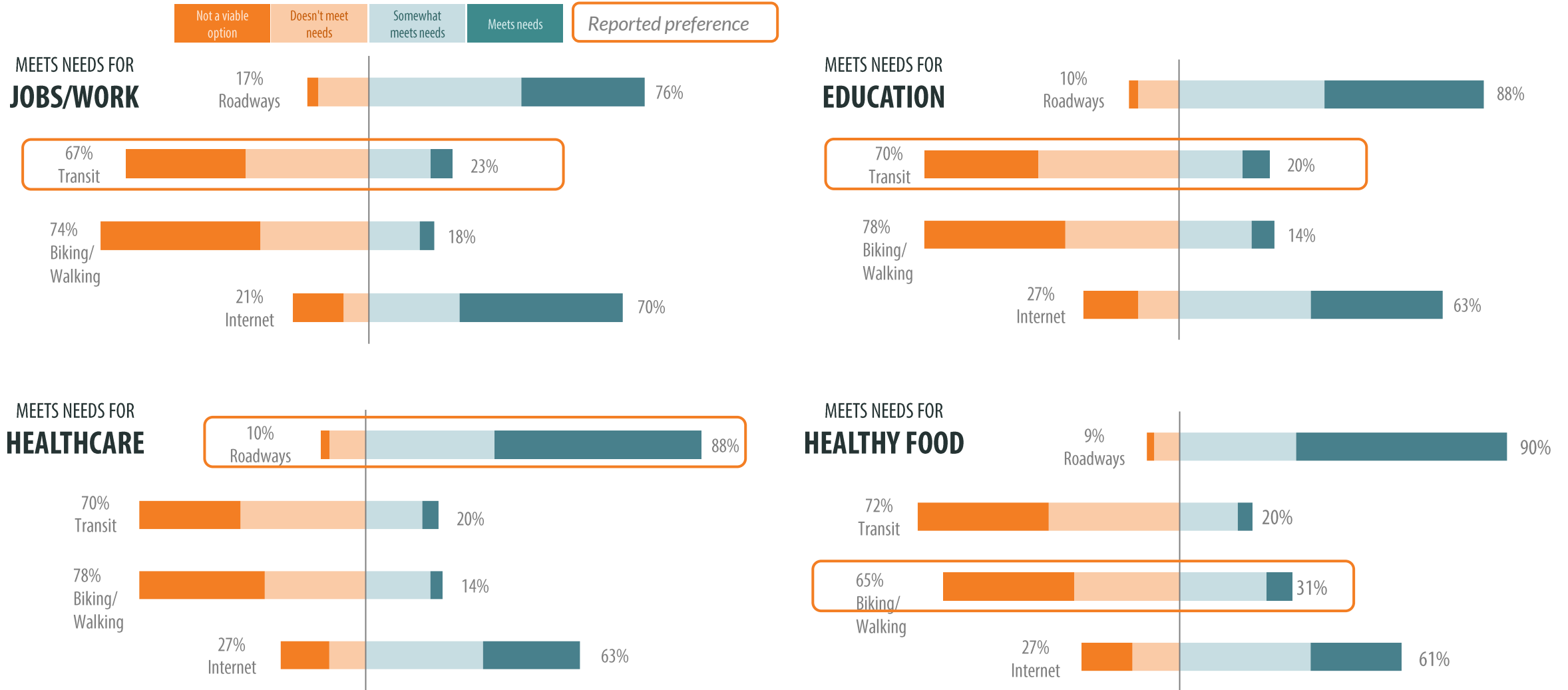
300+ Map Your Experience comments through June 2024



Open-ended survey responses from 1,163 residents to date reveal that the public is feeling frustrated and limited. The top concern is roadways not keeping pace with growth, coupled with the lack of a robust regional transit network and inability to walk or bike.

What should we solve?

Transit and active transportation are the most needed modal investments, according to members of the public.



Emerging Policy Priorities

What is not changing?

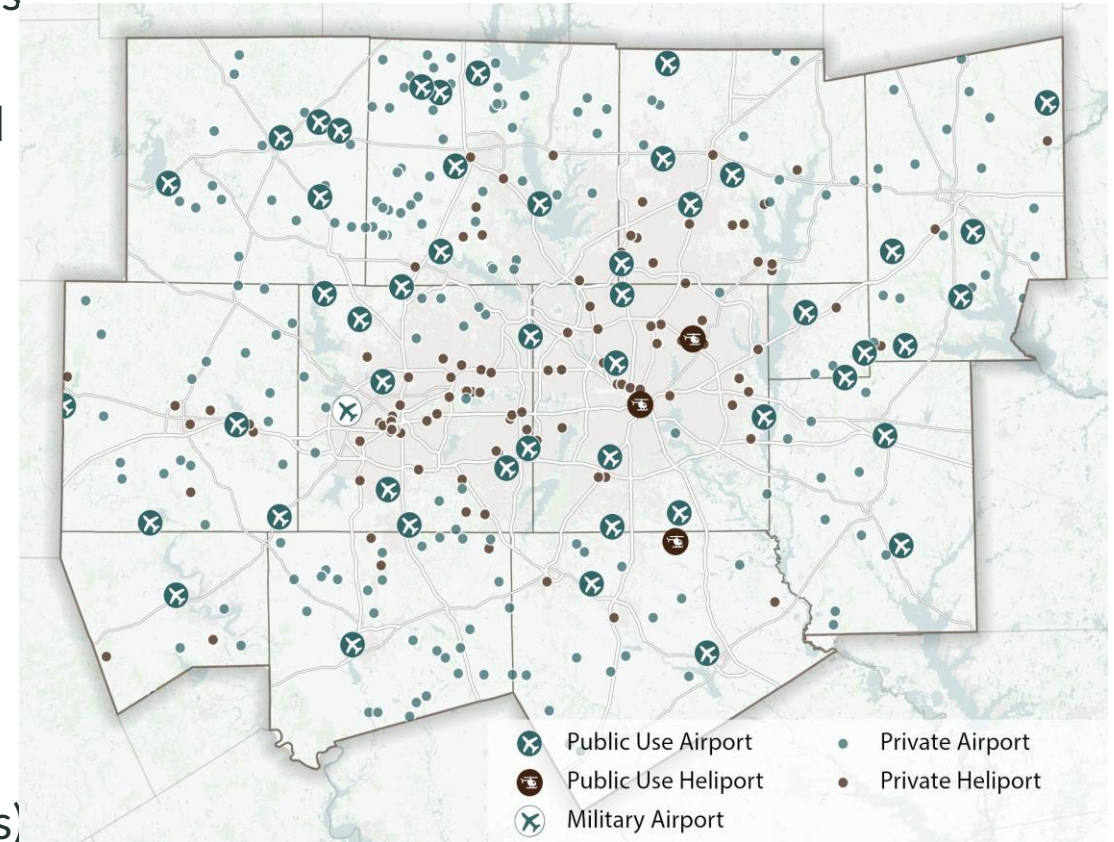
- Continuity of projects over long project development cycles
- Goal themes remain in sync with overall public and policy priority

What are items to examine?

- How to generate infill development/density
- Transit 2.0 guidance for policies to support transit system strategy
- Safety as a priority, including performance measures, modal safety issues, and strategies
- Funding and cost of implementing projects

Aviation Policies in the Plan

- AV3-001: Improve efficiency, safety, air quality, and access related to aviation.
- AV3-002: Provide input to the National Plan of Integrated Airport Systems and the Texas Airport System Plan.
- AV3-003: Encourage compatible land-use planning surrounding airports in the region.
- AV3-004: Establish a comprehensive and integrated Aviation Education System in North Central Texas.
- AV3-005: Implement operational restrictions and other requirements of uncrewed aircraft systems around regionally significant aviation facilities.
- AV3-006: Safely and efficiently integrate vertical mobility technology (advanced air mobility, urban air mobility, unmanned traffic management, uncrewed aircraft systems) into the North Central Texas Council of Governments region.



Highlighted Technology Policies

TT3-013: The region will work with educational institutions at all levels to develop workforce training solutions to prepare area residents for job opportunities in the emerging transportation technologies sector, to pursue funding opportunities, and to support deployments of automated vehicles and other emerging transportation technologies.

TT3-014: The region will prioritize the safety of all transportation system users in and through the deployment of emerging modes of transportation such as e-scooters, e-bikes, automated vehicles, and delivery robots through the use of strategic technology, design, and policy solutions.



Public Input on Aviation

Transit Services to Complement Aviation Mode of Travel

- TRE and Bus Services: Recommendations for more frequent service in the Centreport area, including Sundays.
- Overnight Parking: Proposal to permit overnight parking to facilitate transit use to/from the airport.
- DFW Airport: Suggestions for improved transit options to/from DFW Airport, including rideshare services by DCTA and express train connections.
- Suggestion for a new DART line connecting Mockingbird Lane to a new "Love Field Station" with direct access, bypassing downtown and including an in-fill station at Dallas North Tollway and Lovers Lane.

Airport Connectivity and Accessibility

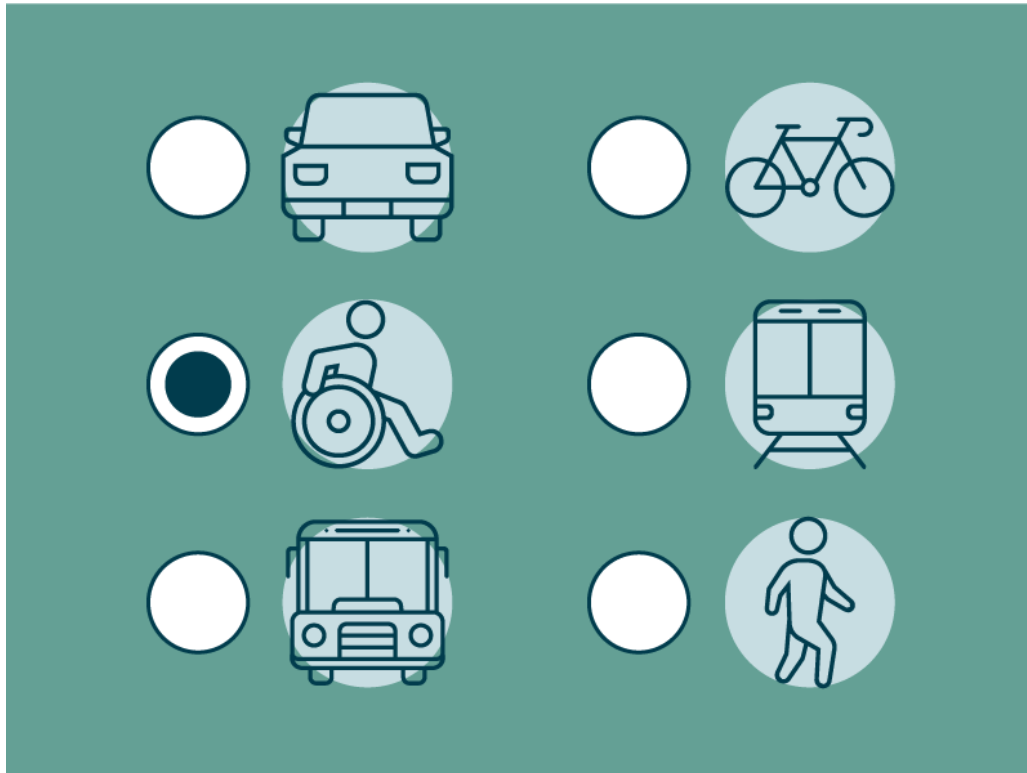
- Highlighting the need for more on-demand accessible taxis and rideshares for disabled travelers at DFW Airport and Love Field.
- Proposal to explore tunneling under Love Field for direct airport access.

Traffic Congestion Around Love Field

- Heavy traffic due to Love Field Airport (Dallas North Tollway and Mockingbird Lane).
- Mockingbird Lane: Originally a residential street, now heavily used for airport traffic.
- Need for Study: Suggestion to identify alternate routes using IH 35 to alleviate congestion on Mockingbird Lane.

If you haven't already, there's still time to provide input at www.nctcog.org/M50

Take the Survey/Opinion Poll



Map Your Experience



Stay Connected



Website

nctcog.org/planinprogress



Social media

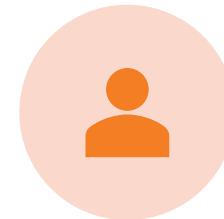
@nctcogtrans

#PlanInProgress



Public Meetings

nctcog.publicinput.com/#events



Public Input Platform

publicinput.com/mobility2050



Email Us

mobility2050@publicinput.com



Take the Survey

nctcog.org/mobility2050survey



Contact Us



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Principal Transportation Planner

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Website

www.nctcog.org/PlanInProgress

Air Transportation Advisory Committee

August 1, 2024

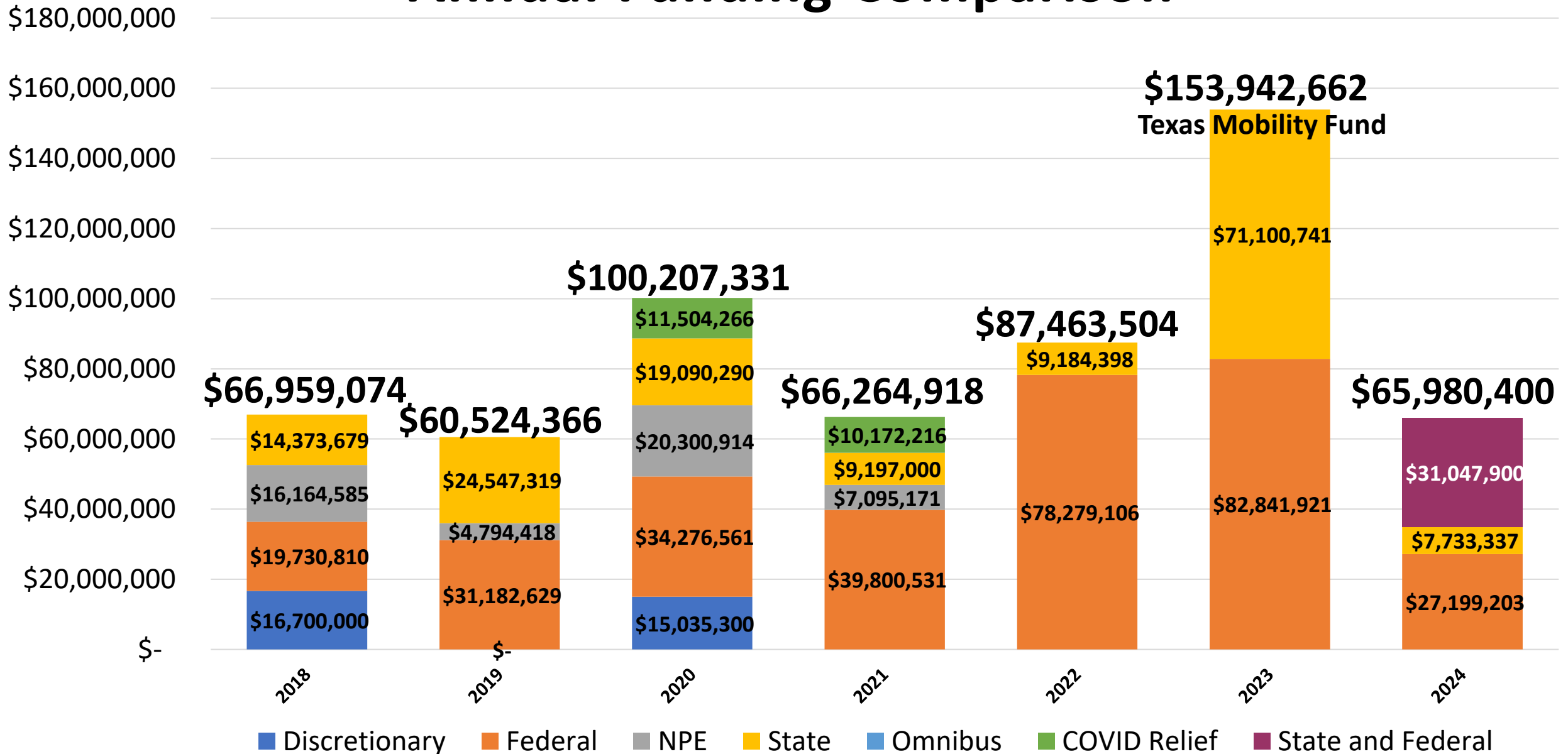


Regional Airport Funding Update
Ernest Huffman



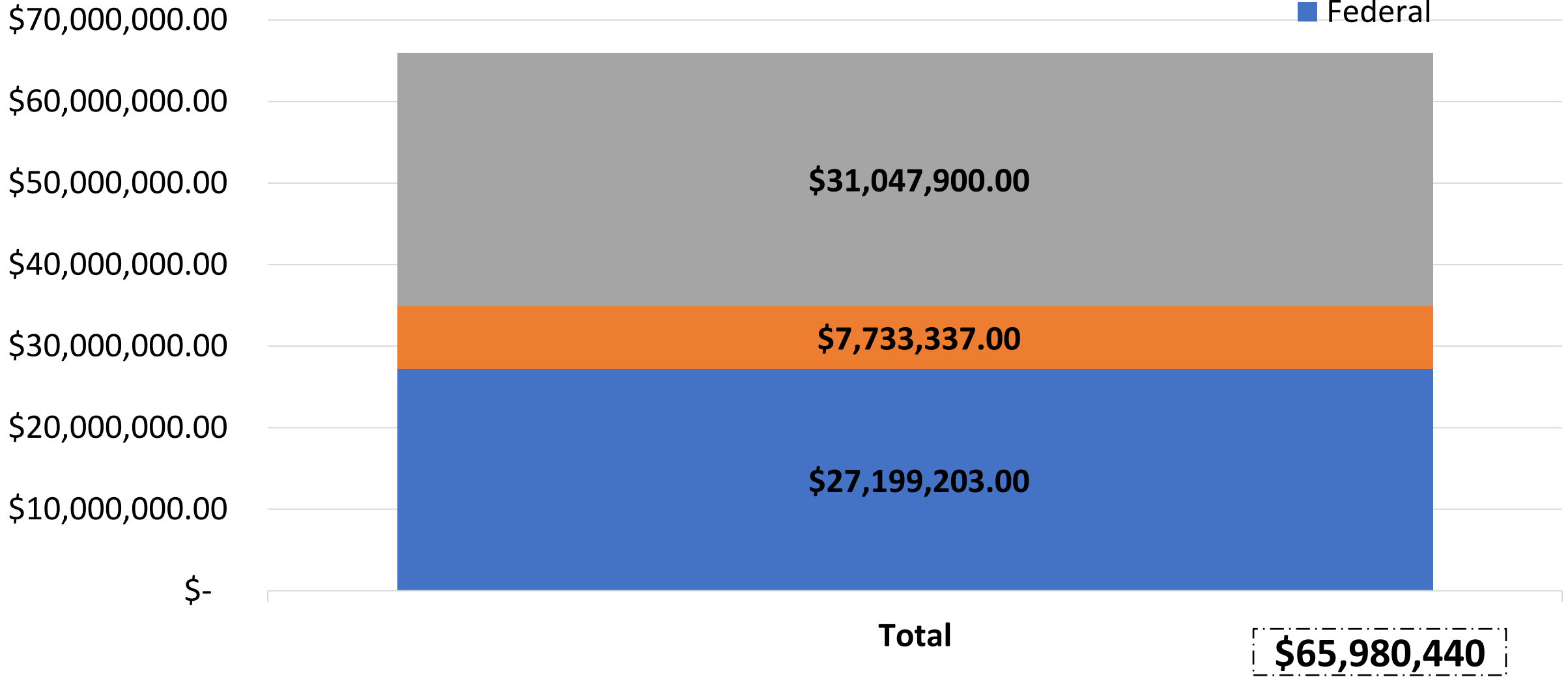
Texas

Annual Funding Comparison

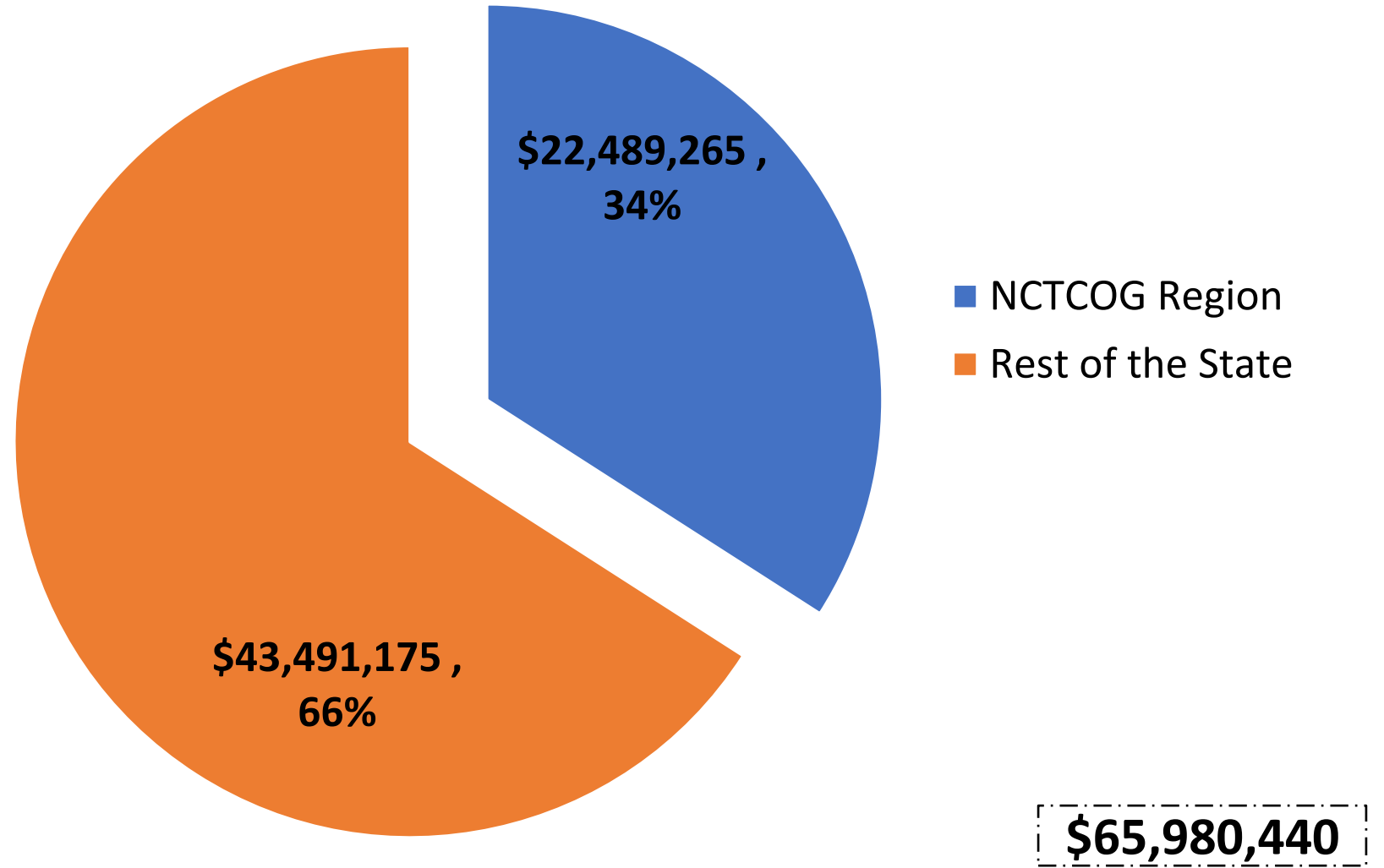


Texas Grants by Funding Source 2024

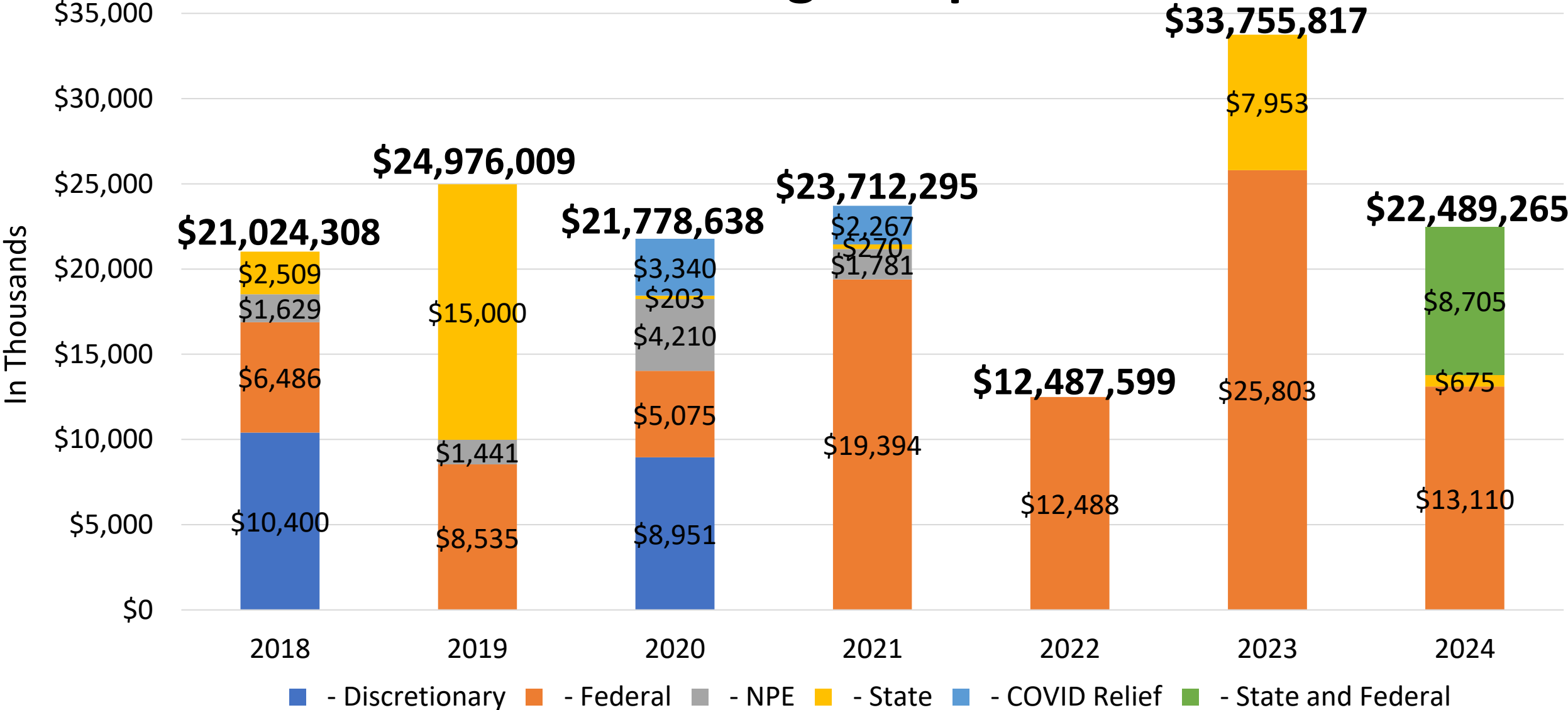
- State and Federal
- State
- Federal



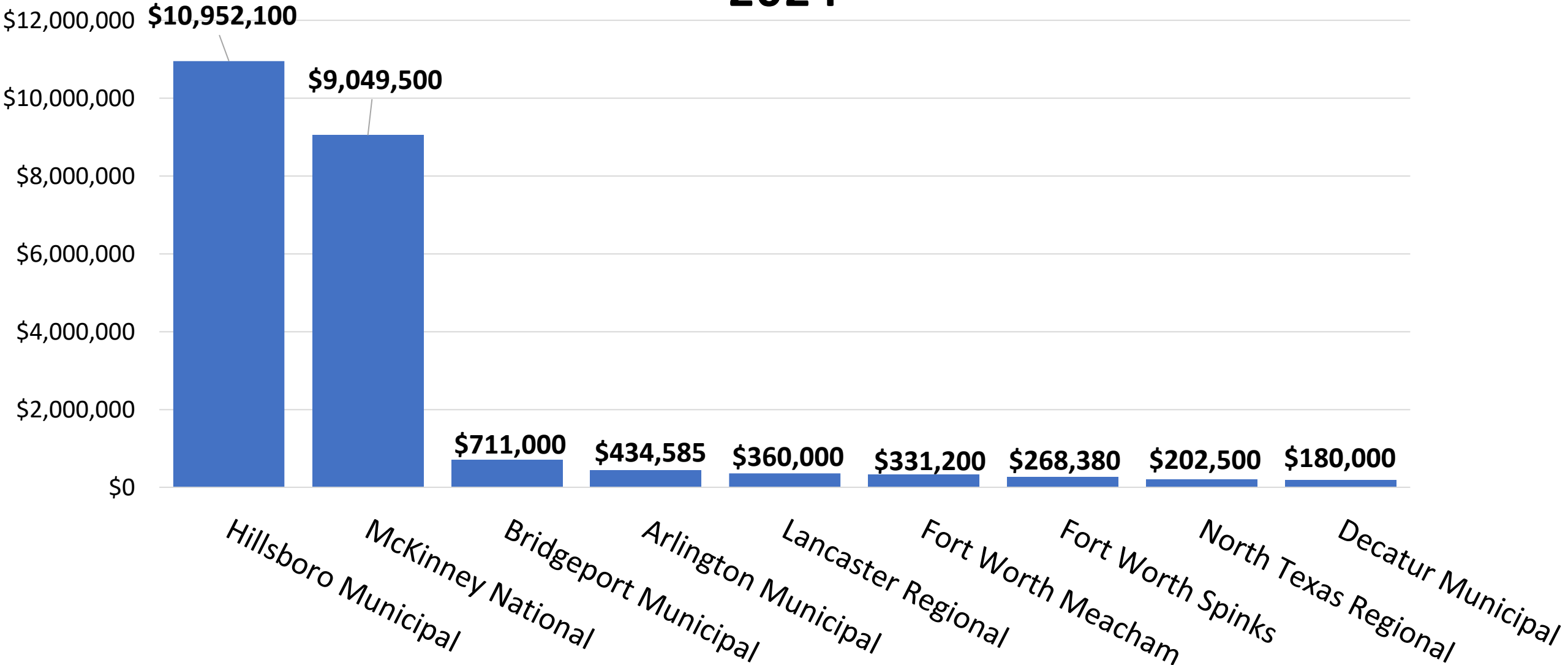
NCTCOG Region vs. Non-Regional Funding 2024



2024 NCTCOG Region Annual Funding Comparison



NCTCOG Region Airport Grant Amount 2024



Other Updates



North Texas Airspace
Awareness Pilot

[Airspace Dashboards](#)



FAA's UAS Traffic Management
(UTM) Key Site News

[Announcement](#)



World Cup 2026 AAM Planning

Questions?

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