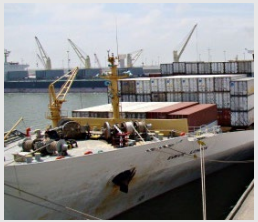
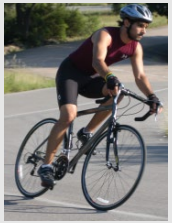
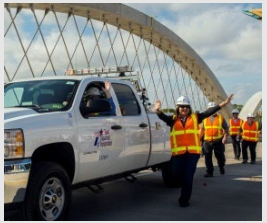


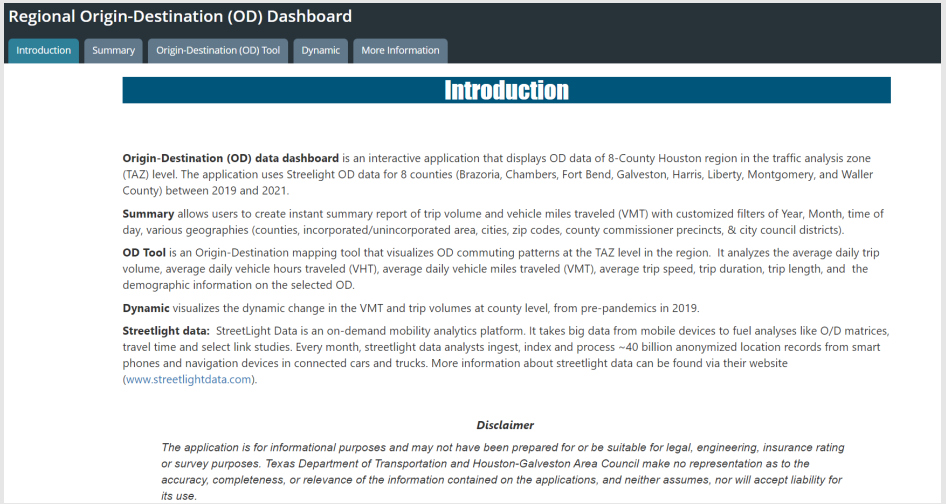
Houston Origin-Destination Travel Behavior Dashboard

Using Big Data and Tableau to Inform Decision Making

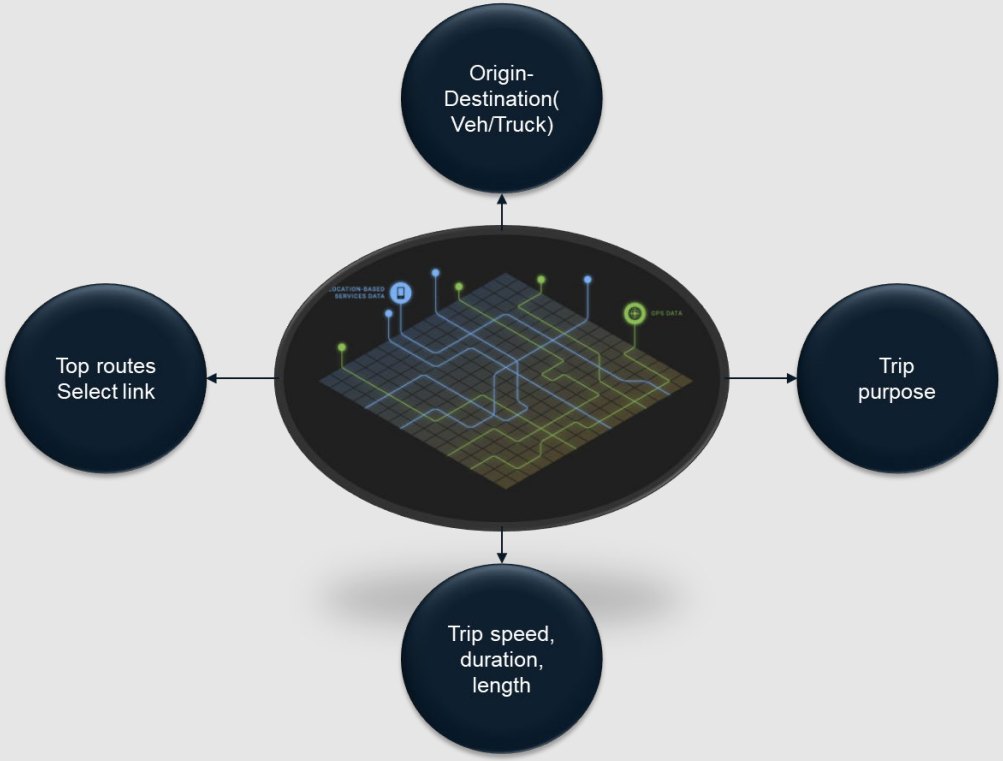
Qing Li, Ph.D., Transportation Planner, Houston District, TxDOT, Houston, Texas
Heng Wang, P.E., Transportation modeler, Houston District, TxDOT, Houston, Texas
Sungmin Lee, Principal Data Analyst, Houston-Galveston Area Council

Regional Origin-Destination (OD) Dashboard

- Interactive online tool
- Focus on traffic demand
- Covers 8 counties
- Big data-Streetlight data

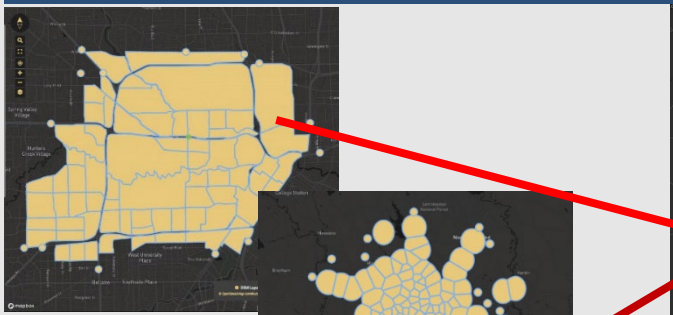


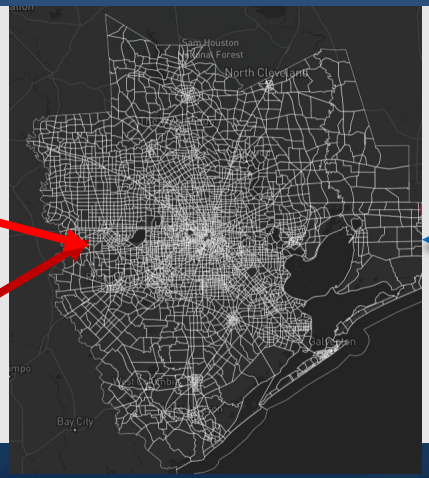
Streetlight Data



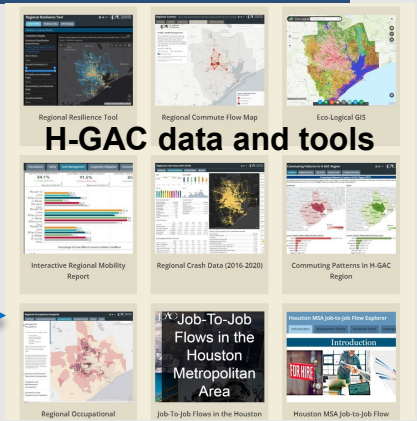
Houston Origin-Destination Dashboard

- Historical Streetlight monthly data
- Standardize Streetlight zone structure for future users in Houston area
- Linked with H-GAC dataset and tools
- Summarize the data and visualize the data for planners and engineers to better understand the travel pattern in the region
- Monitor OD travel pattern and the regional VMT change due to Pandemic
- Provide OD information for planning studies such as mobility study, corridor study and PEL





5000 TAZ zone structure



Summary - All Vehicle Weekday Jan 2019 - Dec 2021

REGIONAL DATA LAB

Trip Volume (Vol)

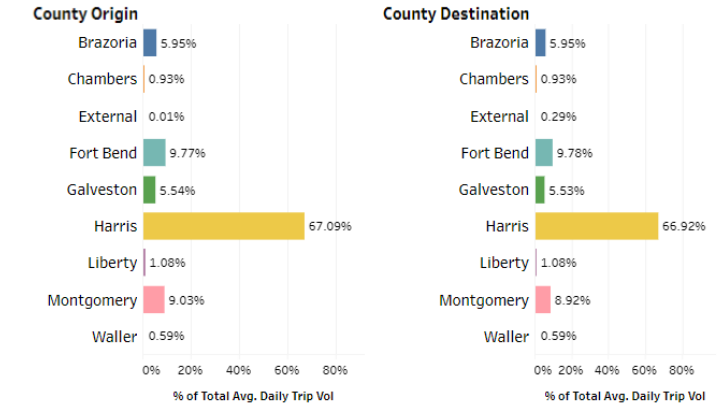
Avg. Daily Trip Vol, All Weekday (24 hr, Tu - Th)	16,248,476	100.0%
Avg. Daily Trip Vol, Morning (AM peak: 6 AM - 9 AM)	2,420,453	14.9%
Avg. Daily Trip Vol, Mid-Day (MD peak: 9 AM - 3 PM)	5,500,286	33.9%
Avg. Daily Trip Vol, Afternoon (PM peak: 3 PM - 7 PM)	5,057,292	31.1%

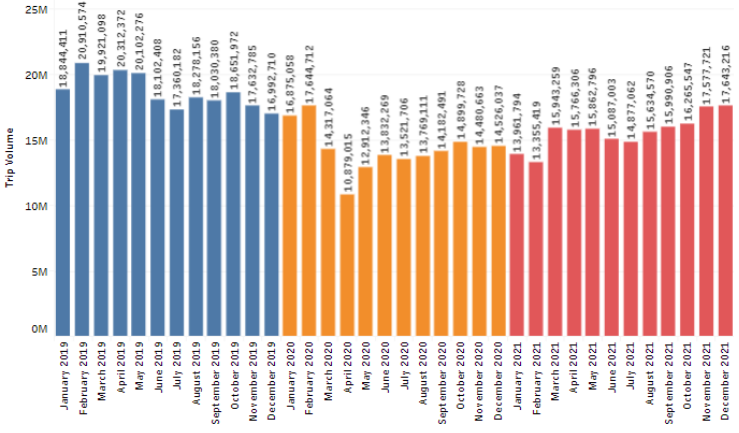
Vehicle Miles Traveled (VMT)

Avg. Daily VMT, All Weekday (24 hr, Tu - Th)	159,525,876	100.0%
Avg. Daily VMT, Morning (AM peak: 6 AM - 9 AM)	28,364,519	17.8%
Avg. Daily VMT, Mid-Day (MD peak: 9 PM - 3 PM)	49,687,738	31.1%
Avg. Daily VMT, Afternoon (PM peak: 3 PM - 7 PM)	47,768,857	29.9%

Select Date: Jan 2019 - Dec 2021
Select Dataset: All Weekday (Tu-Th)
County Origin: All
County Destination: All
City Origin: (All)
City Destination: (All)
Tract Origin: (All)
Tract Destination: (All)
Zone Origin: (All)
Zone Destination: (All)
Mgmt. Dist. Origin: All
Mgmt. Dist. Destination: All
Zip Origin: (All)
Zip Destination: (All)
Unincorp. Area Origin: All
Unincorp. Area Destinaton: All

Eight Counties and External Zones All Weekday (Tu-Th) in Jan 2019 - Dec 2021





Summary - All Vehicle Weekday Jan 2019 - Dec 2021

REGIONAL DATA LAB

Trip Volume (Vol)

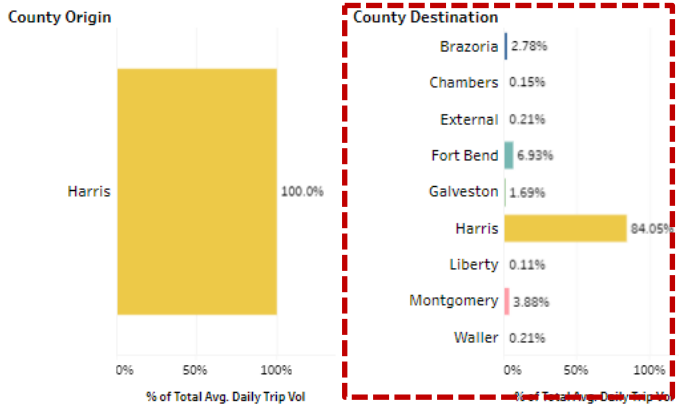
Avg. Daily Trip Vol, All Weekday (24 hr, Tu - Th)	123,177	100.0%
Avg. Daily Trip Vol, Morning (AM peak: 6 AM - 9 AM)	6,827	5.5%
Avg. Daily Trip Vol, Mid-Day (MD peak: 9 AM - 3 PM)	37,079	30.1%
Avg. Daily Trip Vol, Afternoon (PM peak: 3 PM - 7 PM)	55,465	45.0%

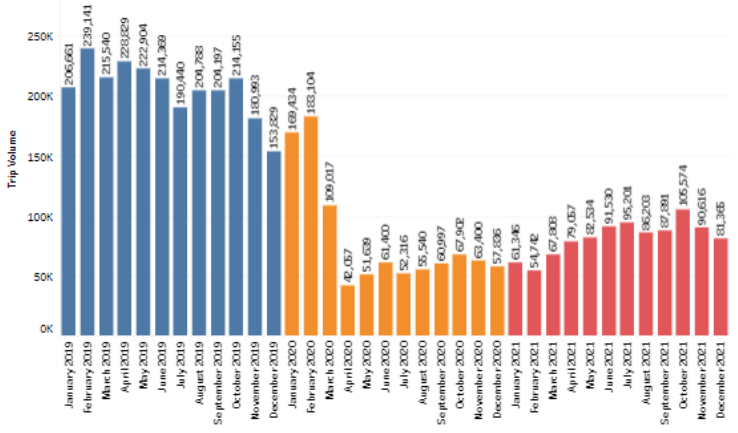
Vehicle Miles Traveled (VMT)

Avg. Daily VMT, All Weekday (24 hr, Tu - Th)	1,884,848	100.0%
Avg. Daily VMT, Morning (AM peak: 6 AM - 9 AM)	63,008	3.3%
Avg. Daily VMT, Mid-Day (MD peak: 9 PM - 3 PM)	465,235	24.7%
Avg. Daily VMT, Afternoon (PM peak: 3 PM - 7 PM)	980,768	52.0%

Select Date: Jan 2019 - Dec 2021	Select Dataset: All Weekday (Tu-Th)
County Origin: All	County Destination: All
City Origin: (All)	City Destination: (All)
Tract Origin: (All)	Tract Destination: (All)
Zone Origin: (All)	Zone Destination: (All)
Mgmt. Dist. Origin: HOUSTON DOWNTOWN	Mgmt. Dist. Destination: All
Zip Origin: (All)	Zip Destination: (All)
Unincorp. Area Origin: All	Unincorp. Area Destinaton: All

Eight Counties and External Zones All Weekday (Tu-Th) in Jan 2019 - Dec 2021





Summary - All Vehicle Weekday Jan 2019 - Dec 2021

Trip Volume (Vol)

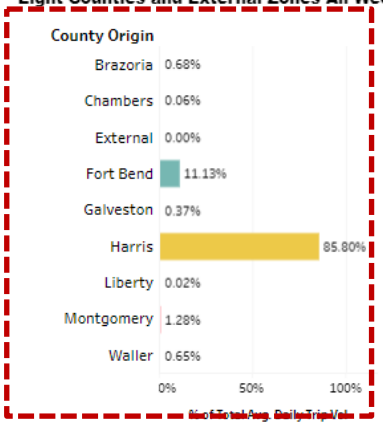
Avg. Daily Trip Vol, All Weekday (24 hr, Tu - Th)	61,150	100.0%
Avg. Daily Trip Vol, Morning (AM peak: 6 AM - 9 AM)	17,350	28.4%
Avg. Daily Trip Vol, Mid-Day (MD peak: 9 AM - 3 PM)	20,417	33.4%
Avg. Daily Trip Vol, Afternoon (PM peak: 3 PM - 7 PM)	12,712	20.8%

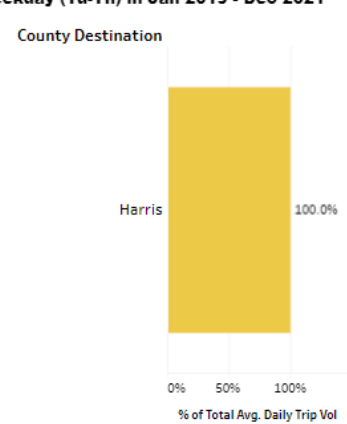
Vehicle Miles Traveled (VMT)

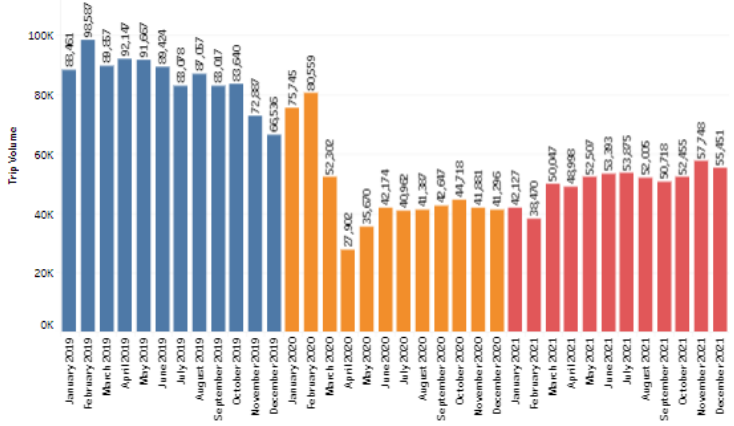
Avg. Daily VMT, All Weekday (24 hr, Tu - Th)	706,334	100.0%
Avg. Daily VMT, Morning (AM peak: 6 AM - 9 AM)	261,163	37.0%
Avg. Daily VMT, Mid-Day (MD peak: 9 PM - 3 PM)	186,418	26.4%
Avg. Daily VMT, Afternoon (PM peak: 3 PM - 7 PM)	118,025	16.7%

Select Date: Jan 2019 - Dec 2021
Select Dataset: All Weekday (Tu-Th)
County Origin: All
County Destination: All
City Origin: (All)
City Destination: (All)
Tract Origin: (All)
Tract Destination: (All)
Zone Origin: (All)
Zone Destination: (All)
Mgmt. Dist. Origin: All
Mgmt. Dist. Destination: ENERGY CORRIDOR
Zip Origin: (All)
Zip Destination: (All)
Unincorp. Area Origin: All
Unincorp. Area Destinaton: All

Eight Counties and External Zones All Weekday (Tu-Th) in Jan 2019 - Dec 2021





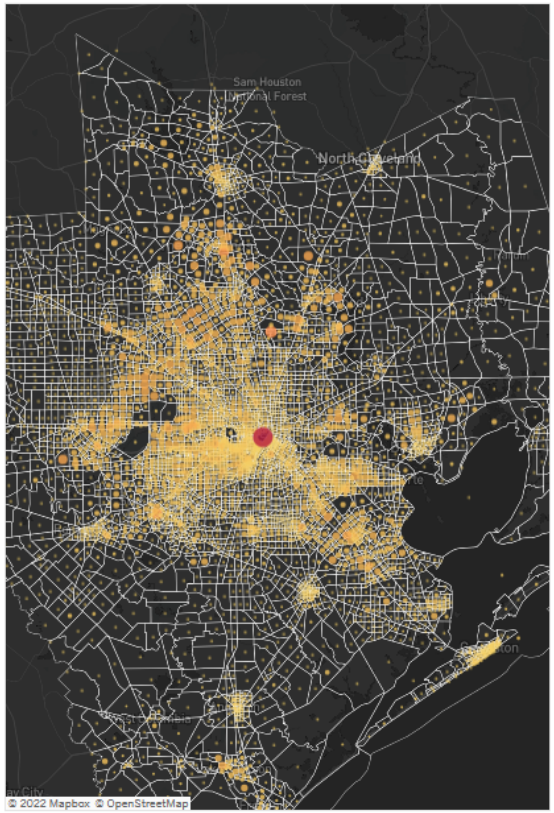


OD Search Tool for All Vehicles Weekday

Origin Daily Trip Vol
0 — 120,896

Destination Daily Trip Vol
0 — 120,896

Origin



Geography Filter

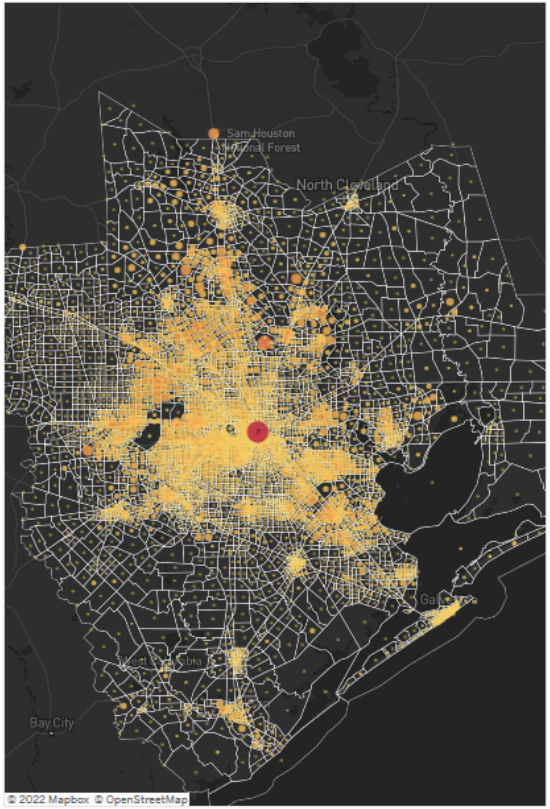
Select Date: Jan 2019 - Dec 2021	Select Dataset: All Weekday (Tu-Th)
County Origin: All	County Destination: All
City Origin: (All)	City Destination: (All)
Mgmt. Dist. Origin: All	Mgmt. Distr. Destination: All
Zip Origin: (All)	Zip Destination: (All)
Tract Origin: (All)	Tract Destination: (All)
Unincorp. Area Origin: All	Unincorp. Area Dest.: All
Zone Origin: (All)	Zone Destination: (All)

Jan 2019 - Dec 2021 All Weekday (Tu-Th)

Summary

Avg. Daily Trip Vol	16,248,476
Avg. Daily VMT (mi)	159,525,876
Avg. Length (mi)	10
Origin Population	7,129,642
Origin Jobs	3,241,815
Destination Population	7,129,642
Destination Jobs	3,241,815

Destination

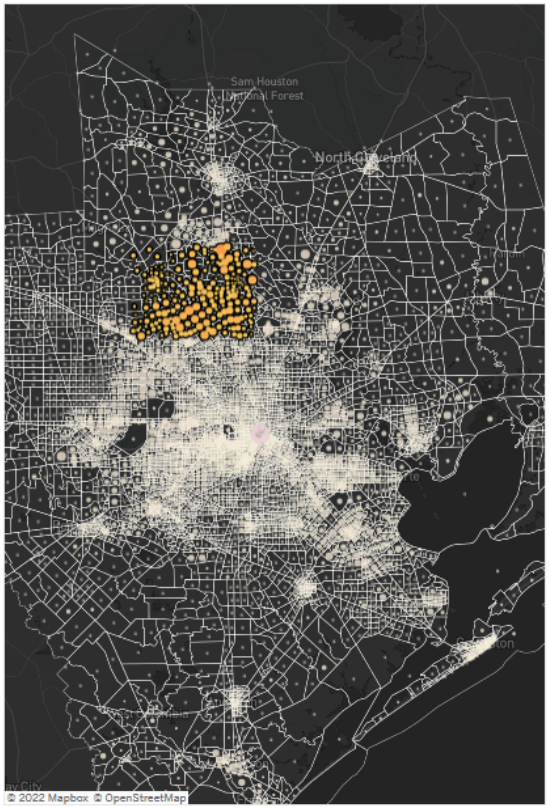


OD Search Tool for All Vehicles Weekday

Origin Daily Trip Vol
0 — 120,896

Destination Daily Trip Vol
0 — 120,896

Origin



Geography Filter

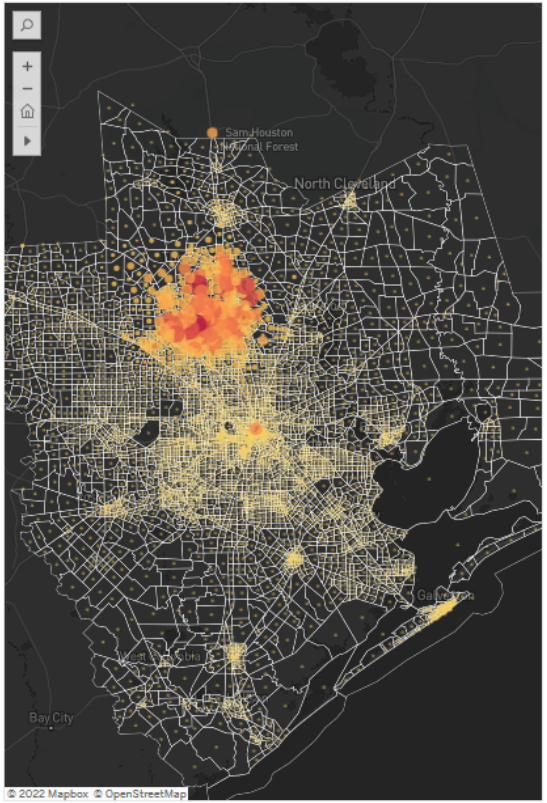
Select Date: Jan 2019 - Dec 2021	Select Dataset: All Weekday (Tu-Th)
County Origin: All	County Destination: All
City Origin: (All)	City Destination: (All)
Mgmt. Dist. Origin: All	Mgmt. Distr. Destination: All
Zip Origin: (All)	Zip Destination: (All)
Tract Origin: (All)	Tract Destination: (All)
Unincorp. Area Origin: All	Unincorp. Area Dest.: All
Zone Origin: (All)	Zone Destination: (All)

Jan 2019 - Dec 2021 All Weekday (Tu-Th)

Summary

Avg. Daily Trip Vol	1,467,770
Avg. Daily VMT (mi)	14,102,398
Avg. Length (mi)	10
Origin Population	655,734
Origin Jobs	248,798
Destination Population	7,129,490
Destination Jobs	3,241,809

Destination



Identify the most popular Origin and Destination TAZs

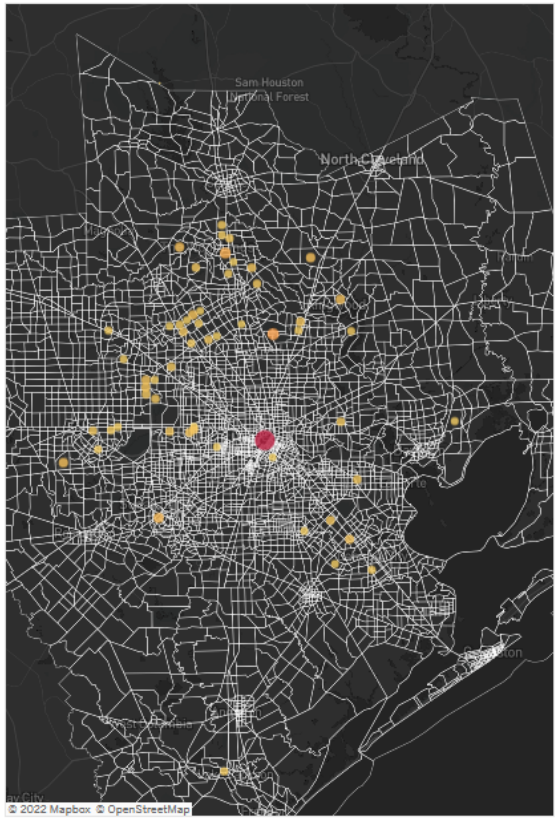
Summary | OD Tool | Dynamic

OD Search Tool for All Vehicles Weekday

Origin Daily Trip Vol
16,920 — 120,896

Destination Daily Trip Vol
16,920 — 120,896

Origin



Geography Filter

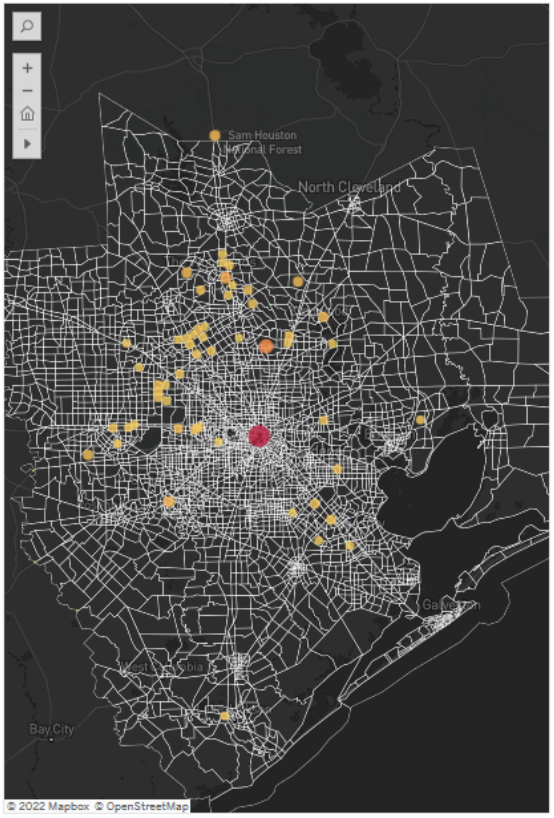
Select Date: Jan 2019 - Dec 2021	Select Dataset: All Weekday (Tu-Th)
County Origin: All	County Destination: All
City Origin: (All)	City Destination: (All)
Mgmt. Dist. Origin: All	Mgmt. Distr. Destination: All
Zip Origin: (All)	Zip Destination: (All)
Tract Origin: (All)	Tract Destination: (All)
Unincorp. Area Origin: All	Unincorp. Area Dest.: All
Zone Origin: (All)	Zone Destination: (All)

Jan 2019 - Dec 2021 All Weekday (Tu-Th)

Summary

Avg. Daily Trip Vol	16,248,476
Avg. Daily VMT (mi)	159,525,876
Avg. Length (mi)	10
Origin Population	7,129,642
Origin Jobs	3,241,815
Destination Population	7,129,642
Destination Jobs	3,241,815

Destination



All Vehicles . All Weekday (Tu-Th) . Eight Counties

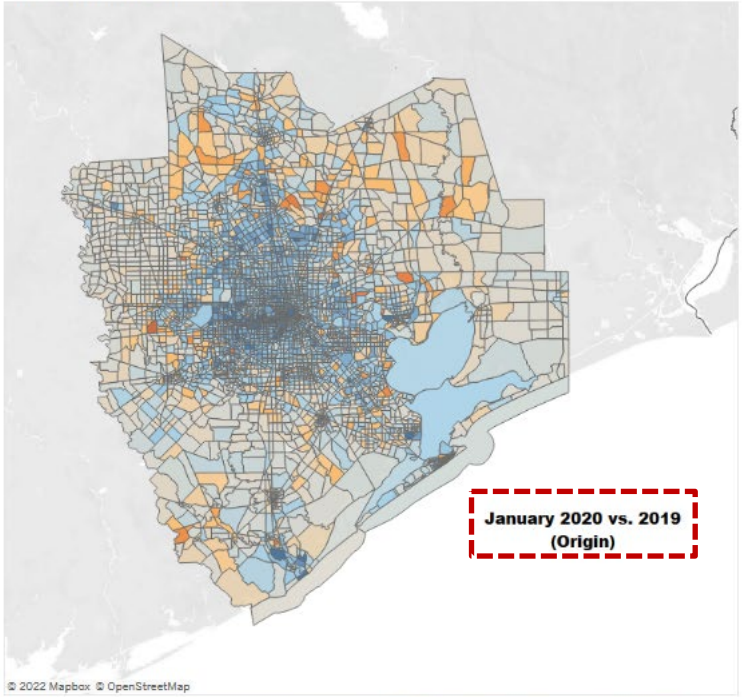
Month, Year of Date: January 2020 | Show history

Select Dataset: All Weekday (Tu-Th)

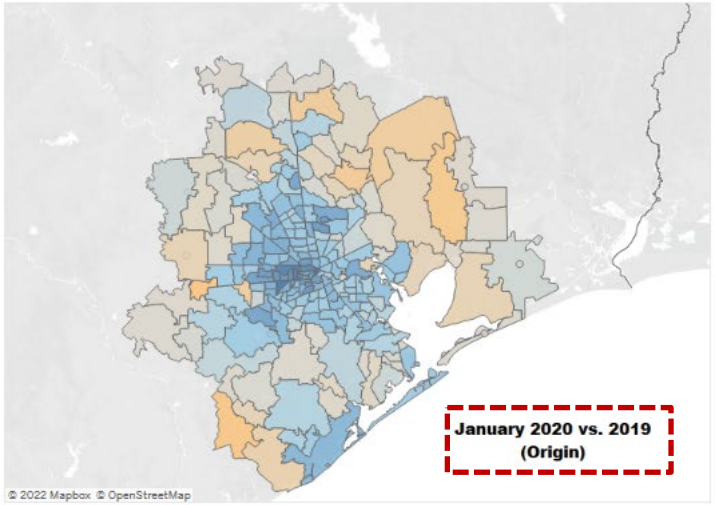
Select County: Eight Counties

Select Origin/Destination at Zip Level: Zip_vol_diff_Origin

Trip Volume Change at TAZ Level

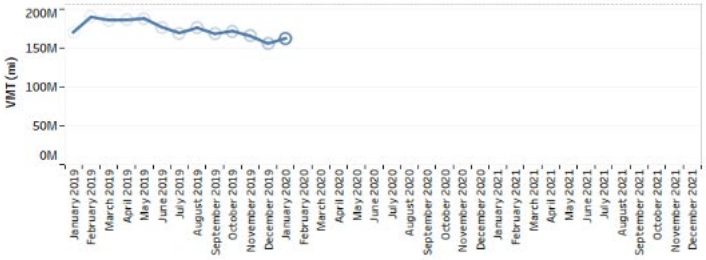


Avg. Diff - ... -4,000 4,000



Avg. Diff - ... -50,000 50,000

Eight Counties VMT in January 2020



TAZ : Traffic Analysis Zone | VMT : Vehicle Mileage Traveled | VHT : Vehicle Hours Traveled

All Vehicles . All Weekday (Tu-Th) . Eight Counties

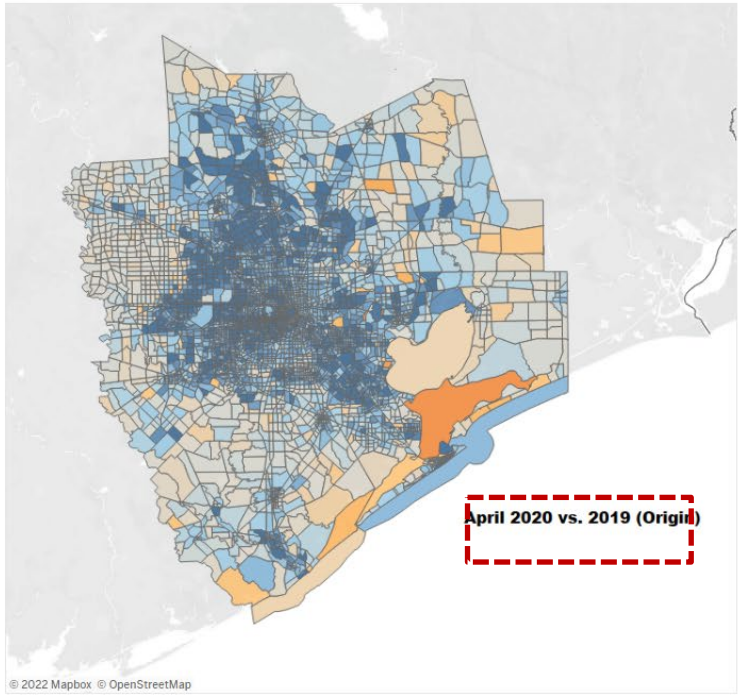
Month, Year of Date: April 2020 | Show history

Select Dataset: All Weekday (Tu-Th)

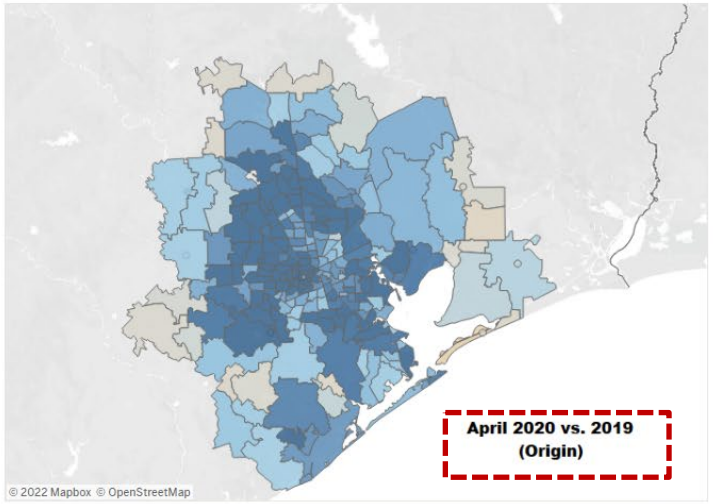
Select County: Eight Counties

Select Origin/Destination at Zip Level: Zip_vol_diff_Origin

Trip Volume Change at TAZ Level

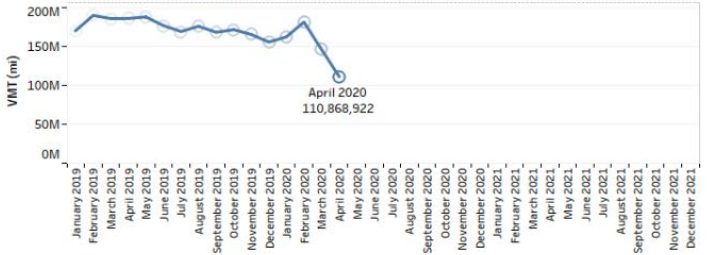


Avg. Diff - ... -4,000 4,000



Avg. Diff - ... -50,000 50,000

Eight Counties VMT in April 2020



TAZ : Traffic Analysis Zone | **VMT** : Vehicle Mileage Traveled | **VHT** : Vehicle Hours Traveled

All Vehicles . All Weekday (Tu-Th) . Eight Counties

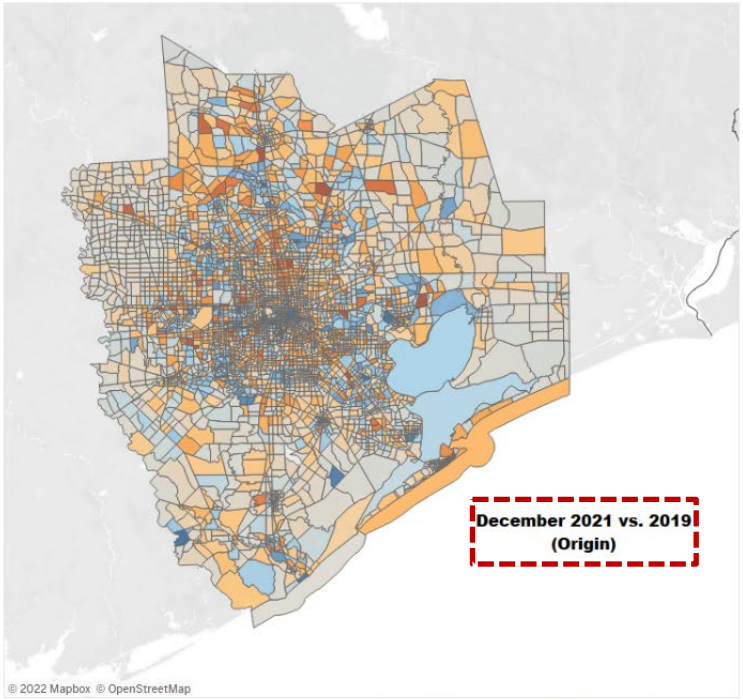
Month, Year of Date: December 2021 | Show history

Select Dataset: All Weekday (Tu-Th)

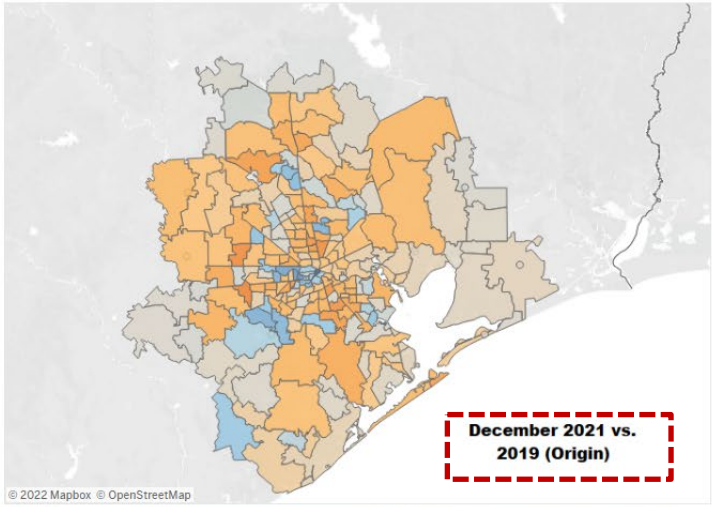
Select County: Eight Counties

Select Origin/Destination at Zip Level: Zip_vol_diff_Origin

Trip Volume Change at TAZ Level

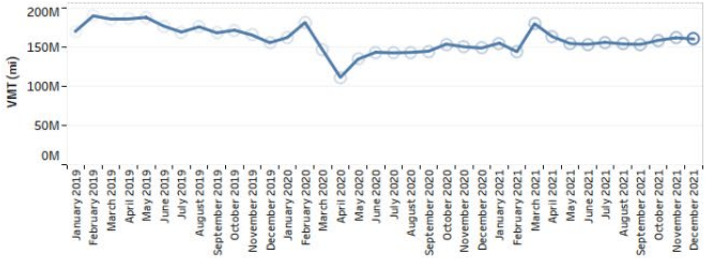


Avg. Diff - ... -4,000 4,000



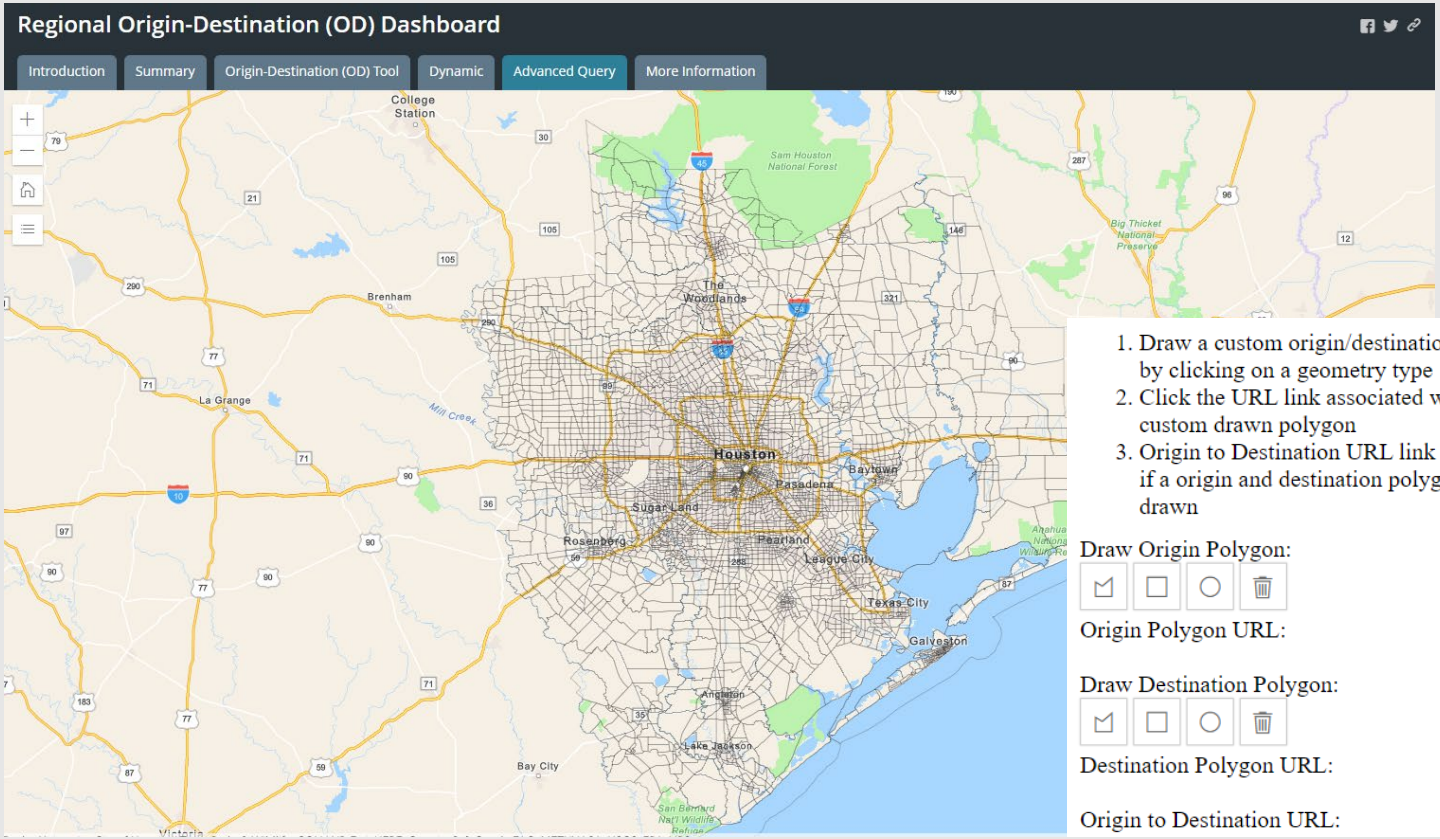
Avg. Diff - ... -50,000 50,000

Eight Counties VMT in December 2021

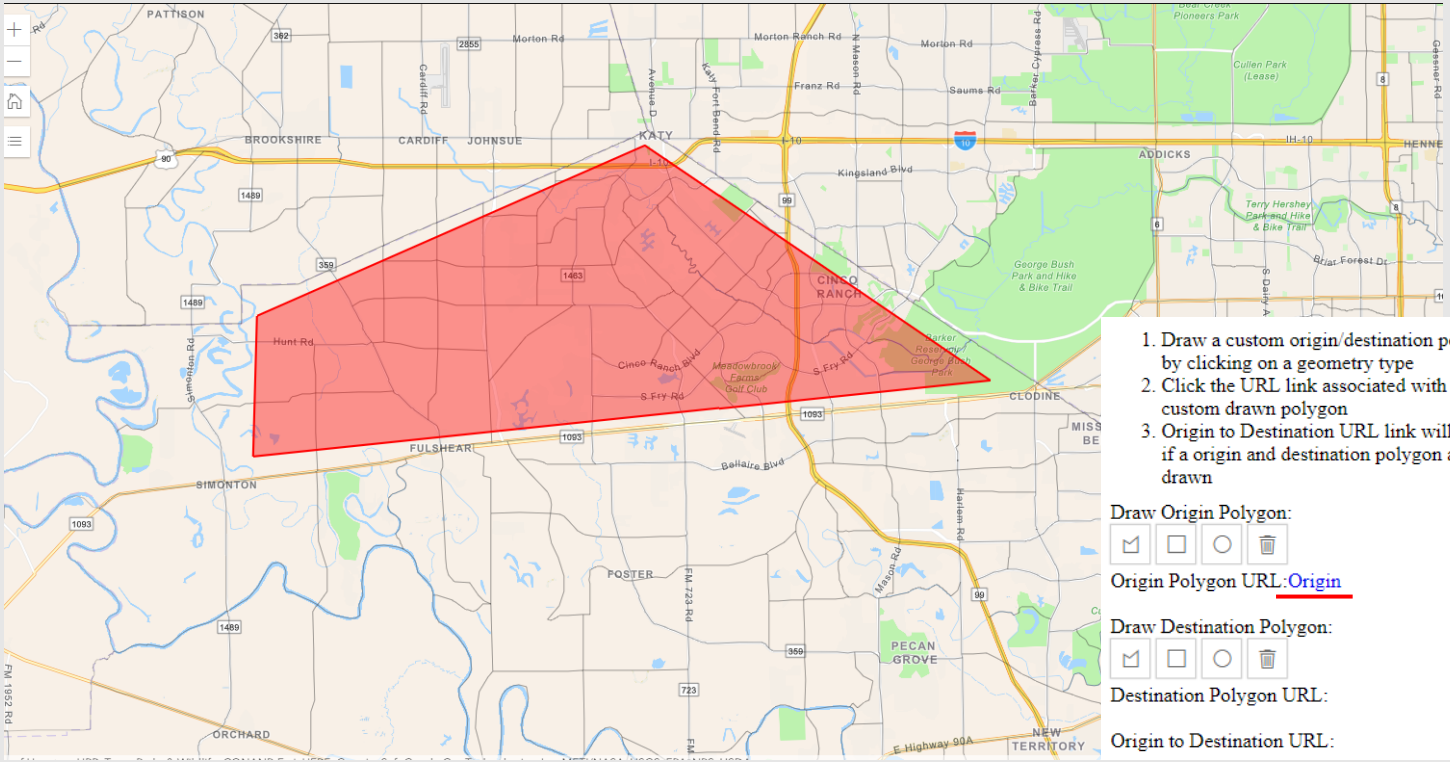


TAZ : Traffic Analysis Zone | **VMT** : Vehicle Mileage Traveled | **VHT** : Vehicle Hours Traveled

Advanced Query



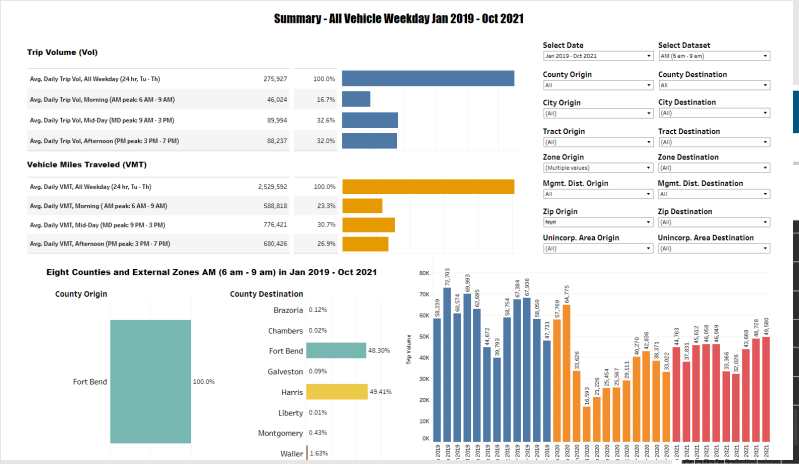
Advanced Query: Origin



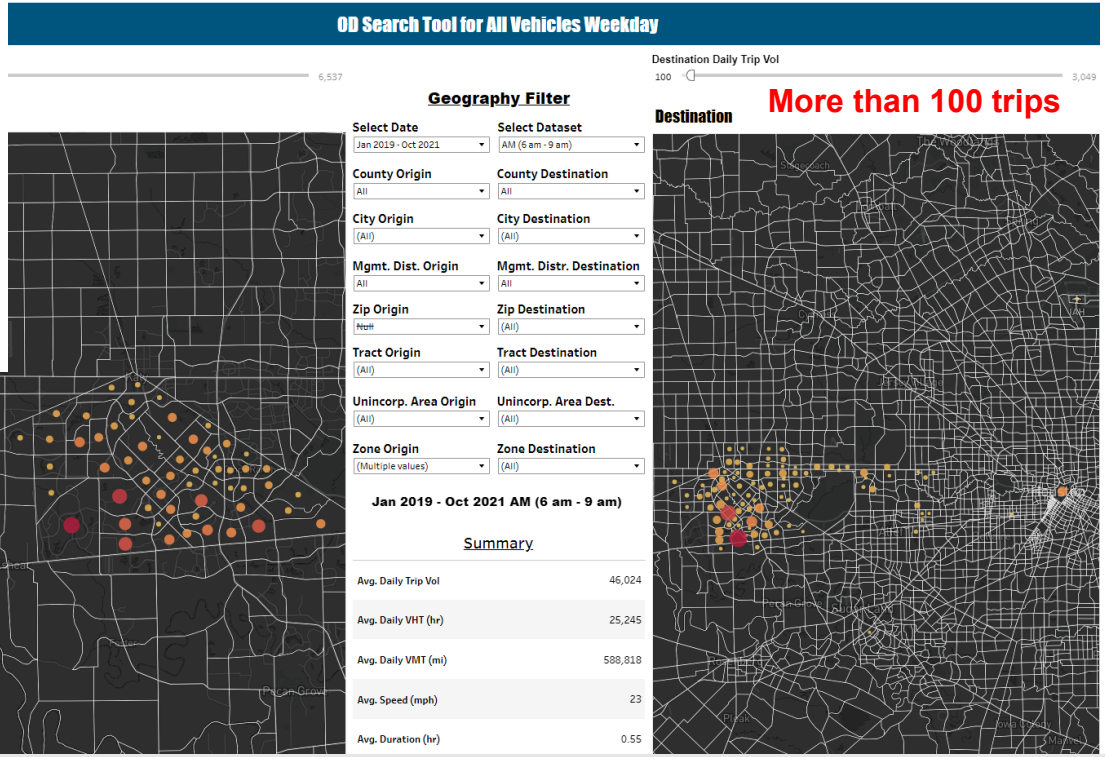
1. Select Areas using Draw tool
2. A hyperlink named 'Origin' is created

Advanced Query: Origin

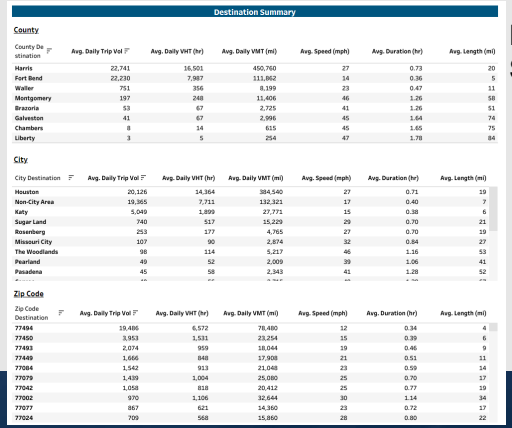
Summary



OD Tool



Destination Summary



Destination Summary

County

County Destination	Avg. Daily Trip Vol	Avg. Daily VHT (hr)	Avg. Daily VMT (mi)	Avg. Speed (mph)	Avg. Duration (hr)	Avg. Length (mi)
Harris	22,741	16,501	450,760	27	0.73	20
Fort Bend	22,230	7,987	111,862	14	0.36	5
Waller	751	356	8,199	23	0.47	11
Montgomery	197	248	11,406	46	1.26	58
Brazoria	53	67	2,725	41	1.26	51
Galveston	41	67	2,996	45	1.64	74
Chambers	8	14	615	45	1.65	75
Liberty	3	5	254	47	1.78	84

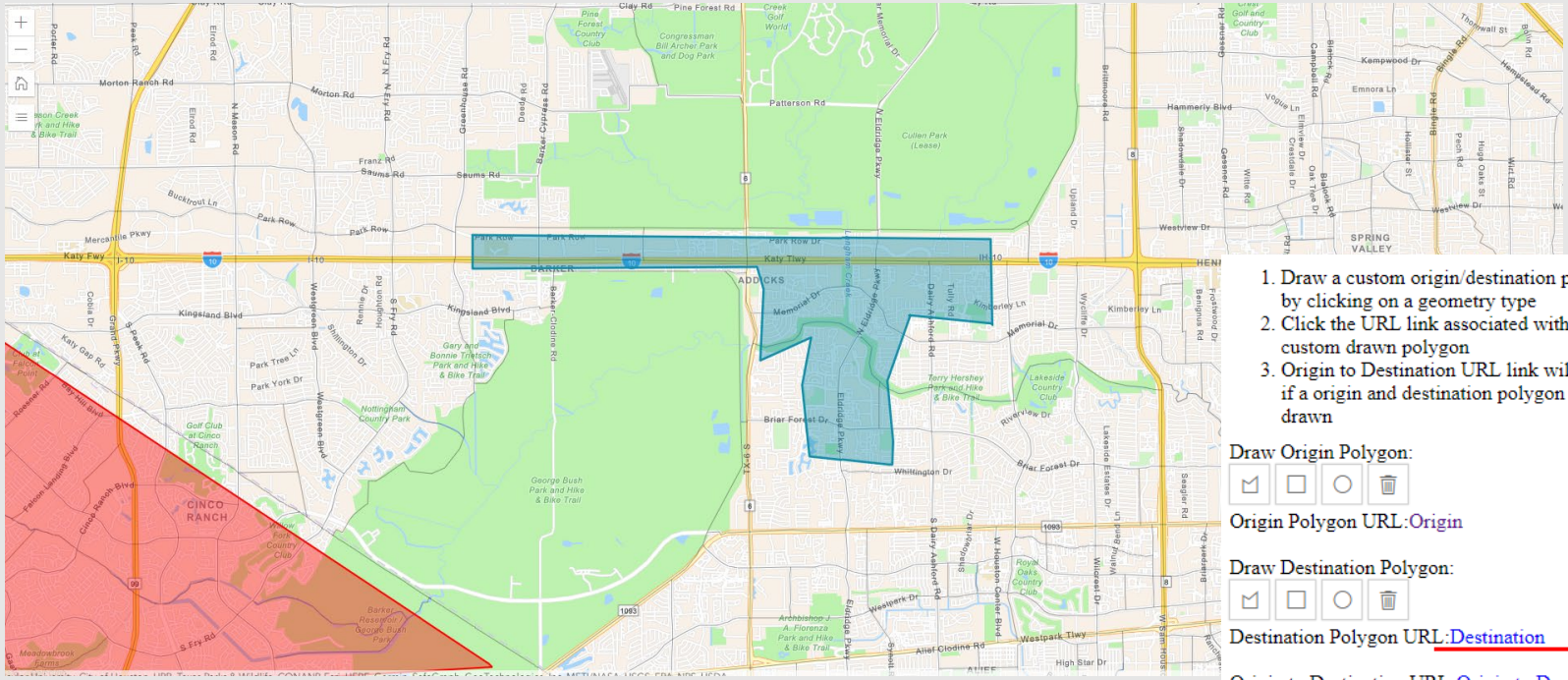
City

City Destination	Avg. Daily Trip Vol	Avg. Daily VHT (hr)	Avg. Daily VMT (mi)	Avg. Speed (mph)	Avg. Duration (hr)	Avg. Length (mi)
Houston	20,126	14,364	384,540	27	0.71	19
Non-City Area	19,365	7,711	132,321	17	0.40	7
Katy	5,049	1,899	27,771	15	0.38	6
Sugar Land	740	517	15,229	29	0.70	21
Rosenberg	253	177	4,765	27	0.70	19
Missouri City	107	90	2,874	32	0.84	27
The Woodlands	98	114	5,217	46	1.16	53
Pearland	49	52	2,009	39	1.06	41
Pasadena	45	58	2,343	41	1.28	52

Zip Code

Zip Code Destination	Avg. Daily Trip Vol	Avg. Daily VHT (hr)	Avg. Daily VMT (mi)	Avg. Speed (mph)	Avg. Duration (hr)	Avg. Length (mi)
77494	19,486	6,572	78,480	12	0.34	4
77450	3,953	1,531	23,254	15	0.39	6
77493	2,074	959	18,044	19	0.46	9
77449	1,666	848	17,908	21	0.51	11
77084	1,542	913	21,048	23	0.59	14
77079	1,439	1,004	25,080	25	0.70	17
77042	1,058	818	20,412	25	0.77	19
77002	970	1,106	32,644	30	1.14	34
77077	867	621	14,360	23	0.72	17
77024	709	568	15,860	28	0.80	22

Advanced Query: Destination



1. Draw a custom origin/destination polygon by clicking on a geometry type
2. Click the URL link associated with the custom drawn polygon
3. Origin to Destination URL link will appear if a origin and destination polygon are drawn

Draw Origin Polygon:

Origin Polygon URL:Origin

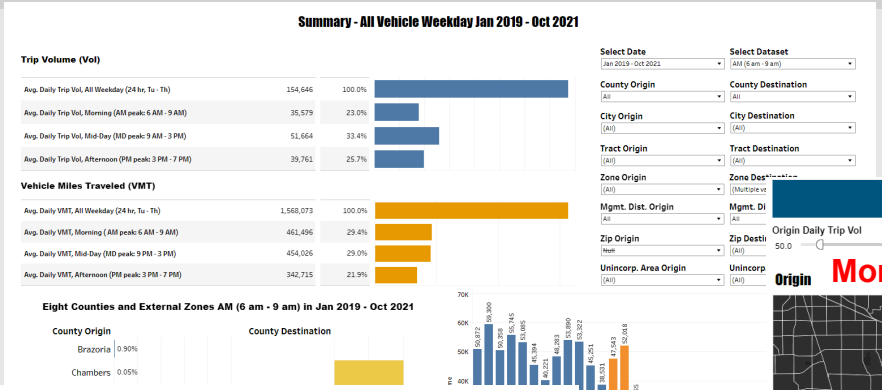
Draw Destination Polygon:

Destination Polygon URL:Destination

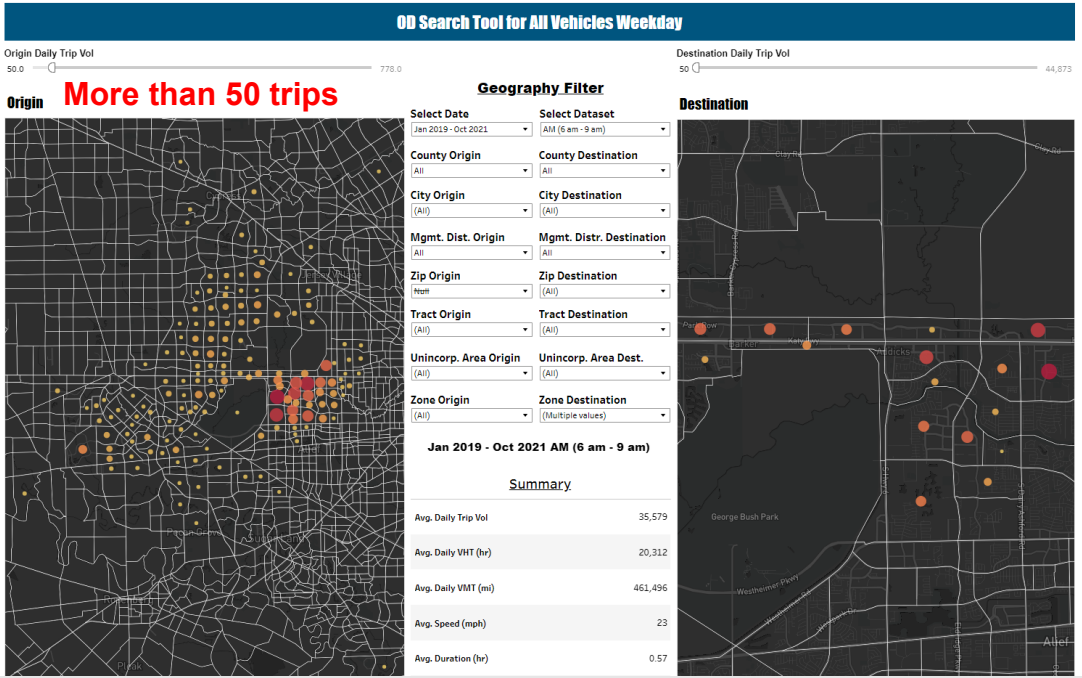
Origin to Destination URL:Origin to Destination

Advanced Query: Destination

Summary



OD Tool



Destination Summary

Origin Summary

County

County Origin	Avg. Daily Trip Vol	Avg. Daily VHT (hr)	Avg. Daily VMT (mi)	Avg. Speed (mph)	Avg. Duration (hr)	Avg. Length (mi)
Harris	27,683	14,290	295,977	21	0.52	11
Fort Bend	6,532	4,604	112,344	24	0.70	17
Montgomery	499	592	23,463	40	1.19	47
Waller	379	288	9,305	32	0.76	25
Brazoria	320	327	11,641	36	1.02	36
Galveston	142	177	7,237	41	1.25	51
Chambers	16	20	912	46	1.20	55
Liberty	9	15	618	42	1.58	67

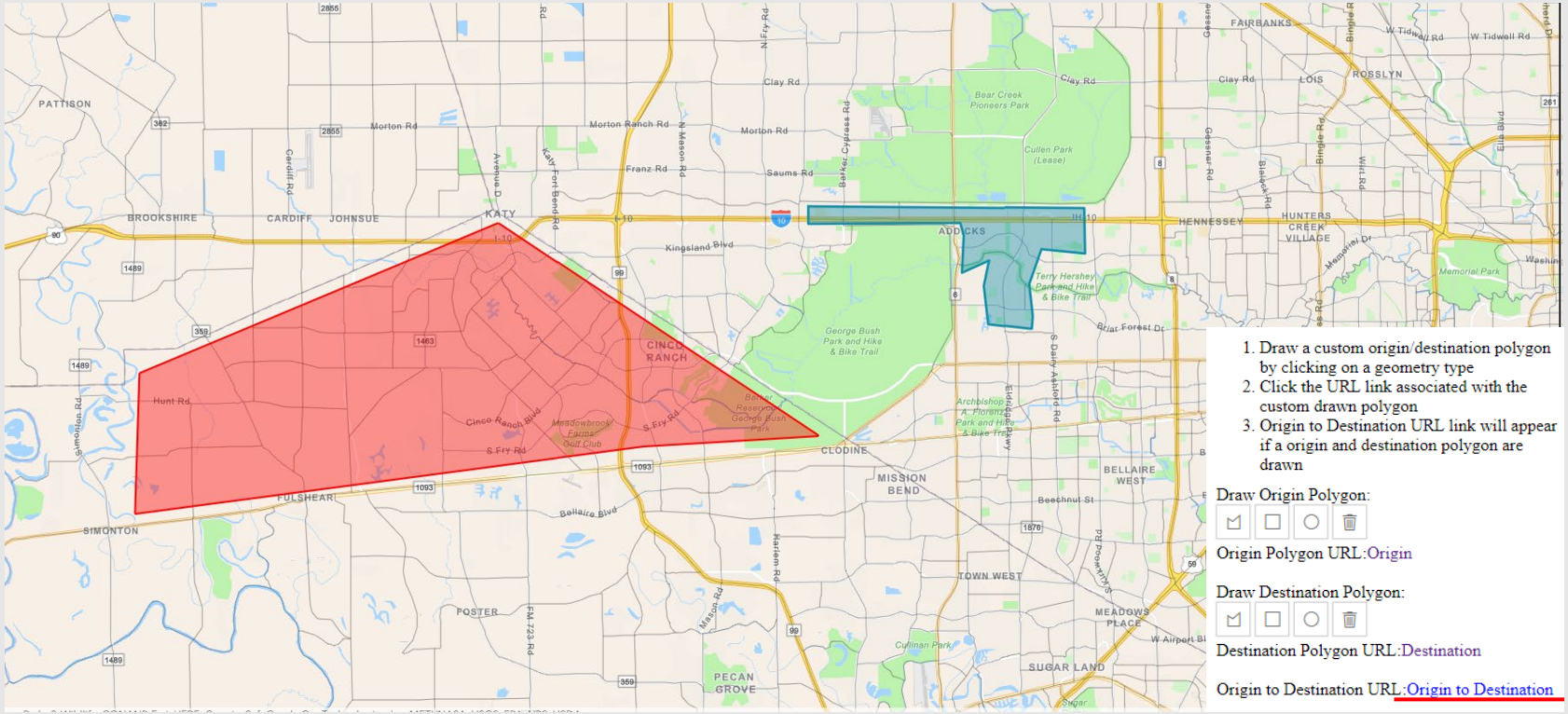
City

City Origin	Avg. Daily Trip Vol	Avg. Daily VHT (hr)	Avg. Daily VMT (mi)	Avg. Speed (mph)	Avg. Duration (hr)	Avg. Length (mi)
Houston	19,054	8,640	159,790	18	0.45	8
Non-City Area	11,443	7,675	186,724	24	0.67	16
Sugar Land	869	651	16,106	25	0.75	19
Katy	558	325	8,169	25	0.58	15
Cinco Ranch	406	237	5,063	21	0.59	12
Mission Bend	349	195	3,470	18	0.56	10
Fulshear	341	265	6,809	26	0.78	20
Missouri City	277	248	6,438	26	0.89	23
Pearland	208	198	6,738	34	0.95	32
Pecan Grove	201	153	3,815	25	0.76	19

Zip Code

Zip Code	Avg. Daily Trip Vol	Avg. Daily VHT (hr)	Avg. Daily VMT (mi)	Avg. Speed (mph)	Avg. Duration (hr)	Avg. Length (mi)
77079	4,017	1,189	11,329	10	0.30	3
77077	3,648	1,244	12,795	10	0.34	4
77084	2,441	1,048	16,468	16	0.43	7
77494	2,397	1,569	37,898	24	0.65	16
77449	1,913	1,022	18,849	18	0.53	10

Advanced Query: Origin-Destination



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Draw Origin Polygon:

Origin Polygon URL:Origin

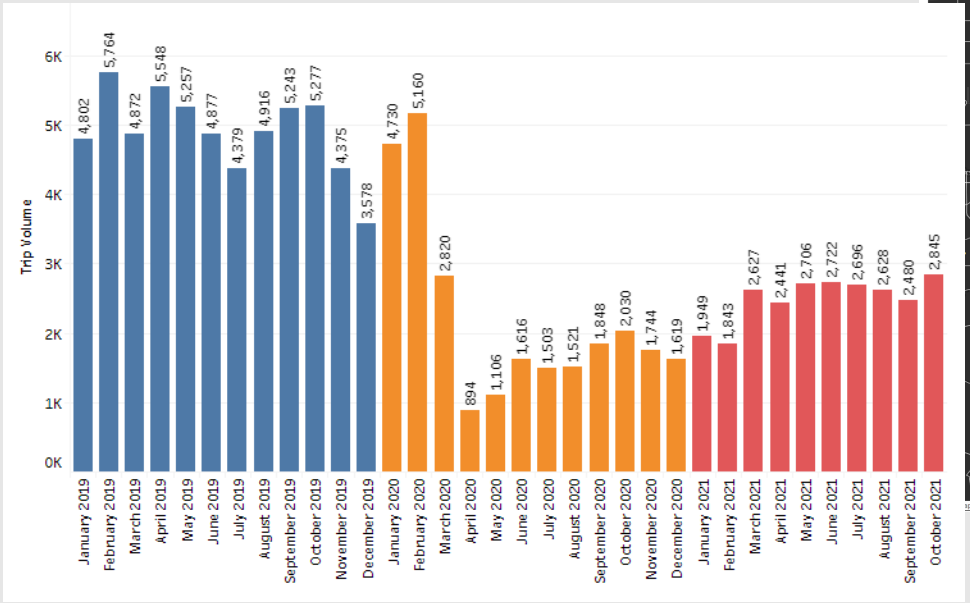
Draw Destination Polygon:

Destination Polygon URL:Destination

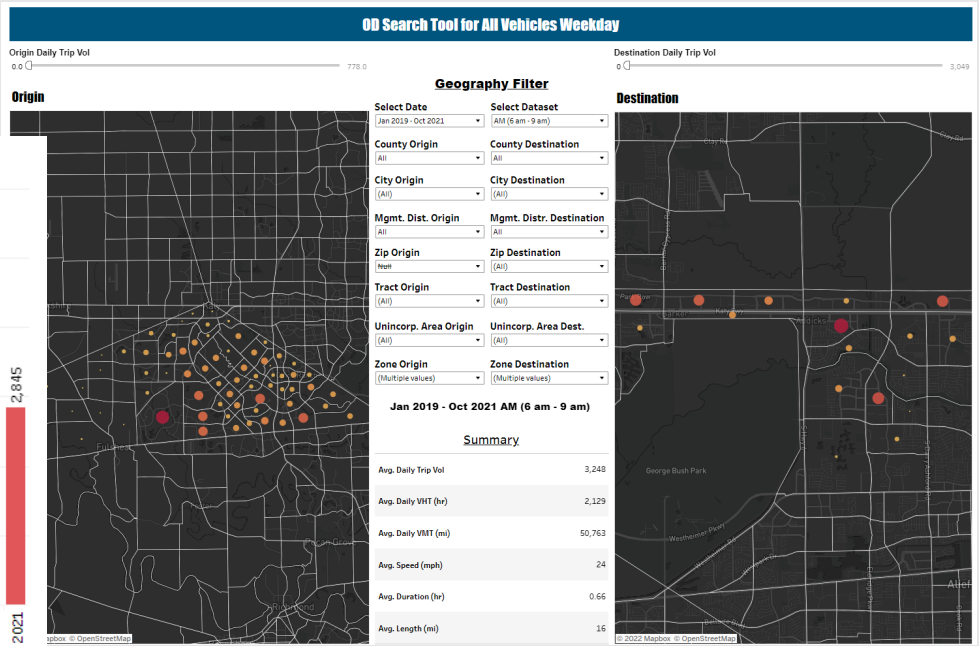
Origin to Destination URL:Origin to Destination

Advanced Query: Origin - Destination

Summary



OD Tool



Questions?

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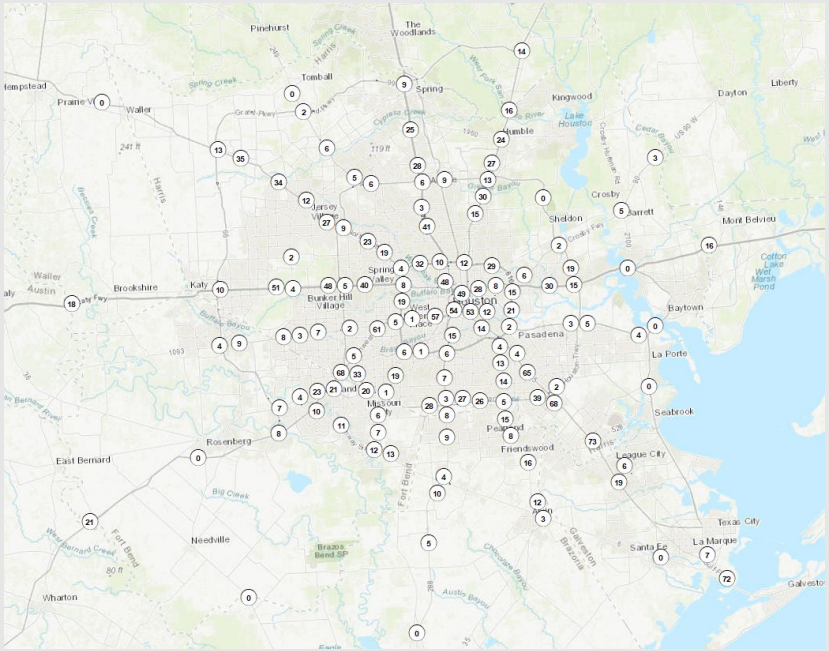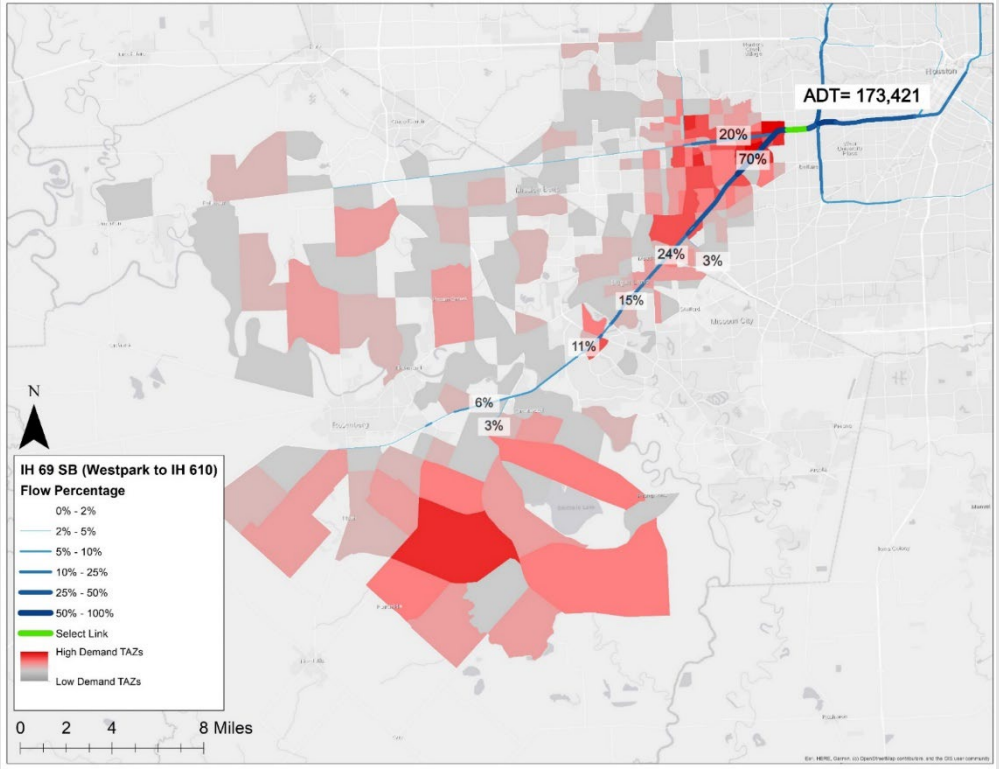
Next Step: Corridor Analysis Information System Component