Texas A&M Transportation Institute

Development of Houston-Galveston-Brazoria (HGB) On-Road Emissions Inventories for 2026

DRAFT REPORT

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EXECUTIVE SUMMARY

This project describes the development of on-road mobile emissions inventories for eight counties within the Houston-Galveston-Brazoria (HGB) area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties) for the analysis year 2026. Under the sponsorship of the Texas Commission on Environmental Quality (TCEQ), the Texas A&M Transportation Institute (TTI) developed eight emissions inventories (EI) to represent two periods and four day type scenarios for the eight-county area. Table 1 presents the eight activity scenarios.[1]

Table 1. Emissions Inventory Activity Scenarios.

Year	Periods[1]	Day Types[2]
2026	School and Summer (non-school)	Weekday Friday Saturday Sunday

[1] The "school" period includes April 15th through May 15th and September 15th through October 15th combined, and the "summer" period includes June 10th through August 10th, excluding July 4th.

[2] The day type "Weekday" represents the average Monday through Thursday.

TTI developed the EIs to produce traffic activity and total emissions at a temporal scale of each hour of the day and a spatial scale of individual roadway links acquired from the HGB area travel demand model (TDM), provided by the Houston-Galveston Area Council (H-GAC). Thirty-three pollutants were included in the analysis, including most of the pollutants with National Ambient Air Quality Standards (NAAQS) and/or their precursors. TTI estimated on-road mobile source vehicle activity and emissions for on-network (roadways) and off-network (e.g., parking areas, driveways) activity categories. The following pollutants were modeled: carbon monoxide (CO); oxides of nitrogen (NO_X); methane (CH_4); ammonia (NH_3); sulfur dioxide (SO_2); nitrogen oxide (NO); nitrogen dioxide (NO_2); nitrous acid (HONO); nitrate (NO_3); ammonium (NH_4); chloride (Cl); sodium (Na); potassium (K); magnesium (Mg); calcium (Ca); titanium (Ti); silicon (Si); aluminum (Al); iron (Fe); volatile organic compounds (VOC); atmospheric carbon dioxide (CO_2); primary exhaust particulate matter of 10 micron diameter threshold level (PM_{10}) – total; primary PM_{10} – brakewear particulate; primary PM_{10} – tirewear particulate; primary

[1] The TCEQ sponsored this work in support of TCEQ's future State Implementation Plan submissions to the U.S. Environmental Protection Agency, involving ozone attainment demonstration modeling (i.e., to show compliance with national ambient air quality standards for ozone).

exhaust particulate matter of 2.5 micron diameter threshold level ($PM_{2.5}$) – total; organic carbon (OC); elemental carbon (EC); sulfate particulate (SO_4); primary $PM_{2.5}$ – brakewear particulate; primary $PM_{2.5}$ – tirewear particulate; aerosol H_2O (H_2O); and non-carbon organic matter (NCOM).

In addition to the on-road mobile source emissions estimates, TTI produced estimates of total energy consumption (TEC) and the area source category refueling loss emissions associated with each activity scenario described in Table 1.

TTI developed the EIs using the latest version of the MOtor Vehicle Emissions Simulator (MOVES), MOVES3, and associated Environmental Protection Agency (EPA) guidance documentation. The EIs were developed using a rates-per-activity approach, which develops and applies MOVES emission rates externally with local activity data. The inventory methods included gasoline and diesel-powered vehicle combinations modeled for on-network and off-network activity and emissions. The on-network or roadway-based activity consists of vehicle miles traveled (VMT) and average operational speeds and off-network activity consists of off-network idling (ONI) hours, source hours parked (SHP), vehicle starts, source hours extended idling (SHEI), and diesel auxiliary power unit (APU) hours. The inventories were calculated using a mix of local data inputs (e.g., fuels and meteorological data, registration data, local TDMs, traffic count data) and some MOVES defaults.

TTI calculated the EIs using utilities developed and maintained by TTI and recently updated for use with MOVES3 (the TTI EI utilities). The EI results were summarized into various formats specified and suitable for downstream air quality planning processes (a primary one being photochemical modeling of ozone) as described below.

- Link-level (with geographical coordinates) and county-level hourly estimates of emissions.
- MOVES inventory mode county-level local activity and emissions inventory inputs to MOVES for all activity scenarios.
- Summaries by county of activity by type and of emissions by pollutant and process.

Table 2 through Table 9 present the county and region aggregate 2026 on-road inventory summaries for a subset of the inventoried pollutants, by period and day type. The tables present VMT, speed, and on-road emissions of VOC, CO, NO_X, PM_{10}, $PM_{2.5}$, NH_3, SO_2, and CO_2. Table 10 and Table 11 show the 2026 VOC refueling loss emissions estimates corresponding to each period by day type.

Table 2. HGB 2026 School Period Weekday On-Road Emissions (Tons/Day).

County	VMT	Speed[1]	VOC	CO	NO_X	PM_{10}[2]	$PM_{2.5}$[2]	NH_3	SO_2	CO_2
Brazoria	10,562,193	42.39	1.50	30.16	2.30	0.45	0.11	0.25	0.03	4,542.39
Chambers	3,495,784	59.38	0.32	11.40	1.81	0.11	0.05	0.09	0.01	2,062.70
Fort Bend	19,171,355	36.76	3.02	54.18	4.31	1.03	0.23	0.45	0.05	8,379.08
Galveston	8,010,320	39.94	1.22	23.99	1.58	0.37	0.08	0.19	0.02	3,394.22
Harris	141,157,040	35.68	18.10	426.48	30.84	7.72	1.66	3.41	0.37	61,767.86
Liberty	3,433,740	48.78	0.61	12.48	1.24	0.13	0.04	0.09	0.01	1,713.45
Montgomery	19,069,766	40.13	2.53	50.89	4.37	0.89	0.21	0.45	0.05	8,188.26
Waller	3,170,982	52.91	0.40	11.71	1.09	0.10	0.03	0.08	0.01	1,512.60
Total	208,071,180	37.21	27.70	621.29	47.54	10.82	2.41	5.03	0.55	91,560.56

[1] System speed in miles-per-hour (mph).
[2] Direct vehicle PM emissions (exhaust plus brake and tire wear), i.e., excludes re-suspended dust.

Table 3. HGB 2026 School Period Friday On-Road Emissions (Tons/Day).

County	VMT	Speed[1]	VOC	CO	NO_X	PM_{10}[2]	$PM_{2.5}$[2]	NH_3	SO_2	CO_2
Brazoria	11,400,479	41.93	1.53	32.33	2.40	0.49	0.12	0.27	0.03	4,863.21
Chambers	3,773,160	59.27	0.33	12.19	1.80	0.12	0.05	0.10	0.01	2,140.37
Fort Bend	20,692,919	36.23	3.07	58.15	4.50	1.13	0.25	0.49	0.05	8,989.04
Galveston	8,646,078	39.73	1.25	25.69	1.67	0.40	0.09	0.21	0.02	3,645.38
Harris	152,360,048	35.05	18.55	459.06	32.44	8.51	1.79	3.67	0.40	66,446.19
Liberty	3,706,236	48.50	0.62	13.38	1.29	0.14	0.04	0.10	0.01	1,825.69
Montgomery	20,583,254	39.57	2.58	54.59	4.52	0.98	0.22	0.49	0.05	8,750.85
Waller	3,422,641	52.70	0.40	12.58	1.05	0.11	0.03	0.09	0.01	1,570.71
Total	224,584,814	36.62	28.32	667.97	49.67	11.88	2.60	5.41	0.59	98,231.45

[1] System speed in miles-per-hour (mph).
[2] Direct vehicle PM emissions (exhaust plus brake and tire wear), i.e., excludes re-suspended dust.

Table 4. HGB 2026 School Period Saturday On-Road Emissions (Tons/Day).

County	VMT	Speed[1]	VOC	CO	NO_X	PM_{10}[2]	$PM_{2.5}$[2]	NH_3	SO_2	CO_2
Brazoria	9,453,785	43.31	1.35	26.35	1.67	0.37	0.09	0.22	0.02	3,864.49
Chambers	3,128,932	59.58	0.27	10.01	1.31	0.09	0.03	0.08	0.01	1,681.85
Fort Bend	17,159,511	37.90	2.72	47.05	3.15	0.84	0.18	0.40	0.04	7,115.05
Galveston	7,169,728	40.35	1.11	20.97	1.12	0.31	0.07	0.17	0.02	2,888.18
Harris	126,343,964	36.84	16.11	373.98	22.18	6.27	1.32	3.01	0.32	52,451.69
Liberty	3,073,402	49.24	0.53	11.01	0.87	0.11	0.03	0.08	0.01	1,412.37
Montgomery	17,068,558	41.35	2.27	44.31	3.17	0.72	0.17	0.40	0.04	6,955.65
Waller	2,838,200	53.38	0.35	10.38	0.87	0.09	0.03	0.07	0.01	1,305.29
Total	186,236,080	38.33	24.71	544.05	34.33	8.79	1.91	4.44	0.47	77,674.57

[1] System speed in miles-per-hour (mph).
[2] Direct vehicle PM emissions (exhaust plus brake and tire wear), i.e., excludes re-suspended dust.

Table 5. HGB 2026 School Period Sunday On-Road Emissions (Tons/Day).

County	VMT	Speed[1]	VOC	CO	NO_X	PM_{10}[2]	$PM_{2.5}$[2]	NH_3	SO_2	CO_2
Brazoria	7,830,957	43.49	1.29	22.38	1.33	0.30	0.07	0.18	0.02	3,164.44
Chambers	2,591,766	59.64	0.25	8.33	1.01	0.07	0.03	0.07	0.01	1,346.42
Fort Bend	14,213,908	38.09	2.62	40.13	2.47	0.68	0.15	0.33	0.04	5,822.84
Galveston	5,938,970	40.43	1.07	17.77	0.88	0.25	0.06	0.14	0.01	2,364.14
Harris	104,655,079	37.03	15.27	315.99	17.27	5.06	1.06	2.48	0.26	42,850.94
Liberty	2,545,801	49.38	0.51	9.37	0.67	0.09	0.02	0.06	0.01	1,138.02
Montgomery	14,138,525	41.54	2.17	37.63	2.49	0.59	0.13	0.33	0.03	5,686.55
Waller	2,350,983	53.46	0.33	8.77	0.68	0.07	0.02	0.06	0.01	1,060.05
Total	154,265,989	38.51	23.50	460.37	26.80	7.10	1.55	3.66	0.39	63,433.40

[1] System speed in miles-per-hour (mph).
[2] Direct vehicle PM emissions (exhaust plus brake and tire wear), i.e., excludes re-suspended dust.

Table 6. HGB 2026 Summer Period Weekday On-Road Emissions (Tons/Day).

County	VMT	Speed[1]	VOC	CO	NO_X	PM_{10}[2]	$PM_{2.5}$[2]	NH_3	SO_2	CO_2
Brazoria	10,547,133	42.40	1.52	30.38	2.32	0.45	0.11	0.25	0.03	4,553.81
Chambers	3,490,800	59.39	0.32	11.43	1.82	0.11	0.05	0.09	0.01	2,063.25
Fort Bend	19,144,018	36.78	3.06	54.62	4.35	1.03	0.23	0.45	0.05	8,404.95
Galveston	7,998,898	39.94	1.24	24.17	1.60	0.37	0.08	0.19	0.02	3,404.25
Harris	140,955,756	35.70	18.32	428.74	31.08	7.72	1.66	3.42	0.37	61,926.87
Liberty	3,428,844	48.79	0.62	12.57	1.25	0.13	0.04	0.09	0.01	1,716.42
Montgomery	19,042,574	40.15	2.56	51.24	4.40	0.89	0.21	0.46	0.05	8,208.73
Waller	3,166,461	52.92	0.40	11.75	1.09	0.10	0.03	0.08	0.01	1,514.36
Total	207,774,483	37.23	28.05	624.89	47.91	10.81	2.42	5.04	0.55	91,792.64

[1] System speed in miles-per-hour (mph).
[2] Direct vehicle PM emissions (exhaust plus brake and tire wear), i.e., excludes re-suspended dust.

Table 7. HGB 2026 Summer Period Friday On-Road Emissions (Tons/Day).

County	VMT	Speed[1]	VOC	CO	NO_X	PM_{10}[2]	$PM_{2.5}$[2]	NH_3	SO_2	CO_2
Brazoria	11,275,854	42.01	1.55	32.26	2.40	0.49	0.12	0.27	0.03	4,827.84
Chambers	3,731,913	59.29	0.33	12.10	1.79	0.12	0.05	0.10	0.01	2,120.75
Fort Bend	20,466,712	36.32	3.10	58.06	4.50	1.11	0.25	0.48	0.05	8,926.89
Galveston	8,551,562	39.77	1.26	25.64	1.67	0.40	0.09	0.20	0.02	3,621.12
Harris	150,694,524	35.16	18.71	456.93	32.36	8.39	1.78	3.65	0.40	65,939.92
Liberty	3,665,721	48.55	0.62	13.35	1.29	0.14	0.04	0.09	0.01	1,811.31
Montgomery	20,358,247	39.66	2.60	54.43	4.51	0.96	0.22	0.49	0.05	8,685.81
Waller	3,385,226	52.74	0.41	12.51	1.05	0.11	0.03	0.09	0.01	1,557.62
Total	222,129,759	36.72	28.58	665.29	49.57	11.72	2.58	5.37	0.58	97,491.26

[1] System speed in miles-per-hour (mph).
[2] Direct vehicle PM emissions (exhaust plus brake and tire wear), i.e., excludes re-suspended dust.

Table 8. HGB 2026 Summer Period Saturday On-Road Emissions (Tons/Day).

County	VMT	Speed[1]	VOC	CO	NO_X	PM_{10}[2]	$PM_{2.5}$[2]	NH_3	SO_2	CO_2
Brazoria	9,229,669	43.39	1.36	25.95	1.65	0.36	0.09	0.22	0.02	3,785.55
Chambers	3,054,756	59.61	0.27	9.82	1.29	0.09	0.03	0.08	0.01	1,648.44
Fort Bend	16,752,719	37.97	2.74	46.35	3.11	0.82	0.18	0.39	0.04	6,972.65
Galveston	6,999,758	40.38	1.12	20.67	1.11	0.30	0.07	0.17	0.02	2,832.50
Harris	123,348,785	36.92	16.17	367.60	21.92	6.11	1.29	2.95	0.31	51,399.54
Liberty	3,000,542	49.30	0.54	10.84	0.86	0.10	0.03	0.08	0.01	1,384.02
Montgomery	16,663,921	41.43	2.28	43.58	3.13	0.71	0.16	0.39	0.04	6,812.14
Waller	2,770,917	53.41	0.35	10.17	0.85	0.08	0.03	0.07	0.01	1,275.82
Total	181,821,067	38.41	24.83	534.99	33.91	8.57	1.88	4.35	0.46	76,110.64

[1] System speed in miles-per-hour (mph).
[2] Direct vehicle PM emissions (exhaust plus brake and tire wear), i.e., excludes re-suspended dust.

Table 9. HGB 2026 Summer Period Sunday On-Road Emissions (Tons/Day).

County	VMT	Speed[1]	VOC	CO	NO_X	PM_{10}[2]	$PM_{2.5}$[2]	NH_3	SO_2	CO_2
Brazoria	7,724,147	43.53	1.31	22.28	1.33	0.29	0.07	0.18	0.02	3,133.68
Chambers	2,556,416	59.65	0.25	8.26	1.00	0.07	0.03	0.07	0.01	1,333.42
Fort Bend	14,020,038	38.13	2.65	39.97	2.47	0.67	0.15	0.32	0.04	5,768.94
Galveston	5,857,965	40.45	1.08	17.71	0.89	0.25	0.06	0.14	0.01	2,343.54
Harris	103,227,638	37.07	15.39	313.92	17.29	5.00	1.06	2.46	0.26	42,450.15
Liberty	2,511,078	49.41	0.52	9.32	0.67	0.08	0.02	0.06	0.01	1,127.30
Montgomery	13,945,683	41.59	2.19	37.41	2.49	0.58	0.13	0.33	0.03	5,630.24
Waller	2,318,917	53.47	0.33	8.68	0.68	0.07	0.02	0.06	0.01	1,047.41
Total	152,161,884	38.55	23.71	457.55	26.82	7.01	1.54	3.62	0.38	62,834.68

[1] System speed in miles-per-hour (mph).
[2] Direct vehicle PM emissions (exhaust plus brake and tire wear), i.e., excludes re-suspended dust.

Table 10. HGB 2026 School Period Refueling Emissions (Tons/Day).

County	Weekday VMT	Weekday VOC	Friday VMT	Friday VOC	Saturday VMT	Saturday VOC	Sunday VMT	Sunday VOC
Brazoria	10,562,193	0.20	11,400,479	0.21	9,453,785	0.16	7,830,957	0.13
Chambers	3,495,784	0.09	3,773,160	0.09	3,128,932	0.07	2,591,766	0.06
Fort Bend	19,171,355	0.35	20,692,919	0.38	17,159,511	0.28	14,213,908	0.23
Galveston	8,010,320	0.14	8,646,078	0.15	7,169,728	0.12	5,938,970	0.09
Harris	141,157,040	2.62	152,360,048	2.80	126,343,964	2.12	104,655,079	1.70
Liberty	3,433,740	0.08	3,706,236	0.08	3,073,402	0.06	2,545,801	0.05
Montgomery	19,069,766	0.35	20,583,254	0.38	17,068,558	0.29	14,138,525	0.23
Waller	3,170,982	0.07	3,422,641	0.07	2,838,200	0.06	2,350,983	0.05
Total	208,071,180	3.91	224,584,814	4.17	186,236,080	3.16	154,265,989	2.54

Table 11. HGB 2026 Summer Period Refueling Emissions (Tons/Day).

County	Weekday VMT	Weekday VOC	Friday VMT	Friday VOC	Saturday VMT	Saturday VOC	Sunday VMT	Sunday VOC
Brazoria	10,547,133	0.20	11,275,854	0.21	9,229,669	0.16	7,724,147	0.13
Chambers	3,490,800	0.09	3,731,913	0.09	3,054,756	0.07	2,556,416	0.06
Fort Bend	19,144,018	0.35	20,466,712	0.37	16,752,719	0.28	14,020,038	0.23
Galveston	7,998,898	0.14	8,551,562	0.15	6,999,758	0.11	5,857,965	0.09
Harris	140,955,756	2.62	150,694,524	2.77	123,348,785	2.07	103,227,638	1.68
Liberty	3,428,844	0.08	3,665,721	0.08	3,000,542	0.06	2,511,078	0.05
Montgomery	19,042,574	0.36	20,358,247	0.37	16,663,921	0.28	13,945,683	0.23
Waller	3,166,461	0.07	3,385,226	0.07	2,770,917	0.06	2,318,917	0.05
Total	207,774,483	3.91	222,129,759	4.13	181,821,067	3.08	152,161,884	2.50

1.0 INTRODUCTION

The Texas Commission on Environmental Quality (TCEQ) works with local planning districts, the Texas Department of Transportation (TxDOT), and the Texas A&M Transportation Institute (TTI) to provide on-road, mobile source emissions inventories (EI) of air pollutants. TCEQ typically funds mobile source inventory work in support of the federal Clean Air Act Amendment (CAAA).

Accurate EIs are critical if state, local, and federal agencies are to attain, and maintain, the National Ambient Air Quality Standards (NAAQS) that the U.S. Environmental Protection Agency (EPA) has established for criteria pollutants such as ozone, particulate matter (PM), and carbon monoxide (CO), as well as to control hazardous air pollutant (HAP) emissions.

This report describes work conducted by TTI on behalf of TCEQ. The work involves the calculation of EIs for the Houston-Galveston-Brazoria area (HGB) for the analysis year 2026. Eight EIs were calculated representing different traffic activity and emissions scenarios for the analysis year. These eight scenarios represent two activity periods (defined as school and summer) and four different day types within each period (weekday, Friday, Saturday, and Sunday). Emission rates for use with all eight activity scenarios were based on summer season inputs (e.g., summer meteorological and fuel property inputs).

The EIs have been commissioned to be used for air quality planning by the TCEQ. Specifically, the outputs of the eight EI scenarios were developed to support photochemical modeling and ultimately revisions to the State Implementation Plan (SIP).

The 2026 HGB EIs described in this report follow 2019 base case and 2023 future year EIs for both HGB and the San Antonio region and for the entire state (254 counties - to also include the 2026 future year), all conducted by TTI in the previous fiscal year. A set of Dallas-Fort Worth (DFW) regional EIs (for 2019, 2023, and 2026) was also recently undertaken by the North Central Texas Council of Governments (NCTCOG). The methods used for these inventories are similar but described in different reports.

1.1 OBJECTIVE

The purpose of this document is to describe the methods and data used to develop on-road mobile source EIs for the HGB region. The EIs were developed for the analysis year 2026. A total of eight inventories are described that represent different on-road mobile source traffic activity and emissions for the analysis year.

The HGB region comprises eight counties (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller). For each activity scenario-based EI, pollutants were estimated based on on-network and off-network traffic activity. On-network activity includes vehicle miles traveled on regional roadways. Off-network activity includes traffic activity such as vehicle starts, off-network idling (ONI), source hours parked, and long-haul truck hotelling. Vehicle refueling loss emissions also fall under the off-network category. In addition to estimating pollutant emissions, TTI also estimated the total energy consumption associated with these activity estimates.

The methods used to calculate the EIs are an extension of historically consistent traffic activity and emission rate methods developed by TTI. The HGB area is served by a Travel Demand Model (TDM) administered by the Houston-Galveston Area Council (H-GAC). The EI calculations described in this document are based on an hourly, link-level analysis that uses the outputs of the regional TDM, other local data sources consistent with the region (e.g., seasonal, day type, and hourly travel factors; vehicle population data; and environmental inputs), and MOtor Vehicle Emissions Simulator (MOVES) default inputs. This report details all the data sources used to define each EI developed for this project.

At the request of TCEQ, the EIs were developed using the latest version of the EPA's on-road EI software – MOVES3. MOVES3 was released in November 2020 (and most recently updated in January 2022) and replaced the MOVES2014b version of the software. The EI methods described in this document have been developed to incorporate the latest information on on-road mobile source emissions and methods outlined in the associated EPA guidance for conducting MOVES3 based EIs.

In addition to calculating EIs for the eight aforementioned emissions scenarios, this project involves the development of electronic deliverables that were post-processed from each EI into formats suitable for downstream air quality planning. These outputs include the following.

- Tabular summaries of activity and emissions by county.
- Detailed link-level summaries (with geographical coordinates) of emissions by county and for each hour of the day.
- Input data for populating County Input Databases (CDBs) for all scenarios, suitable for MOVES3 inventory mode analyses, to include a populated set of summer weekday CDBs and the associated MOVES run specification files.

1.2 Summary of Modeling Methodology

Each EI was calculated using a detailed MOVES rates-per-activity method based on the HGB regional TDM. This approach calculates on-network emissions at the scale of each link defined by the regional TDM outputs. The methods are consistent with EPA guidance on the production of photochemical modeling EIs.

The TTI rates-per-activity EIs estimation methods were performed in four basic steps, simplified below.

1. **Calculate Emission Rates:** MOVES3 was used to estimate regional, county-level emission rates (or factors) relevant to the analysis area. The rates were calculated based on local inputs to MOVES such as temperature and humidity, fuel formulations, etc.
2. **Estimate Traffic Activity:** The local TDM (2026 analysis year) was processed to derive 24 hourly vehicle miles traveled (VMT) and speed estimates for all TDM links as well as for added intrazonal links. Further processing was used to convert VMT based on Highway Performance Monitoring System (HPMS) factors and seasonal and daily adjustment factors. Local automatic traffic recorder (ATR) traffic count data was used to process the TDM. After the on-network activity was estimated, off-network activity was calculated using outputs from the processed travel model, vehicle population data, and some MOVES default inputs. The traffic activity was processed to replicate operating conditions described by each EI scenario.
3. **Calculate Total Emissions:** The emission rates calculated in Step 1 were multiplied by the on- and off-network activity calculated in Step 2. This yielded emissions estimates in units of mass calculated at a spatial scale of each link (on-network) or county (off-network) for each hour of the day.
4. **Postprocess EI Outputs:** Outputs (for each pollutant) were post-processed into a variety of formats and electronic deliverables for reporting purposes and for downstream air quality planning.

Subsequent sections of this report describe these simplified steps in more detail.

1.3 Emissions Inventory Scope

TTI developed the scope of the inventories in consultation with the TCEQ Project Manager. The following is a simplified view of the scope (entities modeled and data inputs) agreed upon with the TCEQ sponsor.

Emissions Inventory Scenarios:

Emissions inventories were developed to model the following emissions scenarios.

- Analysis year 2026.
- The following seasonal activity scenarios were modeled for the analysis year.
    - School period (typical of the period April 15th through May 15th and September 15th through October 15th).
    - Summer period (typical of the period June 10th through August 10th, excluding July 4th).
- For each seasonal activity scenario, the following day types were modeled.
    - Weekday (average Monday through Thursday).
    - Friday.
    - Saturday.
    - Sunday.

These EIs were estimated by combining traffic activity estimated for the eight scenarios listed above, with two emission rate scenarios (one weekday and one weekend day) representative of peak ozone season (June through August) environmental conditions. The final eight EI scenarios were calculated by multiplying the activity by the emission rates corresponding to each scenario.

Source Use Types, Activity, and Pollutant Processes:

- *Source use type (SUT) and fuel types* (the various combinations of these are referred to as *vehicle types*) modeled: See Table 12.
- *Traffic activity modeled*: VMT, vehicle starts, hotelling hours (classified by auxiliary power unit [APU], engine on, engine off), source hours parked, off-network idling.
- *Vehicle-based emissions processes modeled*: running exhaust; crankcase running exhaust; start exhaust; crankcase start exhaust; extended idle exhaust; crankcase extended idle exhaust; auxiliary power exhaust; evaporative permeation; evaporative fuel vapor venting; evaporative liquid leaks; brakewear; tirewear.
- Refueling emissions processes modeled: displaced vapor loss; spillage loss.

Table 12. MOVES SUT/Fuel Types (Vehicle Types).

SUT ID	SUT Description	SUT Abbreviation[1]	Fuel Types
11	Motorcycle	MC	Gasoline
21	Passenger Car	PC	Gasoline, Diesel
31	Passenger Truck	PT	Gasoline, Diesel
32	Light Commercial Truck	LCT	Gasoline, Diesel
41	Other Buses	OBus	Gasoline, Diesel
42	Transit Bus	TBus	Gasoline, Diesel
43	School Bus	SBus	Gasoline, Diesel
51	Refuse Truck	RT	Gasoline, Diesel
52	Single Unit Short-Haul Truck	SUShT	Gasoline, Diesel
53	Single Unit Long-Haul Truck	SULhT	Gasoline, Diesel
54	Motor Home	MH	Gasoline, Diesel
61	Combination Short-Haul Truck	CShT	Gasoline, Diesel
62	Combination Long-Haul Truck	CLhT	Diesel

[1] The SUT/fuel type, or vehicle type, labels are the combined SUT abbreviation and fuel type names separated by an underscore (e.g., MC_Gas, RT_Diesel, and SBus_Gas are gasoline-powered motorcycles, diesel-powered refuse trucks, and gasoline-powered school buses, respectively).

Pollutants (and Energy) Modeled:

- CO; oxides of nitrogen (NO_X); methane (CH_4); ammonia (NH_3); sulfur dioxide (SO_2); nitrogen oxide (NO); nitrogen dioxide (NO_2); nitrous acid (HONO); nitrate (NO_3); ammonium (NH_4); chloride (Cl); sodium (Na); potassium (K); magnesium (Mg); calcium (Ca); titanium (Ti); silicon (Si); aluminum (Al); iron (Fe); volatile organic compounds (VOC); atmospheric (CO_2); total energy consumption (TEC); primary exhaust particulate matter of 10 micron threshold level (PM_{10}) – total; primary PM_{10} – brakewear particulate; primary PM_{10} – tirewear particulate; primary exhaust particulate matter of 2.5 micron threshold level ($PM_{2.5}$) – total; organic carbon (OC); elemental carbon (EC); sulfate particulate (SO_4); primary $PM_{2.5}$ – brakewear particulate; primary $PM_{2.5}$ – tirewear particulate; aerosol H_2O (H_2O); and non-carbon organic matter (NCOM).

Emission Rate (MOVES) Input Data and Adjustments:

- *Emission rates:* EPA's latest Mobile Source Emission Rate Model – MOVES3.0.3 (herein abbreviated to MOVES3 or MOVES). This latest MOVES version (released January, 2022) was downloaded from: https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves.[2]

[2] Since the initial release of MOVES3 (November 2020 as MOVES3.0.0), three MOVES3 updates have been released (MOVES3.0.1, MOVES3.0.2, and MOVES3.0.3). For additional information on MOVES3 updates, see the MOVES3 update log: https://www.epa.gov/moves/moves3-update-log

- Local environmental inputs for MOVES emission rates: Provided by TCEQ.
- Local fuel formulation input data:
    - Consistent with TCEQ's latest (2020) Summer Fuel Field Study conducted by Eastern Research Group (ERG) available at https://www.tceq.texas.gov/airquality/airmod/project/pj_report_mob.html.
    - MOVES individual summer reformulated gasoline (RFG) fuel parameters and/or EPA's latest available (2020) RFG compliance survey data for Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties in the HGB area.
    - Since the quantity of fuel pumped by county is not reported on a seasonal, daily, or hourly basis, TTI used the ATR data referenced previously and assumed that the temporal distribution of fuel pumped coincided with VMT. It was not possible to distinguish between the VMT temporal distribution of gasoline versus diesel vehicles; TTI used the same temporal allocation of refueling emissions estimates for gasoline and diesel fuel.
- *Inspection and maintenance (I/M) program information*: Modeled the I/M program currently in place for Brazoria, Fort Bend, Galveston, Harris, and Montgomery Counties, consistent with Sections 114.50-114.87 of TCEQ rules.
- *Refueling controls*: Since Stage II refueling controls no longer apply, all eight HGB counties were modeled without Stage II refueling controls.
- *Federal motor vehicle control programs*: The effects of all the federal motor vehicle control programs that are included as default inputs in MOVES were modeled.
- *Texas Low Emission Diesel*: For all eight HGB area counties that are subject to the Texas Low Emission Diesel (TxLED) program, post-processed the diesel vehicle NO, NO_2, HONO, and NO_X emission factors consistent with Sections 114.312-114.319 of the TCEQ rules. NO, NO_2, HONO, and NO_X adjustment factors were provided by the TCEQ using a reduction of 4.8 percent for 2002-and-newer model year vehicles, and 6.2 percent for 2001-and-older model year vehicles.

Traffic Activity Input Data:

- *Traffic activity:* The validated H-GAC TDMs appropriate for the analysis year 2026 were used.
- *Traffic patterns:* TxDOT traffic count data from the area (multiple years through latest available 2019) was used to derive seasonal, day type, and hour of day traffic patterns.
- HPMS adjustment factors: HPMS data.

- *Base hotelling hours data*: TTI's 2017 hotelling study.[3]
- *Hotelling mode distributions*: MOVES default.
- *Vehicle starts:* Number of starts per vehicle from MOVES (based on a combination of MOVES default and local data) and local vehicle type population estimates.
- *Vehicle population data*: End of year 2018 vehicle registrations and age class data classified by source use and fuel type provided by Texas Department of Motor Vehicles (TxDMV).
- Local fleet mix data:
    - TxDOT traffic classification data.
    - TxDMV vehicle registrations data.

Emissions Inventory Outputs:

The following output files were produced by county in formats consistent with the most recent on-road EIs submitted by TTI to the TCEQ for photochemical modeling.

- On-road files by season, day type, and hour that summarize TDM link-level on-network emissions outputs coded with A and B link nodes, link roadway classification, MOVES road type, vehicle type, pollutant, and process, with off-network emissions at county level (fixed format).
- Refueling loss files by season, day type, and hour, that summarize VOC emissions by vehicle type and refueling loss process, reported at the county level for the off-network category (fixed format).
- On-road files by season and day type that summarize emissions (by pollutant and process) and activity (by type) by roadway functional classification (including the off-network category), vehicle type, hour of day, and 24-hour day (tab-delimited).
- On-road files by season and day type that summarize TEC and activity (by type), by roadway functional classification (including the off-network category), vehicle type, hour of day, and 24-hour day (tab-delimited).
- Refueling loss files by season and day type that summarize VOC refueling loss emissions by vehicle type, refueling process, hour of day, and 24-hour day (tab-delimited).
- Local county input data files (tab-delimited) for populating CDBs for all scenarios, suitable for MOVES3 inventory mode analyses, to also include a ready-to-run fully populated set of summer weekday scenario CDBs and the associated MOVES run specification files.

[3] Heavy-Duty Vehicle Idle Activity Study Final Report, prepared by TTI for TCEQ, July 2019.

- Output files that summarize the number of registered vehicles used to estimate vehicle populations (tab-delimited files).
- On-road files by season and day type that summarize VMT by hour, road type, and area type; and similar files of vehicle hours traveled (VHT) by hour, road type, area type, and average speed bin (tab-delimited).

1.4 Report Structure

The remainder of this report provides a detailed description of the methods used to estimate the EI scenarios outlined in the summarized scope. The subsequent sections broadly follow the simplified analysis steps reported in Section 1.2.

- Section 2 details the data and calculations used to calculate regional on-network and off-network traffic activity.
- Section 3 details the calculation of emission rates via MOVES and subsequent rates modifications.
- Section 4 details the methods used to calculate regional emissions.
- Sections 5 and 6 detail the methods used to process the final EI outputs into formats and files suitable for downstream air quality planning.
- The references list and the appendices complete the report.

2.0 ESTIMATING TRAFFIC ACTIVITY

On-network and off-network activity are required to estimate mobile source emissions. TTI uses a method that calculates on-network emissions using VMT by hour and direction for each link in a TDM. Off-network emissions are calculated using county-level, hourly estimates of activity, including ONI hours, source hours parked (SHP), starts, source hours extended idling (SHEI), and APU hours. Both on- and off-network activity (and emissions) are divided into the various vehicle type components. This section describes the methods used to develop on- and off-network activity.

2.1 VEHICLE MILES OF TRAVEL

The hourly, link-based emissions modeling process requires VMT estimates by hour and direction for each link in the TDM. The TDM VMT is characteristic of an average non-summer weekday (ANSWT) and is adjusted for HPMS consistency and to reflect estimated traffic activity patterns characteristic of a specifed seasonal day type scenario (i.e., summer Weekday, Friday, Saturday, Sunday, and school Weekday, Friday, Saturday, Sunday). Operational (congested) link speed estimates corresponding to these traffic conditions are also required. All calculations were conducted using a suite of EI utilities developed by TTI (see Appendix A).

2.1.1 Data Sources

Directional link VMT and speeds were calculated using the latest available link data, trips data, and zonal radii data sets extracted from the HGB 2026 TDM provided by H-GAC.[4] Since intrazonal VMT are not accounted for in TDMs, the intrazonal VMT was estimated using the TDM trip matrix and zonal radii data.

Several other data sources were used to adjust the VMT for HPMS consistency and to estimate the season and day type-specific VMT. HPMS VMT estimates[5] were used to adjust the total TDM-based VMT.

[4] This latest TDM data set was provided by H-GAC originally in spring 2021 for development of the HGB 2008 ozone NAAQS Reasonable Further Progress EI analysis as documented in *Houston-Galveston-Brazoria (HGB) 2008-Eight-Hour Ozone Reasonable Further Progress (RFP) On-Road Mobile Emissions Inventories* (TTI, June 2021).

[5] HPMS VMT estimates are based on traffic count data collected according to a statistical sampling procedure specified by the Federal Highway Administration (FHWA). The EPA and FHWA have endorsed HPMS as the appropriate source of VMT and require that VMT used to construct on-road mobile source emissions estimates be consistent with that reported through HPMS.

Seasonal and day type scenario factors derived from local ATR data were used to translate the traffic activity scenario represented by the TDM (i.e., ANSWT) to those defined for each emissions scenario. These seasonal and day type factors were estimated using ATR data collected from 2010 through 2019. Depending on the application, the data were either combined from the ATR stations within the eight-county region for use with all counties, or from within the TxDOT Beaumont District for use with Chambers and Liberty counties, and from within the TxDOT Houston District for use with Harris, Galveston, Fort Bend, Brazoria, Montgomery, and Waller counties.

2.1.2 VMT Adjustments

The following sections describe the steps TTI used to transform TDM-based VMT estimates to the activity scenario hourly VMT estimates required for emissions analysis.

The TDM VMT was adjusted for HPMS consistency and to represent the activity scenario period and day type. For 2026, which is a future year (i.e., HPMS VMT data does not exist for the year), a regional HPMS factor and period day type factors were used. Hourly travel factors were also applied to distribute the 2026 link VMT estimates over each hour of each day.

2.1.2.1 Historical Year Activity Scenario – VMT Control Totals and VMT Adjustments

Although only future year 2026 EIs were developed in this analysis, the historical year VMT adjustment procedure is described here, as it was needed in the development of base VMT for VMT-based scaling factors used in estimating 2026 future year off-network hotelling activity, discussed in a later section.

To estimate the HPMS-consistent link VMT for a historical year activity scenario, county-level analysis year activity scenario VMT control totals are used to develop county-level VMT adjustment factors. The VMT control total is comprised of two key components: the analysis year county-level HPMS annual average daily traffic (AADT) VMT acquired from TxDOT and the AADT-to-seasonal day type activity scenario adjustment factor.

The AADT-to-activity scenario adjustment factor is developed for each county using the multi-year, aggregated TxDOT ATR data. The HGB area spans two TxDOT districts, so two sets of adjustment factors are developed, one set of factors for Liberty and Chambers Counties (which are located in the Beaumont TxDOT District), and one set of factors for Harris, Galveston, Fort Bend, Brazoria, Waller, and Montgomery Counties

(which are located in the Houston TxDOT District). These factors are calculated by dividing the activity scenario average day-of-week count by the AADT traffic count.

The VMT control totals are calculated by multiplying the analysis year HPMS AADT VMT for each county by its ATR-based activity scenario adjustment factor. To develop the county-level VMT adjustment factors, each county's control total is then divided by its corresponding county total model VMT (TDM assignment VMT plus intrazonal VMT estimate) from the TDM for the analysis year. For each link in the TDM, the volume is multiplied by the corresponding VMT adjustment factor (based on the county where the link is located). The adjusted link volumes are then multiplied by the associated link lengths to produce the analysis year link-level HPMS consistent, activity scenario VMT estimates. This same adjustment is applied to the intrazonal VMT.

2.1.2.2 Future Year Activity Scenarios – HPMS Adjustment Factor

For future year activity scenarios, an HPMS adjustment factor was used to adjust the total model VMT (TDM assignment VMT plus intrazonal VMT estimate) from the TDM for HPMS consistency. While TTI typically calculates this factor, the HPMS factor used in this analysis (0.93837) was provided directly by H-GAC.

2.1.2.3 Future Year Activity Scenarios – Period Day Type Adjustment Factors

Seasonal adjustment factors were used to adjust the future year total model VMT to each season and day type. These adjustment factors were developed using the multi-year aggregated ATR data. One set of season and day type adjustment factors was developed for the eight counties in the HGB region. These factors were calculated using local ATR data by dividing the average day-of-week traffic volumes by the ANSWT volumes. Table 13 shows the seasonal adjustment factors.

Table 13. HGB ANSWT-to-Activity Scenario Adjustment Factors.

TDM Region	School Weekday	School Friday	School Saturday	School Sunday	Summer Weekday	Summer Friday	Summer Saturday	Summer Sunday
HGB eight TDM counties	1.00943	1.08954	0.90350	0.74840	1.00799	1.07763	0.88208	0.73819

2.1.3 Activity Scenario VMT Summaries

For each 2026 activity scenario, the final HPMS-consistent, VMT is comprised of two parts: the link-level VMT and the estimated intrazonal VMT. The volume on each link was multiplied by the HPMS factor, the seasonal day type adjustment factor, and the link's respective length to estimate the link-level VMT. For Saturday and Sunday day types, weekend day profile factors were also applied for the temporal reallocation of volumes and VMT from the standard four-period ANSWT pattern to weekend day traffic patterns and hourly factors for all activity scenarios were applied to distribute the resulting VMT over each hour of the day (discussed in a later section). These sets of factors were also applied to the associated intrazonal VMT estimates. Table 14, and Table 15 show the resulting activity scenario VMT summaries.[6]

Table 14. HGB 2026 School VMT Summary.

County	Weekday	Friday	Saturday	Sunday
Brazoria	10,562,193	11,400,479	9,453,785	7,830,957
Chambers	3,495,784	3,773,160	3,128,932	2,591,766
Fort Bend	19,171,355	20,692,919	17,159,511	14,213,908
Galveston	8,010,320	8,646,078	7,169,728	5,938,970
Harris	141,157,040	152,360,048	126,343,964	104,655,079
Liberty	3,433,740	3,706,236	3,073,402	2,545,801
Montgomery	19,069,766	20,583,254	17,068,558	14,138,525
Waller	3,170,982	3,422,641	2,838,200	2,350,983

Table 15. HGB 2026 Summer VMT Summary.

County	Weekday	Friday	Saturday	Sunday
Brazoria	10,547,133	11,275,854	9,229,669	7,724,147
Chambers	3,490,800	3,731,913	3,054,756	2,556,416
Fort Bend	19,144,018	20,466,712	16,752,719	14,020,038
Galveston	7,998,898	8,551,562	6,999,758	5,857,965
Harris	140,955,756	150,694,524	123,348,785	103,227,638
Liberty	3,428,844	3,665,721	3,000,542	2,511,078
Montgomery	19,042,574	20,358,247	16,663,921	13,945,683
Waller	3,166,461	3,385,226	2,770,917	2,318,917

[6] Small but insignificant differences may be noticed between control total VMT and post-processed VMT due to rounding in the process calculations (e.g., up to 0.001%).

2.1.4 VMT Temporal Allocation Factors

In addition to the various VMT adjustment factors applied as previously described, weekend day re-allocations and hourly distributions were needed. For weekend day analyses, the TDM total VMT and volumes by the four time periods were reallocated to replicate weekend day traffic profiles. Further, hourly distributions were applied for all activity scenarios to allocate TDM time period total VMT and volumes to each hour of the day.

2.1.4.1 Weekend Day Profile Factors

Weekend day profile factors were used to reallocate the TDM assignment and intrazonal VMT and volumes from the standard ANSWT four time period "weekday" proportions into four time period weekend day proportions. The weekend day profile factors by assignment period were developed for each inventory scenario weekend day type (i.e., school Saturday, school Sunday, summer Saturday, and summer Sunday) by county. These factors were not used for the Weekday and Friday inventory day types.

The weekend day profile factors were calculated using the county-level TDM total ANSWT VMT (assignment plus intrazonal) and the ATR-based Saturday and Sunday hourly travel factors (see the base factors in Table 17 and Table 18 in the Hourly Travel Factors section that follows). For each weekend day type, the associated hourly travel factors were first summed within the four TDM time periods to produce four weekend day factors that sum to 1.0. These four travel factors were then multiplied by the county-level 24-hour total ANSWT VMT to produce the weekend day VMT by the four time periods for each county. For each time period, this weekend day time period VMT was then divided by the original county-level time period TDM total ANSWT VMT to produce the weekend day profile factors. The weekend day profile factors based on the 2026 TDM are shown in Table 16.

Table 16. Weekend Day Profile Factors for 2026 TDM

Time Period	County	School Saturday	School Sunday	Summer Saturday	Summer Sunday
AM Peak	Harris	0.603870	0.397297	0.589657	0.394491
AM Peak	Brazoria	0.626874	0.412432	0.612119	0.409519
AM Peak	Fort Bend	0.590342	0.388397	0.576448	0.385654
AM Peak	Waller	0.596045	0.392149	0.582016	0.389379
AM Peak	Montgomery	0.606893	0.399286	0.592609	0.396466
AM Peak	Liberty	0.629767	0.414335	0.614944	0.411409
AM Peak	Chambers	0.667184	0.438953	0.651481	0.435853
AM Peak	Galveston	0.650790	0.428166	0.635472	0.425143
Mid-Day	Harris	1.102690	1.141172	1.084902	1.128459
Mid-Day	Brazoria	1.080359	1.118061	1.062930	1.105606
Mid-Day	Fort Bend	1.131167	1.170643	1.112919	1.157602
Mid-Day	Waller	1.067100	1.104340	1.049885	1.092037
Mid-Day	Montgomery	1.107928	1.146593	1.090055	1.133820
Mid-Day	Liberty	1.068874	1.106175	1.051630	1.093852
Mid-Day	Chambers	1.049793	1.086428	1.032857	1.074326
Mid-Day	Galveston	1.052991	1.089738	1.036004	1.077599
PM Peak	Harris	0.794982	0.873999	0.787101	0.853016
PM Peak	Brazoria	0.806369	0.886518	0.798375	0.865235
PM Peak	Fort Bend	0.768534	0.844922	0.760914	0.824637
PM Peak	Waller	0.816091	0.897206	0.808000	0.875666
PM Peak	Montgomery	0.798685	0.878070	0.790767	0.856989
PM Peak	Liberty	0.840545	0.924091	0.832212	0.901905
PM Peak	Chambers	0.892233	0.980916	0.883387	0.957366
PM Peak	Galveston	0.805269	0.885308	0.797285	0.864054
Overnight	Harris	1.587485	1.592272	1.648528	1.655429
Overnight	Brazoria	1.547966	1.552634	1.607489	1.614219
Overnight	Fort Bend	1.651800	1.656780	1.715315	1.722497
Overnight	Waller	1.634020	1.638948	1.696852	1.703956
Overnight	Montgomery	1.553363	1.558047	1.613093	1.619847
Overnight	Liberty	1.468376	1.472803	1.524838	1.531222
Overnight	Chambers	1.323095	1.327085	1.373971	1.379724
Overnight	Galveston	1.569125	1.573857	1.629462	1.636284

2.1.4.2 Hourly Travel Factors

Hourly travel factors were used to distribute the TDM and intrazonal VMT to each hour of the day. These hourly travel factors were developed using the multi-year aggregated ATR station data for the eight-county HGB region. To maintain VMT proportions within each of the four assignment time periods, the hourly fractions were normalized within each time period to produce the time period hourly travel factors. Each factor (i.e., 24, or one for each hour of the day) was then multiplied by the link volume (in addition to the

other VMT adjustment factors). These adjusted link volumes were then multiplied by their respective link lengths to estimate the hourly link-level VMT for each inventory scenario. These factors were also multiplied by the estimated intrazonal VMT to produce the final hourly-adjusted VMT. Table 17 and Table 18 show the school and summer period hourly travel factors.

Table 17. 2026 School Period Hourly Travel Factors.

Time Period	Hour ID[2]	Weekday Base Factor	Weekday Time Period Factor[1]	Friday Base Factor	Friday Time Period Factor[1]	Saturday Base Factor	Saturday Time Period Factor[1]	Sunday Base Factor	Sunday Time Period Factor[1]
AM Peak	7	0.066343	0.339630	0.058170	0.328908	0.029923	0.268404	0.018695	0.254881
AM Peak	8	0.069848	0.357573	0.063652	0.359905	0.036720	0.329372	0.023267	0.317214
AM Peak	9	0.059148	0.302797	0.055036	0.311188	0.044842	0.402225	0.031386	0.427905
Mid-Day	10	0.052483	0.165278	0.049988	0.155317	0.050803	0.142609	0.043799	0.118802
Mid-Day	11	0.050108	0.157799	0.050081	0.155605	0.055631	0.156161	0.055823	0.151416
Mid-Day	12	0.051353	0.161720	0.052642	0.163563	0.059771	0.167782	0.060729	0.164723
Mid-Day	13	0.052876	0.166516	0.054703	0.169966	0.062906	0.176583	0.067367	0.182728
Mid-Day	14	0.053696	0.169098	0.055649	0.172906	0.063332	0.177779	0.070906	0.192328
Mid-Day	15	0.057027	0.179588	0.058783	0.182643	0.063798	0.179087	0.070049	0.190003
PM Peak	16	0.063637	0.240343	0.063157	0.249080	0.064158	0.256578	0.070665	0.257051
PM Peak	17	0.069190	0.261315	0.065377	0.257835	0.063458	0.253778	0.070709	0.257211
PM Peak	18	0.071962	0.271784	0.066194	0.261057	0.062905	0.251567	0.068930	0.250739
PM Peak	19	0.059987	0.226558	0.058833	0.232027	0.059532	0.238078	0.064603	0.234999
Overnight	20	0.046113	0.207400	0.049940	0.201586	0.052953	0.187630	0.057534	0.203249
Overnight	21	0.034763	0.156351	0.039380	0.158960	0.045075	0.159716	0.047910	0.169251
Overnight	22	0.028585	0.128565	0.034043	0.137417	0.041066	0.145511	0.038858	0.137273
Overnight	23	0.021057	0.094707	0.029333	0.118405	0.035778	0.126773	0.028871	0.101992
Overnight	24	0.013373	0.060147	0.021629	0.087307	0.028168	0.099809	0.018824	0.066499
Overnight	1	0.008047	0.036192	0.009068	0.036604	0.017531	0.062118	0.025019	0.088384
Overnight	2	0.005298	0.023828	0.006100	0.024623	0.011930	0.042272	0.017185	0.060709
Overnight	3	0.005011	0.022538	0.005973	0.024110	0.011286	0.039990	0.015709	0.055495
Overnight	4	0.005974	0.026869	0.006187	0.024974	0.008216	0.029112	0.010066	0.035560
Overnight	5	0.013587	0.061109	0.012124	0.048939	0.010345	0.036656	0.009444	0.033363
Overnight	6	0.040531	0.182294	0.033958	0.137074	0.019872	0.070413	0.013651	0.048225
24-Hour Total	n/a	1.000000	4.000000	1.000000	4.000000	1.000000	4.000000	1.000000	4.000000

[1] Used in the VMT calculation process.

[2] Hour ID 1 means the hour from 0:00 to 1:00, etc.

Table 18. 2026 Summer Period Hourly Travel Factors.

Time Period	Hour ID[2]	Weekday Base Factor	Weekday Time Period Factor[1]	Friday Base Factor	Friday Time Period Factor[1]	Saturday Base Factor	Saturday Time Period Factor[1]	Sunday Base Factor	Sunday Time Period Factor[1]
AM Peak	7	0.063918	0.336641	0.055917	0.326277	0.030370	0.278980	0.018877	0.259193
AM Peak	8	0.067908	0.357655	0.061600	0.359437	0.035716	0.328088	0.023312	0.320088
AM Peak	9	0.058044	0.305704	0.053862	0.314286	0.042775	0.392932	0.030641	0.420719
Mid-Day	10	0.052158	0.163098	0.050088	0.154134	0.049272	0.140579	0.042604	0.116862
Mid-Day	11	0.050402	0.157607	0.050674	0.155937	0.054688	0.156031	0.053994	0.148105
Mid-Day	12	0.051900	0.162291	0.053361	0.164206	0.058720	0.167535	0.059346	0.162785
Mid-Day	13	0.053768	0.168132	0.055450	0.170634	0.061960	0.176779	0.067141	0.184167
Mid-Day	14	0.054417	0.170162	0.056320	0.173312	0.062587	0.178568	0.071106	0.195043
Mid-Day	15	0.057151	0.178711	0.059071	0.181777	0.063267	0.180508	0.070375	0.193038
PM Peak	16	0.062782	0.239854	0.062926	0.249733	0.063635	0.257034	0.069551	0.259222
PM Peak	17	0.067971	0.259678	0.064878	0.257480	0.062909	0.254102	0.068931	0.256911
PM Peak	18	0.071567	0.273416	0.066076	0.262234	0.062060	0.250673	0.067015	0.249770
PM Peak	19	0.059431	0.227052	0.058093	0.230552	0.058970	0.238191	0.062810	0.234098
Overnight	20	0.045488	0.199001	0.049215	0.195544	0.052069	0.177666	0.055483	0.188526
Overnight	21	0.034912	0.152733	0.039475	0.156844	0.045158	0.154085	0.047916	0.162814
Overnight	22	0.030423	0.133094	0.034869	0.138543	0.043328	0.147841	0.042375	0.143986
Overnight	23	0.023071	0.100931	0.030079	0.119511	0.038194	0.130323	0.032970	0.112029
Overnight	24	0.015037	0.065784	0.022906	0.091011	0.029760	0.101545	0.021810	0.074108
Overnight	1	0.009085	0.039745	0.010045	0.039911	0.018928	0.064585	0.025183	0.085569
Overnight	2	0.005973	0.026131	0.006726	0.026724	0.013001	0.044361	0.017915	0.060873
Overnight	3	0.005454	0.023860	0.006492	0.025794	0.012193	0.041604	0.016512	0.056106
Overnight	4	0.006191	0.027084	0.006466	0.025691	0.008853	0.030208	0.010539	0.035811
Overnight	5	0.013655	0.059738	0.012338	0.049022	0.011058	0.037731	0.009809	0.033330
Overnight	6	0.039293	0.171899	0.033072	0.131403	0.020530	0.070051	0.013787	0.046847
24-Hour Total	n/a	1.000000	4.000000	1.000000	4.000000	1.000000	4.000000	1.000000	4.000000

[1] Used in the VMT calculation process.

[2] Hour ID 1 means the hour from 0:00 to 1:00, etc.

2.1.5 Link Speeds

The operational speeds for each link, excluding centroid connectors and the special intrazonal links, were calculated using the Houston speed model. The Houston speed model calculates these speeds using the travel model speed, speed factors (consisting of a free-flow speed factor and level of service [LOS] E speed factor), and a volume-to-capacity (V/C) ratio-based speed reduction factor (SRF) associated with each link.

The speed factors were used to convert the link-level travel model (input) speed to a free-flow speed and an LOS E speed (i.e., application of these factors results in two speeds). The free-flow speed factors (grouped by functional class and area type) were calculated by dividing the distance-weighted free-flow speed by the distance-weighted

input speed for each functional class/area type combination. The distance-weighted free-flow speeds were calculated using output from the detailed speed model used by H-GAC in the travel model development process (as provided by H-GAC) with link volumes set to 0 (i.e., V/C = 0). The LOS E speed factors were calculated in a similar manner (distance-weighted LOS E speed divided by distance-weighted input speed) using the detailed speed model output with link volumes set equal to capacity (i.e., V/C = 1). Appendix E shows the speed factors and the network functional class and functional group relationship.

The link-specific V/C ratio is calculated as the time period (hourly) volume divided by the time period capacity. The V/C ratio is expressed as:

$$v/c\ ratio = Vh / Ch$$

Where:

- Vh = the hourly link volume (travel model × HPMS factor × seasonal adjustment factor × hourly time period factor; Weekend profile factor is included for Saturday and Sunday); and
- Ch = the hourly link capacity (travel model capacity × hourly capacity factor). Appendix E shows the hourly capacity factors.

After the V/C ratio was calculated, the link-specific SRF was determined using the V/C ratio, the link-specific SRF area type, the link-specific SRF functional class, and the SRFs. The SRFs are for V/C ratios of 0 to 1 in 0.05 increments (i.e., 0, 0.05, 0.10, … , 0.95, 1.0). Appendix E shows these SRFs. The link-specific SRF was calculated using linear interpolation. For V/C ratios greater than 1.0, an SRF is not required.

The speed model (for V/C ratios from 0.00 to 1.00) is expressed as:

$$S_{V/C} = S_{0.0} - SRF_{V/C} \times (S_{0.0} - S_{1.0})$$

Where:

- $S_{V/C}$ = estimated directional speed for the forecast V/C ratio on the link in the given direction;
- $S_{0.0}$ = estimated free-flow speed for the V/C ratio equal to 0.0;
- $S_{1.0}$ = estimated LOS E speed for the V/C ratio equal to 1.0; and
- $SRF_{V/C}$ = SRF for the V/C ratio on the link. The V/C ratio can be 0.0 to 1.0.

For V/C ratios greater than 1.0 and less than 1.5, the following speed model extension was used.

$$S_{V/C} = S_{1.0} \times (1.15/(1.0 + (0.15 \times (v/c)^4)))$$

Where:

$S_{v/c}$ = estimated directional speed for the forecast V/C ratio on the link in the given direction;
$S_{1.0}$ = estimated LOS E speed for the V/C ratio equal to 1.0; and
v/c = the forecast V/C ratio on the link. The V/C ratio can be 1.0 to 1.5.

For V/C ratios greater than 1.5, the speed was calculated using the previous speed model extension, except the V/C ratio was set to 1.5.

These speed models were applied to all functional classes, excluding the centroid connector and intrazonal functional classes. For these functional classes, capacity data were not used. The centroid connector travel model input speeds were used as the centroid connector operational speed estimates. Operational speeds for the intrazonal functional class were estimated by zone as the average of the zone's centroid connector speeds.

The hourly and 24-hour speed (VMT/VHT) summaries by county and road type were provided electronically to TCEQ (see Appendix B for electronic data descriptions).

2.2 Off-Network Activity

Off-network activity includes ONI hours, SHP, starts, and long-haul combination truck hotelling hours (split into various fractions of activity, such as SHEI and diesel APU hours). These quantities are estimated for each hour of the day at a spatial scale of a county and for each vehicle type.

2.2.1 Vehicle Populations

Vehicle population data were used to estimate SHP and vehicle starts off-network activity. The vehicle population estimates were derived from end of year 2018, county-specific vehicle registration data provided by the TxDMV, TxDOT district level VMT mix data, and HPMS-reported county-level VMT totals.

A single set of vehicle population data inputs was used for all analysis year seasonal day types (i.e., the model assumes that vehicle populations remain constant across seasons and day types).

The end of year 2018 TxDMV vehicle registration data was provided in the form of total vehicles (by TxDMV category) registered by county, subsequently aggregated by the vehicle categories shown in the first column of Table 19. These TxDMV vehicle category

aggregations were disaggregated to the MOVES SUT and fuel type aggregations shown in the corresponding row of the second column of Table 19. As previously mentioned, in MOVES emissions analyses we use the term vehicle type as synonymous with MOVES SUT and fuel type combination.

The following steps were used to disaggregate the TxDMV vehicle registration data to vehicle population data by vehicle type.

1. VMT mix data was used to calculate the proportional representation of each MOVES vehicle type within each TxDMV aggregation class (first column of Table 19).
2. The proportional fractions calculated in Step 1 were multiplied by the total number of vehicles reported in each TxDMV vehicle registration category to obtain the estimated number of vehicles (populations) for each modeled MOVES vehicle type.
3. The long-haul truck vehicle type populations (see the last row of Table 19) were estimated as an extension of their estimated short-haul vehicle type population counterparts. This was accomplished by multiplying a long-haul-to-short-haul ratio derived from the weekday vehicle type VMT mix, by the associated short-haul truck vehicle type populations, from Step 2.

The VMT mix data used in these calculations was the TxDOT district-level, 24-hour weekday VMT mix described in more detail in the "Vehicle Type VMT Mix" section and included in Appendix D.

The methods above yielded 2018 vehicle population data for each of the vehicle types modeled in the EIs.

Analysis year vehicle type populations were then calculated by applying a vehicle types population growth factor (VPGF). The VPGF was calculated using county-level HPMS reported total VMT for the registration data year (2018) and the analysis year (2026).

$$VPGF = Analysis\ Year\ VMT / Registration\ Year\ VMT$$

Table 19. TxDMV Registration Aggregations for Estimating Vehicle Populations.

Vehicle Registration[1] Aggregation	Associated Vehicle Type[2]
Motorcycles	MC_Gas
Passenger Cars (PC)	PC_Gas; PC_Diesel
Trucks ≤ 8.5 K GVWR (pounds)	PT_Gas; PT_Diesel; LCT_Gas; LCT_Diesel
Trucks > 8.5 and ≤ 19.5 K GVWR	RT_Gas; RT_Diesel SUShT_Gas; SUShT_Diesel MH_Gas; MH_Diesel OBus_Gas: OBus_Diesel TBus_Gas; TBus_Diesel SBus_Gas; SBus_Diesel
Trucks > 19.5 K GVWR	CShT_Gas; CShT_Diesel
NA[1]	SULhT_Gas; SULhT_Diesel CLhT_Gas; CLhT_Diesel

[1] The four long-haul SUT/fuel type populations are estimated using a long-haul-to-short-haul weekday SUT VMT mix ratio applied to the short-haul SUT population estimate.
[2] The year-end TxDMV county registrations data extracts were used (consisting of 1—light-duty cars, trucks, and motorcycles; 2—heavy-duty diesel trucks; and 3—heavy-duty gasoline trucks) for estimating the vehicle populations.

2.2.2 ONI Hours

Off-network idling, or ONI, is idling activity that occurs, for example, while a vehicle is idling in a parking lot, drive-through, or driveway while waiting to pick up passengers or loading/unloading cargo. ONI activity applies to all MOVES source types.

TTI estimates ONI hours activity (i.e., source hours idling [SHI] off-network) for each hour of the day using the following formula.

$$ONI\ hours = (SHO_{network} \times TIF - SHI_{network}) / (1 - TIF).$$

Where:

- $SHO_{network}$ is the source hours operating on each link. This is calculated by dividing the VMT associated with each link by the link's congested speed.
- $SHI_{network}$ is the total source hours idling that occurs on the network (idling that occurs as a component of drive cycles) and is calculated by multiplying $SHO_{network}$ by a road idle fraction (RIF). RIF is the proportion of idling (in units of time) that occurs within a drive-cycle at a specified operational speed. Default values for RIF were used as defined in the MOVES data table "roadidlefraction".
- TIF is the total idle fraction or total idling time on and off-network divided by total SHO on and off-network: $TIF = (SHI_{network} + ONI) / (SHO_{network} + ONI)$.

Default values for TIF were used as defined in the MOVES data table "totalidlefraction".

TTI estimated the ONI hours by day type and by summer and school periods using a combination of MOVES factors that vary by MOVES day type and/or month (roadidlefraction and totalidlefraction) in combination with local activity factors for each activity scenario.

2.2.3 SHP

County-level vehicle type SHP was calculated for each hour of the day and each vehicle type as the difference between the local vehicle population (total available vehicle hours) minus source operating hours (SHO).

Adjusted SHP was then calculated by subtracting ONI hours from the previously calculated SHP. Appendix E summarizes county-level 24-hour SHP and adjusted SHP by vehicle type for each activity scenario. Hourly summaries were provided electronically to TCEQ; see Appendix B for electronic data descriptions.

2.2.4 Vehicle Starts

Vehicle starts were estimated using county-level vehicle type populations, and data from MOVES representing the average number of vehicle starts per vehicle type per hour.

The starts per vehicle were calculated using MOVES with data on the age distribution and fuel fractions of the local fleet[7]. TTI used local age distributions and fuel fractions inputs to MOVES combined with MOVES default parameters (startsageadjustment, startsmonthadjust [June through August average], and startspervehicle) to produce hourly starts per vehicle output representative of the June through August summer period. The output was then post-processed to produce the scenario-specific starts per vehicle for the summer (or non-school) and school periods defined by the study scope.

MOVES was used to calculate starts per vehicle (i.e., the average number of starts per vehicle type per hour) for both weekday and weekend-day day types for the June through August summer period. To produce the scenario-specific non-school period (10 June through 10 August) and school period (15 April through 15 May and 15 September through 15 October) starts per vehicle estimates, the MOVES output summer period

[7] Previously with MOVES2014, TTI used MOVES default starts per vehicle (which varied only by MOVES day type) in combination with local vehicle populations to estimate vehicle starts activity. In MOVES3, vehicle starts per hour also vary by county (because age distributions also vary by county).

starts per vehicle were multiplied by conversion factors based on period weighted average MOVES default startsmonthadjust data. Using the startsmonthadjust default data, the non-school conversion factor is the ratio of non-school-period-to-average June through August summer period. For the school period, the conversion factor is the ratio of school period-to-average June through August summer period.

For each hour of the day, the MOVES starts per vehicle data were multiplied by the local vehicle type population estimates to produce the total number of starts by vehicle type per hour.

2.2.5 Hotelling: SHEI and APU Hours

Hotelling hours were calculated for heavy-duty, long-haul trucks only (i.e., SUT 62[8]) in several steps. First total hotelling hours were calculated using information from a TCEQ extended idling study[9]. Scaling factors were then used to convert these base hotelling hours to those relevant to each scenario (defined by analysis year, season, and day type), which were then allocated to each hour of the day. Estimations were then made of the proportions of hotelling hours that occur in each of the four hotelling categories: idling using the main engine (SHEI), diesel APU operation, electric APU operation, or main engine off and no auxiliary power[10].

2.2.5.1 Estimating 24-Hour Hotelling

County-level hotelling scaling factors were developed to transform base 2017 winter weekday total daily hotelling hours to daily hotelling hours for each EI scenario. Scaling factors were calculated using the county-level ratio of heavy-duty long haul VMT for each EI scenario relative to heavy-duty long haul VMT for a 2017 winter weekday base (scenario SUT 62 VMT divided by 2017 winter weekday SUT 62 VMT).

Total daily hotelling for each county and EI scenario was calculated by multiplying the appropriate scaling factor by the total daily hotelling hours contained in the 2017 winter weekday hotelling hours study.

[8] SUT 62 represents long-haul combination trucks, for which only diesel fuel types are modeled.

[9] *Heavy-Duty Vehicle Idle Activity Study, Final Report*. Texas A&M Transportation Institute, Environment and Air Quality Division. July 2019. https://www.tceq.texas.gov/assets/public/implementation/air/am/contracts/reports/mob/582177430806-20190722-TTI-HeavyDutyIdleActivityStudyFinal.pdf

[10] Note that only SHEI and APU diesel hoteling generate emissions. The other fractions are calculated for completeness.

2.2.5.2 Hotelling by Hour Estimation

Daily hotelling hours were allocated to each hour of the day as a function of the inverse of activity scenario hourly VHT fractions for SUT 62. The hourly VHT fractions were calculated using the hourly VHT from the SHP estimation process (where VHT = SHO). The inverses of these hourly VHT fractions were calculated and then normalized across all hours to produce the county-level, hotelling hours hourly distribution.

If the hourly hotelling hours (as calculated above) were greater than SHP (for SUT 62), the final hotelling hours estimate was set to the SHP.

2.2.5.3 SHEI and APU Hours

The hourly, county-level, hotelling estimates were then factored to calculate SHEI and diesel APU hours activity components using extended idle and APU fractions. The SHEI and APU fractions were derived using MOVES default SUT 62 hotelling operating mode distributions by model year. The MOVES SHEI and APU hotelling distributions[11] are shown in Table 20. Note that only SHEI and diesel APU are used to calculate emissions.

Table 20. Hotelling Activity Distributions by Model Year.

First Model Year	Last Model Year	200 Extended Idling	201 Hotelling Diesel Aux	203 Hotelling Battery AC	204 Hotelling APU Off
1960	2009	0.80	0	0	0.20
2010	2020	0.73	0.07	0	0.20
2021	2023	0.48	0.24	0.08	0.20
2024	2026	0.40	0.32	0.08	0.20
2027	2050	0.36	0.32	0.12	0.20

2.3 Vehicle Type VMT Mix

VMT mix represents the fraction of on-road fleet VMT attributable to each SUT by fuel type. It is used to subdivide the total VMT estimates on each link into VMT by vehicle type. Hourly VMT estimates by vehicle type are combined with the appropriate emission factors in the link-emissions calculations.

VMT mixes were calculated and applied at the following scales.

- Each TxDOT District.

[11] Current MOVES3 defaults (previously adopted while in draft stage for use in the TCEQ 2017 truck extended idling study).

- Each analysis year (EI analysis year plus 2017 base for hotelling calculations).
- Each MOVES roadway type (Rural and Urban, Restricted and Unrestricted Access).
- Day type (Weekday, Friday, Saturday, and Sunday).
- Four time-of-day periods (AM peak, Midday, PM peak, and Overnight).

VMT mixes were calculated using local vehicle classification count and ATR data, MOVES defaults, and local registration data. Figure 1 shows a simplified view of the method used to estimate VMT mix[12], which includes the following steps (numbered in Figure 1).

1. MOVES – Data files of MOVES default values extracted from the MOVES database or from MOVES output.
2. TxDOT Classification Counts – Data files of standard TxDOT classification data assembled and used for determining the in-use road fleet mix.
3. TxDMV Registration Data – Data files of standard TxDMV vehicle registration summary data assembled and used for determining the in-use road fleet mix.
4. TxDOT ATR Data – Data files of TxDOT ATR data assembled and used to allocate VMT by season and day of week.
5. Single Unit Local vs. Total SUT_HDVyy – Procedure based on registration data to generate factors to separate Single Unit versus Combined Unit trucks by region. (SUT_HDVyy has multiple outputs based on vehicle category and fuel.)
6. Combination Local vs. Total SUT_HDXyy – Procedure based on MOVES default data to generate short-haul and long-haul combination truck proportions by region.
7. Day of Week (DOW) Factors by Urban Area/TxDOT District – Seasonal day-of-week factors from TxDOT ATR data used to allocate VMT by season and day-of-week by urban area/TxDOT district.
8. Single Unit Short-Haul vs. Long-Haul SUT_SSHZ – Procedure to separate single unit short-haul versus single unit long-haul using factors generated at SUT_HDVyy and classification count data. Short-haul and long-haul are functionally defined as local and pass-through.

[12] *Developing MOVES Source Use Types and VMT Mix for Conformity Analysis* (TxDOT Air Quality / Conformity IAC-A - TTI Task 409252-0643: Maintain, Update and Enhance Traffic Activity Estimation and Forecasting Methods), Texas Department of Transportation, Austin, TX, August 2016.

9. Combination Short-Haul vs. Long-Haul SUT_CSHZ – Procedure to separate combination short-haul versus combination long-haul with factors generated using MOVES defaults and classification count data. Short-haul and long-haul are functionally defined as local and pass-through.
10. PV and LDT Fuel MF_Fuelyy – Procedure to generate passenger vehicle and light truck fuel allocation by year based on MOVES national default values and local registration data.
11. Single Unit and Combination Truck Fuel SUT_HDVyy – Procedure to generate single unit and combined truck fuel allocation factors from registration data. (SUT_HDVyy has multiple outputs based on vehicle category and fuel.)
12. SUT_yyddtt – Procedure to generate SUT proportions by year, day type, and time period, based on the previous steps.
13. MOVES SUTs – Output file of MOVES SUTs by region, analysis year, day type, and time period. For MOVES3, P_ICB41D is renamed P_OB41D (per the redefined MOVES3 category equivalent to the previous MOVES2014 category), and P_OB41G is added and set to zero (since we have no data to support the proportion of the "Other Buses" category that is gasoline fueled).[13]

[13] Specifically, the intercity bus category (ICB41) is redefined and renamed "Other Buses" (OB41). Intercity bus was previously considered diesel only. While there is currently no data available to determine the proportion, or even existence of gas fueled "Other Buses" vehicles, the category is necessary to be consistent with MOVES3. Pending additional data, "Other Buses" (OB41) is treated as equivalent to "Intercity Bus" (ICB41) and a placeholder "null" gasoline fueled "Other Buses" (OB41G) is added. The rest of the procedure is identical to the current VMT mix procedure. Thus, these measures and procedures, as modified, provide a functional, hybrid region-specific, disaggregate link-level application of MOVES3 to the extent possible with the data currently available. This hybrid is consistent with previous applications in terms of activity inputs and fleet data.

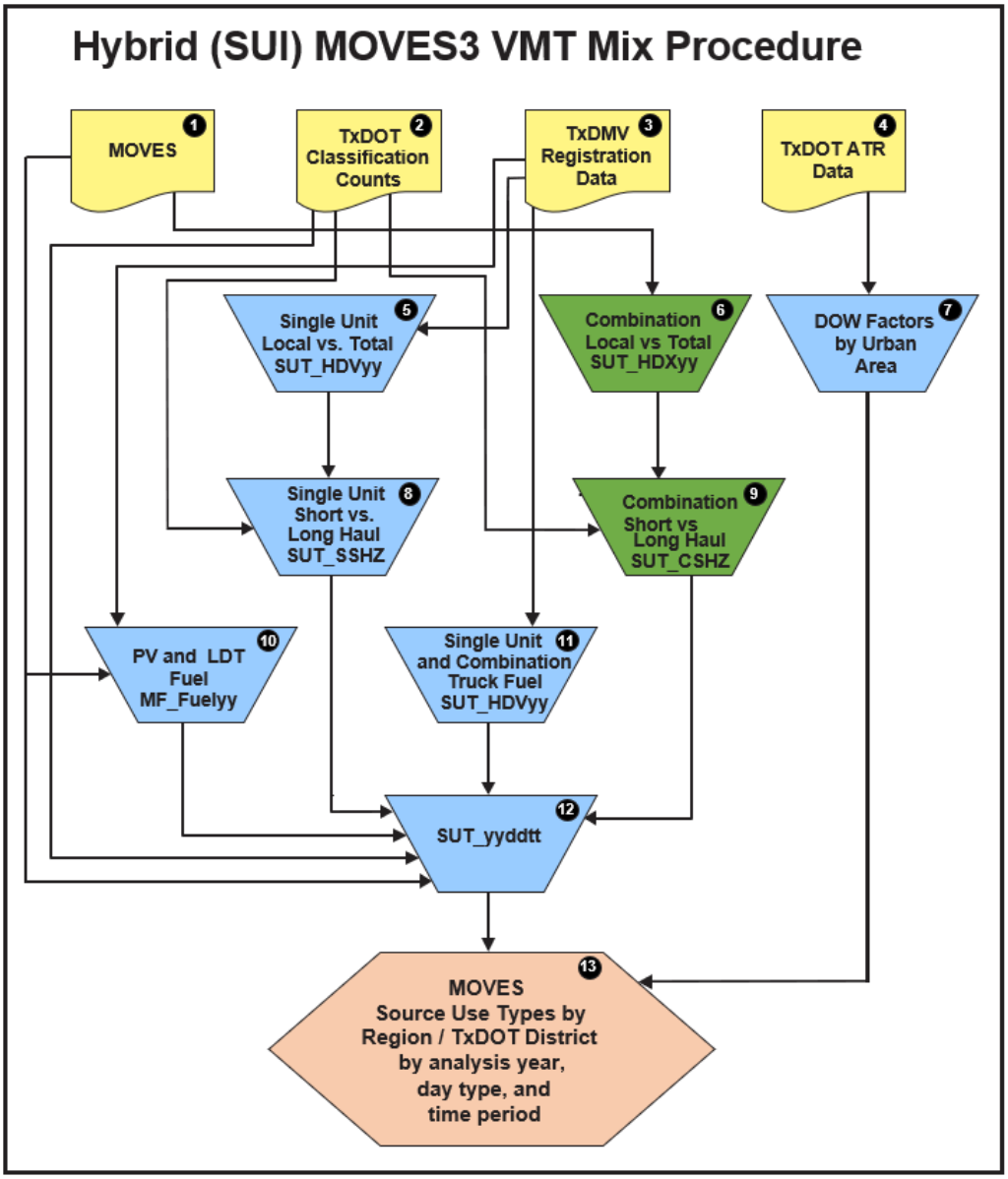

Figure 1. Simplified Overview of the VMT Mix Process.

Using the same data sets and a similar procedure, aggregate (i.e., all road-type categories), TxDOT district-level weekday vehicle type VMT mixes (used in the vehicle population estimation) were also produced. To ensure general applicability and consistency across all study areas, all VMT mixes were developed in five-year increments beginning with the year 2005 and applied to the analysis years based on Table 21.

Table 21. VMT Mix Year/Analysis Year Correlations.

VMT Mix Year	Analysis Years
2005	2003 through 2007
2010	2008 through 2012
2015	2013 through 2017
2020	2018 through 2022
2025	2023 through 2027
2030	2028 through 2032
2035	2033 through 2037
2040	2038 through 2042
2045	2043 through 2047
2050	2048 through 2050

3.0 EMISSION AND TOTAL ENERGY RATES

This section describes the development of the pollutant emission rates as well as the Total Energy Consumption (TEC) rates. The emission (and TEC) rates were calculated using EPA's MOVES3 emission factor model parameterized using local and default data. The resultant MOVES3 emission rates were then post-processed using TTI's EI utilities to yield the emission rates used to calculate total emissions for each EI scenario. The emission rates were developed based on the *TTI Emissions Inventory Utilities User's Guide* methods and procedures but updated as needed to accommodate MOVES3 and EPA's *Technical Guidance*[14] applicable to MOVES3 inventory development.

The following sections describe the emission rates development process.

3.1 PROCESS OVERVIEW

MOVES emission rates mode runs were set up to produce MOVES output databases containing emissions, TEC, and activity data (some of which were used during the activity estimation methods described previously). Data contained in each MOVES output database was then post-processed into the final on-road emission rates and TEC rates and area source refueling emission rates used in each EI scenario.

Emission rates were developed for summer 2026 for a weekday and a weekend day (i.e., the two MOVES day types). These emission rates were then used with the traffic activity estimates associated with the corresponding activity scenarios (which also distinguishes day type) to calculate the full set of EIs.[15]

Post-processing entailed using an on-road rates look-up table post-processor utility to convert the rates output by MOVES into the units defined by the on- and off-network activity detailed in the previous section (emissions per mile for VMT, emissions per start for vehicle starts, emissions per SHP, etc.). Table 22 defines the rates produced for the external inventory calculations relative to traffic activity measures.

Another post-processing step adjusted diesel vehicle NO_X to account for TxLED fuel used in each county.

[14] EPA. 2020. *MOVES3 Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity*, EPA-420-B-20-052, Office of Transportation and Air Quality. November 2020.

[15] Separate emission rates were needed by MOVES day type, since some emission rate output varies by day type (e.g., start emission rates, due to different weekday versus weekend cold start distributions by hour of day).

Table 22. Emission/Energy Rates, MOVES Emissions Processes, and Activity Factors.

MOVES Emissions Processes[1]	Activity[2]	Emission Rates[3]	Energy Rates
Running Exhaust[1]	VMT	mass/mile (mass/mi)	energy/mi
Crankcase Running Exhaust	VMT	mass/mi	
Brake Wear	VMT	mass/mi	
Tire Wear	VMT	mass/mi	
Start Exhaust[1]	Starts	mass/start	energy/start
Crankcase Start Exhaust	Starts	mass/start	
Extended Idle Exhaust[1]	SHEI	mass/hour	energy/hour
Crankcase Extended Idle Exhaust	SHEI	mass/hour	
Auxiliary Power Exhaust[1]	APU hours	mass/hour	energy/hour
Running Exhaust (1) – Road Type 1 Off-Network	ONI hours	mass/hour	energy/hour
Evaporative Permeation Evaporative Fuel Vapor Venting Evaporative Fuel Leaks	VMT, SHP	mass/mi, mass/hour[3]	
Refueling Displacement Vapor Loss	VMT, Starts	mass/mi, mass/start	
Refueling Spillage Loss	VMT, Starts, SHEI, APU hours	mass/mi, mass/start, mass/hour, mass/hour	

[1] MOVES estimates refueling emissions in relation to the amount of energy (or fuel) expended per unit of activity, and associates fuel usage only with running exhaust, start exhaust, extended idle exhaust, and APU exhaust processes. The TEC estimates are based on these same processes.

[2] VMT, ONI hours, SHP, vehicle starts, and the SHEI and APU hours components of hotelling are the basic activity factors. SHEI and APU hours are for combination long-haul trucks only.

[3] All mass per activity rates shown are available in MOVES rate mode table output, except for mass/hour for SHP, and for mass per activity refueling rates, which were produced using the TTI rates post-processing utility.

3.2 MOVES Run Specification Input Files

The MOVES Run Specification (MRS) is a file (in extensible markup language [XML] format) that defines the place, time, road categories, vehicle and fuel types, pollutants and emissions processes, and the overall scale and level of output detail for the modeling scenario. TTI created an MRS for one county and scenario using the MOVES graphical user interface (GUI), then converted the MRS to a template from which all the required MRS files were built. Table 23 describes the MRS selections used, followed by sections describing the input data used per selection.

Table 23. MRS Selections by MOVES GUI Panel.

Navigation Panel	Detail Panel	Selection
Scale[1]	Model; Domain/Scale; Calculation Type	On-Road; County; Emission Rates
Time Spans[1]	Years – Months – Days – Hours	***<YEAR>*** - ***<MONTH>*** - ***<DAY TYPE>*** - All
Geographic Bounds[1]	States; Counties; Selections	Texas - ***<COUNTY>***;[1] ***<TX COUNTY SELECTION>***
On-Road Vehicles[2]	SUT/Fuel Combinations: 1 – Gasoline, 2 – Diesel, 3 – Compressed natural gas (CNG), 5 – E85 (85% ethanol-15% gasoline blend), 9 – Electric	SUT: / Fuel Types Motorcycle: 1 - - - - Passenger Car: 1 2 - 5 9 Passenger Truck: 1 2 - 5 9 Light Commercial Truck: 1 2 - 5 9 Other Buses: 1 2 3 - - Transit Bus: 1 2 3 - - School Bus: 1 2 3 - - Refuse Truck: 1 2 3 - - Single Unit Short-Haul Truck: 1 2 3 - - Single Unit Long-Haul Truck: 1 2 3 - - Motor Home: 1 2 3 - - Combination Short-Haul Truck: 1 2 3 - - Combination Long-Haul Truck: - 2 - - -
Road Type	Selected Road Types	Off-Network – Rural Restricted Access – Rural Unrestricted Access – Urban Restricted Access – Urban Unrestricted Access
Pollutants[3] and Processes	VOC; CO; NO_X; NO; NO_2; HONO; Atmospheric CO_2; SO_2; CH_4; N_2O; NH_3; $PM_{2.5}$: OC, EC, SO_4, H_2O, NCOM, NO_3, NH_4, Total Exhaust, Brakewear, and Tirewear; PM_{10}: Total Exhaust, Brakewear, and Tirewear; TEC	Dependent on pollutant: Running Exhaust, Start Exhaust, Extended Idle Exhaust, Auxiliary Power Exhaust, Crankcase Running Exhaust, Crankcase Start Exhaust, Crankcase Extended Idle Exhaust, Evap Permeation, Fuel Vapor Venting, Fuel Leaks; Refueling Displacement Vapor Loss, Refueling Spillage Loss, Brakewear, Tirewear
General Output	Output Database; Units; Activity	***<MOVES OUTPUT DATABASE NAME>***;[1] Grams, KiloJoules, Miles; Distance Travelled, Hotelling Hours, Population, Starts
Create Input Database	Domain Input Database	***<COUNTY INPUT DATABASE (CDB) NAME>***[1]
Output Emissions Detail	Output Aggregation; For All Vehicles/Equipment; On Road	Time: Hour, Geographic: Link; Fuel Type, Emissions Process; Road Type, Source Use Type
Advanced Features	Aggregation and Data Handling	Only the "clear BaseRateOutput after rate calculations" box was checked

[1] Limited to one county per County Scale run. County Federal Information Processing Standards (FIPS) code, year, and season/day type labels were included in the MRS file and output database names.
[2] Although MOVES requires all fuel types to be included in MRSs, only gasoline and diesel were modeled.
[3] Pre-requisite pollutants that were needed to model the reported pollutants are not shown.

3.2.1 Scale

The MOVES Domain/Scale "County" is required for SIP inventory estimates. The MOVES Calculation Type "Emission Rates" was selected for MOVES to produce the emissions and TEC rates with speed bin indexing required for the link-based inventory estimation process.

3.2.2 Time Span

The Time Spans parameters were specified to provide hourly rates, for all hours of the day, for the selected year, month, and day type. One each "Years" (2026), "Months" (July), and "Days" (Weekdays or Weekend) selection was made per run.

3.2.3 Geographic Bounds

Per the MOVES County Scale, only one county was selected per run.

3.2.4 On-Road Vehicles and Road Type

The local VMT mixes developed for the study include the SUT/fuel type combinations modeled with MOVES, namely, gasoline and diesel. The VMT mixes specify the vehicle fleet as the gasoline and diesel SUTs designated as "on-road vehicles" selections in Table 23. These SUT/fuel type combinations were selected in all the MOVES RunSpecs. All other SUT/fuel type combinations available in MOVES were also selected as required by MOVES, but only gasoline and diesel were modeled. Fuel types output was controlled through adjustments to the MOVES default fuel engine fractions via the MOVES Alternate Vehicle and Fuel Technology (AVFT) table and to the MOVES default flex fuel vehicle fuel type usage fractions in the MOVES fuelusagefraction table (discussed later). All five MOVES road type categories were selected.

3.2.5 Pollutants and Processes

In addition to the required pollutants within the scope of the inventory, MOVES requires that additional pollutants be selected for "chained" pollutants (i.e., pollutants that are calculated as a function of another MOVES pollutant). Of the pollutants listed for the inventory, the following additional pollutants were selected, as required by the model, due to chaining: non-methane hydrocarbons and total gaseous hydrocarbons (for VOC); TEC (for CO_2 and SO_2); and Composite – NonECPM (non-elemental carbon) for Primary

Exhaust $PM_{2.5}$ - Total. All of the associated on-road processes available by the selected pollutants were included, including the two refueling emissions processes.

3.2.6 Output Features

The output units were grams, kilojoules, and miles. The activity categories were pre-set by MOVES rates mode (and not adjustable) for inclusion in the output database. The selected output detail level was by hour, link (in MOVES rates mode "link" is the combination of county, road type, and speed bin), pollutant, process, road type, SUT, and fuel type.

The MOVES model produces results at different aggregation levels that are specified in the MRS. The detailed, hourly, link-based inventory method required MOVES day type-specific rates (weekday and weekend day) at the following MOVES output detail level.

- Source use types.
- Fuel types.
- Road types (four actual MOVES road categories and off-network).
- Hours of day.
- Speed bin (16 – in miles-based rate tables).
- Pollutants.
- On-road emissions processes.

For each emissions scenario, the vehicle fleet fuel types were modeled using only the predominant on-road fuels of gasoline and diesel (alternate fuels were considered de minimis). The five road type categories in MOVES are Off-Network[16], Rural Restricted Access, Rural Unrestricted Access, Urban Restricted Access, and Urban Unrestricted Access. The rates for each of the actual four MOVES road types are indexed by the 16 MOVES speed bin average speeds: 2.5, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, and 75 mph.

3.3 MOVES County Input Databases

MOVES CDBs were created for each county and year with data to cover both MOVES day types. The CDBs were populated with local input data (such as local fleet age distributions, fuel formulations, meteorological conditions) as well as MOVES defaults.

[16] The Off-Network road type is not a 'real' road type and is instead used as a placeholder to define off-network emissions.

TTI developed procedures to build and check CDBs for each emissions scenario. The basic procedure was to write a MySQL script to produce one county scenario CDB and convert it to a template from which all of the CDB scripts were built. The scripts were then run in batch mode to produce all CDBs for the analysis.

Data for populating the CDBs were first prepared in the form of text files and/or MySQL databases (e.g., for local fuels, weather data), and some values were provided directly in the CDB builder MySQL script. Any default data used were selected from the MOVES3.0.3 default database, MOVESDB20220105. After running the scripts to produce the CDBs, the CDBs were checked to verify that all CDB tables were built and populated as intended.

Table 24 provides an outline and brief description of the CDBs, followed by a discussion of the development of the local data and the defaults contained therein. Unless otherwise stated, the CDB table data applies to all counties, years, and both MOVES day types.

Table 24. CDB Input Tables.

Table	Data Source	Notes
auditlog	empty table used	The table must be present for MOVES to recognize CDB
year	MOVES default	Designates analysis year as the base year (i.e., activity inputs supplied, not forecast by MOVES)
state	MOVES default	Identifies the state and idle region
hourvmtfraction	MOVES default	Hourly VMT fractions for each source type, road type, day type
dayvmtfraction	MOVES default	Weekend day and weekday period VMT fractions by month for each source type and road type
monthvmtfraction	MOVES default (3-month average)	Month VMT fractions by source type
hpmsvtypeyear	MOVES default	Annual VMT by HPMS vehicle type
roadtypedistribution	MOVES default	Source type VMT fractions by MOVES road type
avgspeeddistribution	MOVES default	Driving time fractions by speed bin for each source type, road type, day type, hour
sourcetypeyear	MOVES default	Source type populations
startsperdaypervehicle	MOVES default	Average starts per day by source type and day type
startshourfraction	MOVES default	Average hourly allocation of starts by source type and day type
startsmonthadjust	MOVES default (3-month average)	Average monthly multiplicative adjustment to startspervehicleperday

Table	Data Source	Notes
startsageadjustment	MOVES default	Starts by vehicle age within each source type, relative to the number of starts at age 0 (lower frequency of starts with age)
startsopmodedistribution	MOVES default	Distribution of engine start soak times by source type, age, day type, hour
totalidlefraction	MOVES default (3-month average)	Ratio of total source hours idling (SHI) and total source hours operating (SHO) for each source type by month, day type, idle region, county type (Metropolitan Statistical Area [MSA] or non-MSA)
hotellingactivitydistribution	MOVES default	Allocation of hoteling to four operating modes by zone (e.g., county) and model year group
hotellingagefraction	empty table used	Hourly hoteling distribution by age for each zone and day type – included to preempt commandline execution errors
hotellinghourfraction	empty table used	Zone and day type hoteling hourly allocations – included to preempt commandline execution errors
hotellinghoursperday	empty table used	Year, zone, day type hoteling hours – included to preempt commandline execution errors
hotellingmonthadjust	empty table used	Hotelling monthly adjustment for each zone and month – included to preempt commandline execution errors
zone	MOVES default (set factors = 1)	SHO geographic allocation factors, set to 1.0 for county scale runs
zoneroadtype	MOVES default (set factors = 1)	Road type VMT allocation factors to county road type VMT, set to 1.0 for county scale runs
fuelusagefraction	MOVES default (except usage for fueltype 5 = 0)	Flex fuel vehicle fuel type usage, set for Texas modeling assumptions, i.e., flex fuel vehicles operate totally on gasoline
fuelsupply	Local /defaults	Market shares of fuel formulations set to reflect Texas modeling assumptions of gasoline and diesel only, although all MOVES default fuels were included as required to run MOVES3 (i.e., CNG, E85, and electric were included but were not applied as specified in the AVFT and fuel usage configurations)
fuelformulation	Local /defaults	Gasoline and diesel formulations by fuel region based on Texas regional survey data and defaults as needed, with MOVES default CNG, E85, and electric as required to run MOVES3
avft	Local /defaults	Set for Texas modeling assumptions, i.e., gasoline and diesel only, but also including default flex fuel vehicle fractions which were set to 100% gasoline use via the fuelusagefraction table
sourcetypeagedistribution	local/default (actual analysis year default)	Distribution by 31 age categories for each source type, based on latest available county vehicle registrations, and MOVES defaults where needed (i.e., for buses, refuse trucks, motor homes)

Table	Data Source	Notes
imcoverage	local	Empty for non-I/M counties, or includes I/M program modeling parameters characterizing the local program applicable to the county, to include updated compliance factors based on TCEQ area-specific I/M program statistics
county	local	Identifies the county, barometric pressure, high or low altitude, and whether the county is an MSA or non-MSA county
zonemonthhour	local	Provides zone hourly temperatures and relative humidity by month using month ID 7 (July) to represent the summer season (populated with local, 2019 June through August averages)
countyyear	local	Stage II refueling control program adjustments, set to zero to reflect the program is no longer in effect

3.3.1 Year, State, and County Inputs

The year, state, and county tables were populated with data defining the analysis year, state, and county of the run.

The yearID field of the "year" table was populated with the analysis year value, and the year was set as a base year (to specify that certain user-input fleet and activity data were to be used, rather than forecast by MOVES during the model runs). As part of designating the appropriate fuel supply for the modeling scenario, the fuelyearID in the year table was also set to the analysis year. With MOVES3, an idleregionID was added to modify the state table.

StateID "48" (Texas) was inserted in the state table. In addition to identifying the county of analysis, the county table contains barometric pressure, and altitude information (discussed further with other meteorological inputs). The county data were selected from a prepared local "meteorology" database containing tables of weather data records for the analysis. Additionally, information on whether the county is in an MSA is included in the county table.

3.3.2 Activity and Vehicle Population Inputs

The TTI EI methodology uses an emission rate by activity method that calculates emissions by multiplying local activity estimates and MOVES-based emission rates external to MOVES. However, MOVES rates mode CDBs require activity inputs to calculate the emission rates per activity units used in the TTI EI method.

For this reason, default activity input parameters were used to populate the following MOVES tables: hourvmtfraction, dayvmtfraction, monthvmtfraction, hpmsvtypeyear, roadtypedistribution, avgspeeddistribution, sourcetypeyear, startsperdaypervehicle, startshourfraction, startsmonthadjust, startsageadjustment, startssopmodedistribution, totalidelfraction, and hotellingactivitydistribution. Data for all these tables were selected and inserted from the MOVES default database. In the case of the startsmonthadjust and totalidlefraction, which vary by month, the MOVES default data were averaged for the three-month summer season period (same for MOVES default monthvmtfraction, for consistency).

The zone and zoneroadtype tables contain zonal sub-allocation activity factors. For county scale analyses, county is equal to zone; therefore, these allocation factors were set to 1.0.

3.3.3 Age Distributions and Fuel Engine Fractions Inputs

Local age distributions, or age fractions for each SUT, and local fuel fractions by model year (or technology), were used, in conjunction with MOVES defaults as needed. These data were sourced from TxDMV 2018 year-end registration data for each county (this data was used for each analysis year). The age distributions and fuel engine fractions inputs were calculated and written to text files in preparation for loading the data into their CDB tables: the sourcetypeagedistribution table for age distributions and the avft table for fuel engine fractions.

The local TxDMV registration data provides fuel type fractions (proportion of gasoline or diesel-powered vehicles) for heavy-duty vehicles but does not for light-duty vehicles. MOVES default fuel fractions were therefore applied to estimate light-duty fuel fractions. Only gasoline and diesel vehicles were explicitly included in the CDBs[17].

Table 25 summarizes the data sources and aggregation levels used to estimate the local sourcetypeagedistribution and avft inputs to MOVES (inputs summarized in Appendix F).

[17] This was decided after consultation with the TCEQ sponsor.

Table 25. Sources and Aggregations for Age Distributions and Fuel Fractions.

SUT Name	SUT ID	TxDMV Category[1] Aggregations for Age Distributions and Fuel/Engine Fractions	Geographic Aggregation for Age Distributions	Geographic Aggregation for Fuel/Engine Fractions[2]
Motorcycle	11	Motorcycles	County	n/a – 100% gasoline, no Fuel/Engine Fractions
Passenger Car	21	Passenger Cars	County	MOVES default[2]
Passenger Truck	31	Total Trucks<=8500	County	MOVES default[2]
Light Commercial Truck	32	Total Trucks<=8500	County	MOVES default[2]
Single-Unit Short-Haul Truck	52	>8500+ >10000+ >14000+>16000	Region	Texas Statewide
Single-Unit Long-Haul Truck	53	>8500+ >10000+ >14000+>16000	Texas Statewide	Texas Statewide
Refuse Truck	51	MOVES default[3]	MOVES default[3]	MOVES default[3]
Motor Home	54	MOVES default[3]	MOVES default[3]	MOVES default[3]
Other Buses	41	MOVES default[3]	MOVES default[3]	MOVES default[3]
Transit Bus[2]	42	MOVES default[3]	MOVES default[3]	MOVES default[3]
School Bus	43	MOVES default[3]	MOVES default[3]	MOVES default[3]
Combination Short-Haul Truck	61	>19500+ >26000+ >33000+ >60000	Region	Texas Statewide
Combination Long-Haul Truck	62	>19500+ >26000+ >33000+ >60000	Texas Statewide	n/a – 100 % diesel, no Fuel/Engine Fractions

[1] TxDMV year-end 2018 (latest available, used for all years) county vehicle registrations data were used for developing local inputs (weights are GVWR in units of pounds). The MOVES model default age distributions were from the MOVESDB20220105 database.

[2] MOVES fuel engine fraction defaults (for gasoline, diesel, E85 capability) were used for light-duty SUTs (with E85 use set to zero in the fuelusagefraction table). MOVES default fuel engine fractions were taken from the MOVESDB20220105 sample vehicle population table.

[3] MOVES default values consistent with the analysis year.

3.3.4 Meteorological Inputs

Meteorological data were used to develop "county" (barometric pressure and altitude) and "zonemonthhour" (temperature and relative humidity) table inputs for the summer season. TCEQ developed these inputs as June through August hourly temperature and relative humidity, and 24-hour barometric pressure averages, using 2019 base year hourly data from multiple weather stations within each county. Altitude was set to low. Table 26 and Table 27 summarize the temperatures and relative humidity, respectively.

Barometric pressure for the period was 29.95 Inches of Mercury for Brazoria, Galveston, Harris, Montgomery, and Waller Counties; and 29.94 Inches of Mercury for Chambers, Fort Bend, and Liberty Counties.

Table 26. Temperature Inputs to MOVES (degrees Fahrenheit)[1].

Hour	48039	48071	48157	48167	48201	48291	48339	48473
1	79.95	83.09	77.29	82.73	80.63	79.30	77.37	78.03
2	79.53	82.77	76.80	82.44	80.06	78.78	76.61	77.41
3	79.27	82.61	76.35	82.16	79.60	78.41	76.00	76.92
4	78.95	82.50	76.04	81.84	79.23	78.10	75.55	76.50
5	78.66	82.24	75.64	81.53	78.87	77.79	75.04	76.05
6	78.33	82.09	75.28	81.26	78.48	77.37	74.60	75.64
7	78.12	81.75	75.08	80.96	78.18	77.12	74.35	75.33
8	79.50	81.70	77.13	81.40	79.25	78.09	76.30	77.07
9	82.65	82.15	80.62	82.67	81.69	80.55	79.53	81.03
10	85.02	82.89	83.61	83.87	83.86	82.68	82.26	84.29
11	86.53	83.67	85.75	84.62	85.80	84.35	84.54	86.86
12	87.74	84.43	87.41	85.45	87.46	85.55	86.61	88.86
13	88.65	85.34	88.52	86.22	88.54	86.42	88.27	90.31
14	89.01	85.83	89.34	86.38	88.97	86.87	89.28	91.41
15	89.12	86.17	89.83	86.56	89.20	87.24	89.68	91.83
16	89.08	86.34	89.93	86.60	89.45	87.19	89.89	91.82
17	88.60	86.35	89.30	86.49	89.32	86.96	89.54	91.29
18	87.77	86.14	88.45	86.30	88.71	86.47	88.73	90.53
19	86.47	85.71	86.83	85.78	87.55	85.43	87.10	89.07
20	84.56	84.93	84.45	84.72	85.95	83.75	84.62	86.39
21	82.35	84.14	81.87	83.80	84.06	81.77	81.93	83.16
22	81.29	83.72	80.12	83.39	82.83	80.81	80.32	81.27
23	80.73	83.58	79.00	83.15	81.97	80.23	79.21	80.02
24	80.35	83.35	78.05	83.01	81.23	79.75	78.24	78.89

[1] Source: TCEQ – developed from average hourly observations from multiple weather station data within each county. Data are from the period June through August 2019. FIPS county codes from left to right are Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller.

Table 27. Relative Humidity Inputs to MOVES (percent)[1].

Hour	48039	48071	48157	48167	48201	48291	48339	48473
1	86.48	89.08	93.44	78.68	80.46	89.08	89.00	91.59
2	87.58	90.07	94.77	79.57	82.29	90.07	90.25	93.31
3	87.79	90.83	95.37	80.67	83.61	90.83	91.39	94.28
4	88.47	91.28	95.71	80.93	84.76	91.28	91.93	95.35
5	88.87	91.64	96.35	81.46	85.77	91.64	92.12	97.07
6	89.42	91.97	96.99	82.12	86.49	91.97	92.74	97.52
7	89.64	92.20	96.87	81.93	86.87	92.20	93.06	97.85
8	86.35	90.31	94.59	79.95	83.81	90.31	89.67	96.10
9	78.70	83.68	87.64	76.26	76.83	83.68	82.19	86.83
10	72.00	76.96	79.31	73.19	70.33	76.96	75.09	76.86
11	66.88	71.43	72.55	71.40	63.94	71.43	68.24	68.40
12	62.89	67.32	67.36	69.51	58.80	67.32	62.30	62.02
13	60.91	64.45	64.26	68.22	55.81	64.45	58.11	57.94
14	59.89	63.16	62.28	68.19	54.67	63.16	55.72	55.13
15	59.84	62.10	61.09	68.67	54.00	62.10	54.79	53.87
16	60.39	62.47	60.60	68.55	53.80	62.47	54.95	53.87
17	61.23	63.50	62.58	68.62	54.50	63.50	56.53	54.86
18	62.83	65.11	64.34	69.52	56.42	65.11	59.05	56.50
19	66.02	68.46	67.38	71.33	59.59	68.46	64.18	59.42
20	71.74	73.74	72.79	74.29	63.68	73.74	72.96	66.32
21	77.87	81.21	79.33	76.16	68.98	81.21	80.13	74.85
22	81.09	84.76	84.74	76.88	72.82	84.76	83.07	80.53
23	83.61	86.62	88.55	77.35	76.05	86.62	85.09	84.87
24	85.10	87.94	91.34	78.15	78.40	87.94	87.12	88.86

[1] Source: TCEQ – developed from average hourly observations from multiple weather station data within each county. Data are from the period June through August 2019. FIPS county codes from left to right are Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller.

3.3.5 Fuels Inputs

TTI used various data sources to produce the best available Houston summer fuel formulation inputs to MOVES.

3.3.5.1 Overview and Assumptions

There are four MOVES fuels input tables that must be consistent for the fuel types defined by the scope of the inventory analysis. These are listed below.

- AVFT (SUT fuel type distributions by model year).
- fuelformulation (fuel properties for the fuels supplied in the study area).
- fuelsupply (market shares of each study area fuel formulation).

- fuelusagefraction (fuel types used by flex fuel vehicles).

As defined by the scope of the EIs, only gasoline and diesel fuels were modeled[18]. Therefore the AVFT model year fuel fractions were normalized for only gasoline, diesel, and flex fuel vehicles (i.e., vehicles with the capability to be powered by gasoline or E85 [a blend of 85% ethanol and 15% gasoline, by volume]). Flex fuel vehicle fuel usage was set to 100% gasoline via the fuelusagefraction table. Gasoline and diesel fuel properties and market shares were then specified in the fuelformulation and fuelsupply tables.

The gasoline and diesel fuel property inputs were sourced using latest available local fuel survey data, supplemented as needed by defaults and other data (e.g., the U.S. Department of Energy [DOE] annual fuel sales statistics). For future years where no survey data are yet available, the latest available local survey-based fuel properties are used, and particular properties (i.e., gasoline and diesel average sulfur content) are replaced with expected future year values (e.g., regulatory standards or limits, reflected in the MOVES analysis year and season default values).

The local data included latest available retail outlet seasonal fuel surveys of gasoline and diesel fuel, and latest available, annual, state-level fuels sales statistics. The local data included summaries from which to estimate biodiesel (BD) relative to petroleum diesel sales volumes and gasoline sales estimates by the three grades (regular, mid-grade, premium).

Retail outlet summer survey data consisted of TCEQ statewide diesel surveys and EPA summer RFG compliance surveys for Houston. The latest available fuel surveys were from 2020 for both the TCEQ and EPA fuel studies. Latest RFG survey data was used for RFG formulation inputs. The diesel formulation was supplemented with BD volume content estimated based on the U.S. Department of Energy (DOE) Energy Information Administration's (EIA) diesel sales statistics. Biodiesel percentages were based on EIA State Energy Data System (SEDS) state-level 2019 (latest available) transportation sector BD consumption estimates for Texas.

The fuel formulation development procedures for RFG involved aggregating and averaging RFG properties for Houston by fuel grade, then weighting them into composite properties using relative sales volumes by grade. For diesel sulfur, consistently stable across the state, the statewide average was calculated. Both actual

[18] MOVES3 requires that inputs be developed for all on-road vehicle fuel types available in MOVES, regardless of the local inventory scope. Inclusion of all on-road fuels in the MOVES runspecs was needed to prevent MOVES "missing fuels inputs" run errors.

survey-based gasoline and diesel sulfur content values were replaced with their expected future year values (MOVES defaults).

The local, summer season, fuels inputs to MOVES were supplied in the CDB fuelsupply and fuelformulation tables. The fuel supply for each county, year, and month (July for summer) consisted of one local gasoline and one local diesel formulation. Each gasoline and diesel formulation market share in the fuel supply was therefore 1.0.

3.3.5.2 Fuel Formulations

Table 28 summarizes the gasoline and diesel fuel property inputs. Although not listed, the fields CetaneIndex and PAHContent are also included in the fuelformulation table but are not currently enabled for use in MOVES. Although not shown, as required to run MOVES, fuels inputs for the other fuel types in MOVES were input also.

Table 28. HGB Summer RFG and Diesel Fuel Formulation Table Inputs to MOVES.

Field	Units	2026[1] RFG	2026[1] Diesel
fuelFormulationID	-	2179	30600
fuelSubtypeID[2]	-	12	21
RVP	psi	7.15	\N
sulfurLevel	ppm	10.00	6
ETOHVolume	vol.%	9.56	\N
MTBEVolume	vol.%	0	\N
ETBEVolume	vol.%	0	\N
TAMEVolume	vol.%	0	\N
aromaticContent	vol.%	16.89	\N
olefinContent	vol.%	10.29	\N
benzeneContent	vol.%	0.42	\N
e200	vap.%	48.26	\N
e300	vap.%	84.89	\N
BioDieselEsterVolume	vol.%	\N	4.34
T50	deg. F	206.18	\N
T90	deg. F	326.87	\N

[1] 2026 future year RFG based on EPA latest available (2020) summer RFG compliance survey data with sulfur level set to MOVES3 default (future year expected Tier 3 value). 2026 future year BD based on TCEQ summer 2020 fuel survey data for sulfur level and EIA Texas 2019 (latest available) transportation sector fuel consumption data for BD ester volume. BD sulfur level was set to MOVES default (i.e., expected future year value – very close to the observed Texas values for many years).

[2] Fuel subtype IDs 12 and 21 are 10% ethanol-blend gasoline (in this case RFG) and BD, respectively.

3.3.6 I/M Inputs

To model a local I/M program design, it must be defined using MOVES I/M coverage parameters by source type, entered in the MOVES imcoverage table. The appropriate internal MOVES I/M factors for modeling a local I/M program are designated in a model run by the local program input data in the imcoverage table.[19]

MOVES adjusts emissions (Hydrocarbons [HC], CO, and NO_X) at the source-type level to incorporate the benefits of the local I/M program design specified using the MOVES I/M coverage table parameters. TTI previously produced a comprehensive set of MOVES imcoverage records for Texas I/M counties to use in place of MOVES defaults.

TTI produced the local I/M coverage input parameters to represent Texas I/M program designs as specified in the Texas I/M SIP and Texas rules. The I/M program requires annual emissions testing of gasoline vehicles within a 2-through-24 year vehicle age coverage window (motorcycles, military tactical vehicles, diesel-powered vehicles, and antique vehicles are excluded). A gas cap integrity test is required on all these vehicles, and depending on the model year, gross vehicle weight (GVW) (threshold of 8,500 GVW separating light-duty and heavy-duty class), and I/M area, current vehicle emissions testing may use On-Board Diagnostics (OBD) tests, the Acceleration Simulation Mode (ASM-2) test, or the Two-Speed Idle (TSI) test.

Table 29 and associated notes describe MOVES imcoverage records developed by TTI for the years available in MOVES applicable to each HGB I/M county. For additional I/M program details, see the current I/M SIP and/or pertinent Texas Administrative Code.[20]

Following is the general approach used to build the Texas imcoverage tables.

- Identified MOVES I/M test standards applicable to Texas I/M counties in consultation with TCEQ (see Table 29, column 4);
- Queried the MOVES database to determine the extent to which MOVES provides I/M effects corresponding to Texas I/M Programs (i.e., test frequency, fuel type, and test types). From the result, listed the SUTs, test standards, pollutant and

[19] In general, MOVES produces a local I/M program effect as an adjustment to the model's internal reference I/M program effect (i.e., represented as the "standard I/M difference" in the pair of MOVES emission rates [I/M – No I/M], which are specific to vehicle regulatory class categories of which the source types are composed). MOVES contains a large set of "I/M factors" by source type (in the MOVES imfactor table) computed specifically for adjusting the MOVES standard I/M difference to reflect the effects of local I/M program design alternatives.

[20] Revision to the State Implementation Plan Mobile Source Strategies, Inspection and Maintenance State Implementation Plan Revision, TCEQ, adopted February 12, 2014.

emissions process combinations with I/M effects in MOVES (i.e., with non-zero MOVES I/M factors and corresponding base emission rates with non-zero standard I/M differences);
- Categorized counties and years in groups under the pertinent MOVES test standards;
- Assigned MOVES I/M Program IDs such that: 1) all MOVES default I/M Program IDs were excluded; and 2) for each year ID, each I/M Program ID represented a unique combination of test standard, test frequency, begin model year, and end model year pertinent to the local program.
- Updated the MOVES compliancefactor input values using the latest information provided by TCEQ based on the latest available local I/M program statistics.

Table 29. MOVES I/M Coverage Inputs for Annual Inspections of Gasoline Vehicles (Harris, Brazoria, Fort Bend, Galveston, Montgomery)

Year ID[1]	Begin Model Year ID[1]	End Model Year ID[1]	Test Standards ID[2]	Source TypeID[3]
2026	2002	2024	51 (Exh OBD)	21 (PC), 31 (PT), and 32 (LCT)
2026	2002	2024	45 (Evp Cap, OBD)	21 (PC), 31 (PT), and 32 (LCT)

[1] begmodelyearID and endmodelyearID, defining the full range of model years covered, were calculated as YearID – 24, and YearID – 2.

[2] Pollutant/processes affected are starts and running exhaust HC, CO, NO_X, and tank vapor venting HC.

[3] Source TypeID 21 = passenger car; 31 = passenger truck; and 32 = light commercial truck. Source type compliance factor field input values were updated and provided by TCEQ for this analysis (February 2022), per Section 4.9.6, *MOVES Technical Guidance*, EPA, November 2020. The compliance factor inputs were based on latest available (2020) local I/M program statistics combined with 2019 I/M program statistics due to the effects of COVID 19. The HGB I/M county MOVES compliance factors used, in percent, are:

- 2020 and later year MOVES I/M compliance factors: PC – 95.00; PT – 91.31; LCT – 71.50.

3.3.7 Control Programs Modeling

Table 30 summarizes the modeling approaches used for the emissions control strategies.

Table 30. Emissions Control Strategies and Modeling Approaches.

Control Strategy	Approach
Federal Motor Vehicle Control Program Standards	MOVES defaults.
Federal Heavy-Duty Diesel Engines Rebuild and 2004 Pull-Ahead Programs (to Mitigate NO_X Off-Cycle Effects)	MOVES defaults.
RFG Properties	Local inputs to MOVES – TTI developed the RFG fuel formulation based on 2020 (latest available for future) Houston area retail outlet summer RFG survey data (EPA-provided RFG compliance survey data), with sulfur content set consistent with expected future year value (consistent with the Tier 3 gasoline sulfur standard).
Diesel Sulfur	Local input to MOVES – TTI used values reflecting consistency with the federal diesel sulfur standard and recent local observations.
TxLED	MOVES output post-processing – TTI adjusted diesel vehicle NO_X (and NO, NO_2, and HONO) rates for TxLED effects using evaluation-year-specific NO_X reduction factors (using 4.8% reductions for 2002 and later, and 6.2% reductions for 2001 and earlier model years).
I/M Program	Local input to MOVES – For affected counties (Brazoria, Fort Bend, Galveston, Harris, Montgomery), TTI used available MOVES I/M parameters for I/M vehicles (in terms of MOVES I/M "teststandards" and associated "imfactors"), consistent with the current program description and latest I/M modeling protocols and statistics for the Houston I/M program.
Federal On-board Refueling Vapor Recovery Program	MOVES defaults.
Federal Stage II Gasoline Vapor Recovery Program	Local inputs to MOVES – Stage II reductions were set to 0% since the Stage II control program is no longer in effect.

3.4 Checks and Runs

After completing the input data preparation, the CDBs were checked to verify that all tables were in the appropriate CDBs and the tables were populated with data as intended. The MOVES RunSpecs were executed in batches using the MOVES commandline tool. After completion, TTI verified that the MOVES runs were error-free (i.e., checked all run log text files for errors and warnings and compared record counts in each rate table between output databases).

3.5 Post-Processing Runs

Each MOVES output database was post-processed for on-road mobile emission rates, area source refueling emission rates, and TEC rates to produce the on-road, refueling, and TEC rate tables input to the inventory calculations. The following post-processing procedures were performed on the MOVES output database for each county and MOVES day type. See the utility descriptions in Appendix A for more information.

On-Road Mobile Emission Rates:

1. This step calculated the mass/SHP off-network evaporative process rates using data from the CDB, the MOVES default database, and the MOVES rateperprofile and ratepervehicle emission rate output. The utility also copied the mass/mile, mass/start, and mass/hour rates along with the units into emission rate tables. The utility created the look-up tables ttirateperdistance (which also includes the rateperhour rates for off-network idling), ttirateperstart, ttirateperhour (for SHEI and APU hours), and ttiratepershp for each scenario.
2. This step applied TxLED adjustments (see factors provided by TCEQ in Table 31) to the diesel vehicle NO_X, (and NO, NO_2, and HONO subcomponent) emission rates in all counties. TCEQ produced these average diesel SUT NO_X adjustments using 4.8 percent and 6.2 percent reductions for 2002 and later, and 2001 and earlier model years, respectively.[21, 22] For on-road, these final rates inputs to the emissions calculator were merged into one on-rates input table, "ttiemissionrate."

Refueling Emission Rates:

1. The refueling emission rates included no Stage II control effects (i.e., MOVES runs with countyyear table refuelingVaporProgramAdjust and refuelingSpillProgramAdjust field values set to zero for all counties). TTI produced these rates, in general, as described previously for the on-road rates, but for the two refueling emissions process categories, refueling displacement vapor loss and refueling spillage loss. In MOVES off-network refueling emission rates output, however, emissions are not directly linked to the activity categories (i.e., starts, SHEI, APU hours). To produce off-network emission rates by activity, TTI

[21] Reductions as detailed in the EPA Office of Transportation and Air Quality Memorandum, RE: Texas Low Emission Diesel [LED] Fuel Benefits, September 27, 2001.

[22] The TxLED counties list may be found at: http://www.tceq.texas.gov/airquality/mobilesource/txled/txled-affected-counties. For full details on the TCEQ TxLED factor development procedure, see TxLED estimation speadsheets at: ftp://amdaftp.tceq.texas.gov/EI/onroad/txled/.

performed calculations as described in Appendix A. The refueling rates post-processor created three rate tables (ttirateperdistanceRF, ttirateperstartRF, and ttirateperhourRF for SHEI and APU hours). Since there was no MOVES activity type output specific to ONI, no ONI associated refueling rates were produced.

2. The VOC rates were extracted for subsequent input to the refueling emissions calculations. For refueling, these final rates inputs to the refueling emissions calculator were merged into one rates input table, "ttiRFemissionrate."

TEC Rates:

1. The TEC rates in terms of rate-per-activity (i.e., energy per mile, energy per start, and energy per SHEI and APU hour, and energy per ONI hour) were then assembled in the TEC rate tables. The TEC rate tables produced are ttirateperdistanceTEC, ttirateperstartTEC, and ttirateperhourTEC (for SHEI and APU hours only).
2. For subsequent input to the TEC calculations, these final rates tables were merged into one TEC rates input table, "ttiTECemissionrate."

Table 31. TxLED Adjustment Factors Summary.

Diesel Fuel Source Use Type	2026 Reduction	2026 Adjustment
Passenger Car	4.83%	0.9517
Passenger Truck	5.02%	0.9498
Light Commercial Truck	5.06%	0.9494
Other Buses	5.06%	0.9494
Transit Bus	4.88%	0.9512
School Bus	4.97%	0.9503
Refuse Truck	4.92%	0.9508
Single Unit Short-Haul Truck	4.81%	0.9519
Single Unit Long-Haul Truck	4.82%	0.9518
Motor Home	5.17%	0.9483
Combination Short-Haul Truck	4.83%	0.9517
Combination Long-Haul Truck	4.86%	0.9514

Source: TCEQ, March 2021. The TCEQ procedure used MOVES3 and the latest available data (i.e., statewide age distributions and local AVFT inputs based on year-end 2018 TxDMV vehicle registrations data).

See Appendix A for more information on the TTI MOVES on-road and refueling emission rate and TEC rate calculation and adjustment utilities.

The resulting hourly on-road emission rates, refueling loss emission rates, and TEC rates were input to emissions/TEC utilities to calculate and summarize the separate on-road

mobile source and area source refueling inventories and the TEC inventories for each county activity scenario.

4.0 EMISSIONS AND TOTAL ENERGY CONSUMPTION CALCULATIONS

TTI calculated hourly on-road mobile emissions by county for each inventory scenario using the TTI EI utilities. The TDM link-based inventory methodology calculated on- and off-network emissions by multiplying traffic activity by emission rates. The VMT-based emissions calculations used the TDM link-based VMT and congested speeds to estimate link-level emissions. The off-network emissions calculations used off-network activity (ONI hours, SHP, starts, SHEI, and APU hours) to estimate emissions at the county level.

The TTI EI utilities produced emissions outputs aggregated by county, hour, road functional class, road area type, vehicle type, pollutant, pollutant process, and link for on-network emissions; and county, hour, road functional class, vehicle type, pollutant, and pollutant process for off-network emissions. TEC outputs were produced at the scale of county, hour, road functional class, vehicle type, pollutant, and pollutant process (i.e., not at the link level) and refueling outputs were reported similarly, except independent of road functional class.

These outputs were then post-processed to produce electronic files in formats suitable for submission to the TCEQ sponsor.

4.1 EMISSIONS CALCULATIONS

County-level hourly link (on-network) and off-network emissions for each inventory scenario were calculated using TTI's EI utilities and the following inputs.

- *County of inventory* – from study area counties list, county FIPS, link data county code, TxDOT district ID, county group FIPS (not applicable), TxLED flag, county type flag (MSA or non-MSA).
- *Vehicle type VMT mix* – day type and time period TxDOT district-level VMT mix by MOVES roadway type.
- *Time period designation* – the four VMT mix time periods to hour-of-day associations.
- *Roadway-based activity* – link (and intrazonal link)-specific, hourly, directional, operational VMT and speed estimates as developed by the EI utility to include link A and B nodes, county number, TDM road type (functional class) code, link length, congested (operational) speed, VMT, and TDM area type code.

- *TDM road type designations* – TDM road type and area type codes to MOVES road type codes (and to VMT mix road type, and to rates road type codes) (see Table 32).
- *Off-network activity* – county ONI hours, SHP, starts, SHEI, and APU hours by vehicle type.
- *Pollutant/process/units list* – for emissions.
- *Roadway-based emission factors* – MOVES-based, county level by pollutant, process, hour, average speed, MOVES road type, SUT, and fuel type (different input data sets for refueling and on-road category EI calculators).
- *Off-network (parked vehicle) emission factors* – MOVES-based, county level by pollutant, process, hour, SUT, and fuel type (different input data sets for refueling and on-road category EI calculators).

County information IDs were identified (link data county code, TxDOT district, etc.) and inputs for the subject county were selected for the inventory calculations based on these IDs.

4.1.1 VMT-Based On-network Emissions Calculations

The VMT-based emissions were calculated for each hour using the time-period TxDOT-level SUT/fuel type VMT mix, the link VMT and speeds estimates, the MOVES-based "on-network" emission factors, and the TDM link road type and area type-to-MOVES road type designations. For each link, the link was assigned a MOVES road type based on the link's road type and area type (see Table 32). The link VMT was distributed to each vehicle type using the VMT mix from the appropriate time period based on the link's MOVES road type. The time period VMT mixes were applied by the hour as follows: morning peak – 6 a.m. to 9 a.m.; mid-day – 9 a.m. to 3 p.m.; evening peak – 3 p.m. to 7 p.m.; and overnight – 7 p.m. to 6 a.m.

The emissions factors by hour for each vehicle type were selected based on the designated hour and MOVES road type of the link VMT and speed data. For link speeds falling between MOVES speed bin average speeds, emission factors were interpolated from bounding speeds. For link speeds falling outside of the MOVES speed range (less than 2.5 mph and greater than 75 mph), the emission factors for the associated bounding speeds were used. The mass/mi rates were multiplied by the link vehicle type VMT producing the link-level emissions estimates. This was performed for each hour of the day.

Table 32. H-GAC TDM Road Type & Area Type to MOVES Road Type Designations.

TDM Road Type (Code - Name)[1]	TDM Area Type (Code - Name)[1]	MOVES Road Type (Code - Name)[1, 2]
3 - Toll Roads	5 – Rural	2 – Rural Restricted Access
10 - Rural Interstate	5 – Rural	2 – Rural Restricted Access
11 - Rural Other Freeway	5 – Rural	2 – Rural Restricted Access
4 - Ramps (Fwy/Toll/Frnt)	5 – Rural	3 – Rural Unrestricted Access
8 - Local (Centroid Connector)	5 – Rural	3 – Rural Unrestricted Access
12 - Rural Principal Arterial	5 – Rural	3 – Rural Unrestricted Access
13 - Rural Other Arterial	5 – Rural	3 – Rural Unrestricted Access
14 - Rural Major Collector	5 – Rural	3 – Rural Unrestricted Access
15 - Rural Collector	5 – Rural	3 – Rural Unrestricted Access
1 - Urban Interstate	1 – CBD; 2 – Urban; 3 – Urban Fringe	4 – Urban Restricted Access
2 - Urban Other Freeway	2 – Urban; 3 – Urban Fringe	4 – Urban Restricted Access
3 - Toll Roads	1 – CBD; 2 – Urban; 3 – Urban Fringe; 4 – Suburban	4 – Urban Restricted Access
10 - Rural Interstate	2 – Urban; 3 – Urban Fringe; 4 – Suburban	4 – Urban Restricted Access
11 - Rural Other Freeway	3 - Urban Fringe; 4 – Suburban	4 – Urban Restricted Access
4 - Ramps (Fwy/Toll/Frnt)	1 – CBD; 2 – Urban; 3 – Urban Fringe; 4 – Suburban	5 – Urban Unrestricted Access
5 - Urban Principal Arterial	1 – CBD; 2 – Urban; 3 – Urban Fringe	5 – Urban Unrestricted Access
6 - Urban Other Arterial	1 – CBD; 2 – Urban; 3 – Urban Fringe; 4 – Suburban	5 – Urban Unrestricted Access
7 - Urban Collector	1 – CBD; 2 – Urban; 3 – Urban Fringe	5 – Urban Unrestricted Access
8 - Local (Centroid Connector)	1 – CBD; 2 – Urban; 3 – Urban Fringe; 4 – Suburban	5 – Urban Unrestricted Access
12 - Rural Principal Arterial	3 – Urban Fringe; 4 – Suburban	5 – Urban Unrestricted Access
13 - Rural Other Arterial	3 – Urban Fringe; 4 – Suburban	5 – Urban Unrestricted Access
14 - Rural Major Collector	3 – Urban Fringe; 4 – Suburban	5 – Urban Unrestricted Access
15 - Rural Collector	3 – Urban Fringe; 4 – Suburban	5 – Urban Unrestricted Access
40 - Local (Intrazonal)	40 – Local (Intrazonal)	5 – Urban Unrestricted Access

[1] The TDM road type and area type code combinations are also correlated to VMT mix road type codes and emission rate road type codes, which, for this analysis, are identical to the MOVES road type codes.

[2] The four period, time-of-day VMT mix to hour-of-day designations are: AM peak – three hours of 6 a.m. to 9 a.m.; mid-day – six hours of 9 a.m. to 3 p.m.; PM peak – four hours of 3 p.m. to 7 p.m.; and overnight – 11 hours of 7 p.m. to 6 a.m.

4.1.2 Off-Network Emissions Calculations

The hourly off-network emissions were calculated at the county level by multiplying the hourly MOVES-based vehicle type off-network emission factors by the appropriate county-level hourly vehicle type off-network activity, which was determined by the SUT/fuel type, pollutant process, and associated emission rates table. Additionally, for

selecting the ONI emission rates from the rate per distance table, the road type column was used (i.e., to look up rates with road-type ID 1 for off-network). The off-network emissions calculations used off-network activity (ONI hours, SHP, starts, SHEI, and APU hours) to estimate hourly emissions at the county level.

4.2 Emissions Output

The following output files were developed from the raw EI output (including refueling loss emissions), by year, county, and activity scenario.

- A tab-delimited summary output file consisting of one header section followed by hourly and 24-hour totals data blocks of activity and emissions (pounds):
  - *On-road mobile source*: hourly and 24-hour total summaries by road type and vehicle type of VMT, VHT, speed (VMT/VHT), pollutant totals, and pollutant process totals (with the "off-network" category listed as the last road type preceding the TOTALS row in each data block), and with starts, SHP, ONI hours, SHEI, and APU hours activity rows last in the activity data block for each time period; and
  - *Refueling*: hourly and 24-hour totals summaries by vehicle type of VMT, VHT, speed (VMT/VHT), ONI hours, SHEI, APU hours, and starts, and of VOC pollutant refueling loss emissions totals and subtotal for vapor displacement and spillage losses.
- 24 hourly link emissions output files of the individual link-level emissions (grams):
  - *On-road mobile source*: each link-emissions record includes the link A node and B node codes (corresponding to the input link VMT and speeds), TDM roadway class code, MOVES road type code, MOVES pollutant code (see Table 33), MOVES process code, and link emissions estimate for each vehicle type, and emissions units. For off-network emissions, these link emissions files also contain the county-level emissions in the same format, except the link nodes were set to 99999, the link road type code set to 99, and MOVES road type code was set to the off-network category code (1). Additional detail on emissions output files and coding are found in Appendix B, the electronic data submittal description, which also includes the TDM node coordinates file.
  - *Refueling*: the link-emissions records were written as described in the previous bullet for off-network emissions.

The pollutants reported are listed in Table 33.

Table 33. Pollutants Reported.

Pollutant ID	Pollutant Name
2	Carbon Monoxide (CO)
3	Oxides of Nitrogen (NO_X)
5	Methane (CH_4)
30	Ammonia (NH_3)
31	Sulfur Dioxide (SO_2)
32	Nitrogen Oxide (NO)
33	Nitrogen Dioxide (NO_2)
34	Nitrous Acid (HONO)
35	Nitrate (NO_3)
36	Ammonium (NH_4)
51	Chloride (Cl)
52	Sodium (Na)
53	Potassium (K)
54	Magnesium (Mg)
55	Calcium (Ca)
56	Titanium (Ti)
57	Silicon (Si)
58	Aluminum (Al)
59	Iron (Fe)
87	Volatile Organic Compounds (VOC)
90	Atmospheric CO_2
91	Total Energy Consumption (TEC)
100	Primary Exhaust PM_{10} – Total
106	Primary PM_{10} – Brakewear Particulate
107	Primary PM_{10} – Tirewear Particulate
110	Primary Exhaust $PM_{2.5}$ – Total
111	Organic Carbon (OC)
112	Elemental Carbon (EC)
115	Sulfate Particulate
116	Primary $PM_{2.5}$ – Brakewear Particulate
117	Primary $PM_{2.5}$ – Tirewear Particulate
118	Composite - NonECPM
119	Aerosol H_2O (H_2O)
122	Non-carbon Organic Matter (NCOM)

See Appendix A for further details on the utilities and Appendix B for descriptions of the EI electronic data files provided.

4.3 Total Energy Consumption

TTI used its inventory development utilities to calculate hourly total energy consumption for on-road mobile sources by year, county, and activity scenario. The TEC was

calculated using a similar procedure to that used to calculate the refueling emissions using MOVES-based "on-network" TEC rates (by process, hour, average speed, roadway type, SUT, and fuel type) and off-network TEC rates (by process, hour, SUT, and fuel type).

The hourly TEC data was output in the standard tab file format for each county activity scenario. The TEC standard tab file is described as a tab-delimited text summary output file that contains the hourly and 24-hour totals summaries of activity (VMT, VHT, speed, starts, ONI hours, SHEI, and APU hours) and TEC (in kilojoules) by vehicle type and road type. The "off-network" category is listed as the last road type preceding the TOTALS row in each data block, with starts, SHP, ONI hours, SHEI, and APU hours activity rows last in the activity data block for each time period.

Appendix B describes the emissions and energy inventory output files provided. See Appendix A for further details on the inventory production utilities.

5.0 ADDITIONAL MOVES INPUTS FOR INVENTORY MODE

The MOVES CDBs used to produce emission rates for the link-based inventory analyses were designed only for use in MOVES rates mode runs. TTI produced an extra set of MOVES inventory mode input data tables (32) as tab-delimited text files for each county, year, and activity scenario (total of 64 MOVES inventory mode input data sets). These input data files may be imported to MOVES CDBs for use in MOVES inventory mode runs designed to produce results close to results from the detailed, link-based inventories. Using these input data files, TTI subsequently prepared the inventory mode CDBs for the summer weekday scenario along with a corresponding set of MRS files for use in producing inventories consistent with the disaggregate, TDM link-based summer weekday inventory results. One inventory mode CDB and MRS was built corresponding to each of the 2026 summer weekday, link-based, county inventories.

5.1 MOVES Inventory Mode Inputs and Data Sources

The sources for the MOVES inventory mode input data sets for 2026 for each county and activity scenario consisted of inventory data from the link-based inventories (e.g., MOVES rates inputs, link-based activity outputs, off-network activity outputs, and particular MOVES defaults, or modified MOVES defaults consistent with the local inventories). TTI updated the utility to create the MOVES3 inventory mode inputs (MOVESactivityinputbuild). The utility accesses the data sources, performs needed processing of data into MOVES input form, and organizes the resulting MOVES input files in folders by county, year, period, and day type. Table 34 lists the 32 input tables produced and the sources of the data.

Table 34. MOVES Input Tables Developed for Local Inventory Mode Runs

MOVES Table	Data Source
totalidlefraction	Rates CDB (MOVES June - August average) post-processed to reflect summer and school periods activity)
avgspeeddistribution	Post-processed inventory activity output
hotellinghourfraction	Post-processed inventory activity output
hotellinghoursperday	Post-processed inventory activity output
hourvmtfraction	Post-processed inventory activity output
hpmsvtypeday	Post-processed inventory activity output
roadtypedistribution	Post-processed inventory activity output
sourcetypedayvmt	Post-processed inventory activity output
startshourfraction	Post-processed inventory activity output
startsperdaypervehicle	Post-processed inventory activity output
sourcetypeyear	Post-processed inventory vehicle population output
auditlog	Rates CDB
avft	Rates CDB
state	Rates CDB
dayvmtfraction	Rates CDB (update, set dayvmtfraction = 1.0)
monthvmtfraction	Rates CDB (update, set dayvmtfraction = 1.0)
startsmonthadjust	Rates CDB (update, set dayvmtfraction = 1.0)
county	Rates CDBs
countyyear	Rates CDBs
fuelformulation	Rates CDBs
fuelsupply	Rates CDBs
fuelusagefraction	Rates CDBs
hotellingactivitydistribution	Rates CDBs
imcoverage	Rates CDBs
sourcetypeagedistribution	Rates CDBs
year	Rates CDBs
zone	Rates CDBs
zonemonthhour	Rates CDBs
zoneroadtype	Rates CDBs
monthofanyyear	Updated MOVES default – set noOfDays = 7
dayofanyweek	Updated MOVES default – set noOfRealDays = 1
hotellingmonthadjust	Updated MOVES default – set monthadjust =1/12

Testing produced MOVES on-road inventory mode results comparable to the MOVES rates-mode-based, detailed link-based inventories, to within five percent, depending on the pollutant, but generally in the range of within two percent. Additional details on most of these MOVES inputs tables may be found in the MOVES3 inventory development guidance and MOVES technical information at EPA's MOVES model website.

Appendix B describes the files provided.

5.2 Summer Weekday Inventory Mode CDBs and MRSs

The set of summer weekday inventory mode CDBs provided was developed using the summer weekday MOVES input data tables developed with the local, detailed inventory data, as listed in Table 34. The set of corresponding summer weekday MRS files for the inventory mode runs were made like the rates mode run MRS files used in the link-based inventory analysis (Table 23), except with inventory mode specified instead of rates mode, the applicable inventory mode-specific CDBs specified in the MRS, and with output units of pounds specified.

The MOVES inventory mode summer weekday MRSs and CDBs were provided as a part of the electronic data submittal as described in Appendix B.

5.3 Additional Inventory Data Summaries

As a part of the inventory development and MOVES inventory mode inputs development, additional intermediate vehicle activity and population data summary (tab-delimited text) files were produced and provided. These include the following VMT and VHT summaries for each county scenario (year, season, day type) and the following vehicle registration data and vehicle population estimates by county.

- **VMT** summary by hour, TDM road type, and TDM area type.
- **VHT** summary by hour, TDM road type, TDM area type, and MOVES average speed bin.
- **Vehicle registration data** by category of car, light truck/s, and heavier truck weight categories (and fuel type for heavy-duty trucks) used in the estimation of vehicle populations.
- **Vehicle populations estimates** with main fields of year, source type, population.
- **Vehicle populations by fuel type estimate** with fields of year, source type, fuel type, population, source type description, fuel type description.

These files were also provided as a part of the data package as described in Appendix B.

6.0 QUALITY ASSURANCE

Analyses and results were subjected to appropriate internal review and QA/QC procedures, including independent verification and reasonableness checks. All work was completed consistent with applicable elements of American Society for Quality, American National Standard ASQ/ANSI: E4:2014: *Quality Management Systems for Environmental Information and Technology Programs – Requirements with Guidance for Use,* February 2014, and the TCEQ Quality Management Plan.

The Quality Assurance Project Plans (QAPP) category and project type most closely matching the intended use of this analysis are QAPP Category II (for important, highly visible Agency projects involving areas such as supporting the development of environmental regulations or standards) and Modeling for NAAQS Compliance. Internal review and quality control measures consistent with the QA category and project type-specific requirements provided in Guidance for Quality Assurance Project Plans for Modeling, EPA QA/G-5M,[23] along with appropriate audits or assessments of data and reporting of findings, were employed. These include but are not limited to the elements outlined, per EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5),[24] in the following description.

6.1 PROJECT MANAGEMENT

The definition and background of the problem addressed by this project, the project/task description, and project documents and records are as described in the Purpose and Background sections of the Grant Activity Description (GAD). No special training or certification was required. The TTI project manager ensured project personnel used the most current, approved version of the QAPP.

The objective was to produce EIs of the quality level required for air quality modeling, according to the guidance and methods documents as referenced, and in consultation with the TCEQ project manager.

Basic criteria were used to assure the acceptable quality of the product, including the following.

- The product met the purpose of the emissions analysis.
- The full extent of the modeling domain was included.
- Agreed methods, models, tools, and data were used.

[23] PDF available at: https://www.epa.gov/sites/production/files/2015-06/documents/g5m-final.pdf.
[24] PDF available at: https://www.epa.gov/sites/production/files/2016-06/documents/r5-final_0.pdf.

- The output data sets were produced in required formats.
- Any deficiencies found (as discussed in Section 6.5) were corrected.
- Aggregate results were comparable with available, similarly produced emissions estimates.

6.2 Measurement and Data Acquisition

Note that no sampling of data was involved in the EI development; thus, only existing data (non-direct measurements) were used for this project.

The data needed for project implementation was for the development of emission rate model inputs and adjustment factors and the development of the activity inputs for external emissions calculations. Existing data acquired from various organizations (e.g., TxDOT, MPOs, TCEQ, EPA) was reviewed by TTI for suitability, and in most cases was previously QA'd by the providing agency. These data sets may include: HPMS data (from TxDOT's Roadway Inventory Functional Classification Record [RIFCREC] report); regional TDM data; speed model data; vehicle registration data; ATR data; vehicle classification count data; meteorological data; fuels data; MOVES emissions model data; extended idling activity data; and vehicle I/M program design data.

Any significant problems found during review, verification, and/or validation (see QA criteria and methods discussed in Section 6.5) were corrected, and the QA procedure was repeated until satisfied. No significant problems were found.

6.3 Data Management

The project team used the same electronic project folder structure on each individual workstation. As various scripts, inputs, and outputs were developed in the process, data were shared within the team for crosschecking. To perform the MOVES model runs, a computer cluster (multiple computers) configuration or individual workstation configuration was used. After input data were QA'd, data sets were backed up and stored in compressed files.

After the final product was completed, all the project data archives were compiled on a set of optical data discs (CD-ROM or DVD, depending on size) or on an external drive for very large project data sets. A complete archive of the project data is kept by TTI (the computer models and EI development utilities used in the process included). The electronic data submittal package (containing the project deliverables as listed in Appendix B) was produced along with data description (and copied to a shared folder or

CD-ROM, DVD, or external hard drive, depending on needed storage space) and delivered to TCEQ.

6.4 Assessment and Oversight

The following assessments were performed.

- Verified that the overall scope was met (i.e., consistent with the intended purpose, for specified temporal resolution and geographic coverage, for specified sources, pollutants, and emissions processes).
- Checked that input data was prepared according to the plan.
- Checked that correct output data was produced. Records were kept of the checks performed.

In the case of any inconsistency or deficiency found, the issue was directly communicated to responsible staff for correction (or outside agency staff involved, if any). After any correction, QA checks were repeated to assure the additional work resulted in the intended result and were noted in the QA record.

Any major problems were reported to the project manager and communicated to the project team as needed, as well as when various data elements passed QA checks and were ready next steps. The project manager ensured all of the QA checks performed were compiled and maintained in the project archives.

In addition, technical systems audits were performed. Audits of data quality at the requisite 25 percent level were performed for any data produced as part of this study. QA findings were reported in both the draft and the final reports.

6.5 Data Validation

Erroneous or improper inputs at any point during the EI development process may produce inaccurate emissions estimates. The TTI project team performed QA checks at each step of the analysis to ensure data quality.

The criteria for passing quality checks are summarized in the following. These QA guidelines were used to ensure the development of EIs that were as accurate as possible and met the requirements of TCEQ's intended use.

As previously stated, TTI verified the overall scope of the emissions analysis to include the following.

- Purpose (i.e., needed for air quality modeling applications).
- Modeling domain (e.g., analysis years, geographic coverage, seasonal periods, days, sources, pollutants).
- Methods, models, and data (e.g., default versus local input data sources).
- Procedures, tools, and required emissions output data sets.

TTI performed checks on input data, model execution, and output, as follows.

- Input data preparation:
  - The basis of input data sets as planned (e.g., actual, historical, latest available, validated model); aggregation levels.
  - Depending on the procedure and input data set, verification of calculations.
  - Use of correct data dimensions, fields, coding, labeling, formats; distributions sum to 1.0 where appropriate.
  - Reasonability checks: (discussed in the next section).
  - External data sources quality assurance verification.
- Model or utility execution:
  - Correct number of utility or model run input files per application.
  - Utility control or model run specifications verification (e.g., per the applicable user guide, correct inputs, and output options).
- Output:
  - Correct output files by type and quantity.
  - Expected output file sizes.
  - Warnings and errors (e.g., checks of any written to output run logs).
  - Required data, proper coding/labeling, formats.
  - Assessment of any unusual results.

TTI performed further checks for consistency, completeness, and reasonability of data output from model or utility applications.

- Any activity, emission rate, or emissions adjustments were performed as intended.
- Noted whether directional differences were as expected (e.g., between scenarios with temporal or geographic variation).
- Checked for consistency (e.g., input data control totals versus output summaries, utility raw results versus post-processed results).
- Compared results to results from previous similar analyses where available.

Any additional data products required for the emissions analysis were subjected to the appropriate QA checks previously listed. Any issues found needing resolution were corrected, and appropriate QA checks were performed until satisfied, ensuring the project results met the TCEQ requirements, i.e., as outlined in the GAD and QAPP.

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APPENDIX A:
EMISSIONS ESTIMATION UTILITIES FOR MOVES-BASED EMISSIONS INVENTORIES (ELECTRONIC ONLY)

This appendix is available separately in an electronic format (e.g., .docx, .xlsx, .pdf, .txt, .zip, or other format) and can be provided upon request.

APPENDIX B:
ELECTRONIC DATA SUBMITTAL DESCRIPTION (ELECTRONIC ONLY)

This appendix is available separately in an electronic format (e.g., .docx, .xlsx, .pdf, .txt, .zip, or other format) and can be provided upon request.

APPENDIX C:
TXDOT DISTRICT VMT MIX BY DAY OF WEEK

TxDOT District/HGB Counties.

TxDOT District	HGB County
Beaumont	Liberty
Beaumont	Chambers
Houston	Harris
Houston	Galveston
Houston	Fort Bend
Houston	Brazoria
Houston	Montgomery
Houston	Waller

VMT Mix Year/Analysis Year Correlations.

VMT Mix Year	Analysis Years
2025	2023 through 2027

2025 Weekday VMT Mix - Beaumont TxDOT District (2026 Analysis Year).

SUT/FT	AM Peak RT2	AM Peak RT3	AM Peak RT4	AM Peak RT5	Mid-Day RT2	Mid-Day RT3	Mid-Day RT4	Mid-Day RT5	PM Peak RT2	PM Peak RT3	PM Peak RT4	PM Peak RT5	Over-night RT2	Over-night RT3	Over-night RT4	Over-night RT5
11_G	0.00054	0.00052	0.00055	0.00067	0.00049	0.00051	0.00053	0.00064	0.00049	0.00057	0.00056	0.00069	0.00041	0.00054	0.00049	0.00069
21_G	0.52868	0.51758	0.54663	0.66478	0.48240	0.50394	0.52832	0.63084	0.48127	0.56305	0.54982	0.68210	0.40561	0.53717	0.48317	0.68000
21_D	0.00588	0.00576	0.00608	0.00739	0.00537	0.00560	0.00588	0.00702	0.00535	0.00626	0.00612	0.00759	0.00451	0.00597	0.00537	0.00756
31_G	0.22627	0.26238	0.20128	0.21955	0.22454	0.26354	0.19129	0.23673	0.22916	0.26928	0.19360	0.22469	0.20127	0.24803	0.15537	0.21550
31_D	0.00438	0.00508	0.00390	0.00425	0.00435	0.00510	0.00370	0.00458	0.00444	0.00522	0.00375	0.00435	0.00390	0.00480	0.00301	0.00417
32_G	0.05564	0.06451	0.04949	0.05398	0.05521	0.06480	0.04703	0.05821	0.05634	0.06621	0.04760	0.05525	0.04949	0.06098	0.03820	0.05299
32_D	0.00311	0.00361	0.00277	0.00302	0.00309	0.00363	0.00263	0.00326	0.00315	0.00371	0.00266	0.00309	0.00277	0.00341	0.00214	0.00297
41_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41_D	0.00030	0.00112	0.00043	0.00078	0.00018	0.00061	0.00045	0.00062	0.00023	0.00021	0.00037	0.00052	0.00030	0.00020	0.00053	0.00045
42_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42_D	0.00061	0.00227	0.00088	0.00157	0.00036	0.00124	0.00091	0.00125	0.00046	0.00042	0.00075	0.00106	0.00060	0.00041	0.00108	0.00091
43_G	0.00002	0.00006	0.00002	0.00004	0.00001	0.00003	0.00002	0.00003	0.00001	0.00001	0.00002	0.00003	0.00002	0.00001	0.00003	0.00002
43_D	0.00164	0.00613	0.00236	0.00424	0.00096	0.00334	0.00246	0.00338	0.00123	0.00114	0.00203	0.00285	0.00162	0.00111	0.00292	0.00246
51_G	0.00048	0.00075	0.00049	0.00041	0.00052	0.00080	0.00058	0.00056	0.00036	0.00053	0.00041	0.00020	0.00057	0.00055	0.00046	0.00030
51_D	0.00086	0.00133	0.00087	0.00072	0.00092	0.00142	0.00104	0.00100	0.00064	0.00094	0.00073	0.00036	0.00101	0.00099	0.00082	0.00054
52_G	0.01059	0.01636	0.01066	0.00889	0.01135	0.01743	0.01274	0.01227	0.00788	0.01158	0.00900	0.00436	0.01244	0.01212	0.01011	0.00668
52_D	0.01890	0.02921	0.01903	0.01588	0.02026	0.03112	0.02276	0.02191	0.01407	0.02068	0.01608	0.00779	0.02221	0.02164	0.01805	0.01192
53_G	0.00037	0.00058	0.00038	0.00031	0.00040	0.00061	0.00045	0.00043	0.00028	0.00041	0.00032	0.00015	0.00044	0.00043	0.00036	0.00024
53_D	0.00067	0.00103	0.00067	0.00056	0.00071	0.00110	0.00080	0.00077	0.00050	0.00073	0.00057	0.00027	0.00078	0.00076	0.00064	0.00042
54_G	0.00034	0.00053	0.00034	0.00029	0.00037	0.00056	0.00041	0.00040	0.00025	0.00037	0.00029	0.00014	0.00040	0.00039	0.00033	0.00022
54_D	0.00061	0.00094	0.00061	0.00051	0.00065	0.00100	0.00073	0.00071	0.00045	0.00067	0.00052	0.00025	0.00072	0.00070	0.00058	0.00038
61_G	0.00338	0.00194	0.00368	0.00029	0.00453	0.00226	0.00427	0.00037	0.00466	0.00116	0.00397	0.00010	0.00702	0.00241	0.00666	0.00028
61_D	0.03375	0.01933	0.03674	0.00293	0.04526	0.02255	0.04270	0.00370	0.04660	0.01157	0.03970	0.00102	0.07009	0.02403	0.06656	0.00279
62_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
62_D	0.10298	0.05899	0.11212	0.00893	0.13810	0.06882	0.13028	0.01130	0.14218	0.03529	0.12113	0.00312	0.21385	0.07333	0.20310	0.00850

2025 Weekday VMT Mix - Houston TxDOT District (2026 Analysis Year).

SUT/FT	AM Peak RT2	AM Peak RT3	AM Peak RT4	AM Peak RT5	Mid-Day RT2	Mid-Day RT3	Mid-Day RT4	Mid-Day RT5	PM Peak RT2	PM Peak RT3	PM Peak RT4	PM Peak RT5	Over-night RT2	Over-night RT3	Over-night RT4	Over-night RT5
11_G	0.00072	0.00065	0.00071	0.00073	0.00053	0.00058	0.00066	0.00068	0.00069	0.00066	0.00072	0.00074	0.00065	0.00068	0.00071	0.00074
21_G	0.70849	0.64005	0.69909	0.72115	0.52565	0.56999	0.65526	0.67642	0.67748	0.65450	0.70721	0.73484	0.63787	0.67252	0.70401	0.73140
21_D	0.00788	0.00712	0.00778	0.00802	0.00585	0.00634	0.00729	0.00752	0.00754	0.00728	0.00787	0.00817	0.00709	0.00748	0.00783	0.00813
31_G	0.18224	0.20774	0.18272	0.17749	0.15510	0.22653	0.19153	0.19064	0.16588	0.22137	0.18432	0.17464	0.19576	0.19079	0.16213	0.16247
31_D	0.00353	0.00402	0.00354	0.00344	0.00300	0.00439	0.00371	0.00369	0.00321	0.00429	0.00357	0.00338	0.00379	0.00370	0.00314	0.00315
32_G	0.04481	0.05108	0.04493	0.04364	0.03814	0.05570	0.04709	0.04687	0.04078	0.05443	0.04532	0.04294	0.04813	0.04691	0.03986	0.03995
32_D	0.00251	0.00286	0.00251	0.00244	0.00213	0.00312	0.00264	0.00262	0.00228	0.00305	0.00254	0.00240	0.00269	0.00263	0.00223	0.00224
41_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41_D	0.00059	0.00046	0.00045	0.00045	0.00018	0.00030	0.00028	0.00031	0.00003	0.00014	0.00032	0.00016	0.00059	0.00017	0.00032	0.00015
42_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42_D	0.00119	0.00093	0.00091	0.00092	0.00036	0.00060	0.00057	0.00063	0.00005	0.00028	0.00066	0.00033	0.00119	0.00034	0.00064	0.00030
43_G	0.00003	0.00003	0.00002	0.00003	0.00001	0.00002	0.00002	0.00002	0.00000	0.00001	0.00002	0.00001	0.00003	0.00001	0.00002	0.00001
43_D	0.00321	0.00250	0.00245	0.00248	0.00098	0.00163	0.00154	0.00169	0.00014	0.00075	0.00177	0.00089	0.00320	0.00092	0.00173	0.00082
51_G	0.00037	0.00077	0.00056	0.00045	0.00107	0.00111	0.00085	0.00074	0.00044	0.00055	0.00041	0.00036	0.00053	0.00058	0.00042	0.00035
51_D	0.00036	0.00073	0.00053	0.00043	0.00101	0.00105	0.00081	0.00070	0.00042	0.00052	0.00039	0.00034	0.00050	0.00055	0.00040	0.00033
52_G	0.00741	0.01518	0.01097	0.00898	0.02107	0.02185	0.01685	0.01465	0.00879	0.01089	0.00815	0.00704	0.01042	0.01139	0.00827	0.00689
52_D	0.00703	0.01441	0.01042	0.00852	0.02001	0.02075	0.01600	0.01391	0.00834	0.01034	0.00774	0.00669	0.00989	0.01081	0.00785	0.00654
53_G	0.00110	0.00225	0.00163	0.00133	0.00312	0.00324	0.00250	0.00217	0.00130	0.00161	0.00121	0.00104	0.00154	0.00169	0.00123	0.00102
53_D	0.00104	0.00213	0.00154	0.00126	0.00296	0.00307	0.00237	0.00206	0.00124	0.00153	0.00115	0.00099	0.00147	0.00160	0.00116	0.00097
54_G	0.00027	0.00054	0.00039	0.00032	0.00075	0.00078	0.00060	0.00052	0.00031	0.00039	0.00029	0.00025	0.00037	0.00041	0.00030	0.00025
54_D	0.00025	0.00052	0.00037	0.00031	0.00072	0.00074	0.00057	0.00050	0.00030	0.00037	0.00028	0.00024	0.00035	0.00039	0.00028	0.00023
61_G	0.00057	0.00098	0.00060	0.00037	0.00461	0.00166	0.00104	0.00071	0.00171	0.00057	0.00055	0.00031	0.00157	0.00098	0.00122	0.00072
61_D	0.00658	0.01123	0.00695	0.00429	0.05299	0.01907	0.01191	0.00820	0.01969	0.00659	0.00636	0.00354	0.01802	0.01133	0.01401	0.00831
62_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
62_D	0.01983	0.03384	0.02095	0.01293	0.15976	0.05749	0.03592	0.02472	0.05937	0.01988	0.01917	0.01069	0.05432	0.03415	0.04224	0.02504

2025 Friday VMT Mix - Beaumont TxDOT District (2026 Analysis Year).

SUT/FT	AM Peak RT2	AM Peak RT3	AM Peak RT4	AM Peak RT5	Mid-Day RT2	Mid-Day RT3	Mid-Day RT4	Mid-Day RT5	PM Peak RT2	PM Peak RT3	PM Peak RT4	PM Peak RT5	Over-night RT2	Over-night RT3	Over-night RT4	Over-night RT5
11_G	0.00053	0.00052	0.00053	0.00068	0.00049	0.00051	0.00051	0.00065	0.00048	0.00057	0.00053	0.00070	0.00041	0.00054	0.00047	0.00070
21_G	0.54126	0.51969	0.55899	0.66413	0.49729	0.50624	0.54230	0.63005	0.49582	0.56450	0.56273	0.68178	0.42443	0.53944	0.50154	0.67947
21_D	0.00602	0.00578	0.00622	0.00739	0.00553	0.00563	0.00603	0.00701	0.00551	0.00628	0.00626	0.00758	0.00472	0.00600	0.00558	0.00756
31_G	0.23166	0.26345	0.20583	0.21933	0.23147	0.26474	0.19636	0.23643	0.23608	0.26997	0.19814	0.22459	0.21060	0.24908	0.16128	0.21534
31_D	0.00449	0.00510	0.00399	0.00425	0.00448	0.00513	0.00380	0.00458	0.00457	0.00523	0.00384	0.00435	0.00408	0.00482	0.00312	0.00417
32_G	0.05696	0.06478	0.05061	0.05393	0.05691	0.06509	0.04828	0.05813	0.05805	0.06638	0.04872	0.05522	0.05178	0.06124	0.03965	0.05295
32_D	0.00319	0.00363	0.00283	0.00302	0.00319	0.00364	0.00270	0.00325	0.00325	0.00372	0.00273	0.00309	0.00290	0.00343	0.00222	0.00296
41_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41_D	0.00030	0.00112	0.00041	0.00079	0.00017	0.00061	0.00043	0.00063	0.00022	0.00021	0.00036	0.00053	0.00030	0.00020	0.00052	0.00046
42_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42_D	0.00060	0.00226	0.00084	0.00159	0.00035	0.00123	0.00087	0.00127	0.00045	0.00042	0.00072	0.00107	0.00061	0.00041	0.00105	0.00093
43_G	0.00002	0.00006	0.00002	0.00004	0.00001	0.00003	0.00002	0.00003	0.00001	0.00001	0.00002	0.00003	0.00002	0.00001	0.00003	0.00003
43_D	0.00162	0.00610	0.00226	0.00430	0.00095	0.00332	0.00236	0.00343	0.00123	0.00113	0.00194	0.00289	0.00164	0.00111	0.00284	0.00250
51_G	0.00048	0.00074	0.00047	0.00041	0.00051	0.00079	0.00056	0.00057	0.00036	0.00053	0.00039	0.00020	0.00057	0.00055	0.00045	0.00031
51_D	0.00085	0.00133	0.00083	0.00073	0.00092	0.00141	0.00100	0.00101	0.00064	0.00094	0.00070	0.00036	0.00102	0.00098	0.00080	0.00055
52_G	0.00938	0.01592	0.00961	0.00908	0.01012	0.01696	0.01153	0.01253	0.00702	0.01125	0.00812	0.00446	0.01126	0.01179	0.00925	0.00682
52_D	0.01674	0.02842	0.01716	0.01622	0.01806	0.03029	0.02059	0.02238	0.01254	0.02009	0.01451	0.00796	0.02010	0.02105	0.01652	0.01218
53_G	0.00033	0.00056	0.00034	0.00032	0.00036	0.00060	0.00041	0.00044	0.00025	0.00040	0.00029	0.00016	0.00040	0.00041	0.00033	0.00024
53_D	0.00059	0.00100	0.00060	0.00057	0.00064	0.00107	0.00072	0.00079	0.00044	0.00071	0.00051	0.00028	0.00071	0.00074	0.00058	0.00043
54_G	0.00034	0.00053	0.00033	0.00029	0.00036	0.00056	0.00039	0.00040	0.00025	0.00037	0.00028	0.00014	0.00041	0.00039	0.00032	0.00022
54_D	0.00060	0.00094	0.00059	0.00052	0.00065	0.00100	0.00070	0.00072	0.00045	0.00066	0.00050	0.00025	0.00072	0.00070	0.00057	0.00039
61_G	0.00299	0.00188	0.00332	0.00030	0.00404	0.00220	0.00387	0.00038	0.00416	0.00112	0.00359	0.00010	0.00635	0.00234	0.00610	0.00028
61_D	0.02989	0.01881	0.03313	0.00299	0.04035	0.02195	0.03864	0.00378	0.04152	0.01124	0.03582	0.00105	0.06343	0.02339	0.06092	0.00285
62_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
62_D	0.09119	0.05739	0.10109	0.00912	0.12313	0.06698	0.11790	0.01154	0.12669	0.03429	0.10931	0.00319	0.19355	0.07136	0.18588	0.00868

2025 Friday VMT Mix - Houston TxDOT District (2026 Analysis Year).

SUT/FT	AM Peak RT2	AM Peak RT3	AM Peak RT4	AM Peak RT5	Mid-Day RT2	Mid-Day RT3	Mid-Day RT4	Mid-Day RT5	PM Peak RT2	PM Peak RT3	PM Peak RT4	PM Peak RT5	Over-night RT2	Over-night RT3	Over-night RT4	Over-night RT5
11_G	0.00070	0.00065	0.00067	0.00074	0.00055	0.00058	0.00063	0.00069	0.00068	0.00066	0.00067	0.00075	0.00064	0.00068	0.00067	0.00075
21_G	0.71776	0.64081	0.70380	0.72048	0.56941	0.57105	0.66230	0.67536	0.69785	0.65500	0.71117	0.73430	0.65657	0.67323	0.71062	0.73055
21_D	0.00798	0.00713	0.00783	0.00801	0.00633	0.00635	0.00737	0.00751	0.00776	0.00729	0.00791	0.00817	0.00730	0.00749	0.00790	0.00813
31_G	0.18462	0.20799	0.18395	0.17733	0.16801	0.22696	0.19359	0.19034	0.17086	0.22153	0.18535	0.17452	0.20150	0.19099	0.16365	0.16228
31_D	0.00358	0.00403	0.00356	0.00343	0.00325	0.00440	0.00375	0.00369	0.00331	0.00429	0.00359	0.00338	0.00390	0.00370	0.00317	0.00314
32_G	0.04539	0.05114	0.04523	0.04360	0.04131	0.05580	0.04760	0.04680	0.04201	0.05447	0.04557	0.04291	0.04955	0.04696	0.04024	0.03990
32_D	0.00254	0.00286	0.00253	0.00244	0.00231	0.00312	0.00266	0.00262	0.00235	0.00305	0.00255	0.00240	0.00277	0.00263	0.00225	0.00223
41_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41_D	0.00057	0.00046	0.00042	0.00046	0.00018	0.00030	0.00027	0.00031	0.00003	0.00014	0.00030	0.00017	0.00058	0.00017	0.00030	0.00015
42_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42_D	0.00115	0.00093	0.00085	0.00093	0.00037	0.00060	0.00054	0.00064	0.00005	0.00028	0.00062	0.00033	0.00117	0.00034	0.00061	0.00031
43_G	0.00003	0.00003	0.00002	0.00003	0.00001	0.00002	0.00001	0.00002	0.00000	0.00001	0.00002	0.00001	0.00003	0.00001	0.00002	0.00001
43_D	0.00311	0.00250	0.00230	0.00252	0.00101	0.00163	0.00145	0.00171	0.00014	0.00075	0.00166	0.00090	0.00316	0.00092	0.00163	0.00083
51_G	0.00036	0.00077	0.00052	0.00046	0.00111	0.00111	0.00081	0.00075	0.00044	0.00055	0.00039	0.00036	0.00052	0.00058	0.00040	0.00035
51_D	0.00035	0.00073	0.00050	0.00044	0.00105	0.00105	0.00077	0.00071	0.00042	0.00052	0.00037	0.00034	0.00049	0.00055	0.00038	0.00034
52_G	0.00533	0.01498	0.00974	0.00917	0.01622	0.02158	0.01502	0.01496	0.00643	0.01074	0.00723	0.00719	0.00762	0.01123	0.00736	0.00704
52_D	0.00506	0.01422	0.00925	0.00871	0.01539	0.02048	0.01426	0.01420	0.00611	0.01019	0.00686	0.00683	0.00724	0.01066	0.00699	0.00668
53_G	0.00079	0.00222	0.00144	0.00136	0.00240	0.00320	0.00222	0.00222	0.00095	0.00159	0.00107	0.00107	0.00113	0.00166	0.00109	0.00104
53_D	0.00075	0.00211	0.00137	0.00129	0.00228	0.00303	0.00211	0.00210	0.00090	0.00151	0.00102	0.00101	0.00107	0.00158	0.00104	0.00099
54_G	0.00026	0.00054	0.00037	0.00033	0.00078	0.00078	0.00057	0.00053	0.00031	0.00039	0.00027	0.00026	0.00037	0.00041	0.00028	0.00025
54_D	0.00024	0.00052	0.00035	0.00031	0.00074	0.00074	0.00054	0.00050	0.00029	0.00037	0.00026	0.00024	0.00035	0.00039	0.00027	0.00024
61_G	0.00041	0.00096	0.00054	0.00038	0.00355	0.00164	0.00092	0.00073	0.00125	0.00057	0.00049	0.00031	0.00115	0.00097	0.00108	0.00074
61_D	0.00473	0.01108	0.00617	0.00438	0.04078	0.01883	0.01062	0.00837	0.01441	0.00650	0.00564	0.00362	0.01318	0.01117	0.01247	0.00848
62_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
62_D	0.01427	0.03339	0.01859	0.01320	0.12294	0.05676	0.03201	0.02523	0.04344	0.01961	0.01700	0.01092	0.03972	0.03368	0.03759	0.02557

2025 Saturday VMT Mix - Beaumont TxDOT District (2026 Analysis Year).

SUT/FT	AM Peak RT2	AM Peak RT3	AM Peak RT4	AM Peak RT5	Mid-Day RT2	Mid-Day RT3	Mid-Day RT4	Mid-Day RT5	PM Peak RT2	PM Peak RT3	PM Peak RT4	PM Peak RT5	Over-night RT2	Over-night RT3	Over-night RT4	Over-night RT5
11_G	0.00052	0.00048	0.00050	0.00052	0.00048	0.00047	0.00049	0.00050	0.00048	0.00051	0.00051	0.00053	0.00042	0.00050	0.00046	0.00053
21_G	0.55450	0.54362	0.57229	0.67599	0.51318	0.53232	0.55746	0.64463	0.51131	0.58053	0.57664	0.68750	0.44514	0.56508	0.52192	0.68907
21_D	0.00617	0.00605	0.00637	0.00752	0.00571	0.00592	0.00620	0.00717	0.00569	0.00646	0.00641	0.00765	0.00495	0.00629	0.00580	0.00766
31_G	0.23732	0.27558	0.21073	0.22325	0.23886	0.27838	0.20185	0.24190	0.24346	0.27763	0.20304	0.22647	0.22088	0.26092	0.16783	0.21838
31_D	0.00460	0.00534	0.00408	0.00432	0.00463	0.00539	0.00391	0.00469	0.00472	0.00538	0.00393	0.00439	0.00428	0.00505	0.00325	0.00423
32_G	0.05835	0.06776	0.05181	0.05489	0.05873	0.06845	0.04963	0.05948	0.05986	0.06826	0.04992	0.05568	0.05431	0.06415	0.04127	0.05369
32_D	0.00327	0.00379	0.00290	0.00307	0.00329	0.00383	0.00278	0.00333	0.00335	0.00382	0.00279	0.00312	0.00304	0.00359	0.00231	0.00301
41_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41_D	0.00029	0.00102	0.00039	0.00061	0.00017	0.00056	0.00041	0.00048	0.00022	0.00019	0.00034	0.00040	0.00030	0.00019	0.00050	0.00035
42_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42_D	0.00059	0.00207	0.00080	0.00123	0.00035	0.00114	0.00083	0.00098	0.00045	0.00038	0.00068	0.00082	0.00061	0.00038	0.00102	0.00071
43_G	0.00002	0.00006	0.00002	0.00003	0.00001	0.00003	0.00002	0.00003	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001	0.00003	0.00002
43_D	0.00159	0.00560	0.00215	0.00331	0.00094	0.00306	0.00225	0.00265	0.00121	0.00102	0.00185	0.00221	0.00165	0.00102	0.00274	0.00191
51_G	0.00047	0.00068	0.00044	0.00032	0.00051	0.00073	0.00053	0.00044	0.00035	0.00047	0.00037	0.00015	0.00058	0.00051	0.00043	0.00024
51_D	0.00084	0.00122	0.00079	0.00056	0.00091	0.00131	0.00095	0.00078	0.00063	0.00085	0.00067	0.00027	0.00103	0.00090	0.00077	0.00042
52_G	0.00810	0.01096	0.00848	0.00559	0.00881	0.01175	0.01022	0.00775	0.00611	0.00762	0.00718	0.00272	0.00996	0.00813	0.00830	0.00418
52_D	0.01447	0.01957	0.01515	0.00998	0.01572	0.02097	0.01825	0.01384	0.01091	0.01360	0.01282	0.00485	0.01778	0.01452	0.01482	0.00747
53_G	0.00029	0.00039	0.00030	0.00020	0.00031	0.00041	0.00036	0.00027	0.00021	0.00027	0.00025	0.00010	0.00035	0.00029	0.00029	0.00015
53_D	0.00051	0.00069	0.00053	0.00035	0.00055	0.00074	0.00064	0.00049	0.00038	0.00048	0.00045	0.00017	0.00063	0.00051	0.00052	0.00026
54_G	0.00033	0.00048	0.00031	0.00022	0.00036	0.00052	0.00038	0.00031	0.00025	0.00034	0.00026	0.00011	0.00041	0.00036	0.00031	0.00017
54_D	0.00059	0.00086	0.00056	0.00040	0.00064	0.00092	0.00067	0.00055	0.00045	0.00060	0.00047	0.00019	0.00073	0.00064	0.00055	0.00030
61_G	0.00259	0.00130	0.00293	0.00018	0.00352	0.00152	0.00343	0.00023	0.00362	0.00076	0.00317	0.00006	0.00562	0.00161	0.00547	0.00017
61_D	0.02583	0.01296	0.02924	0.00184	0.03513	0.01520	0.03424	0.00234	0.03612	0.00761	0.03165	0.00064	0.05612	0.01613	0.05465	0.00174
62_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
62_D	0.07880	0.03953	0.08922	0.00561	0.10719	0.04638	0.10449	0.00714	0.11021	0.02322	0.09657	0.00194	0.17123	0.04922	0.16676	0.00532

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SUT/FT	AM Peak RT2	AM Peak RT3	AM Peak RT4	AM Peak RT5	Mid-Day RT2	Mid-Day RT3	Mid-Day RT4	Mid-Day RT5	PM Peak RT2	PM Peak RT3	PM Peak RT4	PM Peak RT5	Over-night RT2	Over-night RT3	Over-night RT4	Over-night RT5
11_G	0.00071	0.00063	0.00062	0.00057	0.00054	0.00057	0.00059	0.00054	0.00068	0.00064	0.00063	0.00058	0.00064	0.00066	0.00063	0.00058
21_G	0.71002	0.65566	0.70871	0.73274	0.53248	0.59224	0.66969	0.69499	0.68080	0.66464	0.71528	0.74402	0.64092	0.68714	0.71754	0.74605
21_D	0.00790	0.00729	0.00788	0.00815	0.00592	0.00659	0.00745	0.00773	0.00757	0.00739	0.00796	0.00828	0.00713	0.00764	0.00798	0.00830
31_G	0.18263	0.21281	0.18523	0.18035	0.15711	0.23538	0.19575	0.19587	0.16669	0.22479	0.18642	0.17683	0.19670	0.19494	0.16525	0.16572
31_D	0.00354	0.00412	0.00359	0.00349	0.00304	0.00456	0.00379	0.00379	0.00323	0.00435	0.00361	0.00342	0.00381	0.00378	0.00320	0.00321
32_G	0.04491	0.05232	0.04554	0.04434	0.03863	0.05787	0.04813	0.04816	0.04098	0.05527	0.04584	0.04348	0.04836	0.04793	0.04063	0.04075
32_D	0.00251	0.00293	0.00255	0.00248	0.00216	0.00324	0.00269	0.00270	0.00229	0.00309	0.00257	0.00243	0.00271	0.00268	0.00227	0.00228
41_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41_D	0.00058	0.00044	0.00039	0.00035	0.00018	0.00029	0.00025	0.00024	0.00003	0.00013	0.00028	0.00013	0.00058	0.00016	0.00028	0.00012
42_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42_D	0.00118	0.00090	0.00080	0.00072	0.00036	0.00059	0.00051	0.00049	0.00005	0.00027	0.00058	0.00026	0.00118	0.00033	0.00057	0.00024
43_G	0.00003	0.00002	0.00002	0.00002	0.00001	0.00002	0.00001	0.00001	0.00000	0.00001	0.00002	0.00001	0.00003	0.00001	0.00002	0.00001
43_D	0.00320	0.00242	0.00215	0.00193	0.00098	0.00160	0.00136	0.00133	0.00014	0.00072	0.00155	0.00069	0.00320	0.00089	0.00153	0.00064
51_G	0.00037	0.00074	0.00049	0.00035	0.00107	0.00109	0.00076	0.00058	0.00044	0.00053	0.00036	0.00028	0.00053	0.00056	0.00037	0.00027
51_D	0.00035	0.00071	0.00046	0.00034	0.00102	0.00103	0.00072	0.00055	0.00042	0.00050	0.00034	0.00026	0.00050	0.00053	0.00035	0.00026
52_G	0.00706	0.01100	0.00846	0.00564	0.02032	0.01606	0.01309	0.00931	0.00841	0.00782	0.00627	0.00441	0.00997	0.00823	0.00641	0.00434
52_D	0.00671	0.01044	0.00803	0.00535	0.01929	0.01525	0.01243	0.00883	0.00798	0.00743	0.00595	0.00418	0.00946	0.00781	0.00608	0.00412
53_G	0.00105	0.00163	0.00125	0.00084	0.00301	0.00238	0.00194	0.00138	0.00124	0.00116	0.00093	0.00065	0.00148	0.00122	0.00095	0.00064
53_D	0.00099	0.00155	0.00119	0.00079	0.00286	0.00226	0.00184	0.00131	0.00118	0.00110	0.00088	0.00062	0.00140	0.00116	0.00090	0.00061
54_G	0.00026	0.00053	0.00035	0.00025	0.00076	0.00077	0.00054	0.00041	0.00031	0.00037	0.00026	0.00020	0.00037	0.00039	0.00026	0.00019
54_D	0.00025	0.00050	0.00033	0.00024	0.00072	0.00073	0.00051	0.00039	0.00030	0.00036	0.00024	0.00019	0.00035	0.00037	0.00025	0.00018
61_G	0.00055	0.00071	0.00047	0.00023	0.00444	0.00122	0.00080	0.00045	0.00164	0.00041	0.00043	0.00019	0.00150	0.00071	0.00094	0.00046
61_D	0.00627	0.00813	0.00535	0.00269	0.05109	0.01401	0.00926	0.00521	0.01883	0.00474	0.00489	0.00222	0.01723	0.00819	0.01085	0.00524
62_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
62_D	0.01891	0.02452	0.01614	0.00812	0.15401	0.04225	0.02790	0.01570	0.05677	0.01428	0.01474	0.00669	0.05194	0.02468	0.03272	0.01579

2025 Sunday VMT Mix - Beaumont TxDOT District (2026 Analysis Year).

SUT/FT	AM Peak RT2	AM Peak RT3	AM Peak RT4	AM Peak RT5	Mid-Day RT2	Mid-Day RT3	Mid-Day RT4	Mid-Day RT5	PM Peak RT2	PM Peak RT3	PM Peak RT4	PM Peak RT5	Over-night RT2	Over-night RT3	Over-night RT4	Over-night RT5
11_G	0.00051	0.00046	0.00048	0.00048	0.00048	0.00045	0.00047	0.00046	0.00047	0.00049	0.00049	0.00048	0.00042	0.00048	0.00045	0.00049
21_G	0.56265	0.55234	0.58150	0.67958	0.52308	0.54189	0.56804	0.64907	0.52096	0.58623	0.58630	0.68920	0.45838	0.57444	0.53644	0.69196
21_D	0.00626	0.00614	0.00647	0.00756	0.00582	0.00603	0.00632	0.00722	0.00579	0.00652	0.00652	0.00767	0.00510	0.00639	0.00597	0.00770
31_G	0.24081	0.28000	0.21412	0.22443	0.24347	0.28338	0.20568	0.24357	0.24806	0.28036	0.20644	0.22703	0.22745	0.26524	0.17250	0.21929
31_D	0.00466	0.00542	0.00415	0.00435	0.00472	0.00549	0.00398	0.00472	0.00480	0.00543	0.00400	0.00440	0.00441	0.00514	0.00334	0.00425
32_G	0.05921	0.06884	0.05265	0.05518	0.05986	0.06968	0.05057	0.05989	0.06099	0.06893	0.05076	0.05582	0.05593	0.06522	0.04241	0.05392
32_D	0.00331	0.00385	0.00295	0.00309	0.00335	0.00390	0.00283	0.00335	0.00341	0.00386	0.00284	0.00312	0.00313	0.00365	0.00237	0.00302
41_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41_D	0.00029	0.00099	0.00038	0.00055	0.00017	0.00054	0.00040	0.00044	0.00022	0.00018	0.00033	0.00037	0.00030	0.00018	0.00049	0.00032
42_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42_D	0.00058	0.00201	0.00077	0.00112	0.00035	0.00110	0.00081	0.00089	0.00044	0.00036	0.00066	0.00074	0.00061	0.00037	0.00099	0.00064
43_G	0.00002	0.00005	0.00002	0.00003	0.00001	0.00003	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001	0.00003	0.00002
43_D	0.00157	0.00541	0.00207	0.00301	0.00094	0.00297	0.00218	0.00241	0.00120	0.00098	0.00178	0.00200	0.00165	0.00099	0.00267	0.00174
51_G	0.00046	0.00066	0.00043	0.00029	0.00050	0.00071	0.00052	0.00040	0.00035	0.00046	0.00036	0.00014	0.00058	0.00049	0.00042	0.00022
51_D	0.00083	0.00118	0.00076	0.00051	0.00090	0.00126	0.00092	0.00071	0.00062	0.00081	0.00064	0.00025	0.00103	0.00087	0.00075	0.00038
52_G	0.00732	0.00916	0.00770	0.00453	0.00799	0.00983	0.00931	0.00630	0.00554	0.00633	0.00652	0.00220	0.00913	0.00680	0.00762	0.00339
52_D	0.01307	0.01635	0.01375	0.00809	0.01427	0.01756	0.01662	0.01124	0.00989	0.01130	0.01164	0.00393	0.01630	0.01214	0.01361	0.00605
53_G	0.00026	0.00032	0.00027	0.00016	0.00028	0.00035	0.00033	0.00022	0.00019	0.00022	0.00023	0.00008	0.00032	0.00024	0.00027	0.00012
53_D	0.00046	0.00058	0.00048	0.00028	0.00050	0.00062	0.00058	0.00040	0.00035	0.00040	0.00041	0.00014	0.00057	0.00043	0.00048	0.00021
54_G	0.00033	0.00047	0.00030	0.00020	0.00036	0.00050	0.00036	0.00028	0.00025	0.00032	0.00026	0.00010	0.00041	0.00035	0.00030	0.00015
54_D	0.00058	0.00083	0.00054	0.00036	0.00064	0.00089	0.00065	0.00050	0.00044	0.00058	0.00046	0.00018	0.00073	0.00062	0.00053	0.00027
61_G	0.00234	0.00108	0.00266	0.00015	0.00319	0.00127	0.00312	0.00019	0.00328	0.00063	0.00288	0.00005	0.00515	0.00135	0.00502	0.00014
61_D	0.02333	0.01082	0.02655	0.00149	0.03187	0.01272	0.03118	0.00190	0.03276	0.00632	0.02875	0.00052	0.05144	0.01348	0.05019	0.00141
62_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
62_D	0.07118	0.03303	0.08100	0.00455	0.09725	0.03882	0.09513	0.00580	0.09995	0.01928	0.08772	0.00157	0.15695	0.04114	0.15314	0.00431

2025 Sunday VMT Mix - Houston TxDOT District (2026 Analysis Year).

SUT/FT	AM Peak RT2	AM Peak RT3	AM Peak RT4	AM Peak RT5	Mid-Day RT2	Mid-Day RT3	Mid-Day RT4	Mid-Day RT5	PM Peak RT2	PM Peak RT3	PM Peak RT4	PM Peak RT5	Over-night RT2	Over-night RT3	Over-night RT4	Over-night RT5
11_G	0.00070	0.00063	0.00059	0.00052	0.00055	0.00057	0.00056	0.00049	0.00068	0.00063	0.00060	0.00052	0.00064	0.00066	0.00060	0.00053
21_G	0.71543	0.65704	0.71201	0.73645	0.55784	0.59425	0.67470	0.70101	0.69266	0.66553	0.71804	0.74694	0.65181	0.68843	0.72223	0.75075
21_D	0.00796	0.00731	0.00792	0.00819	0.00620	0.00661	0.00750	0.00780	0.00770	0.00740	0.00799	0.00831	0.00725	0.00766	0.00803	0.00835
31_G	0.18402	0.21326	0.18609	0.18126	0.16460	0.23618	0.19721	0.19757	0.16959	0.22510	0.18714	0.17752	0.20004	0.19530	0.16632	0.16677
31_D	0.00356	0.00413	0.00360	0.00351	0.00319	0.00457	0.00382	0.00383	0.00328	0.00436	0.00362	0.00344	0.00387	0.00378	0.00322	0.00323
32_G	0.04525	0.05244	0.04576	0.04457	0.04047	0.05807	0.04849	0.04858	0.04170	0.05535	0.04601	0.04365	0.04919	0.04802	0.04090	0.04100
32_D	0.00253	0.00293	0.00256	0.00249	0.00226	0.00325	0.00271	0.00272	0.00233	0.00310	0.00258	0.00244	0.00275	0.00269	0.00229	0.00229
41_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41_D	0.00057	0.00044	0.00038	0.00032	0.00018	0.00029	0.00024	0.00022	0.00003	0.00013	0.00027	0.00011	0.00058	0.00016	0.00027	0.00011
42_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42_D	0.00116	0.00089	0.00076	0.00065	0.00037	0.00059	0.00048	0.00045	0.00005	0.00027	0.00055	0.00023	0.00117	0.00033	0.00054	0.00022
43_G	0.00003	0.00002	0.00002	0.00002	0.00001	0.00002	0.00001	0.00001	0.00000	0.00001	0.00001	0.00001	0.00003	0.00001	0.00001	0.00001
43_D	0.00314	0.00241	0.00205	0.00176	0.00100	0.00160	0.00130	0.00122	0.00014	0.00072	0.00148	0.00063	0.00317	0.00089	0.00146	0.00058
51_G	0.00037	0.00074	0.00047	0.00032	0.00110	0.00108	0.00072	0.00053	0.00044	0.00053	0.00034	0.00025	0.00052	0.00056	0.00035	0.00025
51_D	0.00035	0.00070	0.00044	0.00031	0.00104	0.00103	0.00069	0.00051	0.00042	0.00050	0.00033	0.00024	0.00050	0.00053	0.00034	0.00024
52_G	0.00585	0.01063	0.00759	0.00457	0.01750	0.01554	0.01178	0.00757	0.00703	0.00755	0.00562	0.00357	0.00833	0.00795	0.00576	0.00353
52_D	0.00556	0.01009	0.00721	0.00434	0.01661	0.01475	0.01119	0.00719	0.00668	0.00717	0.00534	0.00339	0.00791	0.00755	0.00547	0.00335
53_G	0.00087	0.00157	0.00112	0.00068	0.00259	0.00230	0.00175	0.00112	0.00104	0.00112	0.00083	0.00053	0.00123	0.00118	0.00085	0.00052
53_D	0.00082	0.00149	0.00107	0.00064	0.00246	0.00218	0.00166	0.00106	0.00099	0.00106	0.00079	0.00050	0.00117	0.00112	0.00081	0.00050
54_G	0.00026	0.00052	0.00033	0.00023	0.00077	0.00077	0.00051	0.00038	0.00031	0.00037	0.00024	0.00018	0.00037	0.00039	0.00025	0.00018
54_D	0.00025	0.00050	0.00031	0.00022	0.00074	0.00073	0.00049	0.00036	0.00030	0.00035	0.00023	0.00017	0.00035	0.00037	0.00024	0.00017
61_G	0.00045	0.00068	0.00042	0.00019	0.00383	0.00118	0.00072	0.00037	0.00137	0.00040	0.00038	0.00016	0.00125	0.00069	0.00085	0.00037
61_D	0.00520	0.00786	0.00481	0.00218	0.04401	0.01356	0.00833	0.00424	0.01576	0.00457	0.00438	0.00180	0.01441	0.00791	0.00976	0.00425
62_G	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
62_D	0.01567	0.02369	0.01449	0.00658	0.13268	0.04088	0.02512	0.01278	0.04750	0.01379	0.01322	0.00542	0.04344	0.02384	0.02943	0.01282

APPENDIX D:
TXDOT DISTRICT AGGREGATE WEEKDAY VMT MIX

TxDOT District/HGB Counties

TxDOT District	HGB County
Beaumont	Liberty
Beaumont	Chambers
Houston	Harris
Houston	Galveston
Houston	Fort Bend
Houston	Brazoria
Houston	Montgomery
Houston	Waller

VMT Mix Year/Analysis Year Correlations

VMT Mix Year	Analysis Years
2025	2023 through 2027

2025[1] Aggregate Weekday VMT Mix

SUT/FT	Beaumont	Houston
11_G	0.00053	0.00069
21_G	0.52516	0.67971
21_D	0.00584	0.00756
31_G	0.21783	0.18488
31_D	0.00422	0.00358
32_G	0.05356	0.04546
32_D	0.00300	0.00254
41_G	-	-
41_D	0.00048	0.00033
42_G	-	-
42_D	0.00096	0.00066
43_G	0.00003	0.00002
43_D	0.00260	0.00178
51_G	0.00058	0.00064
51_D	0.00103	0.00061
52_G	0.01260	0.01271
52_D	0.02250	0.01207
53_G	0.00044	0.00188
53_D	0.00079	0.00179
54_G	0.00041	0.00046
54_D	0.00073	0.00043
61_G	0.00354	0.00089
61_D	0.03534	0.01029
62_G	-	-
62_D	0.10784	0.03102

[1] for 2026 analysis year

APPENDIX E:
CAPACITY FACTORS, SPEED FACTORS, AND SPEED REDUCTION FACTORS

Capacity Factors

Time of Day Assignment	Capacity Factor[1]
AM Peak	0.3333333
Mid-Day	0.1666667
PM Peak	0.2500000
Overnight	0.0909091

[1] To obtain hourly capacities, a single capacity factor for each time-of-day assignment is used for all area types and functional classes

Free-Flow (V/C=0) Speed Factors for Houston/Galveston Speed Model

Functional Class Code and Description	Area Type Code and Description	Distance Weighted Input Speeds[1]	Distance Weighted Free-Flow Speeds[2]	Free-Flow Speed Factor[3]
1 - Urban Interstate	1 - CBD	50.85	56.40	1.10906
1 - Urban Interstate	2 - Urban	52.55	61.40	1.16842
2 - Urban Other Freeway	1 - CBD	N/A	58.00	1.21154
2 - Urban Other Freeway	2 - Urban	52.00	63.00	1.21154
3 - Toll Road	1 - CBD	N/A	34.50	0.62652
3 - Toll Road	2 - Urban	57.58	36.08	0.62652
3 - Toll Road	3 - Urban Fringe	61.69	36.14	0.58577
3 - Toll Road	4 - Suburban	64.34	37.99	0.59040
3 - Toll Road	5 - Rural	59.13	38.43	0.64991
4 - Ramp	1 - CBD	28.62	35.13	1.22734
4 - Ramp	2 - Urban	40.06	36.26	0.90509
4 - Ramp	3 - Urban Fringe	43.22	38.52	0.89119
4 - Ramp	4 - Suburban	44.82	45.71	1.01987
4 - Ramp	5 - Rural	55.16	52.11	0.94478
5 - Urban Principal Arterial	1 - CBD	24.72	26.52	1.07262
5 - Urban Principal Arterial	2 - Urban	35.78	29.69	0.82974
6 - Urban Other Arterial	1 - CBD	22.00	24.64	1.11996
6 - Urban Other Arterial	2 - Urban	34.57	27.31	0.79001
7 - Urban Collector	1 - CBD	20.94	24.17	1.15413
7 - Urban Collector	2 - Urban	35.36	25.78	0.72901
10 - Rural Interstate	3 - Urban Fringe	57.84	61.40	1.06152
10 - Rural Interstate	4 - Suburban	59.15	67.20	1.13613
10 - Rural Interstate	5 - Rural	62.00	68.57	1.10599
11 - Rural Other Freeway	3 - Urban Fringe	62.00	63.00	1.01613
11 - Rural Other Freeway	4 - Suburban	62.00	69.00	1.11290
11 - Rural Other Freeway	5 - Rural	64.00	71.00	1.10938
12 - Rural Principal Arterial	3 - Urban Fringe	40.23	33.75	0.83890
12 - Rural Principal Arterial	4 - Suburban	46.12	42.48	0.92125
12 - Rural Principal Arterial	5 - Rural	60.00	55.53	0.92536
13 - Rural Other Arterial	3 - Urban Fringe	39.05	30.51	0.78131
13 - Rural Other Arterial	4 - Suburban	43.03	39.85	0.92612
13 - Rural Other Arterial	5 - Rural	53.97	54.07	1.00194
14 - Rural Major Collector	3 - Urban Fringe	38.00	27.76	0.73061
14 - Rural Major Collector	4 - Suburban	41.00	49.22	1.20059
14 - Rural Major Collector	5 - Rural	53.00	54.06	1.02009
15 - Rural Collector	3 - Urban Fringe	36.00	24.07	0.66864
15 - Rural Collector	4 - Suburban	40.00	35.58	0.88938
15 - Rural Collector	5 - Rural	49.00	49.86	1.01762

[1] Based on 2012 TDM data.

[2] Calculated from detailed speed model runs by H-GAC with link volumes set to 0 (V/C=0).

[3] When input speeds are not available, speed factors are taken from the nearest area type.

LOS E (V/C=1) Speed Factors for Houston/Galveston Speed Model

Functional Class Code and Description	Area Type Code and Description	Distance Weighted Input Speeds[1]	Distance Weighted Free-Flow Speeds[2]	Free-Flow Speed Factor[3]
1 - Urban Interstate	1 - CBD	50.85	34.35	0.67549
1 - Urban Interstate	2 - Urban	52.55	34.35	0.65370
2 - Urban Other Freeway	1 - CBD	N/A	35.00	0.67308
2 - Urban Other Freeway	2 - Urban	52.00	35.00	0.67308
3 - Toll Road	1 - CBD	N/A	24.77	0.43011
3 - Toll Road	2 - Urban	57.58	24.77	0.43011
3 - Toll Road	3 - Urban Fringe	61.69	26.52	0.42983
3 - Toll Road	4 - Suburban	64.34	29.54	0.45920
3 - Toll Road	5 - Rural	59.13	29.70	0.50229
4 - Ramp	1 - CBD	28.62	31.68	1.10692
4 - Ramp	2 - Urban	40.06	30.03	0.74952
4 - Ramp	3 - Urban Fringe	43.22	33.24	0.76908
4 - Ramp	4 - Suburban	44.82	41.22	0.91979
4 - Ramp	5 - Rural	55.16	49.01	0.88861
5 - Urban Principal Arterial	1 - CBD	24.72	22.13	0.89529
5 - Urban Principal Arterial	2 - Urban	35.78	24.44	0.68294
6 - Urban Other Arterial	1 - CBD	22.00	20.80	0.94565
6 - Urban Other Arterial	2 - Urban	34.57	22.76	0.65833
7 - Urban Collector	1 - CBD	20.94	20.06	0.95782
7 - Urban Collector	2 - Urban	35.36	21.23	0.60033
10 - Rural Interstate	3 - Urban Fringe	57.84	39.25	0.67860
10 - Rural Interstate	4 - Suburban	59.15	49.08	0.82973
10 - Rural Interstate	5 - Rural	62.00	49.08	0.79157
11 - Rural Other Freeway	3 - Urban Fringe	62.00	40.00	0.64516
11 - Rural Other Freeway	4 - Suburban	62.00	50.00	0.80645
11 - Rural Other Freeway	5 - Rural	64.00	50.00	0.78125
12 - Rural Principal Arterial	3 - Urban Fringe	40.23	27.30	0.67871
12 - Rural Principal Arterial	4 - Suburban	46.12	32.64	0.70784
12 - Rural Principal Arterial	5 - Rural	60.00	38.32	0.63858
13 - Rural Other Arterial	3 - Urban Fringe	39.05	24.81	0.63540
13 - Rural Other Arterial	4 - Suburban	43.03	30.15	0.70070
13 - Rural Other Arterial	5 - Rural	53.97	38.46	0.71270
14 - Rural Major Collector	3 - Urban Fringe	38.00	22.22	0.58465
14 - Rural Major Collector	4 - Suburban	41.00	34.09	0.83151
14 - Rural Major Collector	5 - Rural	53.00	36.83	0.69499
15 - Rural Collector	3 - Urban Fringe	36.00	19.74	0.54845
15 - Rural Collector	4 - Suburban	40.00	26.40	0.65994
15 - Rural Collector	5 - Rural	49.00	34.33	0.70057

[1] Based on 2012 TDM data.

[2] Calculated from detailed speed model runs by H-GAC with link volumes set to 0 (V/C=0).

[3] When input speeds are not available, speed factors are taken from the nearest area type.

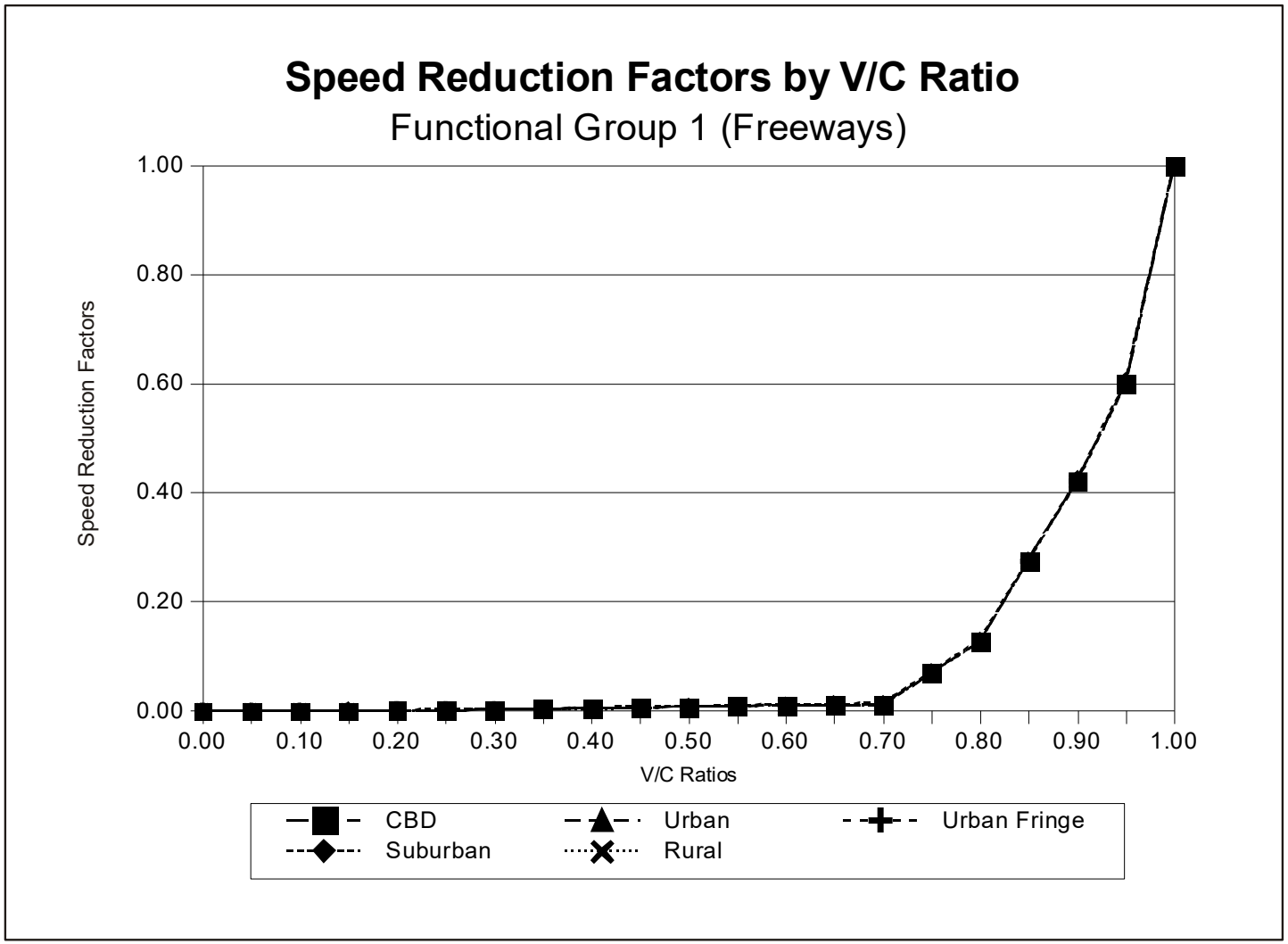

Figure 1. Freeway Speed Reduction Factors by V/C Ratio.

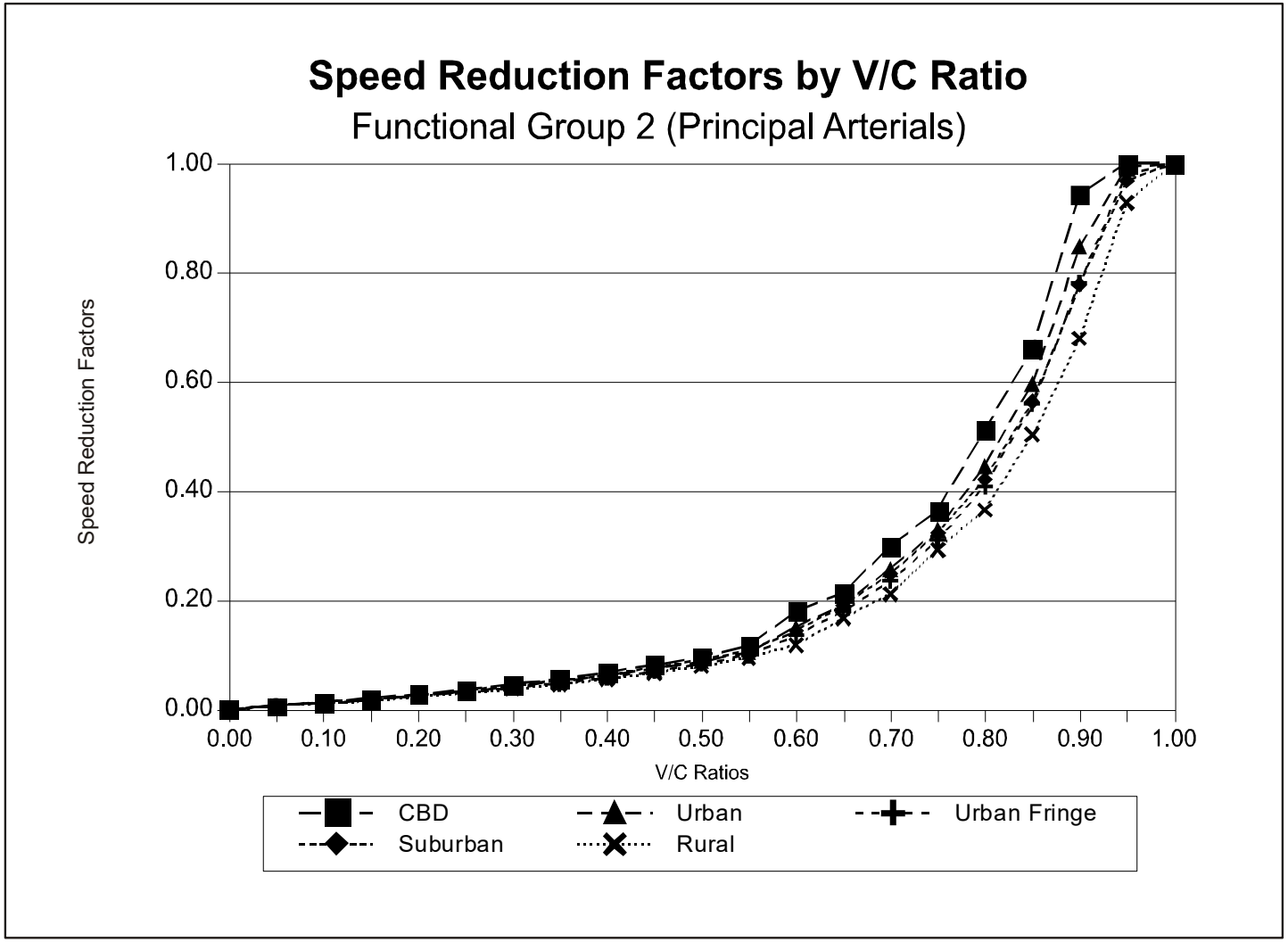

Figure 2. Principal Arterial Speed Reduction Factors by V/C Ratio.

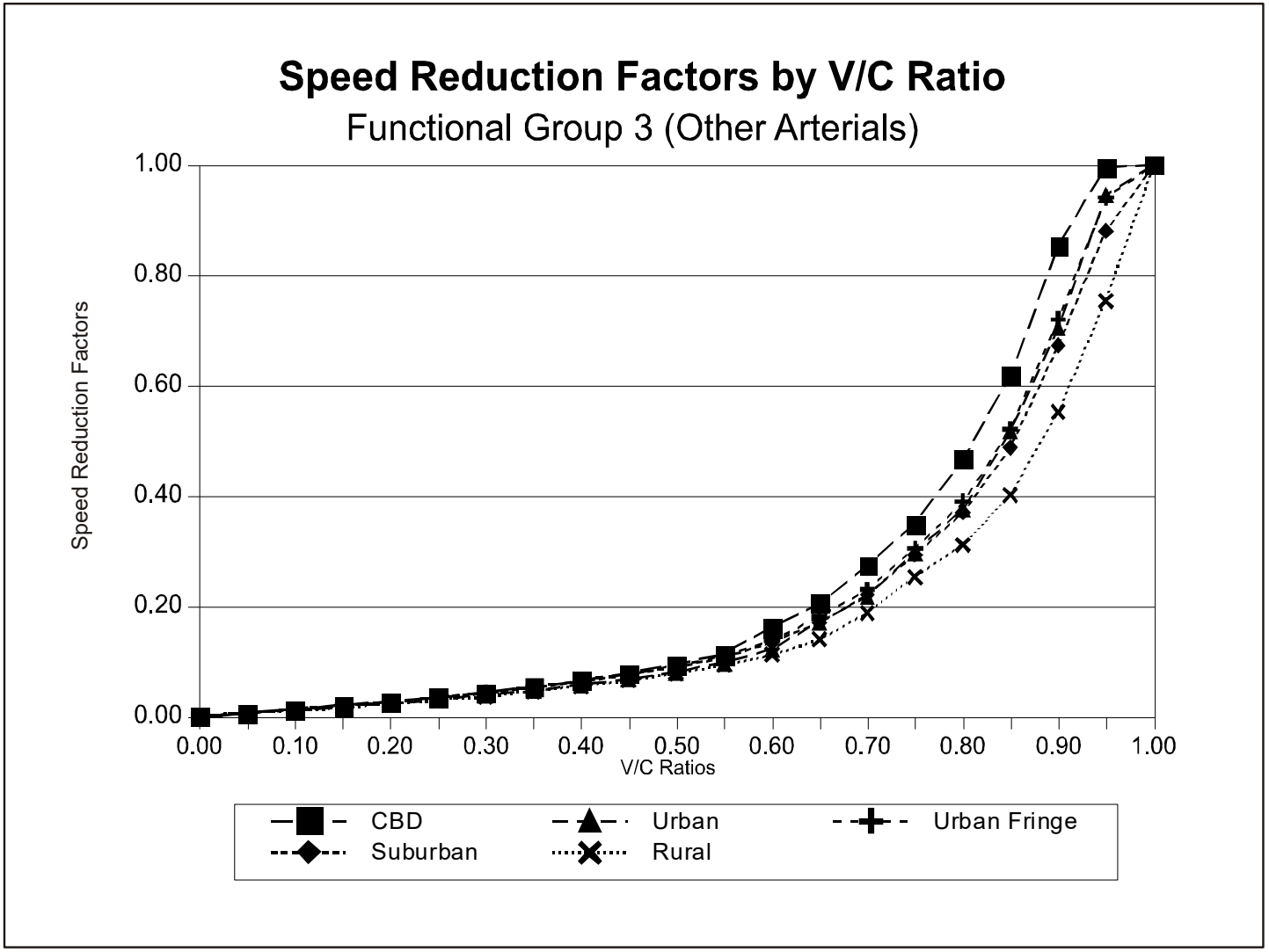

Figure 3. Other Arterial Speed Reduction Factors by V/C Ratio.

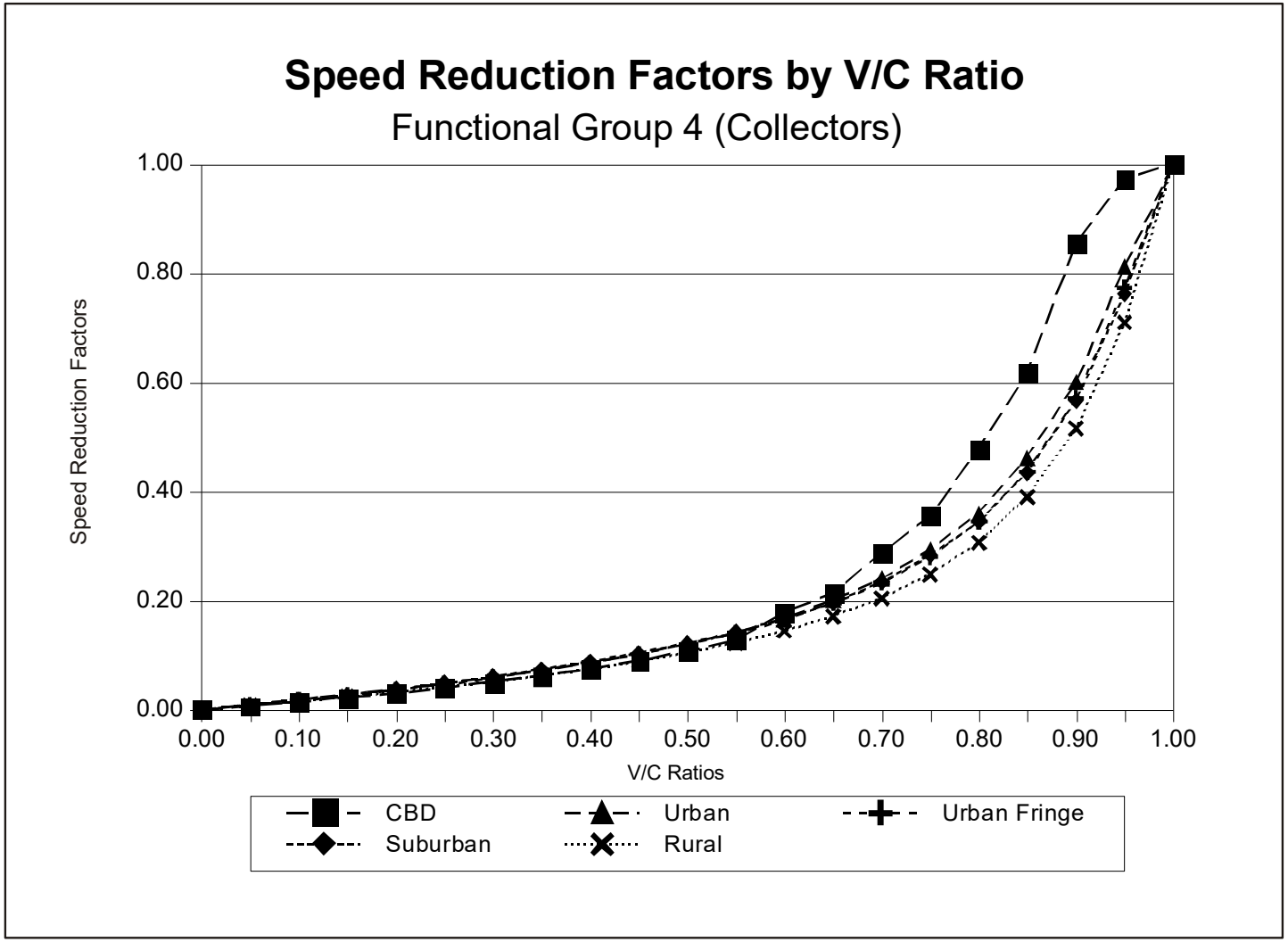

Figure 4. Collector Speed Reduction Factors by V/C Ratio.

Functional Classification to Functional Group Relationship for the Application of Speed Reduction Factors

Functional Group	Corresponding Network Functional Classifications
1. Freeways, Interstates	1. Urban Interstate Freeways 2. Urban Other Freeways 3. Toll Roads 10. Rural Interstate Freeways 11. Rural Other Freeways
2. Principal Arterials	5. Urban Principal Arterials 12. Rural Principal Arterials
3. Other Arterials, Major Collectors	6. Urban Other Arterials 13. Rural Other Arterials 14. Rural Major Collectors
4. Collectors	4. Ramps 7. Urban Collectors 15. Rural Collectors

APPENDIX F:
VEHICLE POPULATION ESTIMATES AND 24-HOUR ONI HOURS, SHP, STARTS, SHEI, AND APU HOURS SUMMARIES

2026 24-Hour School Weekday ONI Hours Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	0	0	0	0	0	0	0	0
21_G	48,352	9,366	95,873	39,407	718,043	11,659	89,376	11,326
21_D	538	104	1,066	438	7,986	130	994	126
31_G	13,531	4,435	25,703	10,238	186,399	5,213	24,460	3,548
31_D	262	86	498	198	3,610	101	474	69
32_G	3,327	1,090	6,320	2,517	45,830	1,282	6,014	872
32_D	186	61	354	141	2,565	72	337	49
41_G	0	0	0	0	0	0	0	0
41_D	40	13	81	32	626	22	76	10
42_G	0	0	0	0	0	0	0	0
42_D	60	23	113	45	914	37	113	18
43_G	1	0	2	1	17	1	2	0
43_D	104	43	186	75	1,505	68	191	33
51_G	125	28	235	88	1,671	36	226	37
51_D	119	50	223	84	1,585	63	214	35
52_G	1,466	370	2,685	1,014	18,834	469	2,603	441
52_D	1,392	660	2,549	963	17,884	838	2,471	419
53_G	217	13	398	150	2,791	17	386	65
53_D	206	23	377	143	2,648	30	366	62
54_G	0	0	0	0	0	0	0	0
54_D	0	0	0	0	0	0	0	0
61_G	94	102	169	57	1,097	63	169	42
61_D	1,083	1,023	1,945	654	12,627	627	1,942	481
62_G	0	0	0	0	0	0	0	0
62_D	1,045	1,054	1,767	597	10,887	648	1,819	485

2026 24-Hour School Friday ONI Hours Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	0	0	0	0	0	0	0	0
21_G	52,655	10,320	104,266	42,633	783,714	12,687	97,152	12,437
21_D	586	115	1,160	474	8,718	141	1,081	138
31_G	14,742	4,887	27,973	11,077	203,595	5,674	26,605	3,892
31_D	286	95	542	215	3,943	110	515	75
32_G	3,625	1,202	6,878	2,724	50,059	1,395	6,542	957
32_D	203	67	385	152	2,800	78	366	54
41_G	0	0	0	0	0	0	0	0
41_D	44	14	88	34	677	24	83	11
42_G	0	0	0	0	0	0	0	0
42_D	65	25	121	48	971	40	120	19
43_G	1	0	2	1	17	1	2	0
43_D	111	47	197	79	1,581	73	202	36
51_G	137	30	256	95	1,804	38	245	41
51_D	130	54	243	91	1,716	69	233	38
52_G	1,568	374	2,855	1,087	19,898	495	2,749	440
52_D	1,488	667	2,710	1,032	18,891	884	2,610	418
53_G	232	13	423	161	2,949	17	407	65
53_D	220	24	401	153	2,797	31	386	62
54_G	0	0	0	0	0	0	0	0
54_D	0	0	0	0	0	0	0	0
61_G	98	101	175	60	1,144	65	173	39
61_D	1,128	1,008	2,008	693	13,172	649	1,993	451
62_G	0	0	0	0	0	0	0	0
62_D	1,083	1,037	1,797	628	11,132	670	1,843	454

2026 24-Hour School Saturday ONI Hours Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	0	0	0	0	0	0	0	0
21_G	40,637	8,232	80,372	33,405	598,582	10,082	75,253	9,581
21_D	452	92	894	372	6,659	112	837	107
31_G	11,332	3,912	21,499	8,628	154,520	4,504	20,513	2,996
31_D	219	76	416	167	2,991	87	397	58
32_G	2,786	962	5,286	2,121	37,994	1,107	5,044	737
32_D	156	54	296	119	2,126	62	282	41
41_G	0	0	0	0	0	0	0	0
41_D	28	10	56	22	424	16	53	8
42_G	0	0	0	0	0	0	0	0
42_D	44	19	82	31	638	27	83	15
43_G	1	0	1	1	11	1	2	0
43_D	78	35	140	53	1,077	50	144	29
51_G	112	27	205	74	1,403	32	200	37
51_D	106	49	194	70	1,330	58	189	35
52_G	1,245	327	2,308	833	16,025	380	2,249	425
52_D	1,182	583	2,190	791	15,205	678	2,134	403
53_G	184	11	342	123	2,373	13	333	63
53_D	175	21	325	117	2,252	24	316	60
54_G	0	0	0	0	0	0	0	0
54_D	0	0	0	0	0	0	0	0
61_G	59	66	109	34	679	38	108	30
61_D	679	662	1,251	390	7,826	376	1,240	343
62_G	0	0	0	0	0	0	0	0
62_D	633	659	1,108	343	6,540	375	1,129	334

2026 24-Hour School Sunday ONI Hours Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	0	0	0	0	0	0	0	0
21_G	33,779	6,932	66,934	27,817	497,867	8,455	62,675	7,996
21_D	376	77	745	309	5,538	94	697	89
31_G	9,433	3,302	17,924	7,192	128,630	3,779	17,107	2,505
31_D	183	64	347	139	2,491	73	331	48
32_G	2,319	812	4,407	1,768	31,627	929	4,206	616
32_D	130	45	247	99	1,769	52	235	34
41_G	0	0	0	0	0	0	0	0
41_D	21	8	42	16	317	12	40	6
42_G	0	0	0	0	0	0	0	0
42_D	34	14	62	23	479	20	63	12
43_G	1	0	1	0	7	0	1	0
43_D	60	27	107	40	821	38	110	22
51_G	88	22	160	57	1,075	26	157	31
51_D	84	39	153	54	1,034	45	150	29
52_G	910	235	1,649	583	11,277	262	1,632	324
52_D	864	420	1,566	554	10,711	467	1,550	308
53_G	135	8	244	86	1,670	9	242	48
53_D	128	15	232	82	1,585	17	229	46
54_G	0	0	0	0	0	0	0	0
54_D	0	0	0	0	0	0	0	0
61_G	44	49	79	24	486	27	79	22
61_D	501	495	906	277	5,582	266	910	258
62_G	0	0	0	0	0	0	0	0
62_D	469	493	810	244	4,721	265	835	252

2026 24-Hour Summer Weekday ONI Hours Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	0	0	0	0	0	0	0	0
21_G	50,753	9,795	100,934	41,402	756,579	12,221	93,978	11,871
21_D	564	109	1,122	460	8,414	136	1,045	132
31_G	14,199	4,638	27,047	10,753	196,306	5,464	25,708	3,718
31_D	275	90	524	208	3,802	106	498	72
32_G	3,491	1,140	6,650	2,644	48,266	1,343	6,321	914
32_D	195	64	372	148	2,701	75	354	51
41_G	0	0	0	0	0	0	0	0
41_D	40	13	80	32	625	22	76	10
42_G	0	0	0	0	0	0	0	0
42_D	60	23	113	45	912	37	113	18
43_G	1	0	2	1	17	1	2	0
43_D	104	43	185	74	1,502	68	191	33
51_G	125	28	234	88	1,668	36	225	37
51_D	118	50	222	83	1,582	63	214	35
52_G	1,463	369	2,680	1,013	18,799	468	2,598	441
52_D	1,389	659	2,545	961	17,850	836	2,467	418
53_G	217	13	397	150	2,786	17	385	65
53_D	206	23	377	142	2,643	29	365	62
54_G	0	0	0	0	0	0	0	0
54_D	0	0	0	0	0	0	0	0
61_G	94	102	169	57	1,094	63	168	42
61_D	1,081	1,022	1,941	653	12,601	626	1,939	480
62_G	0	0	0	0	0	0	0	0
62_D	1,043	1,052	1,764	597	10,866	647	1,816	484

2026 24-Hour Summer Friday ONI Hours Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	0	0	0	0	0	0	0	0
21_G	54,704	10,689	108,688	44,363	817,237	13,166	101,162	12,906
21_D	608	119	1,209	493	9,090	146	1,125	144
31_G	15,311	5,061	29,143	11,523	212,175	5,888	27,689	4,039
31_D	297	98	564	223	4,109	114	536	78
32_G	3,765	1,244	7,165	2,833	52,169	1,448	6,808	993
32_D	211	70	401	159	2,918	81	381	56
41_G	0	0	0	0	0	0	0	0
41_D	43	14	87	34	668	24	81	11
42_G	0	0	0	0	0	0	0	0
42_D	64	25	120	47	958	40	119	19
43_G	1	0	2	1	16	1	2	0
43_D	110	46	195	78	1,561	72	200	35
51_G	135	30	252	94	1,780	38	242	40
51_D	128	53	240	90	1,693	68	230	38
52_G	1,549	369	2,820	1,074	19,640	489	2,715	435
52_D	1,470	659	2,677	1,020	18,647	874	2,577	413
53_G	230	13	418	159	2,911	17	402	64
53_D	218	23	396	151	2,761	31	382	61
54_G	0	0	0	0	0	0	0	0
54_D	0	0	0	0	0	0	0	0
61_G	97	100	172	60	1,129	64	171	39
61_D	1,114	996	1,983	685	13,000	641	1,969	446
62_G	0	0	0	0	0	0	0	0
62_D	1,069	1,026	1,777	622	11,002	662	1,822	449

2026 24-Hour Summer Saturday ONI Hours Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	0	0	0	0	0	0	0	0
21_G	41,766	8,423	82,867	34,383	617,555	10,346	77,488	9,840
21_D	465	94	922	383	6,870	115	862	109
31_G	11,620	4,003	22,115	8,861	159,028	4,617	21,074	3,073
31_D	225	78	428	172	3,079	89	408	60
32_G	2,857	984	5,438	2,179	39,102	1,135	5,182	755
32_D	160	55	304	122	2,188	64	290	42
41_G	0	0	0	0	0	0	0	0
41_D	27	10	54	21	412	15	52	8
42_G	0	0	0	0	0	0	0	0
42_D	43	18	80	31	620	26	80	15
43_G	1	0	1	1	11	0	2	0
43_D	76	34	136	52	1,048	49	140	28
51_G	108	27	199	71	1,359	31	194	36
51_D	103	48	188	68	1,289	56	184	34
52_G	1,207	319	2,239	809	15,533	370	2,182	413
52_D	1,146	569	2,125	768	14,738	660	2,071	392
53_G	179	11	332	120	2,300	13	323	61
53_D	170	20	315	114	2,183	23	307	58
54_G	0	0	0	0	0	0	0	0
54_D	0	0	0	0	0	0	0	0
61_G	57	65	106	33	664	37	105	29
61_D	661	650	1,221	382	7,653	368	1,210	333
62_G	0	0	0	0	0	0	0	0
62_D	616	647	1,082	335	6,400	367	1,102	325

2026 24-Hour Summer Sunday ONI Hours Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	0	0	0	0	0	0	0	0
21_G	35,087	7,166	69,708	28,923	519,123	8,766	65,185	8,296
21_D	390	80	775	322	5,774	98	725	92
31_G	9,779	3,413	18,629	7,464	133,837	3,915	17,756	2,596
31_D	189	66	361	145	2,592	76	344	50
32_G	2,404	839	4,581	1,835	32,908	963	4,366	638
32_D	135	47	256	103	1,841	54	244	36
41_G	0	0	0	0	0	0	0	0
41_D	21	8	41	16	312	12	40	6
42_G	0	0	0	0	0	0	0	0
42_D	33	14	61	23	472	20	62	12
43_G	1	0	1	0	7	0	1	0
43_D	59	27	106	40	809	37	109	22
51_G	87	22	157	56	1,056	25	154	30
51_D	83	39	150	53	1,015	45	148	29
52_G	894	232	1,620	573	11,080	258	1,604	319
52_D	849	415	1,539	545	10,523	460	1,523	303
53_G	132	8	240	85	1,640	9	237	47
53_D	126	15	228	81	1,557	16	225	45
54_G	0	0	0	0	0	0	0	0
54_D	0	0	0	0	0	0	0	0
61_G	43	49	78	24	481	26	78	22
61_D	494	491	895	274	5,530	263	899	254
62_G	0	0	0	0	0	0	0	0
62_D	463	489	800	242	4,679	263	825	248

2026 24-Hour School Weekday Adjusted SHP Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	151,694	19,760	225,539	161,635	984,709	43,492	278,017	23,394
21_G	4,986,561	582,357	14,898,908	4,389,314	61,578,216	1,218,800	9,151,478	648,874
21_D	55,463	6,476	165,712	48,820	684,902	13,554	101,787	7,217
31_G	1,607,702	281,495	2,232,741	1,295,951	13,969,569	643,837	2,481,741	299,486
31_D	31,131	5,453	43,234	25,095	270,503	12,473	48,056	5,799
32_G	395,317	69,214	549,009	318,661	3,434,983	158,307	610,235	73,641
32_D	22,086	3,877	30,673	17,804	191,907	8,867	34,093	4,114
41_G	0	0	0	0	0	0	0	0
41_D	3,992	1,258	4,104	2,711	26,344	1,983	6,256	1,072
42_G	0	0	0	0	0	0	0	0
42_D	8,002	2,519	8,252	5,438	52,985	3,973	12,547	2,147
43_G	243	79	251	165	1,615	125	381	65
43_D	21,639	6,843	22,375	14,712	143,866	10,794	33,953	5,805
51_G	7,675	1,501	7,868	5,229	50,721	2,390	12,036	2,051
51_D	7,317	2,666	7,502	4,985	48,361	4,244	11,474	1,955
52_G	153,455	32,852	158,267	104,588	1,021,851	52,221	240,931	41,029
52_D	145,729	58,664	150,299	99,322	970,402	93,251	228,800	38,963
53_G	22,697	1,147	23,408	15,470	151,131	1,823	35,635	6,068
53_D	21,613	2,060	22,291	14,730	143,925	3,274	33,933	5,779
54_G	5,608	1,081	5,828	3,823	37,687	1,715	8,817	1,501
54_D	5,241	1,925	5,444	3,572	35,199	3,053	8,238	1,403
61_G	5,823	2,034	13,053	2,408	124,740	4,238	10,607	2,121
61_D	67,342	20,307	150,940	27,854	1,442,380	42,311	122,662	24,526
62_G	0	0	0	0	0	0	0	0
62_D	205,226	64,036	459,113	85,339	4,375,328	130,379	373,809	74,898

2026 24-Hour School Friday Adjusted SHP Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	151,677	19,758	225,503	161,623	984,457	43,488	277,987	23,391
21_G	4,966,380	578,391	14,855,128	4,373,996	61,231,488	1,214,203	9,111,694	644,053
21_D	55,238	6,432	165,224	48,649	681,037	13,502	101,343	7,163
31_G	1,602,077	279,623	2,221,088	1,291,999	13,880,189	641,784	2,470,961	297,990
31_D	31,022	5,417	43,008	25,018	268,772	12,433	47,847	5,770
32_G	393,935	68,754	546,144	317,689	3,413,004	157,802	607,585	73,273
32_D	22,009	3,851	30,512	17,749	190,679	8,839	33,946	4,094
41_G	0	0	0	0	0	0	0	0
41_D	3,982	1,256	4,083	2,703	26,192	1,978	6,237	1,070
42_G	0	0	0	0	0	0	0	0
42_D	7,985	2,514	8,217	5,425	52,734	3,964	12,516	2,143
43_G	243	79	250	165	1,612	125	381	65
43_D	21,598	6,830	22,292	14,683	143,271	10,772	33,879	5,795
51_G	7,650	1,497	7,821	5,213	50,411	2,384	11,992	2,044
51_D	7,292	2,657	7,456	4,969	48,057	4,233	11,432	1,948
52_G	153,139	32,840	157,680	104,353	1,017,938	52,144	240,434	41,029
52_D	145,429	58,642	149,742	99,100	966,696	93,114	228,330	38,964
53_G	22,650	1,146	23,320	15,434	150,548	1,820	35,561	6,069
53_D	21,569	2,059	22,209	14,698	143,377	3,269	33,864	5,779
54_G	5,598	1,079	5,808	3,816	37,551	1,712	8,799	1,499
54_D	5,232	1,922	5,427	3,567	35,087	3,049	8,222	1,400
61_G	5,810	2,039	13,031	2,397	124,556	4,232	10,590	2,128
61_D	67,193	20,354	150,696	27,722	1,440,270	42,245	122,466	24,612
62_G	0	0	0	0	0	0	0	0
62_D	204,876	64,146	458,541	85,031	4,370,380	130,223	373,349	75,102

2026 24-Hour School Saturday Adjusted SHP Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	151,737	19,765	225,641	161,675	985,529	43,500	278,105	23,400
21_G	5,012,559	585,426	14,957,117	4,409,018	62,027,521	1,223,527	9,203,699	654,321
21_D	55,751	6,510	166,358	49,038	689,888	13,606	102,367	7,278
31_G	1,615,120	282,890	2,248,377	1,301,295	14,089,060	645,963	2,496,180	301,227
31_D	31,275	5,480	43,538	25,198	272,824	12,514	48,336	5,833
32_G	397,141	69,557	552,853	319,975	3,464,355	158,829	613,785	74,069
32_D	22,188	3,896	30,887	17,877	193,547	8,897	34,292	4,138
41_G	0	0	0	0	0	0	0	0
41_D	4,023	1,266	4,173	2,738	26,911	2,000	6,318	1,077
42_G	0	0	0	0	0	0	0	0
42_D	8,057	2,533	8,372	5,486	54,004	4,003	12,657	2,155
43_G	245	79	255	167	1,647	126	385	66
43_D	21,770	6,876	22,663	14,828	146,311	10,866	34,216	5,825
51_G	7,722	1,507	7,970	5,273	51,569	2,402	12,126	2,057
51_D	7,361	2,675	7,598	5,026	49,166	4,265	11,560	1,961
52_G	154,792	33,142	160,840	105,628	1,041,062	52,669	243,323	41,295
52_D	147,000	59,182	152,745	100,311	988,674	94,052	231,075	39,216
53_G	22,896	1,157	23,790	15,624	153,982	1,839	35,990	6,108
53_D	21,801	2,078	22,653	14,877	146,628	3,302	34,269	5,816
54_G	5,632	1,085	5,878	3,844	38,087	1,721	8,862	1,505
54_D	5,263	1,931	5,492	3,592	35,589	3,064	8,281	1,407
61_G	5,921	2,131	13,225	2,474	125,971	4,307	10,779	2,151
61_D	68,463	21,273	152,924	28,613	1,456,543	42,999	124,643	24,880
62_G	0	0	0	0	0	0	0	0
62_D	207,801	66,276	463,665	87,089	4,407,923	131,984	378,357	75,700

2026 24-Hour School Sunday Adjusted SHP Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	151,766	19,770	225,702	161,699	986,007	43,507	278,160	23,406
21_G	5,045,270	591,130	15,025,115	4,436,067	62,548,376	1,231,032	9,265,657	661,632
21_D	56,115	6,574	167,115	49,339	695,685	13,689	103,056	7,359
31_G	1,624,115	285,560	2,266,286	1,308,186	14,221,513	649,298	2,512,802	303,487
31_D	31,449	5,532	43,884	25,331	275,380	12,579	48,657	5,877
32_G	399,353	70,213	557,256	321,669	3,496,922	159,649	617,872	74,624
32_D	22,312	3,933	31,134	17,972	195,374	8,942	34,521	4,169
41_G	0	0	0	0	0	0	0	0
41_D	4,042	1,272	4,212	2,753	27,212	2,010	6,354	1,082
42_G	0	0	0	0	0	0	0	0
42_D	8,091	2,545	8,443	5,514	54,561	4,023	12,723	2,164
43_G	246	80	257	167	1,665	126	387	66
43_D	21,852	6,904	22,831	14,893	147,617	10,914	34,372	5,847
51_G	7,769	1,518	8,063	5,308	52,249	2,415	12,214	2,069
51_D	7,405	2,695	7,683	5,058	49,782	4,289	11,640	1,973
52_G	155,614	33,362	162,501	106,254	1,053,230	52,952	244,861	41,537
52_D	147,779	59,575	154,318	100,904	1,000,194	94,558	232,531	39,445
53_G	23,017	1,165	24,036	15,716	155,785	1,849	36,218	6,144
53_D	21,917	2,092	22,887	14,965	148,339	3,320	34,486	5,850
54_G	5,648	1,088	5,911	3,856	38,332	1,726	8,892	1,510
54_D	5,279	1,938	5,523	3,604	35,819	3,072	8,311	1,411
61_G	5,971	2,185	13,326	2,508	126,644	4,343	10,875	2,175
61_D	69,053	21,811	154,098	29,000	1,464,370	43,353	125,751	25,151
62_G	0	0	0	0	0	0	0	0
62_D	209,208	67,573	466,462	88,011	4,426,555	132,837	380,995	76,346

2026 24-Hour Summer Weekday Adjusted SHP Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	151,694	19,760	225,539	161,635	984,715	43,492	278,018	23,394
21_G	4,984,476	581,976	14,894,557	4,387,540	61,545,515	1,218,303	9,147,481	648,388
21_D	55,440	6,472	165,664	48,800	684,539	13,548	101,743	7,212
31_G	1,607,120	281,315	2,231,583	1,295,493	13,961,132	643,615	2,480,653	299,334
31_D	31,120	5,450	43,212	25,086	270,340	12,469	48,035	5,796
32_G	395,174	69,170	548,724	318,549	3,432,908	158,252	609,968	73,603
32_D	22,078	3,875	30,657	17,798	191,790	8,864	34,078	4,112
41_G	0	0	0	0	0	0	0	0
41_D	3,992	1,258	4,105	2,711	26,348	1,983	6,256	1,072
42_G	0	0	0	0	0	0	0	0
42_D	8,002	2,519	8,252	5,438	52,992	3,973	12,548	2,147
43_G	243	79	251	165	1,615	125	381	65
43_D	21,640	6,843	22,377	14,713	143,882	10,794	33,955	5,805
51_G	7,675	1,501	7,869	5,229	50,728	2,390	12,036	2,051
51_D	7,317	2,666	7,503	4,985	48,368	4,244	11,475	1,955
52_G	153,463	32,854	158,282	104,593	1,021,967	52,223	240,945	41,031
52_D	145,736	58,668	150,313	99,327	970,513	93,255	228,813	38,965
53_G	22,699	1,147	23,411	15,470	151,148	1,823	35,637	6,069
53_D	21,614	2,060	22,294	14,731	143,941	3,274	33,935	5,779
54_G	5,609	1,081	5,829	3,823	37,690	1,715	8,817	1,501
54_D	5,241	1,925	5,444	3,572	35,202	3,053	8,238	1,403
61_G	5,824	2,035	13,054	2,409	124,748	4,239	10,608	2,121
61_D	67,348	20,312	150,952	27,857	1,442,469	42,314	122,673	24,528
62_G	0	0	0	0	0	0	0	0
62_D	205,240	64,048	459,141	85,347	4,375,540	130,386	373,834	74,903

2026 24-Hour Summer Friday Adjusted SHP Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	151,680	19,758	225,509	161,624	984,500	43,489	277,991	23,391
21_G	4,966,721	578,394	14,856,072	4,374,073	61,241,175	1,214,237	9,112,488	644,069
21_D	55,242	6,432	165,235	48,650	681,145	13,503	101,352	7,164
31_G	1,602,171	279,624	2,221,337	1,292,018	13,882,675	641,799	2,471,169	297,996
31_D	31,024	5,417	43,013	25,018	268,820	12,434	47,851	5,770
32_G	393,958	68,754	546,205	317,694	3,413,615	157,805	607,636	73,274
32_D	22,010	3,851	30,516	17,750	190,714	8,839	33,948	4,094
41_G	0	0	0	0	0	0	0	0
41_D	3,983	1,256	4,086	2,704	26,219	1,979	6,240	1,071
42_G	0	0	0	0	0	0	0	0
42_D	7,987	2,515	8,223	5,427	52,782	3,965	12,522	2,144
43_G	243	79	251	165	1,613	125	381	65
43_D	21,604	6,832	22,306	14,688	143,385	10,776	33,892	5,797
51_G	7,653	1,498	7,828	5,215	50,466	2,385	11,999	2,045
51_D	7,296	2,659	7,463	4,971	48,109	4,235	11,439	1,949
52_G	153,198	32,852	157,795	104,392	1,018,800	52,161	240,542	41,044
52_D	145,485	58,665	149,852	99,137	967,515	93,145	228,433	38,978
53_G	22,659	1,147	23,337	15,440	150,676	1,821	35,577	6,071
53_D	21,577	2,059	22,226	14,703	143,498	3,270	33,879	5,781
54_G	5,599	1,080	5,811	3,817	37,573	1,713	8,801	1,499
54_D	5,233	1,922	5,430	3,568	35,108	3,049	8,225	1,401
61_G	5,814	2,042	13,038	2,399	124,607	4,234	10,596	2,129
61_D	67,238	20,388	150,779	27,748	1,440,856	42,268	122,545	24,628
62_G	0	0	0	0	0	0	0	0
62_D	204,981	64,227	458,735	85,091	4,371,759	130,277	373,535	75,138

2026 24-Hour Summer Saturday Adjusted SHP Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	151,741	19,766	225,648	161,678	985,582	43,501	278,112	23,401
21_G	5,015,193	585,924	14,962,667	4,411,108	62,071,285	1,224,154	9,208,731	654,865
21_D	55,781	6,516	166,420	49,062	690,374	13,613	102,423	7,284
31_G	1,615,955	283,126	2,250,039	1,301,905	14,101,704	646,262	2,497,719	301,418
31_D	31,291	5,485	43,570	25,210	273,069	12,520	48,366	5,837
32_G	397,347	69,615	553,261	320,125	3,467,464	158,903	614,163	74,116
32_D	22,200	3,899	30,910	17,885	193,722	8,901	34,313	4,141
41_G	0	0	0	0	0	0	0	0
41_D	4,026	1,267	4,178	2,740	26,946	2,001	6,322	1,078
42_G	0	0	0	0	0	0	0	0
42_D	8,061	2,534	8,380	5,489	54,069	4,006	12,665	2,156
43_G	245	80	255	167	1,648	126	385	66
43_D	21,780	6,879	22,683	14,836	146,465	10,872	34,234	5,827
51_G	7,729	1,508	7,983	5,277	51,659	2,404	12,138	2,059
51_D	7,367	2,678	7,610	5,031	49,251	4,268	11,571	1,963
52_G	154,885	33,161	161,015	105,690	1,042,326	52,694	243,491	41,324
52_D	147,088	59,216	152,911	100,369	989,873	94,096	231,234	39,244
53_G	22,909	1,158	23,816	15,633	154,169	1,840	36,015	6,112
53_D	21,814	2,079	22,678	14,885	146,806	3,304	34,293	5,820
54_G	5,634	1,085	5,883	3,845	38,121	1,721	8,866	1,506
54_D	5,265	1,932	5,497	3,594	35,620	3,065	8,286	1,407
61_G	5,926	2,135	13,234	2,477	126,024	4,310	10,788	2,154
61_D	68,522	21,312	153,028	28,641	1,457,149	43,024	124,745	24,911
62_G	0	0	0	0	0	0	0	0
62_D	207,942	66,371	463,914	87,157	4,409,369	132,045	378,600	75,774

2026 24-Hour Summer Sunday Adjusted SHP Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	151,768	19,770	225,706	161,701	986,031	43,507	278,164	23,406
21_G	5,045,739	591,237	15,026,200	4,436,429	62,556,523	1,231,154	9,266,603	661,717
21_D	56,120	6,575	167,127	49,344	695,776	13,691	103,066	7,360
31_G	1,624,319	285,611	2,266,704	1,308,332	14,224,589	649,365	2,513,184	303,528
31_D	31,453	5,533	43,892	25,334	275,439	12,580	48,665	5,878
32_G	399,403	70,226	557,359	321,705	3,497,680	159,666	617,966	74,634
32_D	22,315	3,934	31,140	17,974	195,417	8,943	34,526	4,170
41_G	0	0	0	0	0	0	0	0
41_D	4,043	1,272	4,214	2,754	27,226	2,011	6,356	1,082
42_G	0	0	0	0	0	0	0	0
42_D	8,093	2,545	8,446	5,515	54,587	4,024	12,726	2,165
43_G	246	80	257	168	1,665	126	387	66
43_D	21,856	6,905	22,838	14,897	147,680	10,916	34,379	5,848
51_G	7,772	1,518	8,068	5,310	52,289	2,416	12,219	2,070
51_D	7,408	2,696	7,689	5,060	49,820	4,291	11,645	1,974
52_G	155,654	33,369	162,574	106,279	1,053,739	52,962	244,932	41,550
52_D	147,816	59,587	154,388	100,928	1,000,676	94,575	232,598	39,458
53_G	23,023	1,165	24,047	15,720	155,860	1,849	36,229	6,146
53_D	21,922	2,092	22,897	14,968	148,410	3,320	34,496	5,852
54_G	5,649	1,089	5,913	3,857	38,347	1,726	8,894	1,510
54_D	5,280	1,938	5,526	3,604	35,832	3,073	8,313	1,411
61_G	5,973	2,186	13,330	2,508	126,661	4,344	10,878	2,176
61_D	69,075	21,824	154,136	29,009	1,464,555	43,361	125,789	25,165
62_G	0	0	0	0	0	0	0	0
62_D	209,261	67,604	466,553	88,033	4,426,998	132,855	381,085	76,379

2026 24-Hour School Weekday Starts Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	893	116	1,329	951	5,808	256	1,637	138
21_G	817,190	97,559	2,411,179	717,470	10,218,169	199,345	1,502,118	109,627
21_D	9,227	1,104	27,180	8,118	115,304	2,256	17,071	1,241
31_G	275,443	49,518	388,720	221,653	2,454,930	110,045	428,341	52,001
31_D	5,836	1,044	8,197	4,685	52,109	2,348	9,061	1,107
32_G	72,182	12,971	101,829	58,075	643,340	28,855	112,236	13,639
32_D	4,030	730	5,715	3,251	35,899	1,598	6,286	749
41_G	0	0	0	0	0	0	0	0
41_D	1,115	352	1,177	761	7,639	555	1,758	299
42_G	0	0	0	0	0	0	0	0
42_D	2,491	786	2,630	1,700	17,074	1,241	3,928	668
43_G	39	13	41	26	266	20	61	10
43_D	3,751	1,188	3,960	2,560	25,711	1,876	5,915	1,006
51_G	100	20	105	68	685	31	158	27
51_D	557	204	588	380	3,816	322	878	149
52_G	139,960	30,085	147,743	95,508	959,287	47,511	220,704	37,525
52_D	121,328	49,040	128,075	82,794	831,584	77,447	191,323	32,530
53_G	1,393	71	1,471	951	9,549	112	2,197	374
53_D	1,193	114	1,259	814	8,177	180	1,881	320
54_G	114	22	121	78	783	35	180	31
54_D	109	40	116	75	750	64	173	29
61_G	1,537	589	3,416	651	32,251	1,113	2,799	565
61_D	17,671	5,849	39,274	7,481	370,782	11,048	32,185	6,494
62_G	0	0	0	0	0	0	0	0
62_D	4,621	1,548	10,271	1,956	96,967	2,925	8,417	1,698

2026 24-Hour School Friday Starts Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	893	116	1,329	951	5,808	256	1,637	138
21_G	817,190	97,559	2,411,180	717,470	10,218,171	199,345	1,502,118	109,627
21_D	9,227	1,104	27,180	8,118	115,304	2,256	17,071	1,241
31_G	275,443	49,518	388,720	221,653	2,454,931	110,045	428,341	52,001
31_D	5,836	1,044	8,197	4,685	52,109	2,348	9,061	1,107
32_G	72,182	12,971	101,829	58,075	643,340	28,855	112,236	13,639
32_D	4,030	730	5,715	3,251	35,899	1,598	6,286	749
41_G	0	0	0	0	0	0	0	0
41_D	1,115	352	1,177	761	7,639	555	1,758	299
42_G	0	0	0	0	0	0	0	0
42_D	2,491	786	2,630	1,700	17,074	1,241	3,928	668
43_G	39	13	41	26	266	20	61	10
43_D	3,751	1,188	3,960	2,560	25,711	1,876	5,915	1,006
51_G	100	20	105	68	685	31	158	27
51_D	557	204	588	380	3,816	322	878	149
52_G	139,960	30,085	147,743	95,508	959,287	47,511	220,704	37,525
52_D	121,328	49,040	128,075	82,794	831,584	77,447	191,323	32,530
53_G	1,393	71	1,471	951	9,549	112	2,197	374
53_D	1,193	114	1,259	814	8,177	180	1,881	320
54_G	114	22	121	78	783	35	180	31
54_D	109	40	116	75	750	64	173	29
61_G	1,537	589	3,416	651	32,251	1,113	2,799	565
61_D	17,671	5,849	39,275	7,481	370,782	11,048	32,185	6,494
62_G	0	0	0	0	0	0	0	0
62_D	4,621	1,548	10,271	1,956	96,967	2,925	8,417	1,698

2026 24-Hour School Saturday Starts Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	2,995	390	4,455	3,190	19,475	858	5,489	462
21_G	694,401	82,900	2,048,885	609,666	8,682,828	169,392	1,276,415	93,155
21_D	7,841	938	23,096	6,898	97,979	1,917	14,506	1,055
31_G	235,214	42,286	331,946	189,280	2,096,382	93,972	365,781	44,406
31_D	4,984	892	6,999	4,000	44,498	2,005	7,738	946
32_G	61,640	11,076	86,956	49,593	549,378	24,641	95,844	11,647
32_D	3,442	624	4,880	2,776	30,656	1,365	5,368	640
41_G	0	0	0	0	0	0	0	0
41_D	338	106	356	230	2,314	168	532	91
42_G	0	0	0	0	0	0	0	0
42_D	754	238	796	515	5,171	376	1,190	202
43_G	0	0	0	0	0	0	0	0
43_D	0	0	0	0	0	0	0	0
51_G	6	1	6	4	41	2	9	2
51_D	33	12	35	23	228	19	52	9
52_G	9,972	2,143	10,526	6,805	68,348	3,385	15,725	2,674
52_D	8,644	3,494	9,125	5,899	59,249	5,518	13,632	2,318
53_G	1,393	71	1,471	951	9,549	112	2,197	374
53_D	1,193	114	1,259	814	8,177	180	1,881	320
54_G	115	22	121	78	785	35	181	31
54_D	110	40	116	75	753	64	173	29
61_G	354	136	786	150	7,424	256	644	130
61_D	4,068	1,346	9,041	1,722	85,350	2,543	7,409	1,495
62_G	0	0	0	0	0	0	0	0
62_D	3,401	1,139	7,558	1,440	71,358	2,152	6,194	1,250

2026 24-Hour School Sunday Starts Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	2,995	390	4,455	3,190	19,475	858	5,489	462
21_G	694,401	82,900	2,048,885	609,666	8,682,829	169,392	1,276,415	93,155
21_D	7,841	938	23,096	6,898	97,979	1,917	14,506	1,055
31_G	235,214	42,286	331,946	189,280	2,096,382	93,972	365,781	44,406
31_D	4,984	892	6,999	4,000	44,499	2,005	7,738	946
32_G	61,640	11,076	86,956	49,593	549,378	24,641	95,844	11,647
32_D	3,442	624	4,880	2,776	30,656	1,365	5,368	640
41_G	0	0	0	0	0	0	0	0
41_D	338	106	356	230	2,314	168	532	91
42_G	0	0	0	0	0	0	0	0
42_D	754	238	796	515	5,171	376	1,190	202
43_G	0	0	0	0	0	0	0	0
43_D	0	0	0	0	0	0	0	0
51_G	6	1	6	4	41	2	9	2
51_D	33	12	35	23	228	19	52	9
52_G	9,972	2,143	10,526	6,805	68,348	3,385	15,725	2,674
52_D	8,644	3,494	9,125	5,899	59,249	5,518	13,632	2,318
53_G	1,393	71	1,471	951	9,549	112	2,197	374
53_D	1,193	114	1,259	814	8,177	180	1,881	320
54_G	115	22	121	78	785	35	181	31
54_D	110	40	116	75	753	64	173	29
61_G	354	136	786	150	7,424	256	644	130
61_D	4,068	1,346	9,041	1,722	85,350	2,543	7,409	1,495
62_G	0	0	0	0	0	0	0	0
62_D	3,401	1,139	7,558	1,440	71,358	2,152	6,194	1,250

2026 24-Hour Summer Weekday Starts Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	1,096	143	1,631	1,168	7,128	314	2,009	169
21_G	873,819	104,320	2,578,268	767,189	10,926,264	213,159	1,606,211	117,224
21_D	9,867	1,181	29,064	8,681	123,295	2,412	18,254	1,327
31_G	294,530	52,950	415,657	237,013	2,625,051	117,670	458,024	55,604
31_D	6,241	1,117	8,765	5,009	55,720	2,511	9,689	1,184
32_G	77,185	13,870	108,885	62,100	687,921	30,855	120,014	14,584
32_D	4,310	781	6,111	3,476	38,387	1,709	6,722	801
41_G	0	0	0	0	0	0	0	0
41_D	1,192	376	1,258	813	8,169	594	1,879	320
42_G	0	0	0	0	0	0	0	0
42_D	2,664	840	2,812	1,818	18,258	1,327	4,201	714
43_G	42	14	44	28	285	21	65	11
43_D	4,011	1,270	4,234	2,737	27,493	2,006	6,325	1,075
51_G	107	21	113	73	732	33	169	29
51_D	595	218	628	406	4,080	344	939	160
52_G	149,659	32,169	157,981	102,127	1,025,763	50,803	235,998	40,125
52_D	129,736	52,439	136,950	88,532	889,211	82,814	204,581	34,784
53_G	1,490	76	1,573	1,017	10,210	119	2,349	399
53_D	1,276	122	1,347	871	8,743	193	2,012	342
54_G	122	24	129	83	837	37	193	33
54_D	117	43	124	80	802	68	185	31
61_G	1,644	630	3,653	696	34,486	1,190	2,993	604
61_D	18,895	6,254	41,996	8,000	396,476	11,814	34,415	6,944
62_G	0	0	0	0	0	0	0	0
62_D	4,942	1,656	10,983	2,092	103,687	3,127	9,000	1,816

2026 24-Hour Summer Friday Starts Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	1,096	143	1,631	1,168	7,128	314	2,009	169
21_G	873,819	104,320	2,578,268	767,189	10,926,264	213,159	1,606,211	117,224
21_D	9,867	1,181	29,064	8,681	123,295	2,412	18,254	1,327
31_G	294,530	52,950	415,657	237,013	2,625,051	117,670	458,024	55,604
31_D	6,241	1,117	8,765	5,009	55,720	2,511	9,689	1,184
32_G	77,185	13,870	108,885	62,100	687,921	30,855	120,014	14,584
32_D	4,310	781	6,111	3,476	38,387	1,709	6,722	801
41_G	0	0	0	0	0	0	0	0
41_D	1,192	376	1,258	813	8,169	594	1,879	320
42_G	0	0	0	0	0	0	0	0
42_D	2,664	840	2,812	1,818	18,258	1,327	4,201	714
43_G	42	14	44	28	285	21	65	11
43_D	4,011	1,270	4,234	2,737	27,493	2,006	6,325	1,075
51_G	107	21	113	73	732	33	169	29
51_D	595	218	628	406	4,080	344	939	160
52_G	149,659	32,169	157,981	102,127	1,025,763	50,803	235,998	40,125
52_D	129,736	52,439	136,950	88,532	889,211	82,814	204,581	34,784
53_G	1,490	76	1,573	1,017	10,210	119	2,349	399
53_D	1,276	122	1,347	871	8,743	193	2,012	342
54_G	122	24	129	83	837	37	193	33
54_D	117	43	124	80	802	68	185	31
61_G	1,644	630	3,653	696	34,486	1,190	2,993	604
61_D	18,895	6,254	41,996	8,000	396,476	11,814	34,415	6,944
62_G	0	0	0	0	0	0	0	0
62_D	4,942	1,656	10,983	2,092	103,687	3,127	9,000	1,816

2026 24-Hour Summer Saturday Starts Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	3,676	479	5,468	3,916	23,901	1,054	6,737	567
21_G	742,523	88,645	2,190,871	651,915	9,284,544	181,131	1,364,870	99,610
21_D	8,384	1,003	24,697	7,376	104,769	2,050	15,511	1,128
31_G	251,514	45,217	354,950	202,397	2,241,660	100,484	391,129	47,483
31_D	5,329	954	7,484	4,278	47,582	2,144	8,274	1,011
32_G	65,912	11,844	92,982	53,030	587,450	26,348	102,486	12,454
32_D	3,680	667	5,218	2,968	32,780	1,459	5,740	684
41_G	0	0	0	0	0	0	0	0
41_D	361	114	381	246	2,474	180	569	97
42_G	0	0	0	0	0	0	0	0
42_D	807	254	852	551	5,530	402	1,272	216
43_G	0	0	0	0	0	0	0	0
43_D	0	0	0	0	0	0	0	0
51_G	6	1	7	4	44	2	10	2
51_D	36	13	37	24	243	21	56	10
52_G	10,663	2,292	11,256	7,276	73,084	3,620	16,815	2,859
52_D	9,244	3,736	9,758	6,308	63,355	5,900	14,576	2,478
53_G	1,490	76	1,573	1,017	10,210	119	2,349	399
53_D	1,276	122	1,347	871	8,743	193	2,012	342
54_G	123	24	129	84	840	37	193	33
54_D	117	43	124	80	805	68	185	31
61_G	378	145	841	160	7,938	274	689	139
61_D	4,349	1,440	9,667	1,841	91,264	2,719	7,922	1,599
62_G	0	0	0	0	0	0	0	0
62_D	3,636	1,218	8,082	1,540	76,303	2,302	6,623	1,336

2026 24-Hour Summer Sunday Starts Summaries.

SUT/FT	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
11_G	3,676	479	5,468	3,916	23,901	1,054	6,737	567
21_G	742,524	88,646	2,190,874	651,916	9,284,554	181,131	1,364,871	99,610
21_D	8,384	1,003	24,697	7,376	104,769	2,050	15,511	1,128
31_G	251,514	45,217	354,950	202,397	2,241,662	100,484	391,130	47,483
31_D	5,329	954	7,484	4,278	47,582	2,144	8,274	1,011
32_G	65,912	11,844	92,982	53,030	587,450	26,348	102,486	12,454
32_D	3,680	667	5,218	2,968	32,780	1,459	5,740	684
41_G	0	0	0	0	0	0	0	0
41_D	361	114	381	246	2,474	180	569	97
42_G	0	0	0	0	0	0	0	0
42_D	807	254	852	551	5,530	402	1,272	216
43_G	0	0	0	0	0	0	0	0
43_D	0	0	0	0	0	0	0	0
51_G	6	1	7	4	44	2	10	2
51_D	36	13	37	24	243	21	56	10
52_G	10,663	2,292	11,256	7,276	73,084	3,620	16,815	2,859
52_D	9,244	3,736	9,758	6,308	63,355	5,900	14,576	2,478
53_G	1,490	76	1,573	1,017	10,210	119	2,349	399
53_D	1,276	122	1,347	871	8,743	193	2,012	342
54_G	123	24	129	84	840	37	193	33
54_D	117	43	124	80	805	68	185	31
61_G	378	145	841	160	7,938	274	689	139
61_D	4,349	1,440	9,667	1,841	91,264	2,719	7,922	1,599
62_G	0	0	0	0	0	0	0	0
62_D	3,636	1,218	8,082	1,540	76,303	2,302	6,623	1,336

2026 24-Hour School SHEI and APU Hours Summaries (CLhT_Diesel Only).

County	Weekday Hotelling	Weekday SHEI	Weekday APU	Friday Hotelling	Friday SHEI	Friday APU	Saturday Hotelling	Saturday SHEI	Saturday APU	Sunday Hotelling	Sunday SHEI	Sunday APU
Brazoria	1,387	802	248	1,404	811	251	997	576	178	743	429	133
Chambers	5,007	2,894	896	4,902	2,833	877	3,582	2,070	641	2,692	1,556	481
Fort Bend	7,017	4,056	1,255	7,078	4,091	1,266	5,140	2,971	919	3,764	2,175	673
Galveston	505	292	90	524	303	94	343	198	61	246	142	44
Harris	54,775	31,659	9,796	55,617	32,145	9,947	38,749	22,396	6,930	28,054	16,214	5,017
Liberty	2,270	1,312	406	2,325	1,344	416	1,515	876	271	1,083	626	194
Montgomery	8,210	4,745	1,468	8,168	4,721	1,461	6,004	3,470	1,074	4,441	2,567	794
Waller	5,433	3,140	972	4,978	2,877	890	4,346	2,512	777	3,263	1,886	583

2026 24-Hour Summer SHEI and APU Hours Summaries (CLhT_Diesel Only).

County	Weekday Hotelling	Weekday SHEI	Weekday APU	Friday Hotelling	Friday SHEI	Friday APU	Saturday Hotelling	Saturday SHEI	Saturday APU	Sunday Hotelling	Sunday SHEI	Sunday APU
Brazoria	1,385	800	248	1,388	802	248	972	562	174	733	424	131
Chambers	5,000	2,890	894	4,848	2,802	867	3,517	2,033	629	2,671	1,544	478
Fort Bend	7,007	4,050	1,253	7,001	4,046	1,252	5,019	2,901	898	3,718	2,149	665
Galveston	504	291	90	518	299	93	335	194	60	244	141	44
Harris	54,697	31,614	9,782	55,009	31,794	9,838	37,969	21,945	6,790	27,811	16,074	4,974
Liberty	2,267	1,310	405	2,299	1,329	411	1,485	858	266	1,073	620	192
Montgomery	8,198	4,738	1,466	8,078	4,669	1,445	5,860	3,387	1,048	4,386	2,535	784
Waller	5,425	3,136	970	4,924	2,846	881	4,224	2,441	755	3,209	1,855	574

APPENDIX G:
SOURCE TYPE AGE DISTRIBUTIONS AND FUEL ENGINE FRACTIONS INPUTS TO MOVES

Brazoria County 2026 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	TBus	SBus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061795	0.061189	0.051236	0.051236	0.053311	0.053311	0.053311	0.055878	0.107326	0.108951	0.055878	0.054796	0.068825
1	0.060500	0.084498	0.069065	0.069065	0.053213	0.053082	0.053192	0.055727	0.098838	0.103650	0.056089	0.056698	0.059543
2	0.060130	0.085123	0.057148	0.057148	0.053415	0.053131	0.053387	0.055943	0.113632	0.111268	0.056737	0.044354	0.047903
3	0.053284	0.080094	0.054475	0.054475	0.054397	0.054004	0.054308	0.056503	0.089706	0.085755	0.058147	0.053668	0.060675
4	0.055134	0.089629	0.059136	0.059136	0.054744	0.054257	0.054641	0.056502	0.101333	0.102451	0.058545	0.064806	0.071965
5	0.056429	0.074963	0.058544	0.058544	0.051675	0.051124	0.051612	0.054469	0.056427	0.056032	0.056986	0.056252	0.057263
6	0.046994	0.069592	0.049366	0.049366	0.051827	0.051090	0.051839	0.054374	0.053431	0.050813	0.057096	0.057525	0.058116
7	0.045328	0.057499	0.039964	0.039964	0.052672	0.051595	0.052695	0.054749	0.069221	0.071436	0.058059	0.063625	0.060032
8	0.032562	0.047228	0.041399	0.041399	0.048125	0.046622	0.047904	0.050848	0.048059	0.048826	0.055022	0.032744	0.030871
9	0.028307	0.039774	0.034974	0.034974	0.064014	0.070939	0.067696	0.026131	0.017683	0.017043	0.015178	0.021855	0.019997
10	0.058464	0.031670	0.028719	0.028719	0.059196	0.066851	0.059289	0.026395	0.017940	0.016190	0.015220	0.028546	0.027428
11	0.053839	0.046170	0.046351	0.046351	0.050025	0.053616	0.055111	0.030946	0.044072	0.041381	0.015055	0.026198	0.024805
12	0.064755	0.043650	0.049287	0.049287	0.045285	0.051800	0.050126	0.026719	0.028590	0.027061	0.013710	0.087920	0.078722
13	0.061795	0.033678	0.045745	0.045745	0.027519	0.037038	0.026572	0.022762	0.030257	0.030204	0.016287	0.056383	0.050902
14	0.045143	0.030181	0.037120	0.037120	0.023114	0.038227	0.025789	0.022114	0.023951	0.025697	0.008257	0.048250	0.043087
15	0.037743	0.024954	0.039582	0.039582	0.019768	0.029133	0.025323	0.015965	0.018410	0.019228	0.015311	0.028953	0.024421
16	0.034598	0.020635	0.037778	0.037778	0.020334	0.035504	0.022005	0.011312	0.014718	0.015792	0.002516	0.022498	0.021618
17	0.036078	0.018056	0.039056	0.039056	0.021884	0.032433	0.026359	0.020025	0.013232	0.013489	0.004349	0.018760	0.016864
18	0.022202	0.014281	0.033604	0.033604	0.020946	0.027559	0.025198	0.016314	0.013138	0.013534	0.016009	0.025502	0.023545
19	0.014801	0.012135	0.026783	0.026783	0.020545	0.017950	0.020764	0.045336	0.010719	0.009828	0.026480	0.035354	0.032228
20	0.013136	0.008846	0.021819	0.021819	0.024052	0.014542	0.018668	0.035616	0.009528	0.009369	0.034700	0.027142	0.024374
21	0.008881	0.005942	0.013497	0.013497	0.013883	0.010189	0.015413	0.029179	0.003893	0.004506	0.026380	0.020163	0.018389
22	0.007586	0.004517	0.014353	0.014353	0.012940	0.010052	0.016058	0.023923	0.004563	0.004678	0.040035	0.013407	0.012671
23	0.007586	0.002589	0.010205	0.010205	0.015951	0.009652	0.011191	0.025391	0.002344	0.002323	0.029321	0.012108	0.012375
24	0.004255	0.002296	0.008783	0.008783	0.014005	0.008408	0.012497	0.022116	0.002225	0.002388	0.026858	0.012069	0.011774
25	0.004440	0.001692	0.007282	0.007282	0.015337	0.007281	0.013322	0.022806	0.001247	0.001414	0.017266	0.007491	0.008079
26	0.002960	0.001180	0.004596	0.004596	0.016979	0.004626	0.011010	0.026631	0.001003	0.001073	0.031264	0.005785	0.006273
27	0.001850	0.000913	0.003792	0.003792	0.009554	0.002789	0.005589	0.021048	0.000740	0.000713	0.047300	0.003739	0.003870
28	0.002220	0.000913	0.002713	0.002713	0.007379	0.001402	0.004990	0.012815	0.000677	0.000730	0.020905	0.002912	0.003640
29	0.001480	0.000657	0.002436	0.002436	0.006276	0.000575	0.004078	0.008047	0.000533	0.000653	0.033963	0.002335	0.003493
30	0.015726	0.005456	0.011193	0.011193	0.017635	0.001218	0.010061	0.013416	0.002564	0.003525	0.031075	0.008160	0.016255

Chambers County 2026 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	TBus	SBus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.067365	0.074170	0.061786	0.061786	0.053311	0.053311	0.053311	0.055878	0.107326	0.108951	0.055878	0.054796	0.068825
1	0.074850	0.102367	0.085650	0.085650	0.053213	0.053082	0.053192	0.055727	0.098838	0.103650	0.056089	0.056698	0.059543
2	0.059880	0.099585	0.070976	0.070976	0.053415	0.053131	0.053387	0.055943	0.113632	0.111268	0.056737	0.044354	0.047903
3	0.086826	0.089212	0.060009	0.060009	0.054397	0.054004	0.054308	0.056503	0.089706	0.085755	0.058147	0.053668	0.060675
4	0.061377	0.094964	0.061863	0.061863	0.054744	0.054257	0.054641	0.056502	0.101333	0.102451	0.058545	0.064806	0.071965
5	0.047904	0.075538	0.063176	0.063176	0.051675	0.051124	0.051612	0.054469	0.056427	0.056032	0.056986	0.056252	0.057263
6	0.052395	0.065871	0.050587	0.050587	0.051827	0.051090	0.051839	0.054374	0.053431	0.050813	0.057096	0.057525	0.058116
7	0.035928	0.056017	0.041628	0.041628	0.052672	0.051595	0.052695	0.054749	0.069221	0.071436	0.058059	0.063625	0.060032
8	0.019461	0.040881	0.043173	0.043173	0.048125	0.046622	0.047904	0.050848	0.048059	0.048826	0.055022	0.032744	0.030871
9	0.029940	0.032676	0.032592	0.032592	0.064014	0.070939	0.067696	0.026131	0.017683	0.017043	0.015178	0.021855	0.019997
10	0.055389	0.027773	0.027495	0.027495	0.059196	0.066851	0.059289	0.026395	0.017940	0.016190	0.015220	0.028546	0.027428
11	0.055389	0.040834	0.045876	0.045876	0.050025	0.053616	0.055111	0.030946	0.044072	0.041381	0.015055	0.026198	0.024805
12	0.050898	0.039655	0.045181	0.045181	0.045285	0.051800	0.050126	0.026719	0.028590	0.027061	0.013710	0.087920	0.078722
13	0.071856	0.028150	0.039002	0.039002	0.027519	0.037038	0.026572	0.022762	0.030257	0.030204	0.016287	0.056383	0.050902
14	0.043413	0.023199	0.032901	0.032901	0.023114	0.038227	0.025789	0.022114	0.023951	0.025697	0.008257	0.048250	0.043087
15	0.034431	0.023152	0.035218	0.035218	0.019768	0.029133	0.025323	0.015965	0.018410	0.019228	0.015311	0.028953	0.024421
16	0.038922	0.016645	0.034600	0.034600	0.020334	0.035504	0.022005	0.011312	0.014718	0.015792	0.002516	0.022498	0.021618
17	0.017964	0.015466	0.034909	0.034909	0.021884	0.032433	0.026359	0.020025	0.013232	0.013489	0.004349	0.018760	0.016864
18	0.011976	0.010798	0.030816	0.030816	0.020946	0.027559	0.025198	0.016314	0.013138	0.013534	0.016009	0.025502	0.023545
19	0.017964	0.010232	0.020853	0.020853	0.020545	0.017950	0.020764	0.045336	0.010719	0.009828	0.026480	0.035354	0.032228
20	0.010479	0.007591	0.017300	0.017300	0.024052	0.014542	0.018668	0.035616	0.009528	0.009369	0.034700	0.027142	0.024374
21	0.019461	0.005847	0.010504	0.010504	0.013883	0.010189	0.015413	0.029179	0.003893	0.004506	0.026380	0.020163	0.018389
22	0.005988	0.004149	0.012975	0.012975	0.012940	0.010052	0.016058	0.023923	0.004563	0.004678	0.040035	0.013407	0.012671
23	0.011976	0.002499	0.010040	0.010040	0.015951	0.009652	0.011191	0.025391	0.002344	0.002323	0.029321	0.012108	0.012375
24	0.001497	0.002310	0.006796	0.006796	0.014005	0.008408	0.012497	0.022116	0.002225	0.002388	0.026858	0.012069	0.011774
25	0.004491	0.001980	0.005329	0.005329	0.015337	0.007281	0.013322	0.022806	0.001247	0.001414	0.017266	0.007491	0.008079
26	0.004491	0.001273	0.003167	0.003167	0.016979	0.004626	0.011010	0.026631	0.001003	0.001073	0.031264	0.005785	0.006273
27	0.000000	0.000754	0.002858	0.002858	0.009554	0.002789	0.005589	0.021048	0.000740	0.000713	0.047300	0.003739	0.003870
28	0.000000	0.000660	0.001699	0.001699	0.007379	0.001402	0.004990	0.012815	0.000677	0.000730	0.020905	0.002912	0.003640
29	0.001497	0.000236	0.001931	0.001931	0.006276	0.000575	0.004078	0.008047	0.000533	0.000653	0.033963	0.002335	0.003493
30	0.005988	0.005517	0.009113	0.009113	0.017635	0.001218	0.010061	0.013416	0.002564	0.003525	0.031075	0.008160	0.016255

Fort Bend County 2026 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	TBus	SBus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.056937	0.063854	0.059009	0.059009	0.053311	0.053311	0.053311	0.055878	0.107326	0.108951	0.055878	0.054796	0.068825
1	0.075769	0.085558	0.075577	0.075577	0.053213	0.053082	0.053192	0.055727	0.098838	0.103650	0.056089	0.056698	0.059543
2	0.064587	0.088792	0.063943	0.063943	0.053415	0.053131	0.053387	0.055943	0.113632	0.111268	0.056737	0.044354	0.047903
3	0.068118	0.085781	0.060124	0.060124	0.054397	0.054004	0.054308	0.056503	0.089706	0.085755	0.058147	0.053668	0.060675
4	0.065029	0.094456	0.062762	0.062762	0.054744	0.054257	0.054641	0.056502	0.101333	0.102451	0.058545	0.064806	0.071965
5	0.066500	0.081303	0.063767	0.063767	0.051675	0.051124	0.051612	0.054469	0.056427	0.056032	0.056986	0.056252	0.057263
6	0.056348	0.075357	0.054704	0.054704	0.051827	0.051090	0.051839	0.054374	0.053431	0.050813	0.057096	0.057525	0.058116
7	0.050611	0.060597	0.043556	0.043556	0.052672	0.051595	0.052695	0.054749	0.069221	0.071436	0.058059	0.063625	0.060032
8	0.034133	0.050231	0.043225	0.043225	0.048125	0.046622	0.047904	0.050848	0.048059	0.048826	0.055022	0.032744	0.030871
9	0.026482	0.042140	0.035874	0.035874	0.064014	0.070939	0.067696	0.026131	0.017683	0.017043	0.015178	0.021855	0.019997
10	0.051935	0.033392	0.026745	0.026745	0.059196	0.066851	0.059289	0.026395	0.017940	0.016190	0.015220	0.028546	0.027428
11	0.052082	0.043067	0.045179	0.045179	0.050025	0.053616	0.055111	0.030946	0.044072	0.041381	0.015055	0.026198	0.024805
12	0.058702	0.040085	0.048004	0.048004	0.045285	0.051800	0.050126	0.026719	0.028590	0.027061	0.013710	0.087920	0.078722
13	0.053700	0.030779	0.041205	0.041205	0.027519	0.037038	0.026572	0.022762	0.030257	0.030204	0.016287	0.056383	0.050902
14	0.042960	0.025314	0.033997	0.033997	0.023114	0.038227	0.025789	0.022114	0.023951	0.025697	0.008257	0.048250	0.043087
15	0.026924	0.021278	0.036492	0.036492	0.019768	0.029133	0.025323	0.015965	0.018410	0.019228	0.015311	0.028953	0.024421
16	0.035015	0.017481	0.034450	0.034450	0.020334	0.035504	0.022005	0.011312	0.014718	0.015792	0.002516	0.022498	0.021618
17	0.027218	0.014401	0.034251	0.034251	0.021884	0.032433	0.026359	0.020025	0.013232	0.013489	0.004349	0.018760	0.016864
18	0.018685	0.011207	0.030134	0.030134	0.020946	0.027559	0.025198	0.016314	0.013138	0.013534	0.016009	0.025502	0.023545
19	0.012358	0.009129	0.022904	0.022904	0.020545	0.017950	0.020764	0.045336	0.010719	0.009828	0.026480	0.035354	0.032228
20	0.009710	0.006637	0.017661	0.017661	0.024052	0.014542	0.018668	0.035616	0.009528	0.009369	0.034700	0.027142	0.024374
21	0.008092	0.004649	0.012771	0.012771	0.013883	0.010189	0.015413	0.029179	0.003893	0.004506	0.026380	0.020163	0.018389
22	0.005002	0.003228	0.011270	0.011270	0.012940	0.010052	0.016058	0.023923	0.004563	0.004678	0.040035	0.013407	0.012671
23	0.003531	0.001920	0.007771	0.007771	0.015951	0.009652	0.011191	0.025391	0.002344	0.002323	0.029321	0.012108	0.012375
24	0.004561	0.001445	0.006546	0.006546	0.014005	0.008408	0.012497	0.022116	0.002225	0.002388	0.026858	0.012069	0.011774
25	0.002207	0.001124	0.006270	0.006270	0.015337	0.007281	0.013322	0.022806	0.001247	0.001414	0.017266	0.007491	0.008079
26	0.002354	0.000856	0.003709	0.003709	0.016979	0.004626	0.011010	0.026631	0.001003	0.001073	0.031264	0.005785	0.006273
27	0.001913	0.000672	0.003002	0.003002	0.009554	0.002789	0.005589	0.021048	0.000740	0.000713	0.047300	0.003739	0.003870
28	0.000883	0.000565	0.002417	0.002417	0.007379	0.001402	0.004990	0.012815	0.000677	0.000730	0.020905	0.002912	0.003640
29	0.000441	0.000482	0.002031	0.002031	0.006276	0.000575	0.004078	0.008047	0.000533	0.000653	0.033963	0.002335	0.003493
30	0.017213	0.004221	0.010652	0.010652	0.017635	0.001218	0.010061	0.013416	0.002564	0.003525	0.031075	0.008160	0.016255

Galveston County 2026 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	TBus	SBus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.059392	0.059266	0.050818	0.050818	0.053311	0.053311	0.053311	0.055878	0.107326	0.108951	0.055878	0.054796	0.068825
1	0.068727	0.085363	0.072307	0.072307	0.053213	0.053082	0.053192	0.055727	0.098838	0.103650	0.056089	0.056698	0.059543
2	0.061323	0.090480	0.063375	0.063375	0.053415	0.053131	0.053387	0.055943	0.113632	0.111268	0.056737	0.044354	0.047903
3	0.059231	0.081649	0.057840	0.057840	0.054397	0.054004	0.054308	0.056503	0.089706	0.085755	0.058147	0.053668	0.060675
4	0.056333	0.088141	0.058295	0.058295	0.054744	0.054257	0.054641	0.056502	0.101333	0.102451	0.058545	0.064806	0.071965
5	0.053275	0.073997	0.061828	0.061828	0.051675	0.051124	0.051612	0.054469	0.056427	0.056032	0.056986	0.056252	0.057263
6	0.050056	0.068880	0.054079	0.054079	0.051827	0.051090	0.051839	0.054374	0.053431	0.050813	0.057096	0.057525	0.058116
7	0.039433	0.055310	0.041552	0.041552	0.052672	0.051595	0.052695	0.054749	0.069221	0.071436	0.058059	0.063625	0.060032
8	0.028811	0.045595	0.041082	0.041082	0.048125	0.046622	0.047904	0.050848	0.048059	0.048826	0.055022	0.032744	0.030871
9	0.027523	0.038449	0.036639	0.036639	0.064014	0.070939	0.067696	0.026131	0.017683	0.017043	0.015178	0.021855	0.019997
10	0.052953	0.032268	0.028753	0.028753	0.059196	0.066851	0.059289	0.026395	0.017940	0.016190	0.015220	0.028546	0.027428
11	0.051666	0.043966	0.048301	0.048301	0.050025	0.053616	0.055111	0.030946	0.044072	0.041381	0.015055	0.026198	0.024805
12	0.060357	0.042011	0.046799	0.046799	0.045285	0.051800	0.050126	0.026719	0.028590	0.027061	0.013710	0.087920	0.078722
13	0.053114	0.034009	0.042341	0.042341	0.027519	0.037038	0.026572	0.022762	0.030257	0.030204	0.016287	0.056383	0.050902
14	0.047964	0.029856	0.035259	0.035259	0.023114	0.038227	0.025789	0.022114	0.023951	0.025697	0.008257	0.048250	0.043087
15	0.034444	0.025043	0.039141	0.039141	0.019768	0.029133	0.025323	0.015965	0.018410	0.019228	0.015311	0.028953	0.024421
16	0.038468	0.021730	0.036320	0.036320	0.020334	0.035504	0.022005	0.011312	0.014718	0.015792	0.002516	0.022498	0.021618
17	0.033639	0.018405	0.036472	0.036472	0.021884	0.032433	0.026359	0.020025	0.013232	0.013489	0.004349	0.018760	0.016864
18	0.021407	0.014511	0.033378	0.033378	0.020946	0.027559	0.025198	0.016314	0.013138	0.013534	0.016009	0.025502	0.023545
19	0.020924	0.012172	0.024158	0.024158	0.020545	0.017950	0.020764	0.045336	0.010719	0.009828	0.026480	0.035354	0.032228
20	0.013842	0.008949	0.019684	0.019684	0.024052	0.014542	0.018668	0.035616	0.009528	0.009369	0.034700	0.027142	0.024374
21	0.011106	0.006593	0.013285	0.013285	0.013883	0.010189	0.015413	0.029179	0.003893	0.004506	0.026380	0.020163	0.018389
22	0.006921	0.004694	0.012799	0.012799	0.012940	0.010052	0.016058	0.023923	0.004563	0.004678	0.040035	0.013407	0.012671
23	0.009013	0.002880	0.008872	0.008872	0.015951	0.009652	0.011191	0.025391	0.002344	0.002323	0.029321	0.012108	0.012375
24	0.005150	0.002463	0.007507	0.007507	0.014005	0.008408	0.012497	0.022116	0.002225	0.002388	0.026858	0.012069	0.011774
25	0.002897	0.001944	0.006839	0.006839	0.015337	0.007281	0.013322	0.022806	0.001247	0.001414	0.017266	0.007491	0.008079
26	0.004024	0.001392	0.004565	0.004565	0.016979	0.004626	0.011010	0.026631	0.001003	0.001073	0.031264	0.005785	0.006273
27	0.001288	0.001082	0.002881	0.002881	0.009554	0.002789	0.005589	0.021048	0.000740	0.000713	0.047300	0.003739	0.003870
28	0.001449	0.000981	0.002199	0.002199	0.007379	0.001402	0.004990	0.012815	0.000677	0.000730	0.020905	0.002912	0.003640
29	0.002414	0.000800	0.002002	0.002002	0.006276	0.000575	0.004078	0.008047	0.000533	0.000653	0.033963	0.002335	0.003493
30	0.022855	0.007123	0.010631	0.010631	0.017635	0.001218	0.010061	0.013416	0.002564	0.003525	0.031075	0.008160	0.016255

Harris County 2026 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	TBus	SBus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.067022	0.060996	0.050704	0.050704	0.053311	0.053311	0.053311	0.055878	0.107326	0.108951	0.055878	0.054796	0.068825
1	0.073186	0.079200	0.064064	0.064064	0.053213	0.053082	0.053192	0.055727	0.098838	0.103650	0.056089	0.056698	0.059543
2	0.061329	0.076245	0.050862	0.050862	0.053415	0.053131	0.053387	0.055943	0.113632	0.111268	0.056737	0.044354	0.047903
3	0.063540	0.075379	0.048647	0.048647	0.054397	0.054004	0.054308	0.056503	0.089706	0.085755	0.058147	0.053668	0.060675
4	0.062075	0.083557	0.051486	0.051486	0.054744	0.054257	0.054641	0.056502	0.101333	0.102451	0.058545	0.064806	0.071965
5	0.057100	0.072572	0.055214	0.055214	0.051675	0.051124	0.051612	0.054469	0.056427	0.056032	0.056986	0.056252	0.057263
6	0.053341	0.068192	0.046605	0.046605	0.051827	0.051090	0.051839	0.054374	0.053431	0.050813	0.057096	0.057525	0.058116
7	0.045852	0.057464	0.040483	0.040483	0.052672	0.051595	0.052695	0.054749	0.069221	0.071436	0.058059	0.063625	0.060032
8	0.030844	0.047021	0.041143	0.041143	0.048125	0.046622	0.047904	0.050848	0.048059	0.048826	0.055022	0.032744	0.030871
9	0.025565	0.041397	0.034951	0.034951	0.064014	0.070939	0.067696	0.026131	0.017683	0.017043	0.015178	0.021855	0.019997
10	0.053784	0.035266	0.029555	0.029555	0.059196	0.066851	0.059289	0.026395	0.017940	0.016190	0.015220	0.028546	0.027428
11	0.051103	0.047958	0.053325	0.053325	0.050025	0.053616	0.055111	0.030946	0.044072	0.041381	0.015055	0.026198	0.024805
12	0.062324	0.046919	0.054891	0.054891	0.045285	0.051800	0.050126	0.026719	0.028590	0.027061	0.013710	0.087920	0.078722
13	0.054502	0.037948	0.047402	0.047402	0.027519	0.037038	0.026572	0.022762	0.030257	0.030204	0.016287	0.056383	0.050902
14	0.041181	0.032786	0.041876	0.041876	0.023114	0.038227	0.025789	0.022114	0.023951	0.025697	0.008257	0.048250	0.043087
15	0.030181	0.027263	0.043250	0.043250	0.019768	0.029133	0.025323	0.015965	0.018410	0.019228	0.015311	0.028953	0.024421
16	0.037505	0.023986	0.040752	0.040752	0.020334	0.035504	0.022005	0.011312	0.014718	0.015792	0.002516	0.022498	0.021618
17	0.029545	0.019987	0.040158	0.040158	0.021884	0.032433	0.026359	0.020025	0.013232	0.013489	0.004349	0.018760	0.016864
18	0.019955	0.015696	0.036866	0.036866	0.020946	0.027559	0.025198	0.016314	0.013138	0.013534	0.016009	0.025502	0.023545
19	0.014510	0.013126	0.028642	0.028642	0.020545	0.017950	0.020764	0.045336	0.010719	0.009828	0.026480	0.035354	0.032228
20	0.011663	0.009768	0.021304	0.021304	0.024052	0.014542	0.018668	0.035616	0.009528	0.009369	0.034700	0.027142	0.024374
21	0.008015	0.006721	0.014751	0.014751	0.013883	0.010189	0.015413	0.029179	0.003893	0.004506	0.026380	0.020163	0.018389
22	0.006357	0.004944	0.014138	0.014138	0.012940	0.010052	0.016058	0.023923	0.004563	0.004678	0.040035	0.013407	0.012671
23	0.006191	0.003024	0.009339	0.009339	0.015951	0.009652	0.011191	0.025391	0.002344	0.002323	0.029321	0.012108	0.012375
24	0.004201	0.002288	0.008224	0.008224	0.014005	0.008408	0.012497	0.022116	0.002225	0.002388	0.026858	0.012069	0.011774
25	0.003814	0.001584	0.006870	0.006870	0.015337	0.007281	0.013322	0.022806	0.001247	0.001414	0.017266	0.007491	0.008079
26	0.002487	0.001192	0.004385	0.004385	0.016979	0.004626	0.011010	0.026631	0.001003	0.001073	0.031264	0.005785	0.006273
27	0.002073	0.000922	0.003318	0.003318	0.009554	0.002789	0.005589	0.021048	0.000740	0.000713	0.047300	0.003739	0.003870
28	0.001106	0.000832	0.002499	0.002499	0.007379	0.001402	0.004990	0.012815	0.000677	0.000730	0.020905	0.002912	0.003640
29	0.001492	0.000640	0.002173	0.002173	0.006276	0.000575	0.004078	0.008047	0.000533	0.000653	0.033963	0.002335	0.003493
30	0.018158	0.005128	0.012123	0.012123	0.017635	0.001218	0.010061	0.013416	0.002564	0.003525	0.031075	0.008160	0.016255

Liberty County 2026 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	TBus	SBus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.055821	0.052213	0.042145	0.042145	0.053311	0.053311	0.053311	0.055878	0.107326	0.108951	0.055878	0.054796	0.068825
1	0.049442	0.074386	0.057456	0.057456	0.053213	0.053082	0.053192	0.055727	0.098838	0.103650	0.056089	0.056698	0.059543
2	0.050239	0.072547	0.046869	0.046869	0.053415	0.053131	0.053387	0.055943	0.113632	0.111268	0.056737	0.044354	0.047903
3	0.063796	0.068085	0.038317	0.038317	0.054397	0.054004	0.054308	0.056503	0.089706	0.085755	0.058147	0.053668	0.060675
4	0.047049	0.074602	0.043652	0.043652	0.054744	0.054257	0.054641	0.056502	0.101333	0.102451	0.058545	0.064806	0.071965
5	0.043062	0.065895	0.047113	0.047113	0.051675	0.051124	0.051612	0.054469	0.056427	0.056032	0.056986	0.056252	0.057263
6	0.045455	0.057864	0.041575	0.041575	0.051827	0.051090	0.051839	0.054374	0.053431	0.050813	0.057096	0.057525	0.058116
7	0.040670	0.050023	0.036974	0.036974	0.052672	0.051595	0.052695	0.054749	0.069221	0.071436	0.058059	0.063625	0.060032
8	0.034290	0.043182	0.038236	0.038236	0.048125	0.046622	0.047904	0.050848	0.048059	0.048826	0.055022	0.032744	0.030871
9	0.029506	0.038017	0.030499	0.030499	0.064014	0.070939	0.067696	0.026131	0.017683	0.017043	0.015178	0.021855	0.019997
10	0.059011	0.033853	0.027201	0.027201	0.059196	0.066851	0.059289	0.026395	0.017940	0.016190	0.015220	0.028546	0.027428
11	0.055821	0.049455	0.050533	0.050533	0.050025	0.053616	0.055111	0.030946	0.044072	0.041381	0.015055	0.026198	0.024805
12	0.060606	0.052808	0.050330	0.050330	0.045285	0.051800	0.050126	0.026719	0.028590	0.027061	0.013710	0.087920	0.078722
13	0.057416	0.044885	0.049638	0.049638	0.027519	0.037038	0.026572	0.022762	0.030257	0.030204	0.016287	0.056383	0.050902
14	0.055024	0.042019	0.044425	0.044425	0.023114	0.038227	0.025789	0.022114	0.023951	0.025697	0.008257	0.048250	0.043087
15	0.035088	0.031095	0.046991	0.046991	0.019768	0.029133	0.025323	0.015965	0.018410	0.019228	0.015311	0.028953	0.024421
16	0.044657	0.030555	0.047032	0.047032	0.020334	0.035504	0.022005	0.011312	0.014718	0.015792	0.002516	0.022498	0.021618
17	0.040670	0.026120	0.047968	0.047968	0.021884	0.032433	0.026359	0.020025	0.013232	0.013489	0.004349	0.018760	0.016864
18	0.023126	0.021875	0.045566	0.045566	0.020946	0.027559	0.025198	0.016314	0.013138	0.013534	0.016009	0.025502	0.023545
19	0.025518	0.016954	0.034368	0.034368	0.020545	0.017950	0.020764	0.045336	0.010719	0.009828	0.026480	0.035354	0.032228
20	0.021531	0.014412	0.027486	0.027486	0.024052	0.014542	0.018668	0.035616	0.009528	0.009369	0.034700	0.027142	0.024374
21	0.007177	0.009978	0.020604	0.020604	0.013883	0.010189	0.015413	0.029179	0.003893	0.004506	0.026380	0.020163	0.018389
22	0.015152	0.006976	0.019627	0.019627	0.012940	0.010052	0.016058	0.023923	0.004563	0.004678	0.040035	0.013407	0.012671
23	0.006380	0.004759	0.013071	0.013071	0.015951	0.009652	0.011191	0.025391	0.002344	0.002323	0.029321	0.012108	0.012375
24	0.007974	0.004516	0.013519	0.013519	0.014005	0.008408	0.012497	0.022116	0.002225	0.002388	0.026858	0.012069	0.011774
25	0.007974	0.002839	0.010099	0.010099	0.015337	0.007281	0.013322	0.022806	0.001247	0.001414	0.017266	0.007491	0.008079
26	0.001595	0.001622	0.005782	0.005782	0.016979	0.004626	0.011010	0.026631	0.001003	0.001073	0.031264	0.005785	0.006273
27	0.000797	0.001325	0.004153	0.004153	0.009554	0.002789	0.005589	0.021048	0.000740	0.000713	0.047300	0.003739	0.003870
28	0.001595	0.001055	0.003868	0.003868	0.007379	0.001402	0.004990	0.012815	0.000677	0.000730	0.020905	0.002912	0.003640
29	0.001595	0.000730	0.002606	0.002606	0.006276	0.000575	0.004078	0.008047	0.000533	0.000653	0.033963	0.002335	0.003493
30	0.011962	0.005354	0.012297	0.012297	0.017635	0.001218	0.010061	0.013416	0.002564	0.003525	0.031075	0.008160	0.016255

Montgomery County 2026 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	TBus	SBus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.060102	0.106494	0.079624	0.079624	0.053311	0.053311	0.053311	0.055878	0.107326	0.108951	0.055878	0.054796	0.068825
1	0.066549	0.098530	0.076806	0.076806	0.053213	0.053082	0.053192	0.055727	0.098838	0.103650	0.056089	0.056698	0.059543
2	0.058230	0.081980	0.056214	0.056214	0.053415	0.053131	0.053387	0.055943	0.113632	0.111268	0.056737	0.044354	0.047903
3	0.068317	0.080777	0.055472	0.055472	0.054397	0.054004	0.054308	0.056503	0.089706	0.085755	0.058147	0.053668	0.060675
4	0.053135	0.082808	0.056362	0.056362	0.054744	0.054257	0.054641	0.056502	0.101333	0.102451	0.058545	0.064806	0.071965
5	0.060726	0.072633	0.059676	0.059676	0.051675	0.051124	0.051612	0.054469	0.056427	0.056032	0.056986	0.056252	0.057263
6	0.056463	0.067981	0.049253	0.049253	0.051827	0.051090	0.051839	0.054374	0.053431	0.050813	0.057096	0.057525	0.058116
7	0.051159	0.054177	0.041543	0.041543	0.052672	0.051595	0.052695	0.054749	0.069221	0.071436	0.058059	0.063625	0.060032
8	0.028803	0.043392	0.039083	0.039083	0.048125	0.046622	0.047904	0.050848	0.048059	0.048826	0.055022	0.032744	0.030871
9	0.024436	0.036786	0.033685	0.033685	0.064014	0.070939	0.067696	0.026131	0.017683	0.017043	0.015178	0.021855	0.019997
10	0.052927	0.029062	0.025809	0.025809	0.059196	0.066851	0.059289	0.026395	0.017940	0.016190	0.015220	0.028546	0.027428
11	0.046584	0.040771	0.045180	0.045180	0.050025	0.053616	0.055111	0.030946	0.044072	0.041381	0.015055	0.026198	0.024805
12	0.062494	0.037624	0.045799	0.045799	0.045285	0.051800	0.050126	0.026719	0.028590	0.027061	0.013710	0.087920	0.078722
13	0.051055	0.030082	0.041770	0.041770	0.027519	0.037038	0.026572	0.022762	0.030257	0.030204	0.016287	0.056383	0.050902
14	0.045336	0.026070	0.035821	0.035821	0.023114	0.038227	0.025789	0.022114	0.023951	0.025697	0.008257	0.048250	0.043087
15	0.031923	0.022208	0.038412	0.038412	0.019768	0.029133	0.025323	0.015965	0.018410	0.019228	0.015311	0.028953	0.024421
16	0.038578	0.018665	0.035159	0.035159	0.020334	0.035504	0.022005	0.011312	0.014718	0.015792	0.002516	0.022498	0.021618
17	0.028907	0.015398	0.035080	0.035080	0.021884	0.032433	0.026359	0.020025	0.013232	0.013489	0.004349	0.018760	0.016864
18	0.021628	0.012350	0.032402	0.032402	0.020946	0.027559	0.025198	0.016314	0.013138	0.013534	0.016009	0.025502	0.023545
19	0.017365	0.009965	0.024282	0.024282	0.020545	0.017950	0.020764	0.045336	0.010719	0.009828	0.026480	0.035354	0.032228
20	0.013622	0.007440	0.018456	0.018456	0.024052	0.014542	0.018668	0.035616	0.009528	0.009369	0.034700	0.027142	0.024374
21	0.010606	0.005373	0.012996	0.012996	0.013883	0.010189	0.015413	0.029179	0.003893	0.004506	0.026380	0.020163	0.018389
22	0.007175	0.003961	0.013048	0.013048	0.012940	0.010052	0.016058	0.023923	0.004563	0.004678	0.040035	0.013407	0.012671
23	0.004783	0.002340	0.008626	0.008626	0.015951	0.009652	0.011191	0.025391	0.002344	0.002323	0.029321	0.012108	0.012375
24	0.005407	0.001992	0.008068	0.008068	0.014005	0.008408	0.012497	0.022116	0.002225	0.002388	0.026858	0.012069	0.011774
25	0.004575	0.001331	0.006184	0.006184	0.015337	0.007281	0.013322	0.022806	0.001247	0.001414	0.017266	0.007491	0.008079
26	0.003327	0.001128	0.004317	0.004317	0.016979	0.004626	0.011010	0.026631	0.001003	0.001073	0.031264	0.005785	0.006273
27	0.001976	0.000841	0.003114	0.003114	0.009554	0.002789	0.005589	0.021048	0.000740	0.000713	0.047300	0.003739	0.003870
28	0.001144	0.000778	0.002355	0.002355	0.007379	0.001402	0.004990	0.012815	0.000677	0.000730	0.020905	0.002912	0.003640
29	0.001664	0.000733	0.002259	0.002259	0.006276	0.000575	0.004078	0.008047	0.000533	0.000653	0.033963	0.002335	0.003493
30	0.021004	0.006328	0.013144	0.013144	0.017635	0.001218	0.010061	0.013416	0.002564	0.003525	0.031075	0.008160	0.016255

Waller County 2026 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	TBus	SBus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.044529	0.047336	0.037599	0.037599	0.053311	0.053311	0.053311	0.055878	0.107326	0.108951	0.055878	0.054796	0.068825
1	0.068702	0.065493	0.048997	0.048997	0.053213	0.053082	0.053192	0.055727	0.098838	0.103650	0.056089	0.056698	0.059543
2	0.072519	0.070307	0.041818	0.041818	0.053415	0.053131	0.053387	0.055943	0.113632	0.111268	0.056737	0.044354	0.047903
3	0.055980	0.068618	0.040856	0.040856	0.054397	0.054004	0.054308	0.056503	0.089706	0.085755	0.058147	0.053668	0.060675
4	0.055980	0.079301	0.045074	0.045074	0.054744	0.054257	0.054641	0.056502	0.101333	0.102451	0.058545	0.064806	0.071965
5	0.054707	0.068702	0.048257	0.048257	0.051675	0.051124	0.051612	0.054469	0.056427	0.056032	0.056986	0.056252	0.057263
6	0.043257	0.068618	0.045222	0.045222	0.051827	0.051090	0.051839	0.054374	0.053431	0.050813	0.057096	0.057525	0.058116
7	0.041985	0.054894	0.037821	0.037821	0.052672	0.051595	0.052695	0.054749	0.069221	0.071436	0.058059	0.063625	0.060032
8	0.025445	0.044633	0.035379	0.035379	0.048125	0.046622	0.047904	0.050848	0.048059	0.048826	0.055022	0.032744	0.030871
9	0.035623	0.036652	0.032122	0.032122	0.064014	0.070939	0.067696	0.026131	0.017683	0.017043	0.015178	0.021855	0.019997
10	0.048346	0.031205	0.025831	0.025831	0.059196	0.066851	0.059289	0.026395	0.017940	0.016190	0.015220	0.028546	0.027428
11	0.044529	0.049278	0.048849	0.048849	0.050025	0.053616	0.055111	0.030946	0.044072	0.041381	0.015055	0.026198	0.024805
12	0.059796	0.045900	0.050699	0.050699	0.045285	0.051800	0.050126	0.026719	0.028590	0.027061	0.013710	0.087920	0.078722
13	0.055980	0.041973	0.046703	0.046703	0.027519	0.037038	0.026572	0.022762	0.030257	0.030204	0.016287	0.056383	0.050902
14	0.048346	0.038975	0.043446	0.043446	0.023114	0.038227	0.025789	0.022114	0.023951	0.025697	0.008257	0.048250	0.043087
15	0.039440	0.035005	0.047147	0.047147	0.019768	0.029133	0.025323	0.015965	0.018410	0.019228	0.015311	0.028953	0.024421
16	0.031807	0.031416	0.044704	0.044704	0.020334	0.035504	0.022005	0.011312	0.014718	0.015792	0.002516	0.022498	0.021618
17	0.034351	0.026940	0.049737	0.049737	0.021884	0.032433	0.026359	0.020025	0.013232	0.013489	0.004349	0.018760	0.016864
18	0.022901	0.022380	0.047073	0.047073	0.020946	0.027559	0.025198	0.016314	0.013138	0.013534	0.016009	0.025502	0.023545
19	0.024173	0.019382	0.033306	0.033306	0.020545	0.017950	0.020764	0.045336	0.010719	0.009828	0.026480	0.035354	0.032228
20	0.019084	0.012752	0.029383	0.029383	0.024052	0.014542	0.018668	0.035616	0.009528	0.009369	0.034700	0.027142	0.024374
21	0.007634	0.008867	0.018429	0.018429	0.013883	0.010189	0.015413	0.029179	0.003893	0.004506	0.026380	0.020163	0.018389
22	0.006361	0.007221	0.022722	0.022722	0.012940	0.010052	0.016058	0.023923	0.004563	0.004678	0.040035	0.013407	0.012671
23	0.012723	0.004645	0.014655	0.014655	0.015951	0.009652	0.011191	0.025391	0.002344	0.002323	0.029321	0.012108	0.012375
24	0.008906	0.003420	0.013989	0.013989	0.014005	0.008408	0.012497	0.022116	0.002225	0.002388	0.026858	0.012069	0.011774
25	0.007634	0.002407	0.011102	0.011102	0.015337	0.007281	0.013322	0.022806	0.001247	0.001414	0.017266	0.007491	0.008079
26	0.001272	0.002449	0.006883	0.006883	0.016979	0.004626	0.011010	0.026631	0.001003	0.001073	0.031264	0.005785	0.006273
27	0.001272	0.001267	0.006809	0.006809	0.009554	0.002789	0.005589	0.021048	0.000740	0.000713	0.047300	0.003739	0.003870
28	0.002545	0.001267	0.003923	0.003923	0.007379	0.001402	0.004990	0.012815	0.000677	0.000730	0.020905	0.002912	0.003640
29	0.002545	0.000845	0.003479	0.003479	0.006276	0.000575	0.004078	0.008047	0.000533	0.000653	0.033963	0.002335	0.003493
30	0.021628	0.007854	0.017985	0.017985	0.017635	0.001218	0.010061	0.013416	0.002564	0.003525	0.031075	0.008160	0.016255

Texas Statewide 2026 Fuel Engine Fractions Summary by Model Year.

SUT	Fuel Type	2026	2025	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
MC	Gas	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
PC	Gas	0.9538	0.9564	0.9586	0.9602	0.9617	0.9631	0.9643	0.9668	0.9693	0.9698	0.9486	0.9375	0.9437	0.9402	0.9397	0.9031
PC	Diesel	0.0153	0.0128	0.0107	0.0092	0.0078	0.0066	0.0057	0.0033	0.0011	0.0003	0.0012	0.0242	0.0150	0.0135	0.0126	0.0118
PT	Gas	0.8143	0.8141	0.8149	0.8156	0.8167	0.8185	0.8201	0.8276	0.8358	0.8436	0.8232	0.7684	0.7749	0.6941	0.6859	0.7573
PT	Diesel	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389	0.0347	0.0303	0.0237	0.0201	0.0264	0.0234
LCT	Gas	0.8143	0.8141	0.8149	0.8156	0.8167	0.8185	0.8201	0.8276	0.8358	0.8436	0.8232	0.7684	0.6161	0.5943	0.6265	0.6230
LCT	Diesel	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389	0.0347	0.0303	0.0263	0.0312	0.0562	0.0601
OBus	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OBus	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
TBus	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TBus	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
SBus	Gas	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0370	0.0450	0.0314
SBus	Diesel	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9630	0.9550	0.9686
RT	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0066	0.0000	0.0000
RT	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9934	1.0000	1.0000
SUShT	Gas	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.4743	0.4991	0.4898	0.4429	0.4001	0.4214	0.2754	0.2837
SUShT	Diesel	0.4814	0.4814	0.4814	0.4814	0.4814	0.4814	0.4814	0.4814	0.5257	0.5009	0.5102	0.5571	0.5999	0.5786	0.7246	0.7163
SULhT	Gas	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.4743	0.4991	0.4898	0.4429	0.4001	0.4214	0.2754	0.2837
SULhT	Diesel	0.4814	0.4814	0.4814	0.4814	0.4814	0.4814	0.4814	0.4814	0.5257	0.5009	0.5102	0.5571	0.5999	0.5786	0.7246	0.7163
MH	Gas	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.7076	0.7251	0.7013
MH	Diesel	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.2924	0.2749	0.2987
CShT	Gas	0.0806	0.0806	0.0806	0.0806	0.0806	0.0806	0.0806	0.0806	0.0910	0.1062	0.0930	0.0730	0.0976	0.0870	0.0811	0.0645
CShT	Diesel	0.9194	0.9194	0.9194	0.9194	0.9194	0.9194	0.9194	0.9194	0.9090	0.8938	0.9070	0.9270	0.9024	0.9130	0.9189	0.9355
CLhT	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

[1] Conventional internal combustion engine technology only.

Texas Statewide 2026 Fuel Engine Fractions Summary by Model Year – Continued.

SUT	Fuel Type	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996
MC	Gas	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
PC	Gas	0.9357	0.9466	0.9478	0.9692	0.9575	0.9812	0.9871	0.9816	0.9874	0.9872	0.9844	0.9812	0.9888	0.9991	0.9988
PC	Diesel	0.0106	0.0078	0.0007	0.0005	0.0069	0.0049	0.0034	0.0042	0.0046	0.0034	0.0031	0.0019	0.0022	0.0009	0.0012
PT	Gas	0.7941	0.8410	0.8867	0.8563	0.9113	0.9105	0.8919	0.8574	0.8724	0.9215	0.9056	0.9099	0.9721	0.9555	0.9575
PT	Diesel	0.0133	0.0172	0.0300	0.0279	0.0440	0.0359	0.0406	0.0386	0.0347	0.0410	0.0297	0.0392	0.0128	0.0445	0.0425
LCT	Gas	0.6382	0.7656	0.8132	0.8157	0.8518	0.8698	0.8597	0.8401	0.8430	0.8820	0.8728	0.8633	0.9414	0.8988	0.9070
LCT	Diesel	0.0348	0.0465	0.0802	0.0679	0.0998	0.0852	0.0927	0.0841	0.0848	0.0882	0.0773	0.0986	0.0450	0.1012	0.0930
OBus	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OBus	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
TBus	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
TBus	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
SBus	Gas	0.0389	0.0275	0.0130	0.0078	0.0101	0.0066	0.0038	0.0055	0.0260	0.0117	0.0257	0.0100	0.0100	0.0100	0.0415
SBus	Diesel	0.9611	0.9725	0.9870	0.9922	0.9899	0.9934	0.9962	0.9945	0.9740	0.9883	0.9743	0.9900	0.9900	0.9900	0.9585
RT	Gas	0.0000	0.0046	0.0020	0.0023	0.0009	0.0007	0.0000	0.0004	0.0000	0.0000	0.0000	0.1688	0.4036	0.0193	0.0253
RT	Diesel	1.0000	0.9954	0.9980	0.9977	0.9991	0.9993	1.0000	0.9996	1.0000	1.0000	1.0000	0.8312	0.5964	0.9807	0.9747
SUShT	Gas	0.3323	0.3834	0.3310	0.2717	0.2733	0.2492	0.2572	0.2512	0.2749	0.3024	0.3629	0.3252	0.4135	0.4154	0.3828
SUShT	Diesel	0.6677	0.6166	0.6690	0.7283	0.7267	0.7508	0.7428	0.7488	0.7251	0.6976	0.6371	0.6748	0.5865	0.5846	0.6172
SULhT	Gas	0.3323	0.3834	0.3310	0.2717	0.2733	0.2492	0.2572	0.2512	0.2749	0.3024	0.3629	0.3252	0.4135	0.4154	0.3828
SULhT	Diesel	0.6677	0.6166	0.6690	0.7283	0.7267	0.7508	0.7428	0.7488	0.7251	0.6976	0.6371	0.6748	0.5865	0.5846	0.6172
MH	Gas	0.0059	0.5339	0.3808	0.4420	0.5778	0.3493	0.6016	0.5619	0.6028	0.5459	0.6539	0.7975	0.6494	0.8361	0.8008
MH	Diesel	0.9941	0.4661	0.6192	0.5580	0.4222	0.6507	0.3984	0.4381	0.3972	0.4541	0.3461	0.2025	0.3506	0.1639	0.1992
CShT	Gas	0.0768	0.0769	0.0790	0.0543	0.0649	0.0607	0.0769	0.0859	0.0932	0.0957	0.1104	0.1105	0.1092	0.1217	0.1185
CShT	Diesel	0.9232	0.9231	0.9210	0.9457	0.9351	0.9393	0.9231	0.9141	0.9068	0.9043	0.8896	0.8895	0.8908	0.8783	0.8815
CLhT	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

[1] Conventional internal combustion engine technology only.