APPENDIX: MOBILE INPUT PARAMETERS

ANALYSIS SUMMARY

DATE: March 29, 2024

TO: Claudia Valles, Salvador Gonzalez-Ayala (El Paso MPO)

CC: Janie Temple and Laura Norton (TxDOT TPP)

FROM: Chaoyi Gu and Madhusudhan Venugopal – Texas A&M Transportation Institute

SUBJECT: El Paso MPO's RMS 2050 Amendment Emission Inventory – Analysis Notes

EMISSIONS SUMMARIES – EL PASO RMS 2050 MTP

The following tables show the results of the El Paso RMS 2050 MTP Amendment emissions for Analysis years 2017 (Sunland Park only), 2022, 2027, 2032, 2040, and 2050.

Table 1. Summer Weekday Paved Road PM_{10} Emissions Summary (tons/day).

Year	Area[1]	VMT[2]	Speed[2]	Direct Vehicle PM_{10}	Resuspended Dust PM_{10}	PM_{10} Total
2022	El Paso County	19,259,508	38.0	1.12	4.26	5.38
2022	Doña Ana Zones	858,754	35.5	0.06	0.32	0.38
2027	El Paso County	20,127,582	37.1	1.11	4.62	5.72
2027	Doña Ana Zones	947,909	35.5	0.06	0.36	0.42
2032	El Paso County	21,077,483	36.7	1.13	4.90	6.03
2032	Doña Ana Zones	1,021,189	35.8	0.06	0.38	0.44
2040	El Paso County	22,530,833	36.0	1.21	5.23	6.44
2040	Doña Ana Zones	1,110,976	35.2	0.06	0.42	0.48
2050	El Paso County	24,587,643	35.1	1.34	5.69	7.03
2050	Doña Ana Zones	1,239,813	34.4	0.07	0.47	0.54

[1] Doña Ana zones are the portion of Doña Ana County, NM, within the El Paso regional travel demand model (TDM)—including the Sunland Park area.

[2] Vehicle miles of travel; units for speed is miles per hour.

Table 2. Winter Weekday Paved Road PM_{10} Emissions Summary (tons/day).

Year	Area[1]	VMT	Speed	Direct Vehicle PM_{10}	Resuspended Dust PM_{10}	PM_{10} Total
2022	El Paso County	20,639,416	37.1	1.25	4.74	5.99
2022	Doña Ana Zones	920,282	35.0	0.06	0.36	0.42
2027	El Paso County	21,569,684	36.1	1.24	5.13	6.37
2027	Doña Ana Zones	1,015,825	34.9	0.06	0.40	0.46
2032	El Paso County	22,587,644	35.8	1.27	5.44	6.71
2032	Doña Ana Zones	1,094,356	35.3	0.07	0.43	0.49
2040	El Paso County	24,145,125	35.0	1.36	5.81	7.16
2040	Doña Ana Zones	1,190,576	34.7	0.07	0.47	0.54
2050	El Paso County	26,349,303	34.0	1.51	6.32	7.83
2050	Doña Ana Zones	1,328,644	33.7	0.08	0.52	0.60

[1] Doña Ana zones are the portion of Doña Ana County, NM, within the El Paso regional TDM—including Sunland Park area.

Table 3. Summer Weekday NO_X and VOC Emissions Summary for the Sunland Park Part of the TX-NM Ozone Nonattainment Area[1] (tons/day).

Year	VMT	Speed	NO_X	VOC
2017 baseline	94,140	28.5	0.08	0.041
2022	117,627	30.5	0.06	0.035
2027	120,516	30.2	0.04	0.024
2032	126,701	31.1	0.03	0.020
2040	129,719	30.8	0.03	0.016
2050	135,453	30.0	0.03	0.015

[1] El Paso regional TDM zones comprising the Sunland Park part of the El Paso-Las Cruces TX-NM ozone nonattainment area, in Doña Ana County, NM.

Table 4. Summer Weekday NOx and VOC Emissions Summary for the El Paso County Part of the TX-NM Ozone Nonattainment Area[1] (tons/day)

Year	VMT	Speed	NO_X	VOC
2022	19,259,508	38.0	11.66	5.51
2027	20,127,582	37.1	8.18	3.99
2032	21,077,483	36.7	6.75	3.27
2040	22,530,833	36.0	6.27	2.69
2050	24,587,643	35.1	6.56	2.59

[1] El Paso regional TDM zones comprising the El Paso County part of the El Paso-Las Cruces TX-NM ozone nonattainment area.

ANALYSIS NOTES

DATE: March 29, 2024

TO: Claudia Valles, Salvador Gonzalez-Ayala (El Paso MPO)

CC: Laura Norton and Janie Temple (TxDOT TPP)

FROM: Transportation Modeling Program (HMP) – Texas A&M Transportation Institute

SUBJECT: El Paso MPO's RMS 2050 Amendment Emission Inventory – Analysis Notes

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1.0 INTRODUCTION – REGIONAL MOBILE SOURCE EMISSION INVENTORIES FOR EL PASO METROPOLITAN PLANNING ORGANIZATION

This document provides analysis summaries and notes related to regional transportation emission inventories performed by the Texas A&M Transportation Institute (TTI) for the El Paso Metropolitan Planning Organization (EPMPO), sponsored by the Texas Department of Transportation (TxDOT). The emission inventories described in this document are based on the amended Regional Mobility Strategy (RMS) 2050 Metropolitan Transportation Plan (MTP) and the RMS 2023-2026 Transportation Improvements Program (TIP). The analysis is of the quality and scope suitable for demonstrating transportation conformity. Inventories development was undertaken from December 2023 to January 2024. The EPMPO required two different analyses to satisfy regulatory requirements:

- El Paso County and Dona Ana County (New Mexico) PM_{10} (particulate matter 10 micrometers or less in diameter) Nonattainment Summer and Winter Weekday Emissions Estimates (described in Section 3).[1]

[1] While the PM10 nonattainment area was initially determined using the city limits, at the time, conformity was demonstrated at the county-level. Further refinement to include only the emissions within the city limits has not been necessary since the PM10 emissions at the county-level do not typically exceed the PM10 emissions budget.

- Sunland Park Ozone Nonattainment Area and El Paso County Summer Weekday Oxides of Nitrogen (NOx) and Volatile Organic Compounds (VOC) Emissions Estimates (Section 4).[2]

Each inventory requires different input data, uses different methodologies, and estimates different pollutants. To ensure that the methods used in each analysis are clear, TTI has developed two separate analysis notes. These analysis notes document the methodologies for each emissions analysis, in Section 3 and Section 4, following the summaries of results for all the emission inventories, in Section 2.

[2] On June 30, 2023, the D.C. Circuit Court reversed EPA's El Paso-Las Cruces TX-NM zone nonattainment area (TX-NM Ozone NAA) designation. As a result, Sunland Park, NM retained its prior nonattainment area status and El Paso, TX reverted to its prior attainment designation. EPA is evaluating response options to this D.C. Circuit decision. The interagency partners have elected to evaluate El Paso County NOx and VOC emissions as part of this conformity analysis in case EPA issues a nonattainment designation for El Paso County in response to the D.C. Circuit decision before completion of this conformity process.

2.0 EMISSIONS SUMMARIES – EL PASO RMS 2050 MTP UPDATE

Table 2-1. Summer Weekday Paved Road PM_{10} Emissions Summary (tons/day).

Year	Area[1]	VMT[2]	Speed[2]	Direct Vehicle PM_{10}	Resuspended Dust PM_{10}	PM_{10} Total
2022	El Paso County	19,259,508	38.0	1.12	4.26	5.38
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2050	Doña Ana Zones	1,239,813	34.4	0.07	0.47	0.54

[1] Doña Ana zones are the portion of Doña Ana County, NM, within the El Paso regional travel demand model (TDM)—including the Sunland Park area.
[2] Vehicle miles of travel; speed is miles per hour.

Table 2-2. Winter Weekday Paved Road PM_{10} Emissions Summary (tons/day).

Year	Area[1]	VMT	Speed	Direct Vehicle PM_{10}	Resuspended Dust PM_{10}	PM_{10} Total
2022	El Paso County	20,639,416	37.1	1.25	4.74	5.99
2022	Doña Ana Zones	920,282	35.0	0.06	0.36	0.42
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2027	Doña Ana Zones	1,015,825	34.9	0.06	0.40	0.46
2032	El Paso County	22,587,644	35.8	1.27	5.44	6.71
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2040	Doña Ana Zones	1,190,576	34.7	0.07	0.47	0.54
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2050	Doña Ana Zones	1,328,644	33.7	0.08	0.52	0.60

[1] Doña Ana zones are the portion of Doña Ana County, NM, within the El Paso regional TDM—including Sunland Park area.

Table 2-3. Summer Weekday NO_X and VOC Emissions Summary for the Sunland Park Ozone Nonattainment Area[1] (tons/day).

Year	VMT	Speed	NO_X	VOC
2017 baseline	94,140	28.5	0.08	0.041
2022	117,627	30.5	0.06	0.035
2027	120,516	30.2	0.04	0.024
2032	126,701	31.1	0.03	0.020
2040	129,719	30.8	0.03	0.016
2050	135,453	30.0	0.03	0.015

[1] El Paso regional TDM zones comprising the Sunland Park ozone nonattainment area, in Doña Ana County, NM.

Table 2-4. Summer Weekday NOx and VOC Emissions Summary for the El Paso County[1] (tons/day)

Year	VMT	Speed	NO_X	VOC
2022	19,259,508	38.0	11.66	5.51
2027	20,127,582	37.1	8.18	3.99
2032	21,077,483	36.7	6.75	3.27
2040	22,530,833	36.0	6.27	2.69
2050	24,587,643	35.1	6.56	2.59

[1] El Paso regional TDM zones comprising El Paso County, exclusively.

3.0 EL PASO COUNTY AND DOÑA ANA COUNTY, NM SUMMER AND WINTER WEEKDAY PM_{10} EMISSIONS ANALYSIS

3.1 SUMMARY

Under the sponsorship of the TxDOT, TTI produced El Paso County and Doña Ana County area on-road mobile source emissions estimate in support of the EPMPO transportation planning efforts. This analysis description is for the PM_{10} nonattainment area within El Paso County, and the portion of the Doña Ana County New Mexico included in the area TDM. Results are representative of typical summer and winter weekdays for 2022, 2032, 2040 and 2050.

TTI used its on-road inventory methodology to produce emissions estimates of the detail and quality suited for state implementation planning for air quality control and transportation conformity analyses. This is the detailed, disaggregate, TDM link-based rates-per-activity emissions estimation process. It uses MOVES3-based county emission rate look-up tables based on local conditions for external emissions calculations performed at detailed, disaggregate, temporal, and spatial levels, using the latest planning assumptions, and latest available data, emissions model (or model authorized within an applicable grace period)[3], and procedures.

Hourly inventories were estimated by MOVES source use type (SUT) and fuel type (FT) combination (or vehicle type) and TDM roadway class. TDMs were post-processed to estimate hourly, directional, link (roadway segment)-level VMT and operational speeds for the roadway-based emissions calculations. Using estimates of vehicle operating hours (VHT), vehicle populations, truck hotelling activity, and other data, TTI estimated hourly off-network activity factors for the parked vehicle-based emissions calculations. Off-network activity types are source-hours-parked (SHP); starts; off-network idling (ONI); and source hours extended idling (SHEI) and auxiliary power unit (APU) hours (emissions-producing components of combination long-haul truck hotelling hours). Off-

[3] The emission model used is EPA's MOVES 3.1.0. The latest version of MOVES is MOVES4 (refered to as just MOVES in this document), which was released on September 12, 2023. A 2-year conformity grace period is in effect with the release and ends on September 12, 2025. After this date, MOVES4 must be used for new transportation conformity analyses. The federal register notifying this release is available at: https://www.federalregister.gov/documents/2023/09/12/2023-19116/official-release-of-the-moves4-motor-vehicle-emissions-model-for-sips-and-transportation-conformity

network evaporative rates (in mass/SHP form, not directly available from MOVES) were produced by a post-processing procedure and were compiled with other rates produced directly by MOVES to yield look-up tables of all rates in activity terms for the external emissions calculations.[4] The analyses used TTI's MOVES-based inventory development utilities for use with MOVES3.[5] EPA's Technical Guidance is the primary reference on appropriate inputs and use of MOVES.[6]

3.2 Scope of Emissions Analysis

1. **Methodology:**
    - Exhaust, tirewear and brakewear emissions: hourly, MOVES rates-per-activity, TDM link-based, with MOVES3 (for on-road mobile modeling).
    - Paved road re-suspended dust: 24-hour, by road type, EPA's AP-42 re-suspended dust model.[7]
2. **Analysis Years:**
    - 2022, 2032, 2040, and 2050.
3. **Seasonal Period:**
    - Summer: Average June-July-August weekday (average Monday through Friday).
    - Winter: Average January-February-December weekday.
4. **Geography:**
    - The portion of Doña Ana County, NM—including the Sunland Park, NM area—within the El Paso regional TDM.
    - El Paso County.

[4] Although not needed for PM analyses, TTI produces these SHP-based hydrocarbon emission rates in the comprehensive set of emission rates look-up tables, developed as a standard part of the inventory process.

[5] TTI Emissions Inventory Estimation Utilities Using MOVES: MOVES2014aUtl User's Guide, TTI, August 2016. (The MOVES2014aUtl user guide also applies to MOVES3 Utilities, except for off-network idling activity and starts activity calculation, seed Appendix B for details.)

[6] MOVES3 Technical Guidance: Using MOVES to Prepare Emission Inventories for Sate Implementation Plans and Transportation Conformity, EPA, November 2020, https://www.epa.gov/sites/default/files/2020-11/documents/420b20052.pdf

[7] AP-42 paved road re-suspended model provided in "AP-42, Fifth Edition, Volume 1, Chapter 13: Miscellaneous Sources, 13.2.1 Paved Roads" (EPA, January 2011, https://www3.epa.gov/ttn/chief/ap42/ch13/index.html).

5. Pollutants:

- PM_{10}.

6. Sources:

Table 3-1. Vehicle Types Modeled in the Inventory.

MOVES SUT	Gasoline*	Diesel*
Motorcycle	MC_G	-
Passenger Car	PC_G	PC_D
Passenger Truck	PT_G	PT_D
Light Commercial Truck	LCT_G	LCT_D
Other Bus	OBus_G	OBus_D
Transit Bus	TBus_G	TBus_D
School Bus	SBus_G	SBus_D
Refuse Truck	RT_G	RT_D
Single Unit Short-Haul Truck	SUShT_G	SUShT_D
Single Unit Long-Haul Truck	SULhT_G	SULhT_D
Motor Home	MH_G	MH_D
Combination Short-Haul Truck	CShT_G	CShT_D
Combination Long-Haul Truck	-	CLhT_D

These vehicle type (SUT/fuel type) labels are referenced later in the document.

7. Link-Based Emissions Estimation Process Components and Utilities:

TTI developed the inventory components and resulting emissions and activity estimates for the analysis using TTI's utilities developed and maintained for this purpose.

a. Inventory Components:

The MOVES3-based emissions estimation process required development of the following major components for the emissions calculations:

- Hourly, directional, link-level, on-road fleet VMT, and average speeds;
- SUT/fuel type (i.e., vehicle type) time-of-day VMT mix;
- Vehicle type populations;[8]
- Hourly, vehicle type SHP;
- Hourly, vehicle type starts;
- Hourly, vehicle type ONI;
- Hourly, diesel combination long-haul truck hotelling (emissions generating SHEI and APU hours components); and

[8] Vehicle populations are an intermediate parameter used in estimating off-network source hours parked and starts activity.

- Hourly vehicle type pollutant and process mass emission rates: mass per mile, mass per SHP, mass per start, mass per SHEI, mass per ONI, and mass per APU hour.

b. Utilities:

TTI used its emissions estimation utilities to produce the input components and the emissions estimates in the tab-delimited hourly and 24-hour emissions and activity summary file formats. The TTI utilities include MOVES emission rates input and output processing utilities, TDM network information post-processing utility, vehicle population and off-network activity development utilities, and the link-level emissions calculation utility.[9] The AP42-based paved road dust emissions were calculated in spreadsheets.

3.3 Development of On-Road Fleet Link-VMT and Speeds

8. Travel Demand Models:

TTI received the El Paso MPO's RMS 2050 Amendment MTP TDM data sets (i.e., trip matrices and four-time-period, directional, average non-summer weekday [ANSWT] traffic assignments), January 2024.[10] Data sets for this analysis included the 2022, 2032, 2040, and 2050 future analysis years. TTI post-processed the data sets to produce average seasonal (i.e., summer and winter) weekday, county-coded[11], hourly, directional, Highway Performance Monitoring System (HPMS)-consistent, network link VMT and volumes and added intrazonal link VMT estimates.[12] Method details are found in MOVES2014a-Based Travel Demand Model Link Emissions Estimation Method (TTI, August 2016).

a. Adjustments to TDM VMT:

The ANSWT network link volumes and VMT and added intrazonal link VMT were factored to be consistent with HPMS VMT, to reflect summer and winter weekday

[9] TTI Emissions Inventory Estimation Utilities Using MOVES: MOVES2014aUtl User's Guide, TTI, August 2016. (The MOVES2014aUtl user guide also applies to MOVES3 Utilities, except for off-network idling activity and starts activity calculation, seed Appendix B for details.)

[10] The EPMPO provided the TDM data sets for 2022, 2032, 2040, and 2050 (January 22, 2024).

[11] To facilitate use of these TDM link-data sets in a separate analysis of the Sunland Park area of Doña Ana County, NM the following county (and partial county) coding was applied: "1" for El Paso County and "2" and "3" for the complete portion of Dona Ana County in the TDM, where "2" is the Dona Ana area excluding the Sunland Park ozone NAA zones, and "3" is exclusively the Sunland Park, NM ozone NAA.

[12] TDM network ANSWT VMT plus intrazonal ANSWT VMT is referred to herein as "total model VMT".

activity, to allocate by hour, and to allocate total link volumes by direction of travel. The seasonal weekday and hourly factors were developed using the latest available nine-year aggregate, TxDOT Automatic Traffic Recorder (ATR) traffic count data (2013-2021) for El Paso County.

i. Historical Year HPMS Consistency and Seasonal Weekday Adjustments:

- HPMS consistency: Historical year not applicable to this analysis.
- Seasonal adjustment: Historical year not applicable to this analysis.

ii. Forecast Years HPMS Consistency and Seasonal Weekday Adjustments:

- HPMS consistency: TTI applied an HPMS adjustment factor to total model link-level VMT for all county and partial county areas for each analysis year. The validation year HPMS adjustment factor was calculated as 2017 El Paso County HPMS VMT (first adjusted to ANSWT form using the ANSWT/AADT ATR count ratio) divided by 2017 validation year total model VMT for El Paso County. See Table 3-6 in Attachment 3.1.
- Seasonal adjustment: Seasonal day-type factors (summer and winter weekday) were produced and used with the 2022, 2032, 2040, and 2050 analysis years. These factors were calculated as the ratio of the seasonal weekday-to-ANSWT counts. See Table 3-7 in Attachment 3.1,

iii. Seasonal Weekday Hourly VMT Distributions:

- Summer and winter weekday, hourly travel factors were developed and used to allocate the 24-hour link VMT/volume estimates to each hour of the day – a single set was used for all analysis years. In order to maintain VMT proportions within each of the four time periods, the hourly fractions were normalized within each time period. See Table 3-8 in Attachment 3.1.

iv. Directional Factors:

- Directional split factors were applied to total link volumes by functional class and area type. The directional factors were created by aggregating TDM link-level volumes by direction for each functional class/area type. Link-level AB directional volumes were divided by total volumes for each functional class/area type to estimate the direction split. These are the same factors applied in the prior El Paso conformity analysis.

b. Hourly Congested Speeds:

TTI estimated directional, hourly operational link speeds using the TTI speed model, which estimates delay on each link as a function of volume-to-capacity and applies it to the link's estimated free-flow speed. TTI estimated the local streets category average operational link speeds represented by the centroid connector links, as centroid connector TDM input speeds; and represented as added intrazonal links, as the average of the zone's centroid connector input speeds.

3.4 Development of Vehicle Type VMT Mix

9. VMT Mix:

The VMT mix designates the vehicle categories included in the analysis and specifies the fraction of on-road fleet VMT attributable to each vehicle type.

a. Method:

VMT mixes were estimated using TTI's VMT mix method.[13] The method sets Texas vehicle registration category aggregations for MOVES SUT categories for developing the VMT mixes, as well as for developing other fleet parameters needed elsewhere in the process (e.g., SUT age distributions, vehicle population estimates).

b. Temporal and Spatial Aspects:

Consistent with the prior analysis, the VMT mixes were produced in five-year increments and applied to analysis years as follows:

- 2015 VMT mix – for 2013 through 2017 analysis years,
- 2020 VMT mix – for 2018 through 2022 analysis years,
- 2025 VMT mix – for 2023 through 2027 analysis years, etc.

No seasonal adjustments are made for VMT mix. Average weekday vehicle type VMT mixes by MOVES road type and by four time-of-day periods (AM Peak, Mid-Day, PM

[13] *"MOVES3 Source Use Type and Fuel Type Vehicle Miles Traveled (VMT) Distribution Update for Conformity Analysis"* (TxDOT Air Quality / Conformity IAC-A - TTI Task 5.3: Maintain, Update and Enhance Traffic Activity Estimation and Forecasting Methods), Texas Department of Transportation, Austin, TX, July 2022.

Peak, Overnight) were estimated for the TxDOT El Paso District for use with the El Paso TDM region.[14]

c. Data Sources:

TTI used the latest available multi-year TxDOT El Paso District vehicle classification counts (2013-2021) along with MOVES3 default data, as needed (i.e., appropriate for each analysis year).

d. Vehicle Types:

The vehicle types in the VMT mix are the 24 gasoline and diesel MOVES SUT combinations shown in Table 3-1.

3.5 Development of Off-Network Activity by Vehicle Type

10. County and Partial County Off-Network Activity:

Off-network activity types that produce PM emissions include vehicle engine starts and long-haul truck extended idling and diesel APU operation during hotelling.[15] Off-network estimates of starts and hotelling activity for El Paso County were first developed using standard county-level procedures. Off-network activity estimates for the adjacent Doña Ana partial county area (in two parts) were then estimated, as the product of the El Paso County off-network activity estimates and Doña Ana target area-to-El Paso County VMT ratios or scaling factors. El Paso County vehicle populations were needed first for estimating county-level vehicle starts.

a. County Vehicle Population Estimates:

Vehicle populations were estimated only at the county-level, not for the partial county areas.[16] The county vehicle population estimates were based on the latest available TxDMV registration data, vehicle type population factors derived from the VMT mix, and county-level VMT-based growth estimates for the future years where actual registration data were not yet available. Since the latest available registration data for this analysis was end-of-year 2021, base vehicle population estimates were needed

[14] Using the same data sets and a similar procedure, aggregate (i.e., 24-hour, all road-types) TxDOT district-level weekday vehicle type VMT mixes were also produced for use in estimating the vehicle populations.

[15] Off-network SHP activity only produces evaporative hydrocarbon emissions and was not required in this PM analysis.

[16] No vehicle population estimates were needed for the Dona Ana partial county off-network activity estimation procedure.

first for the 2021 historical year from which to project the future analysis year estimates. The vehicle population estimates don't vary by season.

i. Historical Year Vehicle Population Estimates:

- TxDMV registration data: Historical year vehicle population estimates are based on TxDMV registrations corresponding to the historical year. This registration data is aggregated into vehicle registrations categories (Table 3-2).
- Vehicle population factors: Since the TxDMV registration data does not include each SUT/fuel type combination, the vehicle population factors are developed according to procedure using the 24-hour VMT mix for the historical year (as designated per Item 9.b). These factors were applied to the aggregated vehicle registration categories to split them into the SUT/fuel type combinations included in the analysis, creating the base (2021) El Paso County vehicle population estimates.

Table 3-2. Vehicle Registration Aggregations and Vehicle Types for Estimating Vehicle Populations.

Vehicle Registration[1] Aggregation	Associated Vehicle Type[2]
Motorcycles	MC_G
Passenger Cars (PC)	PC_G; PC_D
Trucks <= 8,500 gross vehicle weight rating (GVWR) (pounds)	PT_G; PT_D; LCT_G; LCT_D
Trucks > 8,500 and <= 19,500 GVWR	RT_G; RT_D SUShT_G; SUShT_D MH_G; MH_D OBus_G; OBus_D TBus_G; TBus_D SBus_G; SBus_D
Trucks >19,500 GVWR	CShT_G; CShT_D
NA[2]	SULhT_G; SULhT_D CLhT_D

[1] Mid-year TxDMV county registrations data extracts are used, consisting of 1) light-duty cars, trucks, and motorcycles; 2) heavy-duty diesel trucks, and 3) heavy-duty gasoline trucks.

[2] Vehicle population factors are the 24-hour weekday VMT mix fraction for each vehicle type (see Table 3-1 for label definitions) in a category divided by the sum of the VMT mix fractions for all vehicle types in a category, except long-haul trucks. The four long-haul vehicle type populations are estimated using a long-haul-to-short-haul VMT mix ratio applied to the short-haul SUT population estimate.

ii. Future Analysis Year County Vehicle Population Estimates:

- TxDMV registration data: As described for historical year vehicle population estimates, the registration data were aggregated by vehicle registration category. Since registration data were not available for future year analyses, the most recent TxDMV registration data sets (2021 end-of-year) were used.
- Vehicle population factors: As described for historical year vehicle population estimates, vehicle population factors developed using the analysis year 24-hour VMT mix were applied to vehicle registrations aggregated by category to split the categories into the SUT/fuel type combinations included in the analysis, creating the base (2021) El Paso County vehicle population estimates.
- VMT-based growth estimates: For each analysis year, VMT-based growth estimates were calculated by dividing county, analysis year, summer weekday VMT by county, 2021 summer weekday VMT.[17] These growth estimates were applied to the base vehicle population estimates to scale from the 2021 base to each of the future analysis year estimates.

b. ONI Activity:

The most significant change to MOVES3 based EI's is the addition of an off-network activity called Off-Network Idling (ONI). ONI is intended to model light- and heavy-duty vehicles (not including Long-Haul Combination Trucks) that idle in situations such as parking lots, drive-throughs, and school pick up points (e.g., personal light-duty vehicles) or during deliveries (commercial vehicles). MOVES3 defines "idle" as any time in the driving schedules where speed is less than one mile per hour during engine operation. In this way, ONI emissions are always generated from a running engine and are distinct from Heavy Duty Truck hoteling, which represents emissions generated during compulsory breaks in long haul truck operator schedules (either through engine or auxiliary power unit emissions).

The ONI is calculated for each hour of the day using the following formula as provided in the EPA's MOVES3 technical documentation:

$$\text{ONI Hours} = (\text{SHOnetwork} * \text{TIF} - \text{SHI}_{\text{network}}) / (1 - \text{TIF}).$$

Where:

[17] Base, summer weekday 2021 VMT for the scaling factors was calculated as the product of El Paso County 2021 AADT VMT (from TxDOT's RIFCREC data set) and the El Paso County ATR-based AADT to summer weekday conversion factor.

$SHO_{network}$ = the SHO on each link. This is calculated by dividing the VMT associated with each link by the link's congested speed.

$SHI_{network}$ = the total SHI that occurs on the network (idling that occurs as a component of drive cycles) and is calculated by multiplying $SHO_{network}$ by a 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 are used as defined in the MOVES data table *roadidlefraction*.

TIF = the total idle fraction, i.e., the ratio of total source hours idling and total source hours operating. Default values for TIF are used as defined in the MOVES database table *totalidlefraction* (three-month seasonal averages (June, July and August) for summer weekday scenario and three-month averages (December, January and February) for the winter scenario).

c. SHP Activity:

Note that although SHP activity does not result in PM emissions, SHP estimates were needed in the hotelling hours activity analysis, detailed later. County-level SHP was estimated for use both in county-level analyses and as the preliminary step for estimating SHP for the partial county area. SHP was estimated for each year and hour of day.

i. County SHP Estimates:

El Paso County SHP was estimated as a function of total hours (hours a vehicle exists) minus its hours of operation on roads (source hours operating, or SHO, which is the same as VHT) and off-network idling hours (ONI). The vehicle type SHP estimates were calculated for each hour of the day based on the link VMT and speeds, the VMT mix used in the link-based emissions analysis, and the vehicle population estimates.

The VMT mix was applied to the link VMT to produce VMT estimates by vehicle type. Link VMT was divided by the link speed to produce SHO estimates. SHO was aggregated across links, then subtracted from source hours (equal to vehicle population, since source hours equals the number of hours in the period multiplied by the vehicle population, and each period is one hour) resulting in SHP estimates by vehicle type.

ii. Partial County SHP Estimates:

This procedure was performed for the two separately coded portions of the TDM Doña Ana area. For each area, the hourly SHP by vehicle type was estimated by

scaling the El Paso County SHP activity using the ratio of the target Doña Ana area VMT to the El Paso County VMT. The aggregate of the two Doña Ana area weekday SHP by vehicle type estimates comprises the estimate for the complete portion of Doña Ana County in the TDM region.

d. Starts Activity:

County-level vehicle engine starts were first estimated, followed by estimation of the starts for the partial county areas by scaling the county-level estimates.

i. County Estimates:

El Paso County engine 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 are calculated using the applicable MOVES algorithm with data on the age distribution and fuel fractions of the local fleet. Local age distributions and fuelfractions inputs to MOVES are combined with MOVES default parameters (startsageadjustment, startsmonthadjust [three-month seasonal average (June, July and August) for summer weekday scenario and three-month average (December, January, and February) for winter weekday scenario], and startspervehicle) to produce 24-hour starts per vehicle output representative of each seasonal period. The MOVES output provides the scenario-specific starts per vehicle defined by the study scope. For each hour of the day, the starts per vehicle data calculated by the MOVES algorithm are multiplied by the local vehicle type population estimates to produce the total number of starts by vehicle type per hour.

ii. Partial County Estimates:

This procedure was performed for the two separately coded portions of the TDM Doña Ana area. For each area, the hourly starts by vehicle type were estimated by scaling the El Paso County starts activity using the ratio of the target Doña Ana area VMT to the El Paso County VMT. The aggregate of the two Doña Ana area weekday starts by vehicle type estimates is the estimate for the complete portion of Doña Ana County in the TDM region.

e. SHEI and APU Hours as a Function of Hotelling Hours:

During hotelling, the truck's main engine is assumed to be idling, or its diesel APU is in use, or it is using electric power or no power. Hotelling hours were first estimated, followed by the hours attributed to the two emissions-producing hotelling

components, SHEI and diesel APU hours. County-level hotelling activity estimates were first developed, followed by estimates for the partial county areas, scaled from the county activity estimates using VMT ratios.

i. County Estimates:

County, analysis year, seasonal weekday hotelling hours were first estimated using 24-hour weekday hotelling hour estimates for a 2017 hotelling base year (from the recent TCEQ extended idling study); base and analysis year scenario VMT, speeds, and VMT mix; and analysis year scenario SHP estimation data.[18]

The 2017 base year county hotelling hours estimates for a 24-hour winter weekday from the TCEQ study were scaled to each analysis scenario using the ratio of analysis scenario-to-base combination long-haul truck 24-hour VMT (as truck VMT increases, so does the hotelling activity).

The 24-hour hotelling estimates were then distributed to each hour using the hotelling hours distribution calculated as the inverse of the hourly distribution of VHT (or SHO, from the SHP calculation process) for combination long-haul trucks. Within each hour, SHP and hotelling hours were compared, and if hotelling hours exceeded SHP, hotelling hours were set equal to SHP.

The SHEI and APU hours components of hotelling hours were then estimated for each hour using the hourly hotelling hours estimates, combination long-haul truck travel fractions (calculated from local age distributions, and moves default relative mileage accumulation rates), and hotelling activity distributions for each model year (Table 3-3).

The SHEI and APU hours activity distribution fractions were each first multiplied by the travel distribution (model year operating mode activity fraction multiplied by the associated model year travel fraction).

The product of the SHEI fractions and travel fractions were then summed to produce the total SHEI fraction, and the same process was performed for APU hours to produce total APU hours fraction. (The sum of the SHEI and APU hours fractions

[18] Base estimates of hotelling hours are 2017 winter weekday estimates, developed by TTI as part of a truck extended idling study that produced county 24-hour hotelling estimate totals for all Texas counties, sponsored by TCEQ starting in 2017. The base VMT estimates for hotelling scaling factors were developed using 2017 El Paso TDM datasets (provided by the EPMPO in previous RMS 2050 analysis in 2021) and VMT adjustments, VMT mix, and procedures described in Items 8 and 9.

subtracted from 1.0 results in the remaining fraction of hotelling hours, consisting of the electric power or no power in use modes.)

The total SHEI and APU hours fractions were then each multiplied by the hotelling hours for each hour of the day to produce the SHEI and APU hours estimates for each hour.

Table 3-3. Hotelling Activity Distributions by Model Year and OpMode Fraction.

Begin Model Year	End Model Year	200 Extend Idling	201 Diesel Aux	203 Battery AC	204 APU Off
1960	2009	0.8	0	0	0.2
2010	2020	0.73	0.07	0	0.2
2021	2023	0.48	0.24	0.08	0.2
2024	2026	0.4	0.32	0.08	0.2
2027	2060	0.36	0.32	0.12	0.2

ii. Partial County Estimates:

For the partial county area estimates for SHEI and APU hours as a function of hotelling hours, the procedure of applying a VMT ratio to county-level activity was performed. The SHEI and APU hours for each hour for each Doña Ana area were calculated by scaling the El Paso County activity estimates using the ratios by area of the Doña Ana VMT to the El Paso County VMT. The aggregate results of these two areas makes the total of the Doña Ana partial county area in the TDM region.

3.6 Development of Emission Factors by Vehicle Type

11. Emission Factors Overview:

TTI developed emission rates using MOVES and the TTI post-processing utility, Rates Adjustment Utilities, which prepares MOVES3-based, direct vehicle emission rates for input to TTI's external inventory calculation utility, Main Calculation Utilities. The paved road re-suspended dust emission rates and emissions, discussed toward the end of this section, were calculated separately using the EPA's AP-42 model. El Paso County seasonal weekday emission rates were produced for each analysis year for use in estimating emissions for all El Paso regional TDM area analyses.

These on-road emission rates were developed in terms of mass per activity units: miles for roadway-based processes; and SHP, starts, ONI, SHEI, and APU hours for off-network processes. All activity-based rates were directly output by MOVES, except for parked

vehicle evaporative emission rates based in SHP (although not applicable for this PM analysis). TTI used the RatesCalc utility to calculate emission rates in terms of rate/SHP (as a conversion of MOVES rate/vehicle output) using the data in the county (local) input database (CDB) used in the MOVES emission rates run and the MOVES default database. The RatesCalc utility combined the rate/distance, rate/hour (SHEI and APU hours), and rate/start emission rates tables from MOVES output and the calculated rate/SHP emission rates table into a database of rates look-up tables.[19] For additional details on the post-processing of MOVES output, see Attachment 3.2.

Table 3-4 lists the emissions processes with associated activity basis and emission rate units. The emission factors were developed by pollutant, speed, process, hour, road type, and SUT/FT. The MOVES-based emission factors include PM from exhaust, tire wear, and brake wear, whereas the paved road re-suspended dust estimates were calculated separately using the EPA's AP-42 model (see Item 11.d).

Table 3-4. MOVES On-Road Emission Rates Modeled by Process and Activity Factor.

Emissions Process	Activity[1]	Emission Factor Units
Running Exhaust Crankcase Running Exhaust	VMT	mass/mile (mass/mi)
Brake Wear	VMT	mass/mi
Tire Wear	VMT	mass/mi
Start Exhaust Crankcase Start Exhaust	starts	mass/start
Extended Idle Exhaust Crankcase Extended Idle Exhaust	SHEI	mass/SHEI
Auxiliary Power Exhaust	APU Hours	mass/APU hour
Off-network Idling Exhaust[2]	ONI Hours	mass/ONI hour
Evaporative Permeation Evaporative Fuel Vapor Venting Evaporative Fuel Leaks	VMT, SHP	mass/mi, mass/SHP

[1] The amount of travel on roads (VMT), SHP, vehicle starts, ONI, SHEI and APU hours are the basic activity factors. SHEI and APU hours are for combination long-haul trucks only. Evaporative (hydrocarbon) permeation, fuel vapor venting, and fuel leaks occur both during operation and while parked.

[2] The Off-network idling exhaust is in the rateperdistance table with MOVES roadtypeID = 1.

[19] Although SHP-based rates are for hydrocarbon evaporative emissions only, not required for this PM analysis, these rates were produced in order to have the comprehensive set pollutant emission rates available for other analyses.

a. MOVES Model Inputs:

All of the user-specified model settings and inputs for each run were contained in a MOVES run specification (MRS) and a CDB (the MOVES3 default database used was "MOVESDB20221007"). See Attachment 3.2 for details on the MRS files and CDBs developed for El Paso County and used to estimate the seasonal weekday emission factors for each analysis year for all areas in the El Paso TDM region.

b. Emission Factor Post-Processing Adjustments:

No emission rate adjustments were applied (e.g., El Paso County is not in the Texas Low Emissions Diesel [TxLED] program so no TxLED NOx adjustments were applied [also, TxLED is not relevant to PM emissions]).

c. Emissions Controls Modeling:

Table 3-5 shows the modeling approaches used for the emissions control strategies. Unless otherwise stated, the control strategy was modeled in all years and seasons.

Table 3-5. Emission Control Strategies and Modeling Approaches.

Strategy	Approach
Federal Motor Vehicle Control Program Standards	*MOVES defaults.*
Federal Heavy-Duty Diesel Engines Rebuild and 2004 Pull-Ahead Programs to Mitigate NOx Off-Cycle Effects	*MOVES defaults.*
Gasoline Fuel – Tier 2/Tier 3 sulfur standards, Low Summer Reid Vapor Pressure (RVP), Winter Oxygenate	*Locality-specific user inputs to MOVES*. TTI produced summer 2022 and later (future year) conventional gasoline inputs consistent with pertinent federal and state rules, based on a combination of El Paso fuel sample data and MOVES defaults or other expected future year values. In the absence of local winter fuel survey data, MOVES default winter gasoline formulations were used for the MOVES fuel region specified for El Paso County. Fuel formulations are provided in Attachment 3.2.
Federal Low Sulfur Diesel Fuel	*Locality-specific user inputs to MOVES.* Diesel sulfur input values were set for expected future year values (within the applicable federal diesel sulfur standard and consistent with Texas observed values in the last four TCEQ statewide diesel fuel surveys). Diesel formulations are provided in Attachment 3.2.
Inspection and Maintenance (I/M) Program	*Locality-specific user inputs to MOVES*. TTI developed El Paso I/M Program inputs to MOVES using the available MOVES I/M parameters pertaining to the domain of subject I/M vehicles, consistent with current program descriptions and latest I/M modeling protocols. Attachment 3.2 provides a summary of the I/M program input parameters used, to include updated I/M compliance factors developed based on the latest MOVES technical guidance (EPA November 2020) and El Paso- and Texas-specific I/M program statistics (waiver, failure, and compliance rates) (TCEQ March 2021).

d. Re-Suspended Dust PM_{10} Emission Factors from Paved and Unpaved Roads:

i. Paved Roads:

Re-suspended dust emission factors from paved roads (i.e., TDM network and intrazonal links) were developed according to equation (2) in AP-42 section 13.2.1 (EPA, January 2011). The input parameters are PM_{10} particle size multiplier, road surface silt loading, average vehicle weight, days with at least 0.01 inches precipitation for the seasonal period, and number of days in the seasonal averaging period. The PM_{10} particle size multiplier from the referenced EPA AP-42 guidance was used. The road surface silt loading values were consistent with the PM_{10} State Implementation Plan (SIP). The average vehicle weight values were consistent with

the current VMT mix. Since the climate data used in the MOVES analysis is required to be consistent with the SIP, the days with at least 0.01 inches precipitation for the seasonal period and number of days in the seasonal averaging period used were consistent with prior El Paso MTP analyses. Because control programs (i.e., street sweeping) affect the road surface silt loading and controlled silt loading values are not available, as in the prior El Paso MTP analyses, no control programs were included in the development of the re-suspended dust emission factors and have not been necessary to pass the PM_{10} emissions budget test. While the PM_{10} nonattainment area was initially determined using the city limits, at the time, conformity was demonstrated at the county-level. Further refinement to include only the emissions within the city limits has not been necessary since the PM_{10} emissions at the county-level do not typically exceed the PM_{10} emissions budget.

ii. Unpaved Roads:

No unpaved road emission factor analyses were performed under the assumption that there were no unpaved roads in any of the new TDM networks.

ATTACHMENT 3.1
ADJUSTMENTS TO TDM VMT

Table 3-6. HPMS Factor.

2017 HPMS AADT VMT[1]	AADT-to-ANSWT Factor	HPMS-Based ANSWT VMT	2017TDM VMT[1]	HPMS Factor[2]
17,191,534.000	1.090110	18,740,663.000	18,069,906.000	1.037120

[1] El Paso County.
[2] Applied to all analysis years and areas in the El Paso region TDM.

Table 3-7. Analysis Year Seasonal Weekday Factors.

Year	Seasonal Factor Type[1]	Factor
2022 and later	ANSWT-to-SWKD	0.96285
2022 and later	ANSWT-to-WWKD	1.03184

[1] SWKD and WWKD are summer weekday and winter weekday, respectively.

Table 3-8. Hourly VMT Distributions.

Period	Hour	Summer Fractions 24 Hour Period	Summer Fractions Four-Period[1]	Winter Fractions 24 Hour Period	Winter Fractions Four-Period[1]
AM Peak	7-8 a.m.	0.061580	0.343633	0.063090	0.344417
AM Peak	8-9 a.m.	0.062322	0.347773	0.064049	0.349653
AM Peak	9-10 a.m.	0.055301	0.308594	0.056040	0.30593
Mid-Day	10-11 a.m.	0.053025	0.184042	0.053491	0.18291
Mid-Day	11 a.m-12 p.m.	0.055167	0.191477	0.055808	0.190832
Mid-Day	12-1 p.m.	0.058213	0.202049	0.058949	0.201573
Mid-Day	1-2 p.m.	0.059641	0.207006	0.060769	0.207796
Mid-Day	2-3 p.m.	0.062067	0.215426	0.063428	0.216889
PM Peak	3-4 p.m.	0.066343	0.244438	0.069107	0.245993
PM Peak	4-5 p.m.	0.070696	0.260477	0.074336	0.264606
PM Peak	5-6 p.m.	0.072223	0.266103	0.074267	0.26436
PM Peak	6-7 p.m.	0.062148	0.228982	0.063221	0.225041
Overnight	7-8 p.m.	0.048714	0.186448	0.047639	0.195687
Overnight	8-9 p.m.	0.039459	0.151025	0.036502	0.149939
Overnight	9-10 p.m.	0.032720	0.125233	0.029863	0.122668
Overnight	10-11 p.m.	0.025940	0.099283	0.023235	0.095443
Overnight	11 p.m.-12 a.m.	0.018508	0.070838	0.016362	0.06721
Overnight	12-1 a.m.	0.010813	0.041386	0.009656	0.039664
Overnight	1-2 a.m.	0.007174	0.027458	0.006595	0.02709
Overnight	2-3 a.m.	0.005817	0.022264	0.00549	0.022551
Overnight	3-4 a.m.	0.005831	0.022318	0.005575	0.0229
Overnight	4-5 a.m.	0.008485	0.032475	0.007866	0.032311
Overnight	5-6 a.m.	0.019771	0.075672	0.017402	0.071482
Overnight	6-7 a.m.	0.038042	0.145602	0.037260	0.153053

[1] To maintain VMT proportions within the four periods, the hourly fractions were normalized within each period.

ATTACHMENT 3.2
MOVES RUN SPECIFICATIONS (MRS), COUNTY DATABASES (CDB), OUTPUTS, AND POST-PROCESSING

MOVES Inputs and Output – El Paso County and the Portion of Doña Ana, NM within the TDM:

- MRS input files: One for each season (summer, winter) and analysis year (8).
- CDB inputs: One for each analysis year (4).
- The MOVES default input database (MOVESDB20221007).
- MOVES output databases: One per MOVES run (8).
- MOVES run log output text files: One per MOVES run (8).

Table 3-9 describes the MOVES3 run specification files used. Table 3-10 describes the CDBs built and used for the rates analysis. Unless otherwise stated, inputs were used for all years and seasons.

Table 3-9. MOVES Run Specification Selections by GUI Panel.

Navigation Panel	Detail Panel	Selection		
Scale	Model; Domain/Scale; Calculation Type	On-Road; County; Emission Rates		
Time Spans[1]	Time Aggregation Level; Years – Months – Days – Hours	Hour; <***Year***>[1] - <***Month***>[1] - Weekday - All		
Geographic Bounds[1]	Region; Selections;	Zone and Link; Texas – El Paso County;		
On-Road Vehicle Equipment	SUT/Fuel Combinations	SUT	Gasoline	Diesel
		Motorcycle	X	-
		Passenger Car	X	X
		Passenger Truck	X	X
		Light Commercial Truck	X	X
		Other Bus	X	X
		Transit Bus	X	X
		School Bus	X	X
		Refuse Truck	X	X
		Single Unit Short-Haul Truck	X	X
		Single Unit Long-Haul Truck	X	X
		Motor Home	X	X
		Combination Short-Haul Truck	X	X
		Combination Long-Haul Truck	-	X
Road Type	Selected Road Types	Off-Network – Rural Restricted Access – Rural Unrestricted Access – Urban Restricted Access – Urban Unrestricted Access		
Pollutants and Processes[2]	Primary Exhaust PM_{10}; Primary PM_{10} Brakewear; Primary PM_{10} Tirewear.	Dependent on pollutant: Running Exhaust, Start Exhaust, Extended Idle Exhaust, Auxiliary Power Exhaust, Crankcase Running Exhaust, Crankcase Start Exhaust, Crankcase Extended Idle Exhaust, Brakewear, Tirewear		
Create Input Database	Domain Input Database	<***County Input Database Name***>[1]		
General Output[1]	Output Database; Units; Activity	<***MOVES Output Database Name***>[1]; Grams, KiloJoules, Miles; Hotelling Hours, Population, Starts (not adjustable, pre-selected)		
Output Emissions Detail	Always; For All Vehicles/Equipment; On Road	Time: Hour – Location: Link – Pollutant; Fuel Type, Emissions Process; Source Use Type		
Advanced Features	Aggregation and Data Handling	All check boxes "un-checked" except "clear BaseRateOutput after rate calculations" box		

[1] Year and season labels were included in the MRS file, input CDB, and output database names. Months January and July were used, respectively, to represent winter and summer runs.

[2] Pre-requisite pollutants that were needed to model the reported pollutants are not shown.

Table 3-10. MOVES CDB Input Tables.

Input Table[2]	Category	Notes
year	Time	Designates analysis year as a base year (base year means that local activity inputs will be supplied rather than forecast by the model).
state	Geography	Identifies the state (Texas) for the analysis.
county	Geography/ Meteorology	Identifies county with local altitude and barometric pressure (BP). Used 2017 annual average BP based on El Paso County weather station data provided by TCEQ (from 2017 periodic emissions inventory).
zonemonthhour	Meteorology	Summer / winter hourly temperature and relative humidity for the county. 2017 averages: June-July-August; December-January-February, from TCEQ's El Paso County 2017 periodic emissions inventory.
roadtype	Activity	Lists the MOVES road types and associated ramp activity fractions. Road type ramp fractions were set to 0.
hpmsvtypeyear[1]	Activity (Defaults)	Used MOVES default national annual VMT by HPMS vehicle type.
roadtypedistribution[1]	Activity (Defaults)	Used MOVES default road type VMT fractions.
startsageadjustment[1]	Activity (Defaults)	Used MOVES default starts age adjustment fractions.
totalidlefraction[1]	Activity (Defaults)	Used MOVES default seasonal average total idle fractions.
startsperdaypervehicle[1]	Activity (Defaults)	Used MOVES default starts per day per vehicle.
startshourfraction[1]	Activity (Defaults)	Used MOVES default starts hour fractions.
startsmonthadjust[1]	Activity (Defaults)	Used MOVES default seasonal average starts month adjustment fractions. For summer season, use average value from June, July and August. For winter season, use average value from December, January and February.
startsopmodedistribution[1]	Activity (Defaults)	Used MOVES default starts operating mode fractions.
monthvmtfraction[1]	Activity (Defaults)	Used MOVES default seasonal average VMT fractions.
dayvmtfraction[1]	Activity (Defaults)	Used MOVES default day VMT fractions.
hourvmtfraction[1]	Activity (Defaults)	Used MOVES default hour VMT fractions.
avgspeeddistribution[1]	Activity (Defaults)	Used MOVES default average speed distributions.
sourcetypeyear[1]	Fleet (Defaults)	Used MOVES default national SUT populations.
sourcetypeage-distribution	Fleet	Estimated SUT age fractions using latest available (end-of-year 2021) TxDMV county vehicle registration data and analysis year MOVES defaults, as needed (i.e., for refuse trucks, buses, and motorhomes).
avft	Fleet	Estimated SUT fuel fractions using TxDMV vehicle registration data and MOVES defaults, where needed. Local data sets used were consistent with sourcetypeagedistribution tables. The avft estimate is also consistent with the analysis VMT mix (i.e., gasoline and diesel).
zone	Activity	Start, hotelling, and SHP zone allocation factors. County = zone, and all factors were set to 1.0 (required for county scale analyses).
zoneroadtype	Activity	SHO zone/roadtype allocation factors. County = zone, and all factors were set to 1.0 (required for county scale analyses).
fuelsupply	Fuel	For each analysis year and season, the local fuel supply will consist of one conventional gasoline formulation and one biodiesel formulation. (Although only the predominant fuels gasoline and diesel were modeled, the other MOVES fuel type formulations were also input as required to run the MOVES model.)

Input Table[2]	Category	Notes

fuelformulation	Fuel	• Conventional gasoline (CG) formulations based on TCEQ's summer 2023 (latest available) fuel survey samples from El Paso County.
		  ○ The 2022 CG properties are actual 2023 averages (fuel grade averages weighted by relative sales volumes).
		  ○ The Future Years (2024+) CG properties are latest available actual 2023 averages except with RVP, average sulfur level, and average benzene content set to the "expected" values (MOVES3 defaults, consistent with the pertinent regulatory standards).
		• The 2022 diesel sulfur level is the statewide average from TCEQ's 2023 survey.
		• Future years (2024+) diesel sulfur was set to the current expected future year value (MOVES3 default - 6 ppm), which is conservative and consistent with the statewide diesel sulfur average from TCEQ's latest (2023) survey.
		• The latest available (2021) DOE state-level transportation sector BD consumption estimates is applied for all future analysis years.
		• Fuel subtype IDs 12 and 21 are 10% ethanol-blend gasoline and biodiesel, respectively.

countyyear	Stage II	N/A
imcoverage	I/M	• Begin and end model year define the range of model years covered –calculated as YearID – 24, and YearID – 2. • For future years, I/M compliance factor estimates calculated by TTI using TCEQ 2021 statewide compliance data and MOVES3 I/M compliance factor equation in MOVES3 Technical Guidance (Source: E- mail from Mobile Source Programs Team, values confirmed January 11, 2023, Based on Calendar Year 2021 I/M Program Data); El Paso I/M-program- specific I/M waiver rates and failure rates, and statewide average I/M compliance rates; in combination with MOVES3 regulatory class coverage adjustments. • The model processes/pollutants affected are start and running exhaust HC, CO, NOx, and tank vapor venting HC; fuel type is gasoline; frequency is annual.
hotellingactivity-distribution	Activity (Default)	Used the MOVES default activity distributions.

[1] Use of default activity and population inputs for the MOVES rates mode runs basic to the rates-per-activity emissions estimation method, which calculates the emissions inventory estimates via post-processing. The process uses the local vehicle activity estimates externally in the emissions calculations.
[2] Other optional (empty) tables, not listed here, were included in the CDBs.

Table 3-11 summarizes the meteorological inputs used. Table 3-12 summarizes the fuel formulation inputs used. Table 3-13 summarizes the I/M inputs used. Age distribution and fuel fraction inputs are summarized in Attachment 3.3.

Table 3-11. Meteorological Inputs to MOVES for El Paso County.

Hour	Summer Temperature	Summer Relative Humidity	Winter Temperature	Winter Relative Humidity
12:00 a.m.	79.77	42.73	48.57	45.01
1:00 a.m.	78.51	45.05	47.44	46.81
2:00 a.m.	77.31	47.11	46.44	48.65
3:00 a.m.	76.27	49.05	45.46	50.32
4:00 a.m.	75.38	50.63	44.62	51.63
5:00 a.m.	74.47	52.45	43.71	53.29
6:00 a.m.	73.96	53.51	43.08	54.26
7:00 a.m.	75.19	51.26	43.39	52.85
8:00 a.m.	77.54	46.95	45.76	48.11
9:00 a.m.	80.13	42.42	48.91	43.16
10:00 a.m.	82.81	37.98	52.31	38.25
11:00 a.m.	85.38	33.88	55.29	34.22
12:00 p.m.	87.54	30.66	57.39	31.80
1:00 p.m.	89.27	28.03	59.07	29.61
2:00 p.m.	90.68	25.90	60.29	27.94
3:00 p.m.	91.85	24.01	60.83	27.40
4:00 p.m.	92.09	24.18	60.37	28.06
5:00 p.m.	91.62	24.77	58.77	30.20
6:00 p.m.	90.74	25.75	56.88	32.70
7:00 p.m.	89.02	28.24	55.16	35.17
8:00 p.m.	86.68	32.05	53.66	37.07
9:00 p.m.	84.78	34.61	52.16	39.26
10:00 p.m.	82.97	37.00	50.77	41.34
11:00 p.m.	81.28	40.04	49.58	42.97

Average hourly from weather stations within El Paso County—June through August 2017 and December, January, and February 2017 (provided by TCEQ). Temperature units are degrees Fahrenheit and relative humidity is percent. The annual average barometric pressure input value in units of inches of Mercury was 26.169.

Table 3-12. MOVES Gasoline and Diesel Future Year Fuel Formulation Inputs for El Paso County.

Fuel Parameter	Units	Gasoline[1] Summer 2022	Gasoline[1] Summer 2024+	Gasoline[1] Winter 2022+	Diesel[2] Summer and Winter 2022	Diesel[2] Summer and Winter 2024+
Fuel Formulation ID	-	2373	2473	2313	30236	30600
Fuel Subtype ID	-	12	12	12	21	21
RVP	psi	7.11	7.00	11.50	0	0
Sulfur Level	ppm	9.39	10.00	10.00	5.91	6.00
ETOH Volume	vol. %	9.89	9.89	10.00	0	0
MTBE Volume	vol. %	0.00	0.00	0	0	0
ETBE Volume	vol. %	0.00	0.00	0	0	0
TAME Volume	vol. %	0.00	0.00	0	0	0
Aromatic Content	vol. %	27.10	27.10	22.90	0	0
Olefin Content	vol. %	5.62	5.62	11.14	0	0
Benzene Content	vol. %	1.07	0.70	0.67	0	0
e200	vap. %	45.96	45.96	49.86	0	0
e300	vap. %	85.80	85.80	85.17	0	0
Vol to Wt Percent Oxy	-	0.3653	0.3653	0.3653	0	0
BioDieselEster Volume	vol. %	N/A	N/A	N/A	3.13	3.13
Cetane Index	-	N/A	N/A	N/A	N/A	N/A
PAH Content	-	N/A	N/A	N/A	N/A	N/A
T50	deg. F	207.76	207.76	199.39	0	0
T90	deg. F	315.98	315.98	320.54	0	0

[1] Summer conventional gasoline (CG) - TTI based the CG formulations on TCEQ's summer 2023 (latest available) fuel survey samples from El Paso County. The 2022 CG properties are actual 2023 averages (fuel grade averages weighted by relative sales volumes. The Future Years (2024+) CG properties are latest available actual 2023 averages except with RVP, average sulfur level, and average benzene content set to the "expected" values (MOVES3 defaults, consistent with the pertinent regulatory standards. Winter CG – MOVES defaults in the absence of local data. Fuel subtype ID 12 is 10% ethanol-blend gasoline.

[2] The BD ester volume percentages for 2022 were based on the latest available (2021) DOE state-level transportation sector BD consumption estimates. Future years (2024+) diesel sulfur was set to the current expected future year value (6 ppm), which is conservative and consistent with the statewide diesel sulfur average from TCEQ's latest (2023) survey Fuel subtype ID 21 is biodiesel.

Table 3-13. MOVES I/M Inputs for El Paso County.

Factor	I/M Information	
Test Standards Description	Exhaust OBD Check	Evaporative Gas Cap and OBD Check
Test Standards ID	51	45
Year ID	2022, 2032, 2040, 2050	2022, 2032, 2040, 2050
Source Use Type	21, 31, 32	21, 31, 32
Begin Model Year	X	X
End Model Year	Y	Y
I/M Compliance	21 – 94.00% 31 – 90.35% 32 – 70.74%	21 – 94.00% 31 – 90.35% 32 – 70.74%

POST-PROCESSING OUTPUT:

Each MOVES output database was post-processed using TTI's MOVES emission rates post-processing utility, Rates Adjustment Utility, to produce the final on-road rate tables for subsequent input to the EmsCalc inventory calculation utility.

- Rates Calculation Rate Databases: Mass/SHP off-network evaporative process rates were calculated using data from the CDB, the MOVES default database, and the MOVES rateperprofile and ratepervehicle emission rate output. RatesCalc also copied mass/mile, mass/start, and mass/hour rates along with the units into emission rate tables. RatesCalc does not perform any unit conversions. The utility created the emission rate look-up tables ttirateperdistance, ttirateperstart, ttirateperhour (for SHEI and APU hours), and ttiratepershp in a "ratescalc" output database by county, analysis year, and season. (When the RatesAdj utility is not subsequently applied, RatesCalc produces the final rates inputs to emission calculation module in the Main Calculation Utilities.)
- RatesAdj Final Rate Databases: Not Applicable. The Texas Low Emission Diesel Program (TxLED) is not applicable to El Paso County; thus, the RatesAdj utility was not used.[20]

[20] The TxLED counties list may be found at: https://www.tceq.texas.gov/airquality/mobilesource/txled/txled-affected-counties.

Table 3-14. Estimated TxLED Fuel NO_X Reductions and Adjustments.[1]

Diesel Fuel Source Use Type	NO_X Reduction	NO_X Reduction	NO_X Reduction	NO_X Adjustment	NO_X Adjustment	NO_X Adjustment
Passenger Car	-	-	-	-	-	-
Passenger Truck	-	-	-	-	-	-
Light Commercial Truck	-	-	-	-	-	-
Intercity Bus	-	-	-	-	-	-
Transit Bus	-	-	-	-	-	-
School Bus	-	-	-	-	-	-
Refuse Truck	-	-	-	-	-	-
Single Unit Short-Haul Truck	-	-	-	-	-	-
Single Unit Long-Haul Truck	-	-	-	-	-	-
Motor Home	-	-	-	-	-	-
Combination Short-Haul Truck	-	-	-	-	-	-
Combination Long-Haul Truck	-	-	-	-	-	-

[1] The Texas Low Emission Diesel Program (TxLED) is **not applicable** to El Paso County.

ATTACHMENT 3.3
SOURCE TYPE AGE AND FUEL ENGINE FRACTIONS INPUTS TO MOVES

El Paso County 2022 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061109	0.055527	0.053193	0.053193	0.056712	0.056712	0.056712	0.058830	0.058850	0.078534	0.058830	0.050561	0.041768
1	0.050378	0.056150	0.045311	0.045311	0.054123	0.054106	0.054188	0.057207	0.080111	0.086004	0.057707	0.069567	0.066506
2	0.050775	0.059589	0.054931	0.054931	0.055509	0.055475	0.055721	0.058115	0.087826	0.118415	0.058718	0.071275	0.071530
3	0.048986	0.064477	0.044521	0.044521	0.057747	0.057590	0.058060	0.059567	0.070243	0.085213	0.060634	0.059470	0.058414
4	0.047893	0.069579	0.047230	0.047230	0.054689	0.054317	0.054837	0.056858	0.071409	0.091973	0.058827	0.048110	0.049151
5	0.057333	0.068612	0.045069	0.045069	0.074533	0.085101	0.079523	0.029762	0.061721	0.071366	0.016485	0.091618	0.071145
6	0.053557	0.072800	0.041529	0.041529	0.069771	0.081389	0.070564	0.030339	0.068359	0.082595	0.016659	0.088425	0.074465
7	0.053160	0.062904	0.044286	0.044286	0.060409	0.067195	0.067307	0.036236	0.045483	0.044593	0.016743	0.063479	0.053846
8	0.049285	0.057941	0.031382	0.031382	0.055327	0.065808	0.061977	0.031568	0.033641	0.040108	0.015368	0.047071	0.051710
9	0.044018	0.047698	0.028688	0.028688	0.034433	0.048393	0.033696	0.027389	0.053557	0.056656	0.018548	0.043656	0.048562
10	0.028021	0.036343	0.029305	0.029305	0.029650	0.051474	0.033584	0.027111	0.039562	0.038823	0.009555	0.023684	0.024705
11	0.024245	0.036152	0.028044	0.028044	0.025677	0.039830	0.033422	0.019757	0.021172	0.013596	0.017857	0.022719	0.016595
12	0.052564	0.028406	0.022780	0.022780	0.027077	0.050010	0.029823	0.014265	0.016955	0.012800	0.002982	0.027916	0.023001
13	0.047198	0.041596	0.042755	0.042755	0.029492	0.046329	0.036177	0.025485	0.053647	0.032343	0.005197	0.018561	0.020762
14	0.057035	0.041405	0.044972	0.044972	0.028926	0.040519	0.035494	0.021151	0.027003	0.021687	0.019438	0.047368	0.062512
15	0.046800	0.033595	0.041038	0.041038	0.029104	0.027225	0.030057	0.059913	0.038575	0.024019	0.032680	0.032519	0.040433
16	0.039348	0.030580	0.039036	0.039036	0.034927	0.022711	0.027743	0.047960	0.029335	0.020335	0.043523	0.029624	0.034685
17	0.028219	0.025338	0.042056	0.042056	0.020687	0.016423	0.023548	0.040056	0.022966	0.015496	0.033634	0.014403	0.019448
18	0.034380	0.022210	0.036238	0.036238	0.019535	0.016462	0.024879	0.033159	0.018839	0.012645	0.051458	0.014849	0.017455
19	0.023649	0.017719	0.034541	0.034541	0.024711	0.016309	0.017824	0.035884	0.016148	0.010705	0.038318	0.010765	0.013339
20	0.019475	0.013719	0.032283	0.032283	0.021967	0.014417	0.020167	0.031550	0.014802	0.010759	0.035387	0.015517	0.018454
21	0.013315	0.012059	0.027594	0.027594	0.024376	0.012688	0.021804	0.032852	0.014982	0.007620	0.022936	0.027025	0.025904
22	0.013116	0.008694	0.021478	0.021478	0.027701	0.008321	0.018533	0.039122	0.012739	0.007333	0.042231	0.019081	0.019376
23	0.009738	0.006888	0.016782	0.016782	0.015783	0.005092	0.009533	0.031213	0.005562	0.003379	0.064419	0.013141	0.014545
24	0.005564	0.005044	0.017267	0.017267	0.012354	0.002603	0.008635	0.019193	0.008792	0.003474	0.028707	0.009132	0.010195
25	0.006061	0.003633	0.010978	0.010978	0.010791	0.001102	0.007260	0.012293	0.004127	0.001743	0.047431	0.006756	0.009878
26	0.004173	0.003347	0.011726	0.011726	0.008023	0.001401	0.005992	0.015208	0.004306	0.001780	0.024489	0.006831	0.009086
27	0.003478	0.002337	0.010978	0.010978	0.007756	0.000240	0.006329	0.016688	0.003140	0.001022	0.026536	0.005197	0.006409
28	0.002385	0.001916	0.007342	0.007342	0.005730	0.000419	0.003086	0.010174	0.002602	0.000805	0.027557	0.005346	0.005075
29	0.001789	0.001463	0.005673	0.005673	0.004844	0.000057	0.003461	0.007680	0.001974	0.000530	0.016069	0.002970	0.003028
30	0.022953	0.012280	0.040996	0.040996	0.017635	0.000284	0.010061	0.013416	0.011573	0.003653	0.031075	0.013364	0.018016

El Paso County 2032 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061109	0.055527	0.053193	0.053193	0.052873	0.052873	0.052873	0.055729	0.058850	0.078534	0.055729	0.050561	0.041768
1	0.050378	0.056150	0.045311	0.045311	0.052415	0.052169	0.052421	0.055236	0.080111	0.086004	0.055315	0.069567	0.066506
2	0.050775	0.059589	0.054931	0.054931	0.051766	0.051188	0.051751	0.054443	0.087826	0.118415	0.054267	0.071275	0.071530
3	0.048986	0.064477	0.044521	0.044521	0.051349	0.050353	0.051183	0.054067	0.070243	0.085213	0.054038	0.059470	0.058414
4	0.047893	0.069579	0.047230	0.047230	0.051261	0.050041	0.050996	0.054112	0.071409	0.091973	0.055229	0.048110	0.049151
5	0.057333	0.068612	0.045069	0.045069	0.050813	0.049435	0.050500	0.053448	0.061721	0.071366	0.054865	0.091618	0.071145
6	0.053557	0.072800	0.041529	0.041529	0.049797	0.048274	0.049430	0.052230	0.068359	0.082595	0.054917	0.088425	0.074465
7	0.053160	0.062904	0.044286	0.044286	0.048668	0.047038	0.048278	0.051147	0.045483	0.044593	0.054121	0.063479	0.053846
8	0.049285	0.057941	0.031382	0.031382	0.047235	0.045476	0.046826	0.049829	0.033641	0.040108	0.053142	0.047071	0.051710
9	0.044018	0.047698	0.028688	0.028688	0.046569	0.044675	0.046082	0.049011	0.053557	0.056656	0.053078	0.043656	0.048562
10	0.028021	0.036343	0.029305	0.029305	0.045292	0.043270	0.044765	0.047609	0.039562	0.038823	0.051978	0.023684	0.024705
11	0.024245	0.036152	0.028044	0.028044	0.041351	0.039366	0.040865	0.044604	0.021172	0.013596	0.049222	0.022719	0.016595
12	0.052564	0.028406	0.022780	0.022780	0.040570	0.038443	0.040136	0.043732	0.016955	0.012800	0.048459	0.027916	0.023001
13	0.047198	0.041596	0.042755	0.042755	0.039837	0.037450	0.039391	0.042710	0.053647	0.032343	0.047827	0.018561	0.020762
14	0.057035	0.041405	0.044972	0.044972	0.035638	0.033107	0.035050	0.038996	0.027003	0.021687	0.044571	0.047368	0.062512
15	0.046800	0.033595	0.041038	0.041038	0.046277	0.049108	0.048324	0.019628	0.038575	0.024019	0.012048	0.032519	0.040433
16	0.039348	0.030580	0.039036	0.039036	0.041359	0.044644	0.040872	0.019257	0.029335	0.020335	0.011747	0.029624	0.034685
17	0.028219	0.025338	0.042056	0.042056	0.034175	0.034970	0.037130	0.022168	0.022966	0.015496	0.011414	0.014403	0.019448
18	0.034380	0.022210	0.036238	0.036238	0.029866	0.032563	0.032579	0.018553	0.018839	0.012645	0.010083	0.014849	0.017455
19	0.023649	0.017719	0.034541	0.034541	0.017762	0.022768	0.016896	0.015533	0.016148	0.010705	0.011775	0.010765	0.013339
20	0.019475	0.013719	0.032283	0.032283	0.014379	0.022614	0.015794	0.014605	0.014802	0.010759	0.005780	0.015517	0.018454
21	0.013315	0.012059	0.027594	0.027594	0.011897	0.016640	0.014992	0.010268	0.014982	0.007620	0.010449	0.027025	0.025904
22	0.013116	0.008694	0.021478	0.021478	0.011936	0.019748	0.012698	0.007121	0.012739	0.007333	0.001681	0.019081	0.019376
23	0.009738	0.006888	0.016782	0.016782	0.012401	0.017380	0.014670	0.012233	0.005562	0.003379	0.002824	0.013141	0.014545
24	0.005564	0.005044	0.017267	0.017267	0.011596	0.014411	0.013695	0.009780	0.008792	0.003474	0.010206	0.009132	0.010195
25	0.006061	0.003633	0.010978	0.010978	0.011104	0.009147	0.011010	0.026628	0.004127	0.001743	0.016553	0.006756	0.009878
26	0.004173	0.003347	0.011726	0.011726	0.012689	0.007228	0.009658	0.020483	0.004306	0.001780	0.021245	0.006831	0.009086
27	0.003478	0.002337	0.010978	0.010978	0.007153	0.004940	0.007784	0.016464	0.003140	0.001022	0.015855	0.005197	0.006409
28	0.002385	0.001916	0.007342	0.007342	0.006508	0.004748	0.007910	0.013223	0.002602	0.000805	0.023589	0.005346	0.005075
29	0.001789	0.001463	0.005673	0.005673	0.007828	0.004445	0.005377	0.013738	0.001974	0.000530	0.016917	0.002970	0.003028
30	0.022953	0.012280	0.040996	0.040996	0.017635	0.011488	0.010061	0.013416	0.011573	0.003653	0.031075	0.013364	0.018016

El Paso County 2040 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061109	0.055527	0.053193	0.053193	0.054801	0.054801	0.054801	0.057319	0.058850	0.078534	0.057319	0.050561	0.041768
1	0.050378	0.056150	0.045311	0.045311	0.054145	0.054022	0.054221	0.056273	0.080111	0.086004	0.056004	0.069567	0.066506
2	0.050775	0.059589	0.054931	0.054931	0.053473	0.053184	0.053659	0.055347	0.087826	0.118415	0.054692	0.071275	0.071530
3	0.048986	0.064477	0.044521	0.044521	0.052633	0.052165	0.052927	0.054214	0.070243	0.085213	0.053446	0.059470	0.058414
4	0.047893	0.069579	0.047230	0.047230	0.051971	0.051305	0.052308	0.053760	0.071409	0.091973	0.052554	0.048110	0.049151
5	0.057333	0.068612	0.045069	0.045069	0.051233	0.050313	0.051515	0.053000	0.061721	0.071366	0.051713	0.091618	0.071145
6	0.053557	0.072800	0.041529	0.041529	0.049667	0.048686	0.050007	0.051442	0.068359	0.082595	0.050051	0.088425	0.074465
7	0.053160	0.062904	0.044286	0.044286	0.047665	0.046636	0.048094	0.049384	0.045483	0.044593	0.048343	0.063479	0.053846
8	0.049285	0.057941	0.031382	0.031382	0.045554	0.044413	0.045904	0.047279	0.033641	0.040108	0.046306	0.047071	0.051710
9	0.044018	0.047698	0.028688	0.028688	0.043721	0.042472	0.044057	0.045355	0.053557	0.056656	0.044463	0.043656	0.048562
10	0.028021	0.036343	0.029305	0.029305	0.041814	0.040393	0.042116	0.043324	0.039562	0.038823	0.042245	0.023684	0.024705
11	0.024245	0.036152	0.028044	0.028044	0.039654	0.038039	0.039820	0.041221	0.021172	0.013596	0.040277	0.022719	0.016595
12	0.052564	0.028406	0.022780	0.022780	0.037805	0.036143	0.037884	0.039458	0.016955	0.012800	0.039346	0.027916	0.023001
13	0.047198	0.041596	0.042755	0.042755	0.035795	0.034150	0.035829	0.037334	0.053647	0.032343	0.037426	0.018561	0.020762
14	0.057035	0.041405	0.044972	0.044972	0.033899	0.032261	0.033888	0.035257	0.027003	0.021687	0.036187	0.047368	0.062512
15	0.046800	0.033595	0.041038	0.041038	0.032027	0.030414	0.031992	0.033435	0.038575	0.024019	0.034518	0.032519	0.040433
16	0.039348	0.030580	0.039036	0.039036	0.030045	0.028453	0.029989	0.031533	0.029335	0.020335	0.032794	0.029624	0.034685
17	0.028219	0.025338	0.042056	0.042056	0.028598	0.027016	0.028492	0.029955	0.022966	0.015496	0.031619	0.014403	0.019448
18	0.034380	0.022210	0.036238	0.036238	0.026539	0.025001	0.026405	0.027848	0.018839	0.012645	0.029620	0.014849	0.017455
19	0.023649	0.017719	0.034541	0.034541	0.023396	0.021987	0.023273	0.025194	0.016148	0.010705	0.027073	0.010765	0.013339
20	0.019475	0.013719	0.032283	0.032283	0.021893	0.020508	0.021797	0.023633	0.014802	0.010759	0.025491	0.015517	0.018454
21	0.013315	0.012059	0.027594	0.027594	0.020771	0.019326	0.020668	0.022292	0.014982	0.007620	0.024284	0.027025	0.025904
22	0.013116	0.008694	0.021478	0.021478	0.017942	0.016514	0.017756	0.019679	0.012739	0.007333	0.021867	0.019081	0.019376
23	0.009738	0.006888	0.016782	0.016782	0.022214	0.023387	0.023338	0.009472	0.005562	0.003379	0.005648	0.013141	0.014545
24	0.005564	0.005044	0.017267	0.017267	0.019143	0.020525	0.019032	0.008964	0.008792	0.003474	0.005310	0.009132	0.010195
25	0.006061	0.003633	0.010978	0.010978	0.015264	0.015528	0.016682	0.009976	0.004127	0.001743	0.004985	0.006756	0.009878
26	0.004173	0.003347	0.011726	0.011726	0.012858	0.013955	0.014108	0.008065	0.004306	0.001780	0.004252	0.006831	0.009086
27	0.003478	0.002337	0.010978	0.010978	0.007370	0.009413	0.007050	0.006514	0.003140	0.001022	0.004788	0.005197	0.006409
28	0.002385	0.001916	0.007342	0.007342	0.005829	0.009142	0.006439	0.005988	0.002602	0.000805	0.002296	0.005346	0.005075
29	0.001789	0.001463	0.005673	0.005673	0.004647	0.006489	0.005888	0.004065	0.001974	0.000530	0.004007	0.002970	0.003028
30	0.022953	0.012280	0.040996	0.040996	0.017635	0.033362	0.010061	0.013416	0.011573	0.003653	0.031075	0.013364	0.018016

El Paso County 2050 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061109	0.055527	0.053193	0.053193	0.053520	0.053520	0.053520	0.055645	0.058850	0.078534	0.055645	0.050561	0.041768
1	0.050378	0.056150	0.045311	0.045311	0.053347	0.053057	0.053396	0.055246	0.080111	0.086004	0.055164	0.069567	0.066506
2	0.050775	0.059589	0.054931	0.054931	0.053139	0.052548	0.053236	0.054794	0.087826	0.118415	0.054637	0.071275	0.071530
3	0.048986	0.064477	0.044521	0.044521	0.053031	0.052163	0.053175	0.054480	0.070243	0.085213	0.054254	0.059470	0.058414
4	0.047893	0.069579	0.047230	0.047230	0.052908	0.051607	0.053126	0.053795	0.071409	0.091973	0.053365	0.048110	0.049151
5	0.057333	0.068612	0.045069	0.045069	0.052221	0.050573	0.052476	0.052575	0.061721	0.071366	0.051956	0.091618	0.071145
6	0.053557	0.072800	0.041529	0.041529	0.050686	0.048823	0.051011	0.050722	0.068359	0.082595	0.049898	0.088425	0.074465
7	0.053160	0.062904	0.044286	0.044286	0.049158	0.047112	0.049545	0.048869	0.045483	0.044593	0.047883	0.063479	0.053846
8	0.049285	0.057941	0.031382	0.031382	0.047079	0.045045	0.047463	0.046703	0.033641	0.040108	0.045652	0.047071	0.051710
9	0.044018	0.047698	0.028688	0.028688	0.045125	0.043136	0.045544	0.044715	0.053557	0.056656	0.043515	0.043656	0.048562
10	0.028021	0.036343	0.029305	0.029305	0.043176	0.041256	0.043657	0.042616	0.039562	0.038823	0.041402	0.023684	0.024705
11	0.024245	0.036152	0.028044	0.028044	0.040998	0.039151	0.041493	0.040283	0.021172	0.013596	0.038995	0.022719	0.016595
12	0.052564	0.028406	0.022780	0.022780	0.038915	0.037103	0.039448	0.038167	0.016955	0.012800	0.036728	0.027916	0.023001
13	0.047198	0.041596	0.042755	0.042755	0.036374	0.034633	0.036926	0.035585	0.053647	0.032343	0.034212	0.018561	0.020762
14	0.057035	0.041405	0.044972	0.044972	0.034074	0.032384	0.034604	0.033537	0.027003	0.021687	0.032016	0.047368	0.062512
15	0.046800	0.033595	0.041038	0.041038	0.032198	0.030494	0.032650	0.031729	0.038575	0.024019	0.030269	0.032519	0.040433
16	0.039348	0.030580	0.039036	0.039036	0.029937	0.028351	0.030382	0.029597	0.029335	0.020335	0.028188	0.029624	0.034685
17	0.028219	0.025338	0.042056	0.042056	0.027513	0.026053	0.027968	0.027240	0.022966	0.015496	0.026134	0.014403	0.019448
18	0.034380	0.022210	0.036238	0.036238	0.025216	0.023837	0.025585	0.025060	0.018839	0.012645	0.024086	0.014849	0.017455
19	0.023649	0.017719	0.034541	0.034541	0.023215	0.021905	0.023544	0.023115	0.016148	0.010705	0.022264	0.010765	0.013339
20	0.019475	0.013719	0.032283	0.032283	0.021032	0.019783	0.021306	0.020957	0.014802	0.010759	0.020109	0.015517	0.018454
21	0.013315	0.012059	0.027594	0.027594	0.019104	0.017877	0.019284	0.019142	0.014982	0.007620	0.018430	0.027025	0.025904
22	0.013116	0.008694	0.021478	0.021478	0.017429	0.016284	0.017547	0.017547	0.012739	0.007333	0.017263	0.019081	0.019376
23	0.009738	0.006888	0.016782	0.016782	0.015831	0.014788	0.015913	0.015968	0.005562	0.003379	0.015813	0.013141	0.014545
24	0.005564	0.005044	0.017267	0.017267	0.014356	0.013401	0.014404	0.014471	0.008792	0.003474	0.014691	0.009132	0.010195
25	0.006061	0.003633	0.010978	0.010978	0.012969	0.012103	0.012996	0.013133	0.004127	0.001743	0.013428	0.006756	0.009878
26	0.004173	0.003347	0.011726	0.011726	0.011661	0.010872	0.011669	0.011898	0.004306	0.001780	0.012270	0.006831	0.009086
27	0.003478	0.002337	0.010978	0.010978	0.010611	0.009888	0.010594	0.010825	0.003140	0.001022	0.011345	0.005197	0.006409
28	0.002385	0.001916	0.007342	0.007342	0.009516	0.008855	0.009483	0.009735	0.002602	0.000805	0.010292	0.005346	0.005075
29	0.001789	0.001463	0.005673	0.005673	0.008025	0.007465	0.007992	0.008436	0.001974	0.000530	0.009022	0.002970	0.003028
30	0.022953	0.012280	0.040996	0.040996	0.017635	0.055934	0.010061	0.013416	0.011573	0.003653	0.031075	0.013364	0.018016

Texas Statewide 2022 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
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	0.9922	0.9934	0.9943	0.9967	0.9989	0.9997	0.9988	0.9758	0.9850	0.9865	0.9874	0.9882	0.9894	0.9922	0.9993	0.9995
PC	Diesel	0.0078	0.0066	0.0057	0.0033	0.0011	0.0003	0.0012	0.0242	0.0150	0.0135	0.0126	0.0118	0.0106	0.0078	0.0007	0.0005
PT	Gas	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611	0.9653	0.9697	0.9763	0.9799	0.9736	0.9766	0.9867	0.9828	0.9700	0.9721
PT	Diesel	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389	0.0347	0.0303	0.0237	0.0201	0.0264	0.0234	0.0133	0.0172	0.0300	0.0279
LCT	Gas	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611	0.9653	0.9697	0.9737	0.9688	0.9438	0.9399	0.9652	0.9535	0.9198	0.9321
LCT	Diesel	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389	0.0347	0.0303	0.0263	0.0312	0.0562	0.0601	0.0348	0.0465	0.0802	0.0679
OBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323
OBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677
SBus	Gas	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0370	0.0450	0.0314	0.0389	0.0275	0.0130	0.0078
SBus	Diesel	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9630	0.9550	0.9686	0.9611	0.9725	0.9870	0.9922
RT	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0066	0.0000	0.0000	0.0000	0.0046	0.0020	0.0023
RT	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9934	1.0000	1.0000	1.0000	0.9954	0.9980	0.9977
SUShT	Gas	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366	0.3860	0.3392	0.2749
SUShT	Diesel	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634	0.6140	0.6608	0.7251
SULhT	Gas	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366	0.3860	0.3392	0.2749
SULhT	Diesel	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634	0.6140	0.6608	0.7251
MH	Gas	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.7076	0.7251	0.7013	0.0059	0.5339	0.3808	0.4420
MH	Diesel	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.2924	0.2749	0.2987	0.9941	0.4661	0.6192	0.5580
CShT	Gas	0.0845	0.0845	0.0718	0.0914	0.0903	0.1013	0.0830	0.0702	0.0945	0.0863	0.0864	0.0766	0.0780	0.0819	0.0818	0.0624
CShT	Diesel	0.9155	0.9155	0.9282	0.9086	0.9097	0.8987	0.9170	0.9298	0.9055	0.9137	0.9136	0.9234	0.9220	0.9181	0.9182	0.9376
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 2022 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992
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	0.9931	0.9951	0.9966	0.9958	0.9954	0.9966	0.9969	0.9981	0.9978	0.9991	0.9988	0.9991	0.9998	0.9993	0.9988
PC	Diesel	0.0069	0.0049	0.0034	0.0042	0.0046	0.0034	0.0031	0.0019	0.0022	0.0009	0.0012	0.0009	0.0002	0.0007	0.0012
PT	Gas	0.9560	0.9641	0.9594	0.9614	0.9653	0.9590	0.9703	0.9608	0.9872	0.9555	0.9575	0.9609	0.9662	0.9575	0.9619
PT	Diesel	0.0440	0.0359	0.0406	0.0386	0.0347	0.0410	0.0297	0.0392	0.0128	0.0445	0.0425	0.0391	0.0338	0.0425	0.0381
LCT	Gas	0.9002	0.9148	0.9073	0.9159	0.9152	0.9118	0.9227	0.9014	0.9550	0.8988	0.9070	0.9083	0.9212	0.9056	0.9222
LCT	Diesel	0.0998	0.0852	0.0927	0.0841	0.0848	0.0882	0.0773	0.0986	0.0450	0.1012	0.0930	0.0917	0.0788	0.0944	0.0778
OBus	Gas	0.1773	0.1725	0.1688	0.1525	0.1341	0.1070	0.0740	0.0017	0.0014	0.0012	0.0108	0.0346	0.0138	0.0056	0.0009
OBus	Diesel	0.8227	0.8275	0.8312	0.8475	0.8659	0.8930	0.9260	0.9983	0.9986	0.9988	0.9892	0.9654	0.9862	0.9944	0.9991
TBus	Gas	0.1773	0.1725	0.1688	0.1525	0.1341	0.1070	0.0740	0.0017	0.0014	0.0012	0.0108	0.0346	0.0138	0.0056	0.0009
TBus	Diesel	0.8227	0.8275	0.8312	0.8475	0.8659	0.8930	0.9260	0.9983	0.9986	0.9988	0.9892	0.9654	0.9862	0.9944	0.9991
SBus	Gas	0.0101	0.0066	0.0038	0.0055	0.0260	0.0117	0.0257	0.0100	0.0100	0.0100	0.0415	0.1143	0.1475	0.1205	0.0100
SBus	Diesel	0.9899	0.9934	0.9962	0.9945	0.9740	0.9883	0.9743	0.9900	0.9900	0.9900	0.9585	0.8857	0.8525	0.8795	0.9900
RT	Gas	0.0009	0.0007	0.0000	0.0004	0.0000	0.0000	0.0000	0.1688	0.4036	0.0193	0.0253	0.0235	0.1050	0.0315	0.2103
RT	Diesel	0.9991	0.9993	1.0000	0.9996	1.0000	1.0000	1.0000	0.8312	0.5964	0.9807	0.9747	0.9765	0.8950	0.9685	0.7897
SUShT	Gas	0.2764	0.2556	0.2550	0.2496	0.2593	0.2918	0.3380	0.3125	0.3884	0.3901	0.3928	0.6113	0.4838	0.5095	0.5045
SUShT	Diesel	0.7236	0.7444	0.7450	0.7504	0.7407	0.7082	0.6620	0.6875	0.6116	0.6099	0.6072	0.3887	0.5162	0.4905	0.4955
SULhT	Gas	0.2764	0.2556	0.2550	0.2496	0.2593	0.2918	0.3380	0.3125	0.3884	0.3901	0.3928	0.6113	0.4838	0.5095	0.5045
SULhT	Diesel	0.7236	0.7444	0.7450	0.7504	0.7407	0.7082	0.6620	0.6875	0.6116	0.6099	0.6072	0.3887	0.5162	0.4905	0.4955
MH	Gas	0.5778	0.3493	0.6016	0.5619	0.6028	0.5459	0.6539	0.7975	0.6494	0.8361	0.8008	0.8510	0.8084	0.7276	0.7869
MH	Diesel	0.4222	0.6507	0.3984	0.4381	0.3972	0.4541	0.3461	0.2025	0.3506	0.1639	0.1992	0.1490	0.1916	0.2724	0.2131
CShT	Gas	0.0753	0.0742	0.0796	0.0773	0.0895	0.0919	0.0972	0.1056	0.1094	0.1299	0.1196	0.1993	0.0991	0.1176	0.1108
CShT	Diesel	0.9247	0.9258	0.9204	0.9227	0.9105	0.9081	0.9028	0.8944	0.8906	0.8701	0.8804	0.8007	0.9009	0.8824	0.8892
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.

Texas Statewide 2032 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2032	2031	2030	2029	2028	2027	2026	2025	2024	2023	2022	2021	2020	2019	2018	2017
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	0.9742	0.9742	0.9744	0.9765	0.9786	0.9820	0.9847	0.9872	0.9893	0.9908	0.9922	0.9934	0.9943	0.9967	0.9989	0.9997
PC	Diesel	0.0258	0.0258	0.0256	0.0235	0.0214	0.0180	0.0153	0.0128	0.0107	0.0092	0.0078	0.0066	0.0057	0.0033	0.0011	0.0003
PT	Gas	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310	0.9316	0.9322	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611
PT	Diesel	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389
LCT	Gas	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310	0.9316	0.9322	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611
LCT	Diesel	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389
OBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
OBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
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	0.0079	0.0079	0.0079
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	0.9921	0.9921	0.9921
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	0.0000	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	1.0000	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942
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	0.5797	0.5797	0.5797
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	0.4203	0.4203	0.4203
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0718	0.0914	0.0903	0.1013
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9282	0.9086	0.9097	0.8987
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 2032 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
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	0.9988	0.9758	0.9850	0.9865	0.9874	0.9882	0.9894	0.9922	0.9993	0.9995	0.9931	0.9951	0.9966	0.9958	0.9954
PC	Diesel	0.0012	0.0242	0.0150	0.0135	0.0126	0.0118	0.0106	0.0078	0.0007	0.0005	0.0069	0.0049	0.0034	0.0042	0.0046
PT	Gas	0.9653	0.9697	0.9763	0.9799	0.9736	0.9766	0.9867	0.9828	0.9700	0.9721	0.9560	0.9641	0.9594	0.9614	0.9653
PT	Diesel	0.0347	0.0303	0.0237	0.0201	0.0264	0.0234	0.0133	0.0172	0.0300	0.0279	0.0440	0.0359	0.0406	0.0386	0.0347
LCT	Gas	0.9653	0.9697	0.9737	0.9688	0.9438	0.9399	0.9652	0.9535	0.9198	0.9321	0.9002	0.9148	0.9073	0.9159	0.9152
LCT	Diesel	0.0347	0.0303	0.0263	0.0312	0.0562	0.0601	0.0348	0.0465	0.0802	0.0679	0.0998	0.0852	0.0927	0.0841	0.0848
OBus	Gas	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323	0.1773	0.1725	0.1688	0.1525	0.1341
OBus	Diesel	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677	0.8227	0.8275	0.8312	0.8475	0.8659
TBus	Gas	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323	0.1773	0.1725	0.1688	0.1525	0.1341
TBus	Diesel	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677	0.8227	0.8275	0.8312	0.8475	0.8659
SBus	Gas	0.0079	0.0079	0.0079	0.0370	0.0450	0.0314	0.0389	0.0275	0.0130	0.0078	0.0101	0.0066	0.0038	0.0055	0.0260
SBus	Diesel	0.9921	0.9921	0.9921	0.9630	0.9550	0.9686	0.9611	0.9725	0.9870	0.9922	0.9899	0.9934	0.9962	0.9945	0.9740
RT	Gas	0.0000	0.0000	0.0000	0.0066	0.0000	0.0000	0.0000	0.0046	0.0020	0.0023	0.0009	0.0007	0.0000	0.0004	0.0000
RT	Diesel	1.0000	1.0000	1.0000	0.9934	1.0000	1.0000	1.0000	0.9954	0.9980	0.9977	0.9991	0.9993	1.0000	0.9996	1.0000
SUShT	Gas	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366	0.3860	0.3392	0.2749	0.2764	0.2556	0.2550	0.2496	0.2593
SUShT	Diesel	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634	0.6140	0.6608	0.7251	0.7236	0.7444	0.7450	0.7504	0.7407
SULhT	Gas	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366	0.3860	0.3392	0.2749	0.2764	0.2556	0.2550	0.2496	0.2593
SULhT	Diesel	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634	0.6140	0.6608	0.7251	0.7236	0.7444	0.7450	0.7504	0.7407
MH	Gas	0.5797	0.5797	0.5797	0.7076	0.7251	0.7013	0.0059	0.5339	0.3808	0.4420	0.5778	0.3493	0.6016	0.5619	0.6028
MH	Diesel	0.4203	0.4203	0.4203	0.2924	0.2749	0.2987	0.9941	0.4661	0.6192	0.5580	0.4222	0.6507	0.3984	0.4381	0.3972
CShT	Gas	0.0830	0.0702	0.0945	0.0863	0.0864	0.0766	0.0780	0.0819	0.0818	0.0624	0.0753	0.0742	0.0796	0.0773	0.0895
CShT	Diesel	0.9170	0.9298	0.9055	0.9137	0.9136	0.9234	0.9220	0.9181	0.9182	0.9376	0.9247	0.9258	0.9204	0.9227	0.9105
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.

Texas Statewide 2040 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2040	2039	2038	2037	2036	2035	2034	2033	2032	2031	2030	2029	2028	2027	2026	2025
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	0.9771	0.9769	0.9765	0.9760	0.9757	0.9750	0.9744	0.9750	0.9742	0.9742	0.9744	0.9765	0.9786	0.9820	0.9847	0.9872
PC	Diesel	0.0229	0.0231	0.0235	0.0240	0.0243	0.0250	0.0256	0.0250	0.0258	0.0258	0.0256	0.0235	0.0214	0.0180	0.0153	0.0128
PT	Gas	0.9341	0.9343	0.9344	0.9339	0.9337	0.9334	0.9332	0.9331	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310
PT	Diesel	0.0659	0.0657	0.0656	0.0661	0.0663	0.0666	0.0668	0.0669	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690
LCT	Gas	0.9341	0.9343	0.9344	0.9339	0.9337	0.9334	0.9332	0.9331	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310
LCT	Diesel	0.0659	0.0657	0.0656	0.0661	0.0663	0.0666	0.0668	0.0669	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690
OBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
OBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
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	0.0079	0.0079	0.0079
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	0.9921	0.9921	0.9921
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	0.0000	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	1.0000	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628
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	0.5797	0.5797	0.5797
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	0.4203	0.4203	0.4203
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155
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 2040 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
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	0.9893	0.9908	0.9922	0.9934	0.9943	0.9967	0.9989	0.9997	0.9988	0.9758	0.9850	0.9865	0.9874	0.9882	0.9894
PC	Diesel	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	0.0106
PT	Gas	0.9316	0.9322	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611	0.9653	0.9697	0.9763	0.9799	0.9736	0.9766	0.9867
PT	Diesel	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	0.0133
LCT	Gas	0.9316	0.9322	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611	0.9653	0.9697	0.9737	0.9688	0.9438	0.9399	0.9652
LCT	Diesel	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	0.0348
OBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621
OBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379
SBus	Gas	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0370	0.0450	0.0314	0.0389
SBus	Diesel	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9630	0.9550	0.9686	0.9611
RT	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0066	0.0000	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	0.9934	1.0000	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634
MH	Gas	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.7076	0.7251	0.7013	0.0059
MH	Diesel	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.2924	0.2749	0.2987	0.9941
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0718	0.0914	0.0903	0.1013	0.0830	0.0702	0.0945	0.0863	0.0864	0.0766	0.0780
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9282	0.9086	0.9097	0.8987	0.9170	0.9298	0.9055	0.9137	0.9136	0.9234	0.9220
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.

Texas Statewide 2050 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2050	2049	2048	2047	2046	2045	2044	2043	2042	2041	2040	2039	2038	2037	2036	2035
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	0.9790	0.9786	0.9784	0.9782	0.9782	0.9783	0.9780	0.9778	0.9776	0.9773	0.9771	0.9769	0.9765	0.9760	0.9757	0.9750
PC	Diesel	0.0210	0.0214	0.0216	0.0218	0.0218	0.0217	0.0220	0.0222	0.0224	0.0227	0.0229	0.0231	0.0235	0.0240	0.0243	0.0250
PT	Gas	0.9353	0.9346	0.9342	0.9339	0.9338	0.9339	0.9337	0.9337	0.9338	0.9340	0.9341	0.9343	0.9344	0.9339	0.9337	0.9334
PT	Diesel	0.0647	0.0654	0.0658	0.0661	0.0662	0.0661	0.0663	0.0663	0.0662	0.0660	0.0659	0.0657	0.0656	0.0661	0.0663	0.0666
LCT	Gas	0.9353	0.9346	0.9342	0.9339	0.9338	0.9339	0.9337	0.9337	0.9338	0.9340	0.9341	0.9343	0.9344	0.9339	0.9337	0.9334
LCT	Diesel	0.0647	0.0654	0.0658	0.0661	0.0662	0.0661	0.0663	0.0663	0.0662	0.0660	0.0659	0.0657	0.0656	0.0661	0.0663	0.0666
OBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
OBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
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	0.0079	0.0079	0.0079
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	0.9921	0.9921	0.9921
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	0.0000	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	1.0000	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628
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	0.5797	0.5797	0.5797
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	0.4203	0.4203	0.4203
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155
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 2050 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2034	2033	2032	2031	2030	2029	2028	2027	2026	2025	2024	2023	2022	2021	2020
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	0.9744	0.9750	0.9742	0.9742	0.9744	0.9765	0.9786	0.9820	0.9847	0.9872	0.9893	0.9908	0.9922	0.9934	0.9943
PC	Diesel	0.0256	0.0250	0.0258	0.0258	0.0256	0.0235	0.0214	0.0180	0.0153	0.0128	0.0107	0.0092	0.0078	0.0066	0.0057
PT	Gas	0.9332	0.9331	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310	0.9316	0.9322	0.9337	0.9356	0.9372
PT	Diesel	0.0668	0.0669	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628
LCT	Gas	0.9332	0.9331	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310	0.9316	0.9322	0.9337	0.9356	0.9372
LCT	Diesel	0.0668	0.0669	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628
OBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
OBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
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	0.0079	0.0079
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	0.9921	0.9921
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	0.0000	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	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5157
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4843
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5157
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4843
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	0.5797	0.5797
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	0.4203	0.4203
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0718
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9282
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.

4.0 EL PASO COUNTY AND SUNLAND PARK OZONE NONATTAINMENT AREA SUMMER WEEKDAY EMISSIONS ANALYSIS

4.1 SUMMARY

Under sponsorship of the TxDOT, TTI produced Sunland Park, New Mexico and El Paso County, Texas on-road mobile source emissions estimates in support of the EPMPO's transportation planning efforts. This analysis description is for the Sunland Park, NM ozone nonattainment area (NAA) in the El Paso RMS 2050 regional TDM, as well as for El Paso County.[21, 22] Results, for volatile organic compounds (VOC) and oxides of nitrogen (NO_X), are representative of a typical summer weekday for the years 2017 (Sunland Park base year), 2022, 2032, 2040 and 2050.

TTI used its on-road inventory methodology to produce emissions estimates of the detail and quality suited for state implementation planning for air quality control and transportation conformity analyses. This is the detailed, disaggregate, TDM link-based rates-per-activity emissions estimation process. It uses MOVES3-based county emission rate look-up tables based on local conditions for external emissions calculations performed at detailed, disaggregate, temporal, and spatial levels, using the latest planning assumptions, and latest available data, emissions model (or model authorized within an applicable grace period)[23], and procedures.

Hourly inventories were estimated by MOVES source use type (SUT) and fuel type (FT) combination (or vehicle type) and TDM roadway class. TDMs were post-processed to estimate hourly, directional, link (roadway segment)-level VMT and operational speeds

[21] In November 2021 EPA expanded the Sunland Park, NM partial county 2015 standard marginal ozone nonattainment area by designating El Paso County nonattainment under the 2015 standard and combining the two areas in one multi-county NAA, named El Paso-Las Cruces TX-NM (after the metro area's Combined Statistical Area).

[22] On June 30, 2023, the D.C. Circuit Court reversed EPA's El Paso-Las Cruces TX-NM zone nonattainment area (TX-NM Ozone NAA) designation. As a result, Sunland Park, NM retained its prior nonattainment area status and El Paso, TX reverted to its prior attainment designation. EPA is evaluating response options to this D.C. Circuit decision. The interagency partners have elected to evaluate El Paso County NOx and VOC emissions as part of this conformity analysis in case EPA issues a nonattainment designation for El Paso County in response to the D.C. Circuit decision before completion of this conformity process.

[23] Note that this analysis uses MOVES3.1.0 under EPA's established two-year grace period for MOVES4, which ends September, 2025.

for the roadway-based emissions calculations. Using estimates of vehicle operating hours (VHT), vehicle populations, truck hotelling activity, and other data, TTI estimated hourly off-network activity factors for the parked vehicle-based emissions calculations. Off-network activity types are source-hours-parked (SHP); starts; and source hours extended idling (SHEI) and auxiliary power unit (APU) hours (emissions-producing components of combination long-haul truck hotelling hours). Off-network evaporative rates (in mass/SHP form, not directly available from MOVES) were produced by a post-processing procedure and were compiled with other rates produced directly by MOVES to yield look-up tables of all rates in activity terms for the external emissions calculations. The analyses used TTI's MOVES-based inventory development utilities for use with MOVES3.[24] EPA's Technical Guidance is the primary reference on appropriate inputs and use of MOVES.[25]

4.2 Scope of Emissions Analysis

1. **Methodology:**
    - Detailed, hourly, MOVES rates-per-activity, TDM link-based, with MOVES3 (for on-road mobile modeling).
2. **Analysis Years:**
    - 2017 baseline, 2022, 2032, 2040, and 2050.
3. **Seasonal Period:**
    - Summer: Average June-July-August weekday (average Monday through Friday).
4. **Geography:**
    - El Paso County, TX and Sunland Park, NM.[26]

[24] TTI Emissions Inventory Estimation Utilities Using MOVES: MOVES2014aUtl User's Guide, TTI, August 2016. (The MOVES2014aUtl user guide also applies to MOVES3 Utilities, except for off-network idling activity and starts activity calculation, see Appendix B for details.)

[25] MOVES3 Technical Guidance: Using MOVES to Prepare Emission Inventories for Sate Implementation Plans and Transportation Conformity, EPA, November 2020, https://www.epa.gov/sites/default/files/2020-11/documents/420b20052.pdf

[26] The Sunland Park is included in the southern part of Dona Ana County that is included in the El Paso TDM.

5. Pollutants:

- NO_X and VOC.[27]

6. Sources:

Table 4-1. Vehicle Types Modeled in the Inventory.

MOVES SUT	Gasoline*	Diesel*
Motorcycle	MC_G	-
Passenger Car	PC_G	PC_D
Passenger Truck	PT_G	PT_D
Light Commercial Truck	LCT_G	LCT_D
Intercity Bus	OBus_G	OBus_D
Transit Bus	TBus_G	TBus_D
School Bus	SBus_G	SBus_D
Refuse Truck	RT_G	RT_D
Single Unit Short-Haul Truck	SUShT_G	SUShT_D
Single Unit Long-Haul Truck	SULhT_G	SULhT_D
Motor Home	MH_G	MH_D
Combination Short-Haul Truck	CShT_G	CShT_D
Combination Long-Haul Truck	-	CLhT_D

These vehicle type (SUT/fuel type) labels are referenced later in the document.

7. Link-Based Emissions Estimation Process Components and Utilities:

TTI developed the inventory components and resulting emissions and activity estimates for the analysis using TTI's utilities developed and maintained for this purpose.

a. Inventory Components:

The emissions estimation process includes the following major components for the emissions calculations:

- Hourly, directional, link-level, on-road fleet VMT, and average speeds;
- SUT/fuel type (i.e., vehicle type) time-of-day VMT mix;
- Vehicle type populations; [28]
- Hourly, vehicle type SHP;
- Hourly, vehicle type starts;
- Hourly, vehicle type ONI;

[27] VOC and NO_X are the reported pollutants. Additional pollutants were included in MOVES runs and inventory utility output but not reported for this analysis.

[28] Vehicle populations are an intermediate parameter used in estimating off-network source hours parked and starts activity.

- Hourly, diesel combination long-haul truck hotelling (emissions generating SHEI and APU hours components); and
- Hourly vehicle type pollutant and process mass emission rates: mass per mile, mass per SHP, mass per start, mass per SHEI, mass per ONI, and mass per APU hour.

b. Utilities:

The TTI emissions estimation utilities produced the input components, and the emissions estimates in the tab-delimited hourly and 24-hour emissions and activity summary file formats easy to use in spreadsheets. The TTI utilities include MOVES emission rates input and output processing utilities, TDM network data sets post-processing utility, vehicle population and off-network activity estimation utilities, and the link-level emissions calculation utility.[29]

4.3 Development of On-Road Fleet Link-VMT and Speeds

8. Travel Demand Models:

TTI received the RMS 2050 MTP TDM data sets (i.e., trip matrices and four-time-period, directional, average non-summer weekday [ANSWT] traffic assignments) needed from the EPMPO. Data sets included the 2017 baseline and future analysis years 2022, 2032, 2040, and 2050.[30] TTI post-processed the data sets to produce average summer weekday, county-coded[31], hourly, directional, Highway Performance Monitoring System (HPMS)-consistent, network link VMT and volumes and added intrazonal link VMT estimates.[32] Method details are found in MOVES2014a-Based Travel Demand Model Link Emissions Estimation Method (TTI, August 2016).

[29] TTI Emissions Inventory Estimation Utilities Using MOVES: MOVES2014aUtl User's Guide, TTI, August 2016. (The MOVES2014aUtl user guide also applies to MOVES3 Utilities, except for off-network idling activity and starts activity calculation, see Appendix B for details.)

[30] The EPMPO provided the TDM data sets for 2017 in RMS 2050 analysis in 2021, and the 2022, 2032, 2040, and 2050 in January 2024.

[31] To facilitate use of these TDM link-data sets in the separate analysis of the Sunland Park area of Dona Ana County, NM the following county (and partial county) coding was applied: "1" for El Paso County and "2" and "3" for the complete portion of Dona Ana County in the TDM, where "2" is the Dona Ana area excluding the Sunland Park, NM ozone NAA and "3" is exclusively the Sunland Park, NM ozone NAA.

[32] TDM network ANSWT VMT plus intrazonal ANSWT VMT is referred to herein as "total model VMT".

a. Adjustments to TDM VMT:

The ANSWT network link volumes and VMT and added intrazonal link VMT were factored to be consistent with HPMS VMT, to reflect summer weekday activity, to allocate by hour, and to allocate total link volumes by direction of travel. The seasonal weekday and hourly factors were developed using the latest available nine-year aggregate, TxDOT Automatic Traffic Recorder (ATR) traffic count data (2013-2021) for El Paso County.

i. Historical Year HPMS Consistency and Seasonal Weekday Adjustments Procedure:

- HPMS consistency: Not applied for this analysis (see Item 8.a.ii).
- Seasonal adjustment: applied as described "VMT adjustment" bullet.
- VMT adjustment: TTI applied a VMT adjustment factor to 2017 baseline analysis year calculated as total model link-level VMT to summer weekday 2017 RIFCREC VMT (RIFCREC AADT VMT multiplied by the ratio of summer weekday to AADT count). See Table 4-8 in Attachment 4.1.

ii. Forecast Years HPMS Consistency and Seasonal Weekday Adjustments Procedure:

- HPMS consistency: TTI applied a single HPMS adjustment factor to total model link-level VMT for all county and partial county areas, for each analysis year except for 2017. The validation year HPMS adjustment factor was calculated as 2017 El Paso County HPMS VMT (first adjusted to ANSWT form using the ANSWT/AADT ATR count ratio) divided by the 2017 validation year total model VMT for El Paso County. See Table 4-6 in Attachment 4.1.
- Seasonal adjustment: A seasonal day-type factor (summer weekday) was produced and used with the each analysis year except for 2017. This factor was calculated as the ratio of the summer weekday-to-ANSWT count. See Table 4-7 in Attachment 4.1.

iii. Seasonal Weekday Hourly VMT Distributions:

- Summer weekday, hourly travel factors were developed and used to allocate the 24-hour link VMT/volume estimates to each hour of the day – a single set was used for all analysis years. In order to maintain VMT proportions within each of the four time periods, the hourly fractions were normalized within each time period. See Table 4-9 in Attachment 4.1.

iv. Directional Factors:

- Directional split factors were applied to total link volumes by functional class and area type. The directional factors were created by aggregating TDM link-level volumes by direction for each functional class/area type. Link-level AB directional volumes were divided by total volumes for each functional class/area type to estimate the direction split. These are the same factors applied in the prior El Paso conformity analysis.

b. Hourly Congested Speeds:

TTI estimated directional, hourly operational link speeds using the TTI speed model, which estimates delay on each link as a function of volume-to-capacity and applies it to the link's estimated free-flow speed. TTI estimated the local streets category average operational link speeds represented by the centroid connector links, as centroid connector TDM input speeds; and represented as added intrazonal links, as the average of the zone's centroid connector input speeds.

4.4 Development of Vehicle Type VMT Mix

9. VMT Mix:

The VMT mix designates the vehicle categories included in the analysis and specifies the fraction of on-road fleet VMT attributable to each vehicle type.

a. Method:

VMT mixes were estimated using TTI's VMT mix method.[33] The method sets Texas vehicle registration category aggregations for MOVES SUT categories for developing the VMT mixes, as well as for developing other fleet parameters needed elsewhere in the process (e.g., SUT age distributions, vehicle population estimates).

b. Temporal and Spatial Aspects:

Consistent with the prior conformity analysis, the VMT mixes were produced in five-year increments and were applied to analysis years as follows:

- 2015 VMT mix – for 2013 through 2017 analysis years,
- 2020 VMT mix – for 2018 through 2022 analysis years,

[33] *"MOVES3 Source Use Type and Fuel Type Vehicle Miles Traveled (VMT) Distribution Update for Conformity Analysis"* (TxDOT Air Quality / Conformity IAC-A - TTI Task 5.3: Maintain, Update and Enhance Traffic Activity Estimation and Forecasting Methods), Texas Department of Transportation, Austin, TX, July 2022.

- 2025 VMT mix – for 2023 through 2027 analysis years, etc.

No seasonal adjustments are made for VMT mix. Average weekday vehicle type VMT mixes by MOVES road type and by four time-of-day periods (AM Peak, Mid-Day, PM Peak, Overnight) were estimated for the TxDOT El Paso District for use with the El Paso TDM region.[34]

c. Data Sources:

TTI used the latest available multi-year TxDOT El Paso District vehicle classification counts (2013-2021), along with MOVES3 default data, as needed (i.e., appropriate for each analysis year).

d. Vehicle Types:

The vehicle types in the VMT mix are the 24 gasoline and diesel MOVES SUT combinations shown in Table 4-1.

4.5 Development of Off-Network Activity by Vehicle Type

10. County and Partial County Off-Network Activity:

County-level off-network activity estimates are used to estimate off-network activity for partial county areas. The preliminary step of estimating El Paso County starts, SHP, and long-haul truck hotelling activity was performed using standard county-level procedures. Off-network activity for the adjacent Sunland Park NAA was then estimated as a scaling of El Paso County off-network activity estimates using Sunland Park NAA VMT-to-El Paso County VMT ratios for each year as the scaling factors. El Paso County vehicle population estimates were needed first for estimating county-level vehicle starts and SHP.

a. County Vehicle Population Estimates:

Vehicle populations were estimated only at the county-level, not for partial county areas.[35] The county vehicle population estimates were based on the latest available TxDMV registration data, vehicle type population factors derived from the VMT mix, and county-level VMT-based growth estimates for future years where actual

[34] Using the same data sets and a similar procedure, aggregate (i.e., 24-hour, all road-types) TxDOT district-level weekday vehicle type VMT mixes were also produced for use in the El Paso County vehicle population estimation.

[35] No vehicle population estimates were needed for the Sunland Park partial county area off-network activity procedure.

registration data were not yet available, as well as for the base year since 2017 registration data were neither available. Since the latest available registration data for this analysis was end-of-year 2021, vehicle population estimates were needed first for the 2021 historical year.

i. Historical Year Vehicle Population Estimates:

- TxDMV registration data: Historical year vehicle population estimates are based on TxDMV registrations corresponding to the historical year. This registration data is aggregated into vehicle registrations categories (Table 4-2).
- Vehicle population factors: Since the TxDMV registration data does not include each SUT/fuel type combination, vehicle population factors are developed according to procedure using the 24-hour VMT mix for the historical year (as designated per Item 9.b). These factors were applied to the aggregated vehicle registration categories to split them into the SUT/fuel type combinations included in the analysis, creating the base (2021) El Paso County vehicle population estimates.

Table 4-2. Vehicle Registration Aggregations and Vehicle Types for Estimating Vehicle Populations.

Vehicle Registration[1] Aggregation	Associated Vehicle Type[2]
Motorcycles	MC_G
Passenger Cars (PC)	PC_G; PC_D
Trucks <= 8,500 gross vehicle weight rating (GVWR) (pounds)	PT_G; PT_D; LCT_G; LCT_D
Trucks > 8,500 and <= 19,500 GVWR	RT_G; RT_D SUShT_G; SUShT_D MH_G; MH_D OBus_G; OBus_D TBus_G; TBus_D SBus_G; SBus_D
Trucks >19,500 GVWR	CShT_G; CShT_D
Motorcycles	MC_G
NA[2]	SULhT_G; SULhT_D CLhT_G; CLhT_D

[1] Mid-year TxDMV county registrations data extracts are used, consisting of 1) light-duty cars, trucks, and motorcycles; 2) heavy-duty diesel trucks, and 3) heavy-duty gasoline trucks.

[2] Vehicle population factors are the 24-hour weekday VMT mix fraction for each vehicle type (see Table 4-1 for label definitions) in a category divided by the sum of the VMT mix fractions for all vehicle types in a category, except long-haul trucks. The four long-haul vehicle type populations are estimated using a long-haul-to-short-haul VMT mix ratio applied to the short-haul SUT population estimate.

ii. Future Analysis Year County Vehicle Population Estimates:

- TxDMV registration data: As described for historical year vehicle population estimates, the registration data were aggregated by vehicle registration category. Since registration data were not available for future year analyses, the most recent, and only, TxDMV registration data sets (2021 end-of-year) were used.
- Vehicle population factors: As described for historical year vehicle population estimates, vehicle population factors developed using the analysis year 24-hour VMT mix were applied to vehicle registrations aggregated by category to split the categories into the SUT/fuel type combinations included in the analysis, creating the base (2021) El Paso County vehicle population estimates.
- VMT-based growth estimates: For each analysis year, VMT-based growth estimates were calculated by dividing county, analysis year (and 2017 base), summer weekday VMT by county, 2021 summer weekday VMT.[36] These growth estimates were applied to the base vehicle population estimates to scale from the 2021 base to each of the analysis (and 2017 base) year estimates.

b. ONI Activity

The most significant change to MOVES3 based EI's is the addition of an off-network activity called Off-Network Idling (ONI). ONI is intended to model light- and heavy-duty vehicles (not including Long-Haul Combination Trucks) that idle in situations such as parking lots, drive-throughs, and school pick up points (e.g., personal light-duty vehicles) or during deliveries (commercial vehicles). MOVES3 defines "idle" as any time in the driving schedules where speed is less than one mile per hour during engine operation. In this way, ONI emissions are always generated from a running engine and are distinct from Heavy Duty Truck hoteling, which represents emissions generated during compulsory breaks in long haul truck operator schedules (either through engine or auxiliary power unit emissions).

The ONI is calculated for each hour of the day using the following formula as provided in the EPA's MOVES3 technical documentation:

$$\text{ONI Hours} = (\text{SHOnetwork} * \text{TIF} - \text{SHI}_{\text{network}}) / (1 - \text{TIF}).$$

[36] Base, summer weekday 2021 VMT for the scaling factors was calculated as the product of El Paso County 2021 AADT VMT (from TxDOT's RIFCREC data set) and the El Paso County ATR-based AADT to summer weekday conversion factor.

Where:

$SHO_{network}$ = the SHO on each link. This is calculated by dividing the VMT associated with each link by the link's congested speed.

$SHI_{network}$ = the total SHI that occurs on the network (idling that occurs as a component of drive cycles) and is calculated by multiplying $SHO_{network}$ by a 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 are used as defined in the MOVES data table *roadidlefraction*.

TIF = the total idle fraction, i.e., the ratio of total source hours idling and total source hours operating. Default values for TIF are used as defined in the MOVES database table *totalidlefraction* (three-month seasonal averages for summer weekday scenario and 12-month averages for the annual scenario).

c. SHP Activity:

County-level SHP was estimated for use both in county-level analyses and as the preliminary step for estimating SHP for the partial county area. SHP was estimated for each year and hour of day.

i. County SHP Estimates:

El Paso County SHP was estimated as a function of total hours (hours a vehicle exists) minus its hours of operation on roads (source hours operating, or SHO, which is the same as VHT) and ONI. The vehicle type SHP estimates were calculated for each hour of the day based on the link VMT and speeds, the VMT mix used in the link-based emissions analysis, and the vehicle population estimates.

The VMT mix was applied to the link VMT to produce VMT estimates by vehicle type. Link VMT was divided by the link speed to produce SHO estimates. SHO was aggregated across links, then subtracted from source hours (equal to vehicle population, since source hours equals the number of hours in the period multiplied by the vehicle population, and each period is one hour) resulting in SHP estimates by vehicle type.

ii. Partial County SHP Estimates:

For each analysis year, the hourly SHP by vehicle type for the Sunland Park NAA was calculated as a scaling of El Paso County activity by multiplying the El Paso County SHP by the total VMT ratio, Sunland Park NAA VMT-to-El Paso County VMT.

d. Starts Activity:

County-level vehicle engine starts were first estimated, followed by estimation of the starts for the partial county Sunland Park NAA. Starts were estimated for each year and hour of day.

i. County Starts Estimates:

El Paso County engine 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 are calculated using the applicable MOVES algorithm with data on the age distribution and fuel fractions of the local fleet. Local age distributions and fuelfractions inputs to MOVES are combined with MOVES default parameters (startsageadjustment, startsmonthadjust [three-month seasonal average (June, July and August) for summer weekday scenario and three-month average (December, January, and February) for winter weekday scenario], and startspervehicle) to produce 24-hour starts per vehicle output representative of each seasonal period. The MOVES output provides the scenario-specific starts per vehicle defined by the study scope. For each hour of the day, the starts per vehicle data calculated by the MOVES algorithm are multiplied by the local vehicle type population estimates to produce the total number of starts by vehicle type per hour.

ii. Partial County Starts Estimates:

For each analysis year, the hourly starts by vehicle type for the Sunland Park NAA were calculated by multiplying the El Paso County starts activity by the total VMT ratio, Sunland Park NAA VMT-to-El Paso County VMT.

e. SHEI and APU Hours as a Function of Hotelling Hours:

During hotelling, the truck's main engine is assumed to be idling, or its diesel APU is in use, or it is using electric power or no power. Hotelling hours were first estimated, followed by the hours attributed to the two emissions-producing hotelling components, SHEI and diesel APU hours. County-level hotelling activity estimates were first developed, followed by estimates for the Sunland Park NAA, scaled from the county estimates using VMT ratios.

i. County Estimates:

County, analysis year, summer weekday hotelling hours were first estimated using 24-hour weekday hotelling hour estimates for a 2017 base year (from the recent

TCEQ extended idling study); base and analysis year scenario VMT, speeds, and VMT mix; and analysis year scenario SHP estimation data.[37]

The 2017 base year county hotelling hours estimates for a 24-hour winter weekday from the TCEQ study were scaled to each analysis scenario using the ratio of analysis scenario-to-base combination long-haul truck 24-hour VMT (as truck VMT increases, so does the hotelling activity).

The 24-hour hotelling estimates were then distributed to each hour using the hotelling hours distribution calculated as the inverse of the hourly distribution of VHT (or SHO, from the SHP calculation process) for combination long-haul trucks. Within each hour, SHP and hotelling hours were compared, and if hotelling hours exceeded SHP, hotelling hours were set equal to SHP.

The SHEI and APU hours components of hotelling hours were then estimated for each hour using the hourly hotelling hours estimates, combination long-haul truck travel fractions (calculated from local age distributions, and MOVES default relative mileage accumulation rates), and hotelling activity distributions for each model year (Table 4-3).

The SHEI and APU hours activity distribution fractions were each first multiplied by the travel distribution (model year operating mode activity fraction multiplied by the associated model year travel fraction).

The product of the SHEI fractions and travel fractions were then summed to produce the total SHEI fraction, and the same process was performed for APU hours to produce total APU hours fraction. (The sum of the SHEI and APU hours fractions subtracted from 1.0 results in the remaining fraction of hotelling hours, consisting of the electric power or no power in use modes.)

The total SHEI and APU hours fractions were then each multiplied by the hotelling hours for each hour of the day to produce the SHEI and APU hours estimates for each hour.

[37] Base estimates of hotelling hours are 2017 winter weekday estimates, developed by TTI as part of a truck extended idling study that produced county 24-hour hotelling estimate totals for all Texas counties, sponsored by TCEQ starting in 2017. The base VMT estimates for hotelling scaling factors were developed using 2017 El Paso TDM datasets (provided by the EPMPO January 22, 2024) and VMT adjustments, VMT mix, and procedures described in Items 8 and 9.

Table 4-3. Hotelling Activity Distributions by Model Year and OpMode Fraction.

Begin Model Year	End Model Year	200 Extend Idling	201 Diesel Aux	203 Battery AC	204 APU Off
1960	2009	0.8	0	0	0.2
2010	2020	0.73	0.07	0	0.2
2021	2023	0.48	0.24	0.08	0.2
2024	2026	0.4	0.32	0.08	0.2
2027	2060	0.36	0.32	0.12	0.2

ii. Partial County Estimates:

For the Sunland Park NAA estimates of SHEI and APU hours as a function of hotelling hours, the procedure of applying a VMT ratio, or scaling factor, to county-level activity was used. The SHEI and APU hours for each hour for the Sunland Park NAA were calculated by scaling the El Paso County activity estimates using the ratios of Sunland Park VMT to the El Paso County VMT, for each year.

4.6 Development of Emission Factors by Vehicle Type

11. Emission Factors Overview:

TTI developed emission rates using MOVES and the TTI post-processing utility, RatesCalc, which prepares MOVES3-based, direct vehicle emission rates for input to TTI's external inventory calculation utility, EmsCalc. El Paso County summer weekday emission rates were produced for each analysis year for use in estimating emissions for all El Paso regional TDM area analyses.

These on-road emission rates were developed in terms of mass per activity unit: miles for roadway-based processes; and SHP, starts, SHEI, and APU hours for off-network processes. All activity-based rates were directly output by MOVES, except for parked vehicle evaporative emission rates based in SHP. TTI used the RatesCalc utility to calculate emission rates in terms of rate/SHP (as a conversion of MOVES rate/vehicle output) using the data in the county (local) input database (CDB) used in the MOVES emission rates run and the MOVES default database. The RatesCalc utility combined the rate/distance, rate/hour (SHEI and APU hours), and rate/start emission rate tables from MOVES output and the calculated rate/SHP emission rate table into a database of rates look-up tables. For additional details on the post-processing of MOVES output, see Attachment 4.2.

Table 4-4 lists the emissions processes with associated activity basis and emission rate units. The emission factors were developed by pollutant, speed, process, hour, road type, and SUT/FT.

Table 4-4. MOVES On-Road Emission Rates Modeled by Process and Activity Factor.

Emissions Process	Activity[1]	Emission Factor Units
Running Exhaust Crankcase Running Exhaust	VMT	mass/mile (mass/mi)
Brake Wear	VMT	mass/mi
Tire Wear	VMT	mass/mi
Start Exhaust Crankcase Start Exhaust	starts	mass/start
Extended Idle Exhaust Crankcase Extended Idle Exhaust	SHEI	mass/SHEI
Auxiliary Power Exhaust	APU Hours	mass/APU hour
Off-network Idling Exhaust[2]	ONI Hours	Mass/ONI hour
Evaporative Permeation Evaporative Fuel Vapor Venting Evaporative Fuel Leaks	VMT, SHP	mass/mi, mass/SHP

[1] The amount of travel on roads (VMT), SHP, vehicle starts, SHEI and APU hours are the basic activity factors. SHEI and APU hours are for combination long-haul trucks only. Evaporative (hydrocarbon) permeation, fuel vapor venting, and fuel leaks occur both during operation and while parked.
[2] The Off-network idling exhaust is in the rateperdistance table with MOVES roadtypeID = 1.

a. MOVES Model Inputs:

All user-specified model settings and inputs for each run were contained in a MOVES run specification (MRS) and a CDB (the MOVES3 default database used was "MOVESDB20221007"). See Attachment 4.2 for details on the MRS files and CDBs developed for El Paso County and used to estimate the summer weekday emission factors for each analysis year for all areas in the El Paso TDM region.

b. Emission Factor Post-Processing Adjustments:

No emission rate adjustments were applied (e.g., El Paso County is not in the Texas Low Emissions Diesel [TxLED] program so no TxLED NOx adjustments were applied).

c. Emissions Controls Modeling:

Table 4-5 shows the modeling approaches used for the emissions control strategies. Unless otherwise stated, the control strategy was modeled in all years.

Table 4-5. Emission Control Strategies and Modeling Approaches.

Strategy	Approach
Federal Motor Vehicle Control Program Standards	*MOVES defaults.*
Federal Heavy-Duty Diesel Engines Rebuild and 2004 Pull-Ahead Programs to Mitigate NOx Off-Cycle Effects	*MOVES defaults.*
Gasoline Fuel – Tier 2/Tier 3 sulfur standards, Low Summer Reid Vapor Pressure (RVP)	*Locality-specific user inputs to MOVES*. TTI used summer 2017 conventional gasoline inputs based on summer 2017 El Paso gasoline survey data (TCEQ 2017). The future year (2022 and later) conventional gasoline inputs, consistent with pertinent federal and state rules, were based on a combination of the latest available 2020 El Paso fuel sample data and MOVES defaults for particular expected future year values. Fuel formulations are provided in Attachment 4.2.
Federal Low Sulfur Diesel Fuel	*Locality-specific user inputs to MOVES*. The 2017 diesel sulfur input values were based on summer 2017 El Paso survey data. For 2022 and later, diesel sulfur input values were set to the expected future year value (within the applicable federal diesel sulfur standard and consistent with Texas observed values in the last four TCEQ statewide diesel fuel surveys). Diesel formulations are provided in Attachment 4.2.
Inspection and Maintenance (I/M) Program	*Locality-specific user inputs to MOVES*. TTI developed El Paso I/M Program inputs to MOVES using the available MOVES I/M parameters pertaining to the domain of subject I/M vehicles, consistent with current program descriptions and latest I/M modeling protocols. Attachment 4.2 provides a summary of the I/M program input parameters used, to include updated I/M compliance factors developed based on the latest MOVES technical guidance (EPA November 2020) and El Paso- and Texas-specific I/M program statistics (waiver, failure, and compliance rates) (TCEQ March 2021).

ATTACHMENT 4.1
ADJUSTMENTS TO TDM VMT

Table 4-6. HPMS Factor.

2017 HPMS AADT VMT[1]	AADT-to-ANSWT Factor	2017 HPMS-Based ANSWT VMT	2017 TDM VMT[1]	HPMS Factor[2]
17,191,534.000	1.090110	18,740,663.000	18,069,906.000	1.037120

[1] El Paso County.
[2] Applied to all future years and areas in the El Paso region TDM.

Table 4-7. Future Analysis Years Seasonal Weekday Factor.

Year	Seasonal Factor Type[1]	Factor
2022, 2032, 2040, 2050	ANSWT-to-SWKD	0.96285

[1] SWKD = summer weekday.

Table 4-8. Base Year VMT Adjustment Factor.

Year	2017 TDM VMT[1]	2017 SWKD RIFCREC VMT	Adjustment Factor Type[1]	Factor
2017	18,069,906	17,935,130	TDM-to-SWKD	0.99254

[1] SWKD = summer weekday.

Table 4-9. Hourly VMT Distributions.

Period	Hour	Summer Fractions 24-Hour-Period	Summer Fractions Four-Period[1]	Winter Fractions 24-Hour-Period	Winter Fractions Four-Period[1]
AM Peak	7-8 a.m.	0.061580	0.343633	0.063090	0.344417
AM Peak	8-9 a.m.	0.062322	0.347773	0.064049	0.349653
AM Peak	9-10 a.m.	0.055301	0.308594	0.056040	0.30593
Mid-Day	10-11 a.m.	0.053025	0.184042	0.053491	0.18291
Mid-Day	11 a.m-12 p.m.	0.055167	0.191477	0.055808	0.190832
Mid-Day	12-1 p.m.	0.058213	0.202049	0.058949	0.201573
Mid-Day	1-2 p.m.	0.059641	0.207006	0.060769	0.207796
Mid-Day	2-3 p.m.	0.062067	0.215426	0.063428	0.216889
PM Peak	3-4 p.m.	0.066343	0.244438	0.069107	0.245993
PM Peak	4-5 p.m.	0.070696	0.260477	0.074336	0.264606
PM Peak	5-6 p.m.	0.072223	0.266103	0.074267	0.26436
PM Peak	6-7 p.m.	0.062148	0.228982	0.063221	0.225041
Overnight	7-8 p.m.	0.048714	0.186448	0.047639	0.195687
Overnight	8-9 p.m.	0.039459	0.151025	0.036502	0.149939
Overnight	9-10 p.m.	0.032720	0.125233	0.029863	0.122668
Overnight	10-11 p.m.	0.025940	0.099283	0.023235	0.095443
Overnight	11 p.m.-12 a.m.	0.018508	0.070838	0.016362	0.06721
Overnight	12-1 a.m.	0.010813	0.041386	0.009656	0.039664
Overnight	1-2 a.m.	0.007174	0.027458	0.006595	0.02709
Overnight	2-3 a.m.	0.005817	0.022264	0.00549	0.022551
Overnight	3-4 a.m.	0.005831	0.022318	0.005575	0.0229
Overnight	4-5 a.m.	0.008485	0.032475	0.007866	0.032311
Overnight	5-6 a.m.	0.019771	0.075672	0.017402	0.071482
Overnight	6-7 a.m.	0.038042	0.145602	0.037260	0.153053

[1] To maintain VMT proportions within the four periods, the hourly fractions were normalized within each period.

ATTACHMENT 4.2
MOVES RUN SPECIFICATIONS (MRS), COUNTY DATABASES (CDB), OUTPUTS, AND POST-PROCESSING

MOVES Inputs and Output – El Paso County and the Sunland Park NAA:[38]

- MRS input files: One for each analysis year (5).
- CDB inputs: One for each analysis year (5).
- The MOVES default input database (MOVESDB20221007).
- MOVES output databases: One per MOVES run (5).
- MOVES run log output text files: One per MOVES run (5).

Table 4-10 describes the MOVES3 run specification files used. Table 4-11 describes the CDBs built and used for the rates analysis. Unless otherwise stated, inputs were used for all years.

[38] Applicable to all TDM areas, e.g., El Paso County and the Dona Ana County, NM partial county areas in the TDM.

Table 4-10. MOVES Run Specification Selections by GUI Panel.

Navigation Panel	Detail Panel	Selection		
Scale	Model; Domain/Scale; Calculation Type	On-Road; County; Emission Rates		
Time Spans[1]	Time Aggregation Level; Years – Months – Days – Hours	Hour; <***Year***>[1] - <***Month***>[1] - Weekday - All		
Geographic Bounds[1]	Region; Selections;	Zone and Link; Texas – El Paso County;		
On-Road Vehicle Equipment	SUT/Fuel Combinations	SUT	Gasoline	Diesel
		Motorcycle	X	-
		Passenger Car	X	X
		Passenger Truck	X	X
		Light Commercial Truck	X	X
		Other Bus	X	X
		Transit Bus	X	X
		School Bus	X	X
		Refuse Truck	X	X
		Single Unit Short-Haul Truck	X	X
		Single Unit Long-Haul Truck	X	X
		Motor Home	X	X
		Combination Short-Haul Truck	X	X
		Combination Long-Haul Truck	-	X
Road Type	Selected Road Types	Off-Network – Rural Restricted Access – Rural Unrestricted Access – Urban Restricted Access – Urban Unrestricted Access		
Pollutants and Processes[2]	Primary Exhaust PM_{10}; Primary PM_{10} Brakewear; Primary PM_{10} Tirewear.	Dependent on pollutant: Running Exhaust, Start Exhaust, Extended Idle Exhaust, Auxiliary Power Exhaust, Crankcase Running Exhaust, Crankcase Start Exhaust, Crankcase Extended Idle Exhaust, Brakewear, Tirewear		
Create Input Database	Domain Input Database	<***County Input Database Name***>[1]		
General Output[1]	Output Database; Units; Activity	<***MOVES Output Database Name***>[1]; Grams, KiloJoules, Miles; Hotelling Hours, Population, Starts (not adjustable, pre-selected)		
Output Emissions Detail	Always; For All Vehicles/Equipment; On Road	Time: Hour – Location: Link – Pollutant; Fuel Type, Emissions Process; Source Use Type		
Advanced Features	Aggregation and Data Handling	All check boxes "un-checked" except "clear BaseRateOutput after rate calculations" box		

[1] Year and season labels were included in the MRS file, input CDB, and output database names.

[2] Pre-requisite pollutants that were needed to model the reported pollutants are not shown.

Table 4-11. MOVES CDB Input Tables.

Input Table[2]	Category	Notes
year	Time	Designates analysis year as a base year (base year means local activity inputs will be supplied rather than forecast by the model).
state	Geography	Identifies the state (Texas) for the analysis.
county	Geography/ Meteorology	Identifies county with local altitude and barometric pressure (BP). Used 2017 annual average BP based on El Paso County weather station data provided by TCEQ (from 2017 periodic emissions inventory).
zonemonthhour	Meteorology	Summer / winter hourly temperature and relative humidity for the county. 2017 June-July-August averages, from TCEQ's El Paso County 2017 periodic emissions inventory.
roadtype	Activity	Lists the MOVES road types and associated ramp activity fractions. Road type ramp fractions were set to 0.
Hpmsvtypeyear[1]	Activity (Defaults)	Used MOVES default national annual VMT by HPMS vehicle type.
roadtypedistribution[1]	Activity (Defaults)	Used MOVES default road type VMT fractions.
startsageadjustment[1]	Activity (Defaults)	Used MOVES default starts age adjustment fractions.
totalidlefraction[1]	Activity (Defaults)	Used MOVES default seasonal average total idle fractions.
startsperdaypervehicle[1]	Activity (Defaults)	Used MOVES default starts per day per vehicle.
startshourfraction[1]	Activity (Defaults)	Used MOVES default starts hour fractions.
startsmonthadjust[1]	Activity (Defaults)	Used MOVES default seasonal average starts month adjustment fractions. For summer season, use average value from June, July and August.
startsopmodedistribution[1]	Activity (Defaults)	Used MOVES default starts operating mode fractions.
monthvmtfraction[1]	Activity (Defaults)	Used MOVES default seasonal average VMT fractions.
dayvmtfraction[1]	Activity (Defaults)	Used MOVES default day VMT fractions.
hourvmtfraction[1]	Activity (Defaults)	Used MOVES default hour VMT fractions.
avgspeeddistribution[1]	Activity (Defaults)	Used MOVES default average speed distributions.
sourcetypeyear[1]	Fleet (Defaults)	Used MOVES default national SUT populations.
sourcetypeage-distribution	Fleet	Estimated SUT age distributions using latest and only available (end-of-year 2021 for future years, end-of-year 2018 for 2017 base year) TxDMV local registration data and analysis year MOVES defaults, as needed (i.e., for refuse trucks, buses, and motorhomes).
avft	Fleet	Estimated SUT fuel fractions using TxDMV registration data and defaults, where needed. Local data sets used were consistent with sourcetypeagedistribution table. The avft estimate is also consistent with the analysis VMT mix (i.e., gasoline and diesel).
zone	Activity	Start, hotelling, and SHP zone allocation factors. County = zone, and all factors were set to 1.0 (required for county scale analyses).
zoneroadtype	Activity	SHO zone/roadtype allocation factors. County = zone, and all factors were set to 1.0 (required for county scale analyses).
fuelsupply	Fuel	For each analysis year and season, the local fuel supply will consist of one conventional gasoline formulation and one biodiesel formulation. (Although only the predominant fuels gasoline and diesel will be modeled, the other MOVES fuel type formulations will be input as required to run the MOVES model.)

Input Table[2]	Category	Notes
fuelformulation	Fuel	• Conventional gasoline (CG) formulations based on TCEQ's summer 2017 and summer 2023 (latest available) fuel survey samples from El Paso County. ○ The 2017 CG properties are actual 2017 averages (fuel grade averages weighted by relative sales volumes). ○ The 2022 CG properties are actual 2023 averages (fuel grade averages weighted by relative sales volumes). ○ The Future Years (2024+) CG properties are latest available actual 2023 averages except with RVP, average sulfur level, and average benzene content set to the "expected" values (MOVES3 defaults, consistent with the pertinent regulatory standards). • The 2017 diesel sulfur level is the statewide average from TCEQ's 2017 survey. • The 2022 diesel sulfur level is the statewide average from TCEQ's 2023 survey. • Future years (2024+) diesel sulfur was set to the current expected future year value (6 ppm), which is conservative and consistent with the statewide diesel sulfur average from TCEQ's latest (2023) survey. • The BD ester volume percentages for 2017 and future years were based on 2017 and the latest available (2021) DOE state-level transportation sector BD consumption estimates. • Fuel subtype IDs 12 and 21 are 10% ethanol-blend gasoline and biodiesel, respectively.
countyyear	Stage II	N/A
imcoverage	I/M	• Begin and end model year (X, Y) define the range of model years covered – where X and Y, respectively, are calculated as YearID – 24, and YearID – 2. • For analysis year 2017, I/M compliance factor estimates were applied the same compliance factors in the previous MOVES2014b-based Regional Mobility Strategy 2050 MTP emissions analysis. For future years, I/M compliance factor estimates calculated by TTI using TCEQ 2021 statewide compliance data and MOVES3 I/M compliance factor equation in MOVES3 Technical Guidance (Source: E- mail from Mobile Source Programs Team, values confirmed January 11, 2023, Based on Calendar Year 2021 I/M Program Data); El Paso I/M-program- specific I/M waiver rates and failure rates, and statewide average I/M compliance rates; in combination with MOVES3 regulatory class coverage adjustments. • The model processes/pollutants affected are start and running exhaust HC, CO, NOx, and tank vapor venting HC; fuel type is gasoline; frequency is annual.
Hotellingactivity-distribution	Activity	Used the MOVES default hotelling activity distributions.

[1] Use of default activity and population inputs for the MOVES rates mode runs basic to the rates-per-activity emissions estimation method, which calculates the emissions inventory estimates via post-processing. The process uses the local vehicle activity estimates externally in the emissions calculations.
[2] Other optional (empty) tables, not listed here, were included in the CDBs.

Table 4-12 summarizes the meteorological inputs used. Table 4-13 summarizes the fuel formulation inputs used. Table 4-14 summarize the I/M factor inputs used. Age distribution and fuel fraction inputs are summarized in Attachment 4.3.

Table 4-12. Summer 2017 Meteorological Inputs to MOVES for El Paso County.

Hour	Temperature (degrees Fahrenheit)	Relative Humidity (percent)
12:00 a.m.	79.77	42.73
1:00 a.m.	78.51	45.05
2:00 a.m.	77.31	47.11
3:00 a.m.	76.27	49.05
4:00 a.m.	75.38	50.63
5:00 a.m.	74.47	52.45
6:00 a.m.	73.96	53.51
7:00 a.m.	75.19	51.26
8:00 a.m.	77.54	46.95
9:00 a.m.	80.13	42.42
10:00 a.m.	82.81	37.98
11:00 a.m.	85.38	33.88
12:00 p.m.	87.54	30.66
1:00 p.m.	89.27	28.03
2:00 p.m.	90.68	25.90
3:00 p.m.	91.85	24.01
4:00 p.m.	92.09	24.18
5:00 p.m.	91.62	24.77
6:00 p.m.	90.74	25.75
7:00 p.m.	89.02	28.24
8:00 p.m.	86.68	32.05
9:00 p.m.	84.78	34.61
10:00 p.m.	82.97	37.00
11:00 p.m.	81.28	40.04

[2] Average hourly inputs developed from weather stations within El Paso County—June through August 2017 (provided by TCEQ).

Table 4-13. MOVES Summer Gasoline and Diesel Fuel Formulation Inputs for El Paso County.

Fuel Parameter	Units	Gasoline[1] 2017	Gasoline[1] 2022	Gasoline[1] 2024+	Diesel[2] 2017	Diesel[2] 2022	Diesel[2] 2024+
Fuel Formulation ID	-	17703	2373	2473	30176	30236	30600
Fuel Subtype ID	-	12	12	12	21	21	21
RVP	psi	6.94	7.11	7.00	0	0	0
Sulfur Level	ppm	19.56	9.39	10.00	6.37	5.91	6.00
ETOH Volume	vol. %	9.60	9.89	9.89	0	0	0
MTBE Volume	vol. %	0	0.00	0.00	0	0	0
ETBE Volume	vol. %	0	0.00	0.00	0	0	0
TAME Volume	vol. %	0	0.00	0.00	0	0	0
Aromatic Content	vol. %	26.67	27.10	27.10	0	0	0
Olefin Content	vol. %	5.50	5.62	5.62	0	0	0
Benzene Content	vol. %	1.13	1.07	0.70	0	0	0
e200	vap. %	48.74	45.96	45.96	0	0	0
e300	vap. %	87.84	85.80	85.80	0	0	0
Vol to Wt Percent Oxy	-	0.3653	0.3653	0.3653	0	0	0
BioDieselEster Volume	vol. %	/N	N/A	N/A	4.68	3.13	3.13
Cetane Index	-	/N	N/A	N/A	N/A	N/A	N/A
PAH Content	-	/N	N/A	N/A	N/A	N/A	N/A
T50	deg. F	206.12	207.76	207.76	0	0	0
T90	deg. F	306.72	315.98	315.98	0	0	0

[1] Summer conventional gasoline (CG) - TTI based the CG formulations on TCEQ's summer 2023 (latest available) fuel survey samples from El Paso County. The 2017 CG properties are actual 2017 averages. The 2022 CG properties are actual 2023 averages (fuel grade averages weighted by relative sales volumes. The Future Years (2024+) CG properties are latest available actual 2023 averages except with RVP, average sulfur level, and average benzene content set to the "expected" values (MOVES3 defaults, consistent with the pertinent regulatory standards.

[2] The BD ester volume percentages for 2017 were based on 2017 and 2022 were based on the latest available (2021) DOE state-level transportation sector BD consumption estimates. Future years (2024+) diesel sulfur was set to the current expected future year value (6 ppm), which is conservative and consistent with the statewide diesel sulfur average from TCEQ's latest (2023) survey Fuel subtype ID 21 is biodiesel.

Table 4-14. MOVES I/M Inputs for El Paso County.

Factor	I/M Information			
Test Standards Description	Two-mode, 2500 RPM/Idle Test	Evaporative Gas Cap Check	Exhaust OBD Check	Evaporative Gas Cap and OBD Check
Test Standards ID	12	41	51	45
Year ID	2017	2017	2017, 2022, 2032, 2040, 2050	2017, 2022, 2032, 2040, 2050
Source Use Type	21, 31, 32	21, 31, 32	21, 31, 32	21, 31, 32
Begin Model Year	X	X	X	X
End Model Year	1995	1995	Y	Y
I/M Compliance	21 – 95.20% 31 – 93.30% 32 – 87.58%	21 – 95.20% 31 – 93.30% 32 – 87.58%	**2017** 21 – 95.20% 31 – 93.30% 32 – 87.58% **Future Years** 21 – 94.00% 31 – 90.35% 32 – 70.74%	**2017** 21 – 95.20% 31 – 93.30% 32 – 87.58% **Future Years** 21 – 94.00% 31 – 90.35% 32 – 70.74%

POST-PROCESSING OUTPUT:

Each MOVES output database was post-processed using TTI's MOVES emission rates post-processing utility, RatesCalc, to produce the final on-road rate tables for subsequent input to the EmsCalc inventory calculation utility.

- Rates Calculation Rate Databases: Mass/SHP off-network evaporative process rates were calculated using data from the CDB, the MOVES default database, and the MOVES rateperprofile and ratepervehicle emission rate output. RatesCalc also copied mass/mile, mass/start, and mass/hour rates along with the units into emission rate tables. RatesCalc does not perform any unit conversions. The utility created the emission rate look-up tables ttirateperdistance, ttirateperstart, ttirateperhour (for SHEI and APU hours), and ttiratepershp in a "ratescalc" output database by county, analysis year, and season. (When the RatesAdj utility is not subsequently applied, RatesCalc produces the final rates inputs to EmsCalc.)
- RatesAdj Final Rate Databases: Not Applicable. The Texas Low Emission Diesel Program (TxLED) is not applicable to El Paso County; thus, the RatesAdj utility was not used.[39]

[39] The TxLED counties list may be found at: https://www.tceq.texas.gov/airquality/mobilesource/txled/txled-affected-counties.

Table 4-15. Estimated TxLED Fuel NO_X Reductions and Adjustments.[1]

Diesel Fuel Source Use Type	NO_X Reduction	NO_X Reduction	NO_X Reduction	NO_X Adjustment	NO_X Adjustment	NO_X Adjustment
Passenger Car	-	-	-	-	-	-
Passenger Truck	-	-	-	-	-	-
Light Commercial Truck	-	-	-	-	-	-
Intercity Bus	-	-	-	-	-	-
Transit Bus	-	-	-	-	-	-
School Bus	-	-	-	-	-	-
Refuse Truck	-	-	-	-	-	-
Single Unit Short-Haul Truck	-	-	-	-	-	-
Single Unit Long-Haul Truck	-	-	-	-	-	-
Motor Home	-	-	-	-	-	-
Combination Short-Haul Truck	-	-	-	-	-	-
Combination Long-Haul Truck	-	-	-	-	-	-

[1] The Texas Low Emission Diesel Program (TxLED) is **not applicable** to El Paso County.

ATTACHMENT 4.3
SOURCE TYPE AGE AND FUEL ENGINE FRACTIONS INPUTS TO MOVES

El Paso County 2017 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.045852	0.054194	0.049544	0.049544	0.078824	0.091142	0.083978	0.031614	0.072882	0.108951	0.016664	0.073421	0.068825
1	0.051001	0.066078	0.048569	0.048569	0.075667	0.090093	0.076580	0.032820	0.083472	0.103650	0.017093	0.056130	0.059543
2	0.046143	0.069510	0.049632	0.049632	0.067199	0.077034	0.075099	0.039904	0.083264	0.111268	0.017428	0.041706	0.047903
3	0.064504	0.071280	0.047521	0.047521	0.063959	0.079629	0.072132	0.035734	0.072467	0.085755	0.016351	0.072899	0.060675
4	0.062464	0.076914	0.044244	0.044244	0.041394	0.062045	0.040955	0.031878	0.079630	0.102451	0.020170	0.071249	0.071965
5	0.061395	0.066839	0.047184	0.047184	0.036596	0.068674	0.042028	0.032138	0.051391	0.056032	0.010539	0.059084	0.057263
6	0.057121	0.061546	0.033286	0.033286	0.032532	0.055132	0.043047	0.023869	0.037064	0.050813	0.019997	0.060996	0.058116
7	0.047989	0.051187	0.030500	0.030500	0.035230	0.072004	0.039560	0.017559	0.058451	0.071436	0.003389	0.065948	0.060032
8	0.030892	0.039353	0.031014	0.031014	0.039392	0.069145	0.049382	0.031958	0.046200	0.048826	0.005994	0.034755	0.030871
9	0.028366	0.039896	0.030097	0.030097	0.039680	0.062851	0.049899	0.027028	0.026890	0.017043	0.022758	0.026240	0.019997
10	0.056829	0.032384	0.024790	0.024790	0.041020	0.044016	0.043545	0.078002	0.022737	0.016190	0.038819	0.035972	0.027428
11	0.053915	0.048988	0.047184	0.047184	0.050566	0.038149	0.041402	0.063658	0.066341	0.041381	0.052497	0.023894	0.024805
12	0.067321	0.049623	0.049295	0.049295	0.030779	0.028742	0.036224	0.054189	0.030627	0.027061	0.041177	0.062299	0.078722
13	0.051875	0.043221	0.045432	0.045432	0.029860	0.029906	0.039417	0.045716	0.046927	0.030204	0.063961	0.045790	0.050902
14	0.046143	0.039656	0.044435	0.044435	0.038819	0.030838	0.029111	0.050432	0.035714	0.025697	0.048354	0.039361	0.043087
15	0.033612	0.033629	0.047909	0.047909	0.035967	0.028980	0.034482	0.045640	0.029693	0.019228	0.045680	0.019115	0.024421
16	0.043229	0.030194	0.041510	0.041510	0.041037	0.026572	0.038448	0.048454	0.026267	0.015792	0.030061	0.021983	0.021618
17	0.029046	0.025194	0.041342	0.041342	0.047968	0.018212	0.033726	0.058821	0.019414	0.013489	0.056177	0.015466	0.016864
18	0.023800	0.019453	0.038762	0.038762	0.028106	0.011607	0.017894	0.047873	0.017753	0.013534	0.087043	0.022678	0.023545
19	0.015154	0.017617	0.032831	0.032831	0.022635	0.006198	0.016732	0.030019	0.020453	0.009828	0.039384	0.036667	0.032228
20	0.016709	0.012782	0.025428	0.025428	0.020051	0.002680	0.014288	0.019410	0.016092	0.009369	0.065558	0.028152	0.024374
21	0.010200	0.009910	0.020649	0.020649	0.015338	0.003551	0.012169	0.024501	0.007164	0.004506	0.034386	0.017204	0.018389
22	0.007286	0.007460	0.020678	0.020678	0.015262	0.000636	0.013276	0.027421	0.012251	0.004678	0.037837	0.013381	0.012671
23	0.006800	0.005067	0.013612	0.013612	0.011438	0.001134	0.006577	0.016877	0.005606	0.002323	0.039588	0.009471	0.012375
24	0.004177	0.004761	0.014125	0.014125	0.009950	0.000160	0.007616	0.013002	0.006541	0.002388	0.023454	0.008950	0.011774
25	0.004080	0.003478	0.013311	0.013311	0.006052	0.000234	0.006794	0.010264	0.004153	0.001414	0.022808	0.006864	0.008079
26	0.002817	0.002666	0.008825	0.008825	0.005200	0.000182	0.008420	0.012742	0.002492	0.001073	0.015103	0.005648	0.006273
27	0.002234	0.002091	0.007308	0.007308	0.007295	0.000215	0.008562	0.014199	0.002492	0.000713	0.022934	0.004431	0.003870
28	0.001651	0.001816	0.005138	0.005138	0.008928	0.000108	0.004271	0.010231	0.001973	0.000730	0.028466	0.003476	0.003640
29	0.002429	0.001506	0.004647	0.004647	0.005620	0.000040	0.004325	0.010633	0.002180	0.000653	0.025257	0.003389	0.003493
30	0.024966	0.011707	0.041195	0.041195	0.017635	0.000091	0.010061	0.013416	0.011420	0.003525	0.031075	0.013381	0.016255

El Paso County 2022 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061109	0.055527	0.053193	0.053193	0.056712	0.056712	0.056712	0.058830	0.058850	0.078534	0.058830	0.050561	0.041768
1	0.050378	0.056150	0.045311	0.045311	0.054123	0.054106	0.054188	0.057207	0.080111	0.086004	0.057707	0.069567	0.066506
2	0.050775	0.059589	0.054931	0.054931	0.055509	0.055475	0.055721	0.058115	0.087826	0.118415	0.058718	0.071275	0.071530
3	0.048986	0.064477	0.044521	0.044521	0.057747	0.057590	0.058060	0.059567	0.070243	0.085213	0.060634	0.059470	0.058414
4	0.047893	0.069579	0.047230	0.047230	0.054689	0.054317	0.054837	0.056858	0.071409	0.091973	0.058827	0.048110	0.049151
5	0.057333	0.068612	0.045069	0.045069	0.074533	0.085101	0.079523	0.029762	0.061721	0.071366	0.016485	0.091618	0.071145
6	0.053557	0.072800	0.041529	0.041529	0.069771	0.081389	0.070564	0.030339	0.068359	0.082595	0.016659	0.088425	0.074465
7	0.053160	0.062904	0.044286	0.044286	0.060409	0.067195	0.067307	0.036236	0.045483	0.044593	0.016743	0.063479	0.053846
8	0.049285	0.057941	0.031382	0.031382	0.055327	0.065808	0.061977	0.031568	0.033641	0.040108	0.015368	0.047071	0.051710
9	0.044018	0.047698	0.028688	0.028688	0.034433	0.048393	0.033696	0.027389	0.053557	0.056656	0.018548	0.043656	0.048562
10	0.028021	0.036343	0.029305	0.029305	0.029650	0.051474	0.033584	0.027111	0.039562	0.038823	0.009555	0.023684	0.024705
11	0.024245	0.036152	0.028044	0.028044	0.025677	0.039830	0.033422	0.019757	0.021172	0.013596	0.017857	0.022719	0.016595
12	0.052564	0.028406	0.022780	0.022780	0.027077	0.050010	0.029823	0.014265	0.016955	0.012800	0.002982	0.027916	0.023001
13	0.047198	0.041596	0.042755	0.042755	0.029492	0.046329	0.036177	0.025485	0.053647	0.032343	0.005197	0.018561	0.020762
14	0.057035	0.041405	0.044972	0.044972	0.028926	0.040519	0.035494	0.021151	0.027003	0.021687	0.019438	0.047368	0.062512
15	0.046800	0.033595	0.041038	0.041038	0.029104	0.027225	0.030057	0.059913	0.038575	0.024019	0.032680	0.032519	0.040433
16	0.039348	0.030580	0.039036	0.039036	0.034927	0.022711	0.027743	0.047960	0.029335	0.020335	0.043523	0.029624	0.034685
17	0.028219	0.025338	0.042056	0.042056	0.020687	0.016423	0.023548	0.040056	0.022966	0.015496	0.033634	0.014403	0.019448
18	0.034380	0.022210	0.036238	0.036238	0.019535	0.016462	0.024879	0.033159	0.018839	0.012645	0.051458	0.014849	0.017455
19	0.023649	0.017719	0.034541	0.034541	0.024711	0.016309	0.017824	0.035884	0.016148	0.010705	0.038318	0.010765	0.013339
20	0.019475	0.013719	0.032283	0.032283	0.021967	0.014417	0.020167	0.031550	0.014802	0.010759	0.035387	0.015517	0.018454
21	0.013315	0.012059	0.027594	0.027594	0.024376	0.012688	0.021804	0.032852	0.014982	0.007620	0.022936	0.027025	0.025904
22	0.013116	0.008694	0.021478	0.021478	0.027701	0.008321	0.018533	0.039122	0.012739	0.007333	0.042231	0.019081	0.019376
23	0.009738	0.006888	0.016782	0.016782	0.015783	0.005092	0.009533	0.031213	0.005562	0.003379	0.064419	0.013141	0.014545
24	0.005564	0.005044	0.017267	0.017267	0.012354	0.002603	0.008635	0.019193	0.008792	0.003474	0.028707	0.009132	0.010195
25	0.006061	0.003633	0.010978	0.010978	0.010791	0.001102	0.007260	0.012293	0.004127	0.001743	0.047431	0.006756	0.009878
26	0.004173	0.003347	0.011726	0.011726	0.008023	0.001401	0.005992	0.015208	0.004306	0.001780	0.024489	0.006831	0.009086
27	0.003478	0.002337	0.010978	0.010978	0.007756	0.000240	0.006329	0.016688	0.003140	0.001022	0.026536	0.005197	0.006409
28	0.002385	0.001916	0.007342	0.007342	0.005730	0.000419	0.003086	0.010174	0.002602	0.000805	0.027557	0.005346	0.005075
29	0.001789	0.001463	0.005673	0.005673	0.004844	0.000057	0.003461	0.007680	0.001974	0.000530	0.016069	0.002970	0.003028
30	0.022953	0.012280	0.040996	0.040996	0.017635	0.000284	0.010061	0.013416	0.011573	0.003653	0.031075	0.013364	0.018016

El Paso County 2032 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061109	0.055527	0.053193	0.053193	0.052873	0.052873	0.052873	0.055729	0.058850	0.078534	0.055729	0.050561	0.041768
1	0.050378	0.056150	0.045311	0.045311	0.052415	0.052169	0.052421	0.055236	0.080111	0.086004	0.055315	0.069567	0.066506
2	0.050775	0.059589	0.054931	0.054931	0.051766	0.051188	0.051751	0.054443	0.087826	0.118415	0.054267	0.071275	0.071530
3	0.048986	0.064477	0.044521	0.044521	0.051349	0.050353	0.051183	0.054067	0.070243	0.085213	0.054038	0.059470	0.058414
4	0.047893	0.069579	0.047230	0.047230	0.051261	0.050041	0.050996	0.054112	0.071409	0.091973	0.055229	0.048110	0.049151
5	0.057333	0.068612	0.045069	0.045069	0.050813	0.049435	0.050500	0.053448	0.061721	0.071366	0.054865	0.091618	0.071145
6	0.053557	0.072800	0.041529	0.041529	0.049797	0.048274	0.049430	0.052230	0.068359	0.082595	0.054917	0.088425	0.074465
7	0.053160	0.062904	0.044286	0.044286	0.048668	0.047038	0.048278	0.051147	0.045483	0.044593	0.054121	0.063479	0.053846
8	0.049285	0.057941	0.031382	0.031382	0.047235	0.045476	0.046826	0.049829	0.033641	0.040108	0.053142	0.047071	0.051710
9	0.044018	0.047698	0.028688	0.028688	0.046569	0.044675	0.046082	0.049011	0.053557	0.056656	0.053078	0.043656	0.048562
10	0.028021	0.036343	0.029305	0.029305	0.045292	0.043270	0.044765	0.047609	0.039562	0.038823	0.051978	0.023684	0.024705
11	0.024245	0.036152	0.028044	0.028044	0.041351	0.039366	0.040865	0.044604	0.021172	0.013596	0.049222	0.022719	0.016595
12	0.052564	0.028406	0.022780	0.022780	0.040570	0.038443	0.040136	0.043732	0.016955	0.012800	0.048459	0.027916	0.023001
13	0.047198	0.041596	0.042755	0.042755	0.039837	0.037450	0.039391	0.042710	0.053647	0.032343	0.047827	0.018561	0.020762
14	0.057035	0.041405	0.044972	0.044972	0.035638	0.033107	0.035050	0.038996	0.027003	0.021687	0.044571	0.047368	0.062512
15	0.046800	0.033595	0.041038	0.041038	0.046277	0.049108	0.048324	0.019628	0.038575	0.024019	0.012048	0.032519	0.040433
16	0.039348	0.030580	0.039036	0.039036	0.041359	0.044644	0.040872	0.019257	0.029335	0.020335	0.011747	0.029624	0.034685
17	0.028219	0.025338	0.042056	0.042056	0.034175	0.034970	0.037130	0.022168	0.022966	0.015496	0.011414	0.014403	0.019448
18	0.034380	0.022210	0.036238	0.036238	0.029866	0.032563	0.032579	0.018553	0.018839	0.012645	0.010083	0.014849	0.017455
19	0.023649	0.017719	0.034541	0.034541	0.017762	0.022768	0.016896	0.015533	0.016148	0.010705	0.011775	0.010765	0.013339
20	0.019475	0.013719	0.032283	0.032283	0.014379	0.022614	0.015794	0.014605	0.014802	0.010759	0.005780	0.015517	0.018454
21	0.013315	0.012059	0.027594	0.027594	0.011897	0.016640	0.014992	0.010268	0.014982	0.007620	0.010449	0.027025	0.025904
22	0.013116	0.008694	0.021478	0.021478	0.011936	0.019748	0.012698	0.007121	0.012739	0.007333	0.001681	0.019081	0.019376
23	0.009738	0.006888	0.016782	0.016782	0.012401	0.017380	0.014670	0.012233	0.005562	0.003379	0.002824	0.013141	0.014545
24	0.005564	0.005044	0.017267	0.017267	0.011596	0.014411	0.013695	0.009780	0.008792	0.003474	0.010206	0.009132	0.010195
25	0.006061	0.003633	0.010978	0.010978	0.011104	0.009147	0.011010	0.026628	0.004127	0.001743	0.016553	0.006756	0.009878
26	0.004173	0.003347	0.011726	0.011726	0.012689	0.007228	0.009658	0.020483	0.004306	0.001780	0.021245	0.006831	0.009086
27	0.003478	0.002337	0.010978	0.010978	0.007153	0.004940	0.007784	0.016464	0.003140	0.001022	0.015855	0.005197	0.006409
28	0.002385	0.001916	0.007342	0.007342	0.006508	0.004748	0.007910	0.013223	0.002602	0.000805	0.023589	0.005346	0.005075
29	0.001789	0.001463	0.005673	0.005673	0.007828	0.004445	0.005377	0.013738	0.001974	0.000530	0.016917	0.002970	0.003028
30	0.022953	0.012280	0.040996	0.040996	0.017635	0.011488	0.010061	0.013416	0.011573	0.003653	0.031075	0.013364	0.018016

El Paso County 2040 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061109	0.055527	0.053193	0.053193	0.054801	0.054801	0.054801	0.057319	0.058850	0.078534	0.057319	0.050561	0.041768
1	0.050378	0.056150	0.045311	0.045311	0.054145	0.054022	0.054221	0.056273	0.080111	0.086004	0.056004	0.069567	0.066506
2	0.050775	0.059589	0.054931	0.054931	0.053473	0.053184	0.053659	0.055347	0.087826	0.118415	0.054692	0.071275	0.071530
3	0.048986	0.064477	0.044521	0.044521	0.052633	0.052165	0.052927	0.054214	0.070243	0.085213	0.053446	0.059470	0.058414
4	0.047893	0.069579	0.047230	0.047230	0.051971	0.051305	0.052308	0.053760	0.071409	0.091973	0.052554	0.048110	0.049151
5	0.057333	0.068612	0.045069	0.045069	0.051233	0.050313	0.051515	0.053000	0.061721	0.071366	0.051713	0.091618	0.071145
6	0.053557	0.072800	0.041529	0.041529	0.049667	0.048686	0.050007	0.051442	0.068359	0.082595	0.050051	0.088425	0.074465
7	0.053160	0.062904	0.044286	0.044286	0.047665	0.046636	0.048094	0.049384	0.045483	0.044593	0.048343	0.063479	0.053846
8	0.049285	0.057941	0.031382	0.031382	0.045554	0.044413	0.045904	0.047279	0.033641	0.040108	0.046306	0.047071	0.051710
9	0.044018	0.047698	0.028688	0.028688	0.043721	0.042472	0.044057	0.045355	0.053557	0.056656	0.044463	0.043656	0.048562
10	0.028021	0.036343	0.029305	0.029305	0.041814	0.040393	0.042116	0.043324	0.039562	0.038823	0.042245	0.023684	0.024705
11	0.024245	0.036152	0.028044	0.028044	0.039654	0.038039	0.039820	0.041221	0.021172	0.013596	0.040277	0.022719	0.016595
12	0.052564	0.028406	0.022780	0.022780	0.037805	0.036143	0.037884	0.039458	0.016955	0.012800	0.039346	0.027916	0.023001
13	0.047198	0.041596	0.042755	0.042755	0.035795	0.034150	0.035829	0.037334	0.053647	0.032343	0.037426	0.018561	0.020762
14	0.057035	0.041405	0.044972	0.044972	0.033899	0.032261	0.033888	0.035257	0.027003	0.021687	0.036187	0.047368	0.062512
15	0.046800	0.033595	0.041038	0.041038	0.032027	0.030414	0.031992	0.033435	0.038575	0.024019	0.034518	0.032519	0.040433
16	0.039348	0.030580	0.039036	0.039036	0.030045	0.028453	0.029989	0.031533	0.029335	0.020335	0.032794	0.029624	0.034685
17	0.028219	0.025338	0.042056	0.042056	0.028598	0.027016	0.028492	0.029955	0.022966	0.015496	0.031619	0.014403	0.019448
18	0.034380	0.022210	0.036238	0.036238	0.026539	0.025001	0.026405	0.027848	0.018839	0.012645	0.029620	0.014849	0.017455
19	0.023649	0.017719	0.034541	0.034541	0.023396	0.021987	0.023273	0.025194	0.016148	0.010705	0.027073	0.010765	0.013339
20	0.019475	0.013719	0.032283	0.032283	0.021893	0.020508	0.021797	0.023633	0.014802	0.010759	0.025491	0.015517	0.018454
21	0.013315	0.012059	0.027594	0.027594	0.020771	0.019326	0.020668	0.022292	0.014982	0.007620	0.024284	0.027025	0.025904
22	0.013116	0.008694	0.021478	0.021478	0.017942	0.016514	0.017756	0.019679	0.012739	0.007333	0.021867	0.019081	0.019376
23	0.009738	0.006888	0.016782	0.016782	0.022214	0.023387	0.023338	0.009472	0.005562	0.003379	0.005648	0.013141	0.014545
24	0.005564	0.005044	0.017267	0.017267	0.019143	0.020525	0.019032	0.008964	0.008792	0.003474	0.005310	0.009132	0.010195
25	0.006061	0.003633	0.010978	0.010978	0.015264	0.015528	0.016682	0.009976	0.004127	0.001743	0.004985	0.006756	0.009878
26	0.004173	0.003347	0.011726	0.011726	0.012858	0.013955	0.014108	0.008065	0.004306	0.001780	0.004252	0.006831	0.009086
27	0.003478	0.002337	0.010978	0.010978	0.007370	0.009413	0.007050	0.006514	0.003140	0.001022	0.004788	0.005197	0.006409
28	0.002385	0.001916	0.007342	0.007342	0.005829	0.009142	0.006439	0.005988	0.002602	0.000805	0.002296	0.005346	0.005075
29	0.001789	0.001463	0.005673	0.005673	0.004647	0.006489	0.005888	0.004065	0.001974	0.000530	0.004007	0.002970	0.003028
30	0.022953	0.012280	0.040996	0.040996	0.017635	0.033362	0.010061	0.013416	0.011573	0.003653	0.031075	0.013364	0.018016

El Paso County 2050 Age Distribution Inputs to MOVES.

Age	MC	PC	PT	LCT	OBus	Tbus	Sbus	RT	SUShT	SULhT	MH	CShT	CLhT
0	0.061109	0.055527	0.053193	0.053193	0.053520	0.053520	0.053520	0.055645	0.058850	0.078534	0.055645	0.050561	0.041768
1	0.050378	0.056150	0.045311	0.045311	0.053347	0.053057	0.053396	0.055246	0.080111	0.086004	0.055164	0.069567	0.066506
2	0.050775	0.059589	0.054931	0.054931	0.053139	0.052548	0.053236	0.054794	0.087826	0.118415	0.054637	0.071275	0.071530
3	0.048986	0.064477	0.044521	0.044521	0.053031	0.052163	0.053175	0.054480	0.070243	0.085213	0.054254	0.059470	0.058414
4	0.047893	0.069579	0.047230	0.047230	0.052908	0.051607	0.053126	0.053795	0.071409	0.091973	0.053365	0.048110	0.049151
5	0.057333	0.068612	0.045069	0.045069	0.052221	0.050573	0.052476	0.052575	0.061721	0.071366	0.051956	0.091618	0.071145
6	0.053557	0.072800	0.041529	0.041529	0.050686	0.048823	0.051011	0.050722	0.068359	0.082595	0.049898	0.088425	0.074465
7	0.053160	0.062904	0.044286	0.044286	0.049158	0.047112	0.049545	0.048869	0.045483	0.044593	0.047883	0.063479	0.053846
8	0.049285	0.057941	0.031382	0.031382	0.047079	0.045045	0.047463	0.046703	0.033641	0.040108	0.045652	0.047071	0.051710
9	0.044018	0.047698	0.028688	0.028688	0.045125	0.043136	0.045544	0.044715	0.053557	0.056656	0.043515	0.043656	0.048562
10	0.028021	0.036343	0.029305	0.029305	0.043176	0.041256	0.043657	0.042616	0.039562	0.038823	0.041402	0.023684	0.024705
11	0.024245	0.036152	0.028044	0.028044	0.040998	0.039151	0.041493	0.040283	0.021172	0.013596	0.038995	0.022719	0.016595
12	0.052564	0.028406	0.022780	0.022780	0.038915	0.037103	0.039448	0.038167	0.016955	0.012800	0.036728	0.027916	0.023001
13	0.047198	0.041596	0.042755	0.042755	0.036374	0.034633	0.036926	0.035585	0.053647	0.032343	0.034212	0.018561	0.020762
14	0.057035	0.041405	0.044972	0.044972	0.034074	0.032384	0.034604	0.033537	0.027003	0.021687	0.032016	0.047368	0.062512
15	0.046800	0.033595	0.041038	0.041038	0.032198	0.030494	0.032650	0.031729	0.038575	0.024019	0.030269	0.032519	0.040433
16	0.039348	0.030580	0.039036	0.039036	0.029937	0.028351	0.030382	0.029597	0.029335	0.020335	0.028188	0.029624	0.034685
17	0.028219	0.025338	0.042056	0.042056	0.027513	0.026053	0.027968	0.027240	0.022966	0.015496	0.026134	0.014403	0.019448
18	0.034380	0.022210	0.036238	0.036238	0.025216	0.023837	0.025585	0.025060	0.018839	0.012645	0.024086	0.014849	0.017455
19	0.023649	0.017719	0.034541	0.034541	0.023215	0.021905	0.023544	0.023115	0.016148	0.010705	0.022264	0.010765	0.013339
20	0.019475	0.013719	0.032283	0.032283	0.021032	0.019783	0.021306	0.020957	0.014802	0.010759	0.020109	0.015517	0.018454
21	0.013315	0.012059	0.027594	0.027594	0.019104	0.017877	0.019284	0.019142	0.014982	0.007620	0.018430	0.027025	0.025904
22	0.013116	0.008694	0.021478	0.021478	0.017429	0.016284	0.017547	0.017547	0.012739	0.007333	0.017263	0.019081	0.019376
23	0.009738	0.006888	0.016782	0.016782	0.015831	0.014788	0.015913	0.015968	0.005562	0.003379	0.015813	0.013141	0.014545
24	0.005564	0.005044	0.017267	0.017267	0.014356	0.013401	0.014404	0.014471	0.008792	0.003474	0.014691	0.009132	0.010195
25	0.006061	0.003633	0.010978	0.010978	0.012969	0.012103	0.012996	0.013133	0.004127	0.001743	0.013428	0.006756	0.009878
26	0.004173	0.003347	0.011726	0.011726	0.011661	0.010872	0.011669	0.011898	0.004306	0.001780	0.012270	0.006831	0.009086
27	0.003478	0.002337	0.010978	0.010978	0.010611	0.009888	0.010594	0.010825	0.003140	0.001022	0.011345	0.005197	0.006409
28	0.002385	0.001916	0.007342	0.007342	0.009516	0.008855	0.009483	0.009735	0.002602	0.000805	0.010292	0.005346	0.005075
29	0.001789	0.001463	0.005673	0.005673	0.008025	0.007465	0.007992	0.008436	0.001974	0.000530	0.009022	0.002970	0.003028
30	0.022953	0.012280	0.040996	0.040996	0.017635	0.055934	0.010061	0.013416	0.011573	0.003653	0.031075	0.013364	0.018016

Texas Statewide 2017 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
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	0.9997	0.9988	0.9758	0.9850	0.9865	0.9874	0.9882	0.9894	0.9922	0.9993	0.9995	0.9931	0.9951	0.9966	0.9958	0.9954
PC	Diesel	0.0003	0.0012	0.0242	0.0150	0.0135	0.0126	0.0118	0.0106	0.0078	0.0007	0.0005	0.0069	0.0049	0.0034	0.0042	0.0046
PT	Gas	0.9611	0.9653	0.9697	0.9763	0.9799	0.9736	0.9766	0.9867	0.9828	0.9700	0.9721	0.9560	0.9641	0.9594	0.9614	0.9653
PT	Diesel	0.0389	0.0347	0.0303	0.0237	0.0201	0.0264	0.0234	0.0133	0.0172	0.0300	0.0279	0.0440	0.0359	0.0406	0.0386	0.0347
LCT	Gas	0.9611	0.9653	0.9697	0.9737	0.9688	0.9438	0.9399	0.9652	0.9535	0.9198	0.9321	0.9002	0.9148	0.9073	0.9159	0.9152
LCT	Diesel	0.0389	0.0347	0.0303	0.0263	0.0312	0.0562	0.0601	0.0348	0.0465	0.0802	0.0679	0.0998	0.0852	0.0927	0.0841	0.0848
OBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323	0.1773	0.1725	0.1688	0.1525	0.1341
OBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677	0.8227	0.8275	0.8312	0.8475	0.8659
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323	0.1773	0.1725	0.1688	0.1525	0.1341
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677	0.8227	0.8275	0.8312	0.8475	0.8659
SBus	Gas	0.0079	0.0079	0.0079	0.0079	0.0370	0.0450	0.0314	0.0389	0.0275	0.0130	0.0078	0.0101	0.0066	0.0038	0.0055	0.0260
SBus	Diesel	0.9921	0.9921	0.9921	0.9921	0.9630	0.9550	0.9686	0.9611	0.9725	0.9870	0.9922	0.9899	0.9934	0.9962	0.9945	0.9740
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	0.0000	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	1.0000	1.0000	1.0000
SUShT	Gas	0.4991	0.4898	0.4429	0.4001	0.4214	0.2754	0.2837	0.3323	0.3834	0.3310	0.2717	0.2733	0.2492	0.2572	0.2512	0.2749
SUShT	Diesel	0.5009	0.5102	0.5571	0.5999	0.5786	0.7246	0.7163	0.6677	0.6166	0.6690	0.7283	0.7267	0.7508	0.7428	0.7488	0.7251
SULhT	Gas	0.4991	0.4898	0.4429	0.4001	0.4214	0.2754	0.2837	0.3323	0.3834	0.3310	0.2717	0.2733	0.2492	0.2572	0.2512	0.2749
SULhT	Diesel	0.5009	0.5102	0.5571	0.5999	0.5786	0.7246	0.7163	0.6677	0.6166	0.6690	0.7283	0.7267	0.7508	0.7428	0.7488	0.7251
MH	Gas	0.5797	0.5797	0.5797	0.5797	0.7076	0.7251	0.7013	0.0059	0.5339	0.3808	0.4420	0.5778	0.3493	0.6016	0.5619	0.6028
MH	Diesel	0.4203	0.4203	0.4203	0.4203	0.2924	0.2749	0.2987	0.9941	0.4661	0.6192	0.5580	0.4222	0.6507	0.3984	0.4381	0.3972
CShT	Gas	0.1062	0.0930	0.0730	0.0976	0.0870	0.0811	0.0645	0.0768	0.0769	0.0790	0.0543	0.0649	0.0607	0.0769	0.0859	0.0932
CShT	Diesel	0.8938	0.9070	0.9270	0.9024	0.9130	0.9189	0.9355	0.9232	0.9231	0.9210	0.9457	0.9351	0.9393	0.9231	0.9141	0.9068
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 2017 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987
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	0.9966	0.9969	0.9981	0.9978	0.9991	0.9988	0.9991	0.9998	0.9993	0.9988	0.9972	0.9989	0.9991	0.9997	0.9872
PC	Diesel	0.0034	0.0031	0.0019	0.0022	0.0009	0.0012	0.0009	0.0002	0.0007	0.0012	0.0028	0.0011	0.0009	0.0003	0.0128
PT	Gas	0.9590	0.9703	0.9608	0.9872	0.9555	0.9575	0.9609	0.9662	0.9575	0.9619	0.9660	0.9692	0.9741	0.9804	0.9767
PT	Diesel	0.0410	0.0297	0.0392	0.0128	0.0445	0.0425	0.0391	0.0338	0.0425	0.0381	0.0340	0.0308	0.0259	0.0196	0.0233
LCT	Gas	0.9118	0.9227	0.9014	0.9550	0.8988	0.9070	0.9083	0.9212	0.9056	0.9222	0.9187	0.9259	0.9376	0.9369	0.9350
LCT	Diesel	0.0882	0.0773	0.0986	0.0450	0.1012	0.0930	0.0917	0.0788	0.0944	0.0778	0.0813	0.0741	0.0624	0.0631	0.0650
OBus	Gas	0.1070	0.0740	0.0017	0.0014	0.0012	0.0108	0.0346	0.0138	0.0056	0.0009	0.0039	0.0014	0.0000	0.0009	0.0000
OBus	Diesel	0.8930	0.9260	0.9983	0.9986	0.9988	0.9892	0.9654	0.9862	0.9944	0.9991	0.9961	0.9986	1.0000	0.9991	1.0000
TBus	Gas	0.1070	0.0740	0.0017	0.0014	0.0012	0.0108	0.0346	0.0138	0.0056	0.0009	0.0039	0.0014	0.0000	0.0009	0.0000
TBus	Diesel	0.8930	0.9260	0.9983	0.9986	0.9988	0.9892	0.9654	0.9862	0.9944	0.9991	0.9961	0.9986	1.0000	0.9991	1.0000
SBus	Gas	0.0117	0.0257	0.0100	0.0100	0.0100	0.0415	0.1143	0.1475	0.1205	0.0100	0.0895	0.1240	0.2290	0.2498	0.2655
SBus	Diesel	0.9883	0.9743	0.9900	0.9900	0.9900	0.9585	0.8857	0.8525	0.8795	0.9900	0.9105	0.8760	0.7710	0.7502	0.7345
RT	Gas	0.0000	0.0000	0.1688	0.4036	0.0193	0.0253	0.0235	0.1050	0.0315	0.2103	0.1012	0.2040	0.0294	0.1139	0.1141
RT	Diesel	1.0000	1.0000	0.8312	0.5964	0.9807	0.9747	0.9765	0.8950	0.9685	0.7897	0.8988	0.7960	0.9706	0.8861	0.8859
SUShT	Gas	0.3024	0.3629	0.3252	0.4135	0.4154	0.3828	0.6233	0.5018	0.4900	0.4938	0.5069	0.5453	0.7823	0.7823	0.7823
SUShT	Diesel	0.6976	0.6371	0.6748	0.5865	0.5846	0.6172	0.3767	0.4982	0.5100	0.5062	0.4931	0.4547	0.2177	0.2177	0.2177
SULhT	Gas	0.3024	0.3629	0.3252	0.4135	0.4154	0.3828	0.6233	0.5018	0.4900	0.4938	0.5069	0.5453	0.7823	0.7823	0.7823
SULhT	Diesel	0.6976	0.6371	0.6748	0.5865	0.5846	0.6172	0.3767	0.4982	0.5100	0.5062	0.4931	0.4547	0.2177	0.2177	0.2177
MH	Gas	0.5459	0.6539	0.7975	0.6494	0.8361	0.8008	0.8510	0.8084	0.7276	0.7869	0.8497	0.9199	0.9513	0.9806	0.9918
MH	Diesel	0.4541	0.3461	0.2025	0.3506	0.1639	0.1992	0.1490	0.1916	0.2724	0.2131	0.1503	0.0801	0.0487	0.0194	0.0082
CShT	Gas	0.0957	0.1104	0.1105	0.1092	0.1217	0.1185	0.2083	0.1003	0.1042	0.1162	0.1415	0.1370	0.2556	0.2556	0.2556
CShT	Diesel	0.9043	0.8896	0.8895	0.8908	0.8783	0.8815	0.7917	0.8997	0.8958	0.8838	0.8585	0.8630	0.7444	0.7444	0.7444
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.

Texas Statewide 2022 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
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	0.9922	0.9934	0.9943	0.9967	0.9989	0.9997	0.9988	0.9758	0.9850	0.9865	0.9874	0.9882	0.9894	0.9922	0.9993	0.9995
PC	Diesel	0.0078	0.0066	0.0057	0.0033	0.0011	0.0003	0.0012	0.0242	0.0150	0.0135	0.0126	0.0118	0.0106	0.0078	0.0007	0.0005
PT	Gas	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611	0.9653	0.9697	0.9763	0.9799	0.9736	0.9766	0.9867	0.9828	0.9700	0.9721
PT	Diesel	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389	0.0347	0.0303	0.0237	0.0201	0.0264	0.0234	0.0133	0.0172	0.0300	0.0279
LCT	Gas	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611	0.9653	0.9697	0.9737	0.9688	0.9438	0.9399	0.9652	0.9535	0.9198	0.9321
LCT	Diesel	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389	0.0347	0.0303	0.0263	0.0312	0.0562	0.0601	0.0348	0.0465	0.0802	0.0679
OBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323
OBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677
SBus	Gas	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0370	0.0450	0.0314	0.0389	0.0275	0.0130	0.0078
SBus	Diesel	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9630	0.9550	0.9686	0.9611	0.9725	0.9870	0.9922
RT	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0066	0.0000	0.0000	0.0000	0.0046	0.0020	0.0023
RT	Diesel	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9934	1.0000	1.0000	1.0000	0.9954	0.9980	0.9977
SUShT	Gas	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366	0.3860	0.3392	0.2749
SUShT	Diesel	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634	0.6140	0.6608	0.7251
SULhT	Gas	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366	0.3860	0.3392	0.2749
SULhT	Diesel	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634	0.6140	0.6608	0.7251
MH	Gas	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.7076	0.7251	0.7013	0.0059	0.5339	0.3808	0.4420
MH	Diesel	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.2924	0.2749	0.2987	0.9941	0.4661	0.6192	0.5580
CShT	Gas	0.0845	0.0845	0.0718	0.0914	0.0903	0.1013	0.0830	0.0702	0.0945	0.0863	0.0864	0.0766	0.0780	0.0819	0.0818	0.0624
CShT	Diesel	0.9155	0.9155	0.9282	0.9086	0.9097	0.8987	0.9170	0.9298	0.9055	0.9137	0.9136	0.9234	0.9220	0.9181	0.9182	0.9376
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 2022 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992
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	0.9931	0.9951	0.9966	0.9958	0.9954	0.9966	0.9969	0.9981	0.9978	0.9991	0.9988	0.9991	0.9998	0.9993	0.9988
PC	Diesel	0.0069	0.0049	0.0034	0.0042	0.0046	0.0034	0.0031	0.0019	0.0022	0.0009	0.0012	0.0009	0.0002	0.0007	0.0012
PT	Gas	0.9560	0.9641	0.9594	0.9614	0.9653	0.9590	0.9703	0.9608	0.9872	0.9555	0.9575	0.9609	0.9662	0.9575	0.9619
PT	Diesel	0.0440	0.0359	0.0406	0.0386	0.0347	0.0410	0.0297	0.0392	0.0128	0.0445	0.0425	0.0391	0.0338	0.0425	0.0381
LCT	Gas	0.9002	0.9148	0.9073	0.9159	0.9152	0.9118	0.9227	0.9014	0.9550	0.8988	0.9070	0.9083	0.9212	0.9056	0.9222
LCT	Diesel	0.0998	0.0852	0.0927	0.0841	0.0848	0.0882	0.0773	0.0986	0.0450	0.1012	0.0930	0.0917	0.0788	0.0944	0.0778
OBus	Gas	0.1773	0.1725	0.1688	0.1525	0.1341	0.1070	0.0740	0.0017	0.0014	0.0012	0.0108	0.0346	0.0138	0.0056	0.0009
OBus	Diesel	0.8227	0.8275	0.8312	0.8475	0.8659	0.8930	0.9260	0.9983	0.9986	0.9988	0.9892	0.9654	0.9862	0.9944	0.9991
TBus	Gas	0.1773	0.1725	0.1688	0.1525	0.1341	0.1070	0.0740	0.0017	0.0014	0.0012	0.0108	0.0346	0.0138	0.0056	0.0009
TBus	Diesel	0.8227	0.8275	0.8312	0.8475	0.8659	0.8930	0.9260	0.9983	0.9986	0.9988	0.9892	0.9654	0.9862	0.9944	0.9991
SBus	Gas	0.0101	0.0066	0.0038	0.0055	0.0260	0.0117	0.0257	0.0100	0.0100	0.0100	0.0415	0.1143	0.1475	0.1205	0.0100
SBus	Diesel	0.9899	0.9934	0.9962	0.9945	0.9740	0.9883	0.9743	0.9900	0.9900	0.9900	0.9585	0.8857	0.8525	0.8795	0.9900
RT	Gas	0.0009	0.0007	0.0000	0.0004	0.0000	0.0000	0.0000	0.1688	0.4036	0.0193	0.0253	0.0235	0.1050	0.0315	0.2103
RT	Diesel	0.9991	0.9993	1.0000	0.9996	1.0000	1.0000	1.0000	0.8312	0.5964	0.9807	0.9747	0.9765	0.8950	0.9685	0.7897
SUShT	Gas	0.2764	0.2556	0.2550	0.2496	0.2593	0.2918	0.3380	0.3125	0.3884	0.3901	0.3928	0.6113	0.4838	0.5095	0.5045
SUShT	Diesel	0.7236	0.7444	0.7450	0.7504	0.7407	0.7082	0.6620	0.6875	0.6116	0.6099	0.6072	0.3887	0.5162	0.4905	0.4955
SULhT	Gas	0.2764	0.2556	0.2550	0.2496	0.2593	0.2918	0.3380	0.3125	0.3884	0.3901	0.3928	0.6113	0.4838	0.5095	0.5045
SULhT	Diesel	0.7236	0.7444	0.7450	0.7504	0.7407	0.7082	0.6620	0.6875	0.6116	0.6099	0.6072	0.3887	0.5162	0.4905	0.4955
MH	Gas	0.5778	0.3493	0.6016	0.5619	0.6028	0.5459	0.6539	0.7975	0.6494	0.8361	0.8008	0.8510	0.8084	0.7276	0.7869
MH	Diesel	0.4222	0.6507	0.3984	0.4381	0.3972	0.4541	0.3461	0.2025	0.3506	0.1639	0.1992	0.1490	0.1916	0.2724	0.2131
CShT	Gas	0.0753	0.0742	0.0796	0.0773	0.0895	0.0919	0.0972	0.1056	0.1094	0.1299	0.1196	0.1993	0.0991	0.1176	0.1108
CShT	Diesel	0.9247	0.9258	0.9204	0.9227	0.9105	0.9081	0.9028	0.8944	0.8906	0.8701	0.8804	0.8007	0.9009	0.8824	0.8892
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.

Texas Statewide 2032 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2032	2031	2030	2029	2028	2027	2026	2025	2024	2023	2022	2021	2020	2019	2018	2017
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	0.9742	0.9742	0.9744	0.9765	0.9786	0.9820	0.9847	0.9872	0.9893	0.9908	0.9922	0.9934	0.9943	0.9967	0.9989	0.9997
PC	Diesel	0.0258	0.0258	0.0256	0.0235	0.0214	0.0180	0.0153	0.0128	0.0107	0.0092	0.0078	0.0066	0.0057	0.0033	0.0011	0.0003
PT	Gas	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310	0.9316	0.9322	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611
PT	Diesel	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389
LCT	Gas	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310	0.9316	0.9322	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611
LCT	Diesel	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628	0.0551	0.0465	0.0389
IBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
IBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
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	0.0079	0.0079	0.0079
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	0.9921	0.9921	0.9921
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	0.0000	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	1.0000	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942
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	0.5797	0.5797	0.5797
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	0.4203	0.4203	0.4203
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0718	0.0914	0.0903	0.1013
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9282	0.9086	0.9097	0.8987
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 2032 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
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	0.9988	0.9758	0.9850	0.9865	0.9874	0.9882	0.9894	0.9922	0.9993	0.9995	0.9931	0.9951	0.9966	0.9958	0.9954
PC	Diesel	0.0012	0.0242	0.0150	0.0135	0.0126	0.0118	0.0106	0.0078	0.0007	0.0005	0.0069	0.0049	0.0034	0.0042	0.0046
PT	Gas	0.9653	0.9697	0.9763	0.9799	0.9736	0.9766	0.9867	0.9828	0.9700	0.9721	0.9560	0.9641	0.9594	0.9614	0.9653
PT	Diesel	0.0347	0.0303	0.0237	0.0201	0.0264	0.0234	0.0133	0.0172	0.0300	0.0279	0.0440	0.0359	0.0406	0.0386	0.0347
LCT	Gas	0.9653	0.9697	0.9737	0.9688	0.9438	0.9399	0.9652	0.9535	0.9198	0.9321	0.9002	0.9148	0.9073	0.9159	0.9152
LCT	Diesel	0.0347	0.0303	0.0263	0.0312	0.0562	0.0601	0.0348	0.0465	0.0802	0.0679	0.0998	0.0852	0.0927	0.0841	0.0848
IBus	Gas	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323	0.1773	0.1725	0.1688	0.1525	0.1341
IBus	Diesel	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677	0.8227	0.8275	0.8312	0.8475	0.8659
TBus	Gas	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621	0.1266	0.1669	0.1323	0.1773	0.1725	0.1688	0.1525	0.1341
TBus	Diesel	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379	0.8734	0.8331	0.8677	0.8227	0.8275	0.8312	0.8475	0.8659
SBus	Gas	0.0079	0.0079	0.0079	0.0370	0.0450	0.0314	0.0389	0.0275	0.0130	0.0078	0.0101	0.0066	0.0038	0.0055	0.0260
SBus	Diesel	0.9921	0.9921	0.9921	0.9630	0.9550	0.9686	0.9611	0.9725	0.9870	0.9922	0.9899	0.9934	0.9962	0.9945	0.9740
RT	Gas	0.0000	0.0000	0.0000	0.0066	0.0000	0.0000	0.0000	0.0046	0.0020	0.0023	0.0009	0.0007	0.0000	0.0004	0.0000
RT	Diesel	1.0000	1.0000	1.0000	0.9934	1.0000	1.0000	1.0000	0.9954	0.9980	0.9977	0.9991	0.9993	1.0000	0.9996	1.0000
SUShT	Gas	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366	0.3860	0.3392	0.2749	0.2764	0.2556	0.2550	0.2496	0.2593
SUShT	Diesel	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634	0.6140	0.6608	0.7251	0.7236	0.7444	0.7450	0.7504	0.7407
SULhT	Gas	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366	0.3860	0.3392	0.2749	0.2764	0.2556	0.2550	0.2496	0.2593
SULhT	Diesel	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634	0.6140	0.6608	0.7251	0.7236	0.7444	0.7450	0.7504	0.7407
MH	Gas	0.5797	0.5797	0.5797	0.7076	0.7251	0.7013	0.0059	0.5339	0.3808	0.4420	0.5778	0.3493	0.6016	0.5619	0.6028
MH	Diesel	0.4203	0.4203	0.4203	0.2924	0.2749	0.2987	0.9941	0.4661	0.6192	0.5580	0.4222	0.6507	0.3984	0.4381	0.3972
CShT	Gas	0.0830	0.0702	0.0945	0.0863	0.0864	0.0766	0.0780	0.0819	0.0818	0.0624	0.0753	0.0742	0.0796	0.0773	0.0895
CShT	Diesel	0.9170	0.9298	0.9055	0.9137	0.9136	0.9234	0.9220	0.9181	0.9182	0.9376	0.9247	0.9258	0.9204	0.9227	0.9105
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.

Texas Statewide 2040 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2040	2039	2038	2037	2036	2035	2034	2033	2032	2031	2030	2029	2028	2027	2026	2025
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	0.9771	0.9769	0.9765	0.9760	0.9757	0.9750	0.9744	0.9750	0.9742	0.9742	0.9744	0.9765	0.9786	0.9820	0.9847	0.9872
PC	Diesel	0.0229	0.0231	0.0235	0.0240	0.0243	0.0250	0.0256	0.0250	0.0258	0.0258	0.0256	0.0235	0.0214	0.0180	0.0153	0.0128
PT	Gas	0.9341	0.9343	0.9344	0.9339	0.9337	0.9334	0.9332	0.9331	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310
PT	Diesel	0.0659	0.0657	0.0656	0.0661	0.0663	0.0666	0.0668	0.0669	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690
LCT	Gas	0.9341	0.9343	0.9344	0.9339	0.9337	0.9334	0.9332	0.9331	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310
LCT	Diesel	0.0659	0.0657	0.0656	0.0661	0.0663	0.0666	0.0668	0.0669	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690
IBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
IBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
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	0.0079	0.0079	0.0079
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	0.9921	0.9921	0.9921
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	0.0000	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	1.0000	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628
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	0.5797	0.5797	0.5797
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	0.4203	0.4203	0.4203
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155
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 2040 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
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	0.9893	0.9908	0.9922	0.9934	0.9943	0.9967	0.9989	0.9997	0.9988	0.9758	0.9850	0.9865	0.9874	0.9882	0.9894
PC	Diesel	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	0.0106
PT	Gas	0.9316	0.9322	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611	0.9653	0.9697	0.9763	0.9799	0.9736	0.9766	0.9867
PT	Diesel	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	0.0133
LCT	Gas	0.9316	0.9322	0.9337	0.9356	0.9372	0.9449	0.9535	0.9611	0.9653	0.9697	0.9737	0.9688	0.9438	0.9399	0.9652
LCT	Diesel	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	0.0348
IBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621
IBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1986	0.2177	0.2234	0.1621
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8014	0.7823	0.7766	0.8379
SBus	Gas	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0370	0.0450	0.0314	0.0389
SBus	Diesel	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9921	0.9630	0.9550	0.9686	0.9611
RT	Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0066	0.0000	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	0.9934	1.0000	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5157	0.5236	0.4870	0.5058	0.4958	0.4464	0.4112	0.4258	0.2848	0.2896	0.3366
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4843	0.4764	0.5130	0.4942	0.5042	0.5536	0.5888	0.5742	0.7152	0.7104	0.6634
MH	Gas	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.5797	0.7076	0.7251	0.7013	0.0059
MH	Diesel	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.4203	0.2924	0.2749	0.2987	0.9941
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0718	0.0914	0.0903	0.1013	0.0830	0.0702	0.0945	0.0863	0.0864	0.0766	0.0780
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9282	0.9086	0.9097	0.8987	0.9170	0.9298	0.9055	0.9137	0.9136	0.9234	0.9220
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.

Texas Statewide 2050 Fuel Engine Fractions by Model Year Summary.

SUT	Fuel Type	2050	2049	2048	2047	2046	2045	2044	2043	2042	2041	2040	2039	2038	2037	2036	2035
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	0.9790	0.9786	0.9784	0.9782	0.9782	0.9783	0.9780	0.9778	0.9776	0.9773	0.9771	0.9769	0.9765	0.9760	0.9757	0.9750
PC	Diesel	0.0210	0.0214	0.0216	0.0218	0.0218	0.0217	0.0220	0.0222	0.0224	0.0227	0.0229	0.0231	0.0235	0.0240	0.0243	0.0250
PT	Gas	0.9353	0.9346	0.9342	0.9339	0.9338	0.9339	0.9337	0.9337	0.9338	0.9340	0.9341	0.9343	0.9344	0.9339	0.9337	0.9334
PT	Diesel	0.0647	0.0654	0.0658	0.0661	0.0662	0.0661	0.0663	0.0663	0.0662	0.0660	0.0659	0.0657	0.0656	0.0661	0.0663	0.0666
LCT	Gas	0.9353	0.9346	0.9342	0.9339	0.9338	0.9339	0.9337	0.9337	0.9338	0.9340	0.9341	0.9343	0.9344	0.9339	0.9337	0.9334
LCT	Diesel	0.0647	0.0654	0.0658	0.0661	0.0662	0.0661	0.0663	0.0663	0.0662	0.0660	0.0659	0.0657	0.0656	0.0661	0.0663	0.0666
IBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
IBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
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	0.0079	0.0079	0.0079
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	0.9921	0.9921	0.9921
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	0.0000	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	1.0000	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628
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	0.5797	0.5797	0.5797
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	0.4203	0.4203	0.4203
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155
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 2050 Fuel Engine Fractions by Model Year Summary – Continued.

SUT	Fuel Type	2034	2033	2032	2031	2030	2029	2028	2027	2026	2025	2024	2023	2022	2021	2020
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	0.9744	0.9750	0.9742	0.9742	0.9744	0.9765	0.9786	0.9820	0.9847	0.9872	0.9893	0.9908	0.9922	0.9934	0.9943
PC	Diesel	0.0256	0.0250	0.0258	0.0258	0.0256	0.0235	0.0214	0.0180	0.0153	0.0128	0.0107	0.0092	0.0078	0.0066	0.0057
PT	Gas	0.9332	0.9331	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310	0.9316	0.9322	0.9337	0.9356	0.9372
PT	Diesel	0.0668	0.0669	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628
LCT	Gas	0.9332	0.9331	0.9326	0.9323	0.9324	0.9320	0.9323	0.9318	0.9314	0.9310	0.9316	0.9322	0.9337	0.9356	0.9372
LCT	Diesel	0.0668	0.0669	0.0674	0.0677	0.0676	0.0680	0.0677	0.0682	0.0686	0.0690	0.0684	0.0678	0.0663	0.0644	0.0628
IBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
IBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
TBus	Gas	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466	0.1466
TBus	Diesel	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534	0.8534
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	0.0079	0.0079
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	0.9921	0.9921
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	0.0000	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	1.0000	1.0000
SUShT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5157
SUShT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4843
SULhT	Gas	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5372	0.5157
SULhT	Diesel	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4628	0.4843
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	0.5797	0.5797
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	0.4203	0.4203
CShT	Gas	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0845	0.0718
CShT	Diesel	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9155	0.9282
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.

TTI Emissions Estimation Utility Modules for MOVES3-Based Emissions Inventories

The following is a summary of the utility modules developed by TTI (written in the Python programming language) for producing detailed, link-based, hourly and 24-hour emissions estimates for on-road mobile sources using the latest version of EPA's MOVES model (MOVES3). These utility modules produce inputs used with the MOVES model, calculate the necessary activity (VMT and off-network activity), calculate 24-hour emission factors, make special adjustments to the emissions factors (when required), and multiply the emissions factors with travel model link-baed of Highway Performance Monitoring System (HPMS)-based (virtual link) activity estimates to produce emissions at user specified temporal and spatial scales.

The new TTI Utilities were redeveloped to ensure new MOVES3 features could be accurately incorporated into Texas' EI methods. To efficiently accommodate these changes, the TTI research team redesigned the code using the Python programming language.

Figure 1 outlines the basic steps required to run the new MOVES3 based TTI utilities.

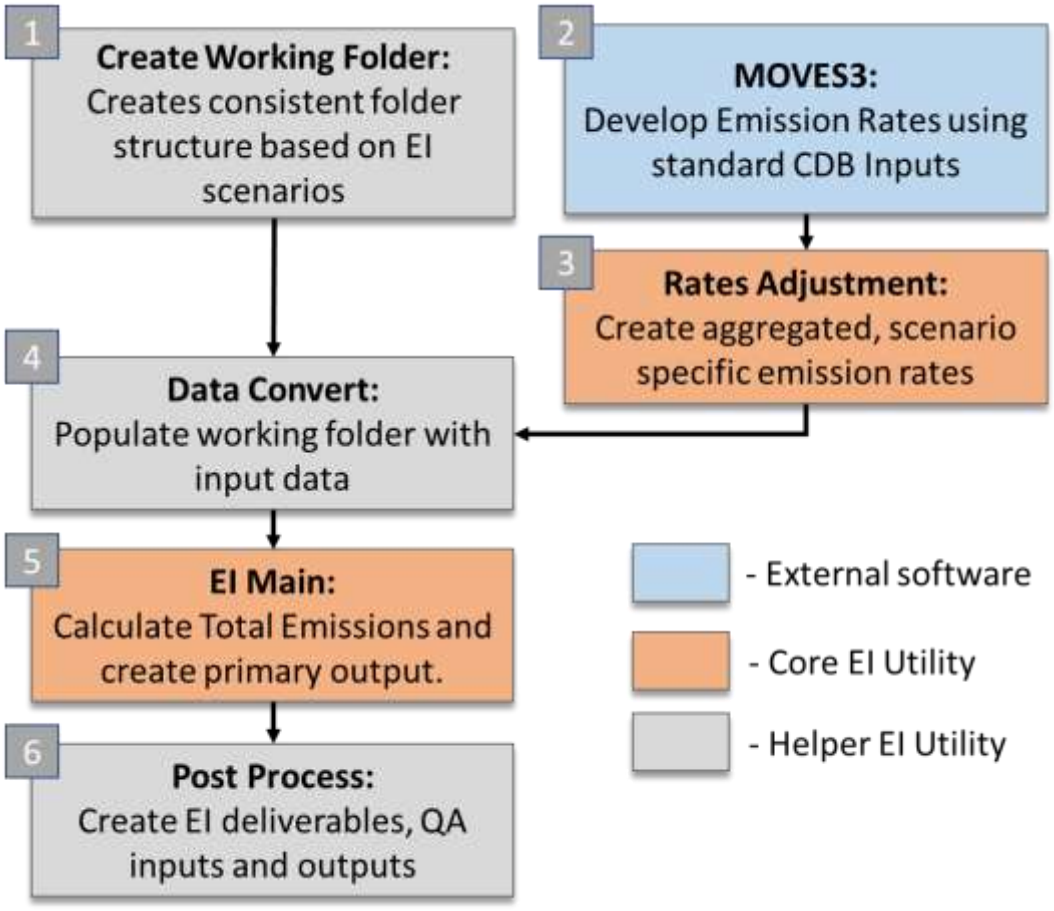

Figure 1. Basic steps required to develop an EI using the new TTI Utilities.

The numbered grey boxes indicate sequential steps and are described in the main text.

The following is a description of each step outlined in Figure 1:

1. The user specifies the number of EI scenarios to run. Scenarios are specified by area, analysis year, season, and day type. Analysts are able to calculate emissions for a single multi-county area or create multiple areas based on individual counties (or another relevant jurisdiction). Scenarios are defined through a JSON (JavaScript Object Notation) file that defines the scope of the EI's to be run (this file is also used during Steps 4-6). A "Create Working Folder" utility uses the JSON file to create a project workspace containing empty folders that will subsequently become populated with input data required to run an EI and outputs for each scenario-driven EI (i.e., during Steps 4-6).
2. County Data Base (CDB) files are prepared and run using MOVES3 to obtain MOVES3 output databases for each scenario.
3. The TTI "Rates Adjustment" utility locates the MOVES3 output database for each modeled scenario and performs necessary adjustments to emission rates based on county Low Emission Diesel (LED) factors and inspection maintenance programs. Various other MOVES default and local values (defined in the input CDB) are also extracted from the MOVES database and transferred to the working folder. This is the only time that the new TTI Utilities interact with MOVES3 databases.
4. The "Data Convert" utility is used to assemble all input data relevant to an EI scenario into local working folders created during Step 1. This includes copying data from TTI databases that contain master copies of vehicle population and vehicle mix (VMT mix) data, processed travel models, and emissions rates, and other data mined from MOVES3 (Steps 2 and 3). At the end of Step 4, each scenario folder within the working project folder (created during Step 1) is populated with all information required to run each EI scenario.
5. The "EI Main" utility is responsible for calculating and aggregating primary emission inventory inputs. Options required for running EI Main are specified in another JSON control file called Utility_Control.json. The EI Main inventory works sequentially through each scenario defined in an EI project. It begins by calculating on-network and off-network activities. The EI Main Utility then works through each pollutant defined in the EI scenario and multiplies on- and off-network activities by the appropriate emission rates derived from Step 3. The EI

Main utility produces simple, highly consistent output in the form of tab-delimited text files (depending on runtime specifications, the user can specify whether to output EI results as link-by-link or county scale summary files).

6. After the EI main utility has been run, outputs are organized in a consistent format in each of the specific EI scenario working folders. At this point, the analyst can choose from a variety of post-processing utilities designed to QA EI inputs and outputs and create formatted data files suitable for reporting EI results for various downstream air quality planning purposes.

The main utilities in for calculation hourly and 24-hour aggregate emissions using MOVES are same as what have been used in most recent TCEQ emission inventory projects (AERR, RFP, etc.) including Rates Adjustment, EI Main (including TRANSVMT, HPMS based Link VMT, Vehicle Population Build, Off-network Activity Calculation, Emssion Calculation), MOVES Activity Input Build, and Post Processing. TRANSVMT utility module and HPMS based Link VMT utility module prepare the link VMT and speeds activity input. The Vehicle Population Build utility module builds the vehicle population used to calculate the off-network activity. The Off-network Activity Calculation utility module builds the off-network idling activity (ONI), source hours parked activity (SHP), engine starts activity (Starts), extended idling activity (SHEI) and auxiliary power unit activity (APU) hours required to estimate emissions using the rate-per-activity emissions rates produced by the new Rates Adjsutment utility module. The MOVES Activity Input Build utility modules build inputs used in MOVES. The Rates Adjustment utility module assembles the emissions rates from the MOVES output in terms of rate-per-activity, including calculating rate-per-SHP for the evaporative emissions processes. It also makes special adjustments to the emissions rate when required. The Emission Calculation utility module calculates emissions by hourly time periods, producing the results for Post Processing utility module to produce a a tab-delimited summary file (including 24-hour totals), hourly link emissions output files (optional), and an optional tab-delimited summary file by MOVES source classification code (SCC). The following sections are describing the details of each module in the utilities.

TRANSVMT Module

The TRANSVMT utility module post-processes travel demand models (TDMs) to produce hourly, on-road vehicle, seasonal and day-of-week specific, directional link VMT, and speed estimates. The TRANSVMT utility module processes a TDM traffic assignment by multiplying the link volumes by the appropriate HPMS, seasonal, or other VMT factors.

Hourly factors are then used to distribute the link VMT to each hour in the day. The TTI speed model is used to estimate the operational time-of-day link speeds for each direction. Since intrazonal links are not included in the TDM, special intrazonal links are created and the VMT and speeds for these special links are estimated using the intrazonal trips from the trip matrix and the zonal radii. The link VMT and speeds produced by TRANSVMT are subsequently input to the EmsCalc utility for applying the MOVES-based emissions factors (as well as with other utilities to develop off-network activity estimates).

HPMS Based Link VMT Module

The HPMS based Link VMT calculation module processes analysis scenario (by year, season, day type) county level VMT control totals to produce analysis scenario county level hourly VMT by MOVES road type and SUT/FT. The main inputs to this module:

- County-level, 24-hour analysis scenario VMT control totals.
- County HPMS data sets, which include AADT VMT, centerline miles, and lane miles by HPMS area type and functional class.
- Hourly VMT distributions.
- 24-hour or time period VMT mix by roadway type, MOVES source type, and MOVES fuel type.
- Time period designations (only if time period VMT mix is used); and
- HPMS roadway type designations, which list associations of the link roadway types/area type combination to the VMT mix, emissions rate, and MOVES roadway types.

The utility module initially calculates the HPMS functional class/area type VMT distribution from the county HPMS data sets by dividing the HPMS functional class/area type AADT VMT by the county total HPMS AADT VMT. The county-level, 24-hour analysis scenario VMT is then distributed to each HPMS functional class/area type by multiplying this distribution by the county-level, 24-hour VMT control total. The 24-hour HPMS functional class/area type VMT is then distributed to each hour of the day using the hourly VMT distribution.

The utility module then distributes the hourly HPMS functional class/area type VMT to each SUT/fuel type using the VMT mix and the HPMS roadway type designations. For each HPMS functional class/area type, the appropriate VMT mix road type is selected

from the HPMS roadway type designations and the VMT mix for that VMT mix road type is applied to the hourly HPMS functional/area type VMT. If the 24-hour VMT mix is used, each hour uses the same VMT mix data set. If the time period VMT mix is used, each hour is assigned a time period based on the time period designations and the appropriate time period VMT mix data set is used.

The utility module then calculates the hourly VMT by MOVES road type and SUT/fuel type. For each hour, the HPMS functional class/area type combinations are assigned a MOVES road type using the HPMS roadway type designations and the hourly VMT is aggregated across MOVES road types to produce the county-level hourly VMT by MOVES road type and SUT/fuel type.

Vehicle Population Build Module

The Vehicle Population Build utility module builds the sourcetypeyear data files in a format consistent with the MOVES input database table and the SUT/fuel type population input file to estimate emissions or the offnetwork activity module to estimate starts and SHP) using the VMT mix and the Texas Department of Motor Vehicles (TxDMV) registration data sets. The TxDMV registration data sets are three sets of registration data (an age registration data file, a gas trucks registration data file, and a diesel trucks registration data file) that list 31 years of registration data. The primary inputs to this utility are:

- County ID file, which specifies the county for which the output will be calculated;
- Age registration data file, which lists 31 years of registration data for Passenger Vehicle, Motorcycles, Trucks <=6000, Trucks >6000 <=8500, Total Trucks <=8500, Gas Trucks >8500, Diesel Trucks >8500, TotalTrucks >8500, and Total All Trucks vehicle categories;
- Gas trucks registration data file, which lists 31 years of registration data for the Gas >8500, Gas >10000, Gas >14000, Gas >16000, Gas >19500, Gas >26000, Gas >33000, Gas >60000, and Gas Totals gas truck categories;
- Diesel trucks registration data file, which lists 31 years of registration data for the Diesel >8500, Diesel >10000, Diesel >14000, Diesel >16000, Diesel >19500, Diesel >26000, Diesel >33000, Diesel >60000, and Diesel Totals diesel truck categories;
- No roadtype VMT mix by TxDOT district, MOVES SUT, and MOVES fuel type;

- TxDOT district name file, which specifies the VMT mix TxDOT district;
- MOVES default database; and
- Population scaling factor file (optional);

For the desired county (from the county ID file), the age registration data (for the Passenger Vehicle, Motorcycles, Trucks <=6000, Trucks >6000 <=8500, and Total Trucks <=8500 vehicle categories) are saved in an age registration data array. The gas truck registration data (for the Gas >8500, Gas >10000, Gas >14000, Gas >16000, Gas >19500, Gas >26000, Gas >33000, and Gas >60000 gas truck categories) are saved in the gas truck section of the diesel/gas registration data array. The diesel truck registration data (for the Diesel >8500, Diesel >10000, Diesel >14000, Diesel >16000, Diesel >19500, Diesel >26000, Diesel >33000, and Diesel >60000 diesel truck categories) are saved in the diesel truck section of the diesel/gas registration data array. The age registration data array and the diesel/gas registration data array are combined to form the registration category data array (seven categories for 31 years of data and the total) using the combinations in Table 20.

The registration category data array is used to fill the SUT population array (by SUT and fuel type) for all vehicles except long-haul trucks. Each SUT/fuel type combination is assigned the total registrations from one or more of the registration categories in the registration category data array:

- SUT 11 to Registration Category 2,
- SUT 21 to Registration Category 1,
- SUT 31 and 32 to Registration Category 3,
- SUT 41, 42, 43, 51, 52, 54 to Registration Category 4 and 6,
- SUT 61 to Registration Category 5 and 7.

SUT population factors are calculated, by SUT/fuel type using the data from the VMT mix input for all SUTs except motorcycles (SUT 11) and the long-haul trucks (SUTs 53 and 62), and saved in the SUT population factors array. For SUT 21, each fuel type VMT mix fraction is divided by the total VMT mix for SUT 21. For SUT 31, each fuel type VMT mix fraction is divided by the total VMT mix for SUTs 31 and 32. The same process applies to SUT 32. For SUT 41, each fuel type VMT mix fraction is divided by the total VMT mix for SUTs 41, 42, 43, 51, 52, and 54. The same process applies to SUTs 42, 43,

51, 52, and 54. For SUT 61, each fuel type VMT mix fraction is divided by the total VMT mix for SUT 61.

For SUT 11, the SUT population factor for fuel type 1 (gasoline) is set to 1 with all other factors set to 0. For SUT 53, the SUT population factors by fuel type are calculated by dividing each fuel type VMT mix fraction for SUT 53 by the fuel type VMT mix for SUT 52. For SUT 62, the SUT population factors by fuel type are calculated by dividing each fuel type VMT mix fraction for SUT 62 by the fuel type VMT mix for SUT 61, therefore creating a ratio of long-haul and short-haul trucks. The SUT population factors are applied to the SUT population array for all SUTs except SUT 53 and 62. For SUT 53, the SUT population factors for SUT 53 are applied to the SUT population array for SUT 52. For SUT 62, the SUT population factors for SUT 62 are applied to the SUT population array for SUT 61.

Offnetwork Activity Calculation Module

The Off-network activity utility module calculates the analysis scenario off-network activity (ONI, Adjusted SHP, starts, SHEI and APU hours activity) by hour and SUT/fuel type (SHEI and APU hours activity are for SUT 62, fuel type 2 [CLhT_Diesel] only).

The ONI is calculated for each hour of the day using the following formula:

$$\text{ONI Hours} = (\text{SHOnetwork} * \text{TIF} - \text{SHI}_{\text{network}}) / (1 - \text{TIF}).$$

Where:

$\text{SHO}_{\text{network}}$ = the SHO on each link. This is calculated by dividing the VMT associated with each link by the link's congested speed.

$\text{SHI}_{\text{network}}$ = the total SHI that occurs on the network (idling that occurs as a component of drive cycles) and is calculated by multiplying $\text{SHO}_{\text{network}}$ by a 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 are used as defined in the MOVES data table *roadidlefraction*.

TIF = the total idle fraction, i.e., the ratio of total source hours idling and total source hours operating. Default values for TIF are used as defined in the MOVES database table *totalidlefraction* (three-month seasonal averages for summer weekday scenario and 12-month averages for the annual scenario).

The Adjusted SHP is calculated using hourly MOVES road type and SUT/fuel type VMT, an average speed distribution (same format as the MOVES default average speed distribution), and the SUT/fuel type population, and ONI activity. To calculate the Adjusted SHP activity, the utility first calculates the hourly MOVES road type and SUT average speed by applying the average speed distribution to the average speed bin speeds from MOVES and summing across the average speed bins. The utility then calculates the VHT (or SHO) by SUT/fuel type by dividing the hourly MOVES road type and SUT/fuel type VMT by the hourly MOVES road type and SUT average speed and aggregating across the MOVES road types; thus producing hourly SUT/fuel type SHO. The hourly SUT/fuel type SHP is calculated by subtracting the hourly SUT/fuel type SHO from the hourly SUT/fuel type total hours(since these are hourly calculations, total hours are set equal to the vehicle population). If the calculated SHP is negative (i.e., SHO is greater than the total hours), the SHP is set to 0. Adjusted SHP was then calculated by subtracting ONI hours from the previously calculated SHP.

Vehicle starts are 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 are calculated using the applicable MOVES algorithm with data on the age distribution and fuel fractions of the local fleet[1]. Local age distributions and fuelfractions inputs to MOVES are combined with MOVES default parameters (startsageadjustment, startsmonthadjust [three-month seasonal average for summer weekday scenario and 12-month average for annual scenario], and startspervehicle) to produce 24-hour starts per vehicle output representative of each seasonal period. The MOVES output provides the scenario-specific starts per vehicle defined by the study scope. For each hour of the day, the starts per vehicle data calculated by the MOVES algorithm are multiplied by the local vehicle type population estimates to produce the total number of starts by vehicle type per hour.

The SHEI and APU hours activity are a function of hotelling hours and are calculated using base data (24-hour hoteling and hourly MOVES road type and SUT/fuel type VMT), the analysis scenario data used to calculate the SHP, and the analysis scenario SHP. The utility also aggregates the SHP across hours to produce the daily SUT/fuel Type SHP. The utility module first calculates the 24-hour base CLhT_Diesel VMT from the base hourly MOVES road type and SUT/fuel type VMT and the analysis scenario

[1] Previously with MOVES2014, TTI used MOVES default start 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).

CLhT_Diesel VMT from the base hourly MOVES road type and SUT/fuel type VMT. The 24-hour analysis scenario CLhT_Diesel VMT is then divided by the 24-hour baseCLhT_Diesel VMT to create a scaling factor, which is then applied to the base 24-hour hotelling hours to calculate the analysis scenario 24-hour hotelling hours. The utility then calculates the analysis scenario hourly hotelling hours. The analysis scenario hourly CLhT_Diesel SHO (from the SHP calculation process) is converted to hourly VHT fractions. The hourly hotellingfractions are calculated as the inverse of the hourly VHT fractions. The hourly hotellingfractions are then applied to the analysis scenario 24-hour hotelling hours to calculate the hourly hotelling hours. For each hour, the hourly hotelling hours are then compared to the hourly CLhT_Diesel SHP. For those hours where the hotelling hours are greater than the SHP, hotelling hours are set to the SHP for that hour. The utility then calculates the SHEI fraction and the APU hours fraction using the source type age distribution (same distribution used in the MOVES runs), the relative mileage accumulation rates, and the hotelling activity distribution. Travel fractions for source type 62 (CLhT) by ageID (0 through 30) are calculated by multiplying the age distribution by the appropriate relative mileage accumulation rate, which is then turned into a distribution by dividing the individual travel fraction (ageID 0 through 30) by the sum of the travel fractions. These travel fractions are then applied, by model year, to each pertinent operating mode fraction (e.g., for SHEI and APU hours [operating mode IDs 200 and 201]), from the MOVES hotelling activity distribution (also by model year), and summed by operating mode to calculate the composite operating mode fractions (e.g., for operating modes 200 and 201). For each hour the analysis scenario hotelling hours are multiplied by the SHEI fraction to calculate the analysis scenario hourly SHEI activity and by the APU hours fraction to calculate the analysis scenario hourly APU hours activity. The utility also aggregates the hoteling, SHEI, and APU hours activity across hours to produce the daily hoteling, SHEI, and APU hours activity.

Rates Adjustment Module

The Rates Adjustment utility module consist of two utilities:

- RatesCalc module. The module calculates emissions rates in terms of the rate/SHP for the evaporative emissions process using the data in the CDB in the MOVES emissions rates run and the MOVES default database,
- and RatesAdj Module. The module applies emissions rate adjustments to an emissions rate database table if necessary.

The RatesCalc module creates copies of the rateperdistance, rateperhour, and rateperstartemissions rate tables to include the units for each pollutant. If not specified, emissions rates are assembled for each pollutant and process combination (excluding total energy and the refueling emissions processes) in the MOVES emissions rate tables. The utility also uses the movesrun database table, along with a pollutant energy or mass lookup table (mass, TEQ, or gmole), to determine the units of the emissions rates, which are added to the emissions rate tables, which will allow the user to specify any of the units available in MOVES for the MOVES emissions rate run. The type of activity used for the emissions rate calculation is determined by the process, as Table 1 shows.

Table 1. MOVES3 Emissions Process and Corresponding Activity for Rate-per-Activity Emissions Rates.

MOVES3 Emissions Process	Activity	Emissions Rate Units
Running Exhaust	Miles Traveled	Rate/Mile
Crankcase Running Exhaust	Miles Traveled	Rate/Mile
Start Exhaust	Starts	Rate/Start
Crankcase Start Exhaust	Starts	Rate/Start
Extended Idle Exhaust	Extended Idle Hours	Rate/Extended Idle Hour
Crankcase Extended Idle Exhaust	Extended Idle Hours	Rate/Extended Idle Hour
Auxiliary Power Exhaust	APU Hours	Rate/APU Hour
Off-network Idling Exhaust[1]	ONI Hours	Rate/ONI Hour
Evaporative Permeation	Miles Traveled Source Hours Parked	Rate/Mile Rate/SHP
Evaporative Fuel Vapor Venting	Miles Traveled Source Hours Parked	Rate/Mile Rate/SHP
Evaporative Fuel Leaks	Miles Traveled Source Hours Parked	Rate/Mile Rate/SHP
Brake Wear	Miles Traveled	Rate/Mile
Tire Wear	Miles Traveled	Rate/Mile

[1] The ONI emission rates have the same processID as running exhaust, with roadTypeID = 1.

For the rateperdistance (rate/mile emissions rates) emissions rate table, the utility creates a copy of the emissions rates in the specified output database with the table name ttirateperdistance. If specific pollutants are specified, only the emissions rates for those pollutants are copied to the ttirateperdistance table. Otherwise, the entire

rateperdistance table is copied to the ttirateperdistance table. The utility also adds a "Units_Per_Activity" field to the ttirateperdistance table and fills that field based on the pollutants energy or mass designation (mass, TEQ, or gmole). For those pollutants designated as mass, the mass units from the movesrun table are added to the "Units_Per_Activity" field. For those pollutants designated as gmole, the mass units from the movesrun table, along with the text "-mole" (i.e., pound-mole or gram-mole) are added to the "Units_Per_Activity" field. For those pollutants designated as TEQ, the text "TEQ" is added to the "Units_Per_Activity" field. No unit conversions are performed in this utility. The rateperstart and rateperhour, emissions rate tables are processed in a similar manner to produce the ttirateperstart and ttirateperhour, emissions rate tables.

For the evaporative emissions rates, the utility uses the CDB from the MOVES run and the MOVES default database to replicate the MOVES vehicle population and SHP calculation process. Using the emissions rates from the rateperprofile and ratepervehicle emissions rate tables, the utility calculates the rate-per-SHP emissions rates by multiplying the emissions rate by the appropriate vehicle population and dividing by the appropriate SHP value. These rate-per-SHP emissions rates are then saved in the ttiratepershp emissions rate table. Similar to the previous RatesCalc emissions rate tables, the "Units_Per_Activity" field is added to the ttiratepershp table and filled based on the pollutants energy or mass designation.

The RatesAdj module applies emissions rate adjustments to an emissions rate database table produced by RatesCalc module (ttirateperdistance, ttirateperstart, ttirateperhour, or ttiratepershp) or by this utility to produce a new emissions rate database table in the same format as the input emissions rate database table. The emissions rate adjustments can be linear adjustments that are applied to all emissions rates or can be applied by SUT, fuel type, pollutant, and process (adjustments may also include roadway type, average speed bin, and hour). The user has the option of selecting which pollutants will be in the new emissions rate database table, along with the output units of the emissions rates. This allows the user to perform any unit conversions between mass units (i.e., pounds to grams or pound-mole to gram-mole) without providing any addition adjustment factors. Unit conversions between unit types (i.e., gram-moles to grams or TEQ to grams) are not performed internally by the utility. These types of conversions must be made using the emissions rate adjustment factors. The utility also has the option for combining multiple emissions rate database tables into one new emissions rate database table, if the input emissions rate database tables are in the same format.

For the first input emissions rate database table, the utility extracts the emissions rates for the specified pollutants (or all the pollutants if not specified) from the input database emissions rate table, applies the emissions rate adjustments (if necessary) and any unit conversion adjustments, and saves these adjusted emissions rates. If more than one emissions rate database table is input, then the utility performs a similar calculation process to the first input emissions rate database table for each input emissions rate database table. If pollutants are found in more than one input emissions rate database table, the adjusted emissions rates are summed to produce one emissions rate.

After processing all of the input emissions rate database tables, the utility creates a new emissions rate database table in the same format as the first input emissions rate database table and writes the adjusted emissions rates to this new emissions rate database table. Using MySQL code, the utility also creates a minimum and maximum emissions rate summary for each input emissions rate table and the output emissions rate table by pollutant, process, and source type/fuel type, which is written to a tab-delimited file specified by the user.

Emission Calculation Module

The Emssion Calculation utility module estimates the hourly link emissions for one user-specified county using the emissions factors (either from RatesCalc or RatesAdj), the 24-hour or time period VMT mix, the hourly link VMT and speeds activity estimates (either from TRANSVMT or VirtualLinkVMT), and the off-network activity (SHP, starts, and SHI). This utility produces a tab-delimited output summary (including hourly and 24-hour totals) and hourly link emissions output files (optional). The primary inputs to EmsCalc are:

- Emissions factors from Rates Adjustment utility.
- Link-based hourly VMT and speeds developed with the TRANSVMT or HPMS VMT utility module. For each link, the following information is input to EmsCalc: link start node, link end node, link county number, link roadway type number, link area type number, link VMT, and link operational speed estimate;
- 24-hour or time period VMT mix by roadway type, MOVES SUT, and MOVES fuel type;
- Off-network activity (SHP, starts, ONI, SHEI, and APU hours) by hour and SUT/fuel type;
- VMT roadway type designations, which lists associations of the link roadway

types/area type combination to the VMT mix, emissions rate, and MOVES roadway types;

- Pollutants input file, which specifies which pollutant/process combinations for which the emissions calculations will be performed and their respective units in the tab-delimited output;

The emissions estimation can be categorized by two basic types based on the type of emissions factors: the roadway-based emissions and the off-network-based emissions. For the roadway-based emissions (ttirateperdistance emissions factors), the VMT for each link is distributed to each of the SUT/fuel type combinations listed in the VMT mix by roadway type (as designated in the VMT roadway type designations). If the time period VMT mix is input, each hour is assigned a time period by the user. Otherwise, the 24-hour VMT mix is used for all hours. For each pollutant/process combination in the pollutants input file, the emissions factors are selected based on the emissions rate roadway type (as designated in the VMT roadway type designations) and the link speed for each SUT/fuel type combinations listed in the VMT mix.

For link speeds greater than 75 mph, the emissions factors for 75 mph are used. For link speeds less than 2.5 mph, the emissions factors for 2.5 mph are used. For those link speeds that fall between the 16 MOVES speeds, the emissions factors are interpolated using the emissions factor interpolation methodology in the following section. These SUT/fuel type combination-specific emissions factors are multiplied by the SUT/fuel type combination-specific VMT to estimate the mobile source emissions for that link by SUT/fuel type combination. If the activity and emissions by SCC are to be created, the activity and emissions are also aggregated by SCC using the SCC input file and by SCC pollutant using the SCC pollutants input file (thus allowing the user the option to combine multiple MOVES pollutants into one more aggregate pollutant).

For the off-network emissions , the ttirateperstart, ttirateperhour, and ttiratepershp emissions rates(by SUT/fuel type) are multiplied by the appropriate activity, which is determined by the emissions process (see Table 1).

Emissions Factor Interpolation Methodology

To calculate emissions factors for link speeds that fall between two of the 16 MOVES speed bin speeds, an interpolation methodology similar to the methodology used with MOBILE6 is used. This methodology interpolates each emissions factor using a factor

developed from the inverse link speed and the inverse high and low bounding speed bin speeds. The following is an example for a link speed of 41.2 mph.

The interpolated emissions factor (EFInterp) is expressed as:

$$EF_{Interp} = EF_{LowSpeed} - FAC_{Interp} \times (EF_{LowSpeed} - EF_{HighSpeed})$$

Where:

$EF_{LowSpeed}$ = emissions factor (EF) corresponding to the speed below the link speed;

$EF_{HighSpeed}$ = EF corresponding to the speed above the link speed; and

$FAC_{Interp} = (1/Speed_{link} - 1/Speed_{low})/ (1/Speed_{high} - 1/Speed_{low})$

Given that:

$EF_{LowSpeed}$ = 0.7413 g/mi;
$EF_{HighSpeed}$ = 0.7274 g/mi;
$Speed_{link}$ = 41.2 mph;
$Speed_{low}$ = 40 mph; and
$Speed_{high}$ = 45 mph.

FACInterp = (1/41.2 – 1/40)/(1/45 – 1/40) = 0.26214;

EFInterp = 0.7413 g/mi - (0.26214) ▪ (0.7413 g/mi - 0.7274 g/mi);

= 0.7377 g/mi.

MOVES CDB Activity Input Build Module

The MOVES CDB Activity Input Build utility builds the roadtypedistribution, hourvmtfraction, avgspeeddistribution, roadtype, hpmsvtypeday, sourcetypedayvmt, year, state, zone, zoneroadtype, monthvmtfraction, and dayvmtfraction data files in a format consistent with the MOVES input database tables using the link-based hourly VMT and speeds developed with the TRANSVMT or HPMS VMT utility, the VMT mix, and the MOVES defaults. The utility also has the option of building the sourcetypeage (adjusted to reflect the 24-hour VMT mix), starts, and hotellinghours data files in a format consistent with the MVOES input database tables using the output from the OffNetActCalc utility, along with inputs from the MOVES runs and the MOVES defaults. The primary inputs to this utility are:

- Link-based hourly VMT and speeds developed with the TRANSVMT or HPMS VMT utility;
- County ID file which specifies the county number in the link-based hourly VMT and speeds for which the output will be calculated;
- VMT roadway type designations, which lists associations of the link roadway types/area type combination to the VMT mix, emissions rate, and MOVES roadway types (same as used with the Emission Calculation utility module);
- 24-hour or time period VMT mix by roadway type, MOVES source type, and MOVES fuel type (same as used with the Emission Calculation utility module);
- Day ID, which specifies the MOVES day ID for calculating the output;
- Year ID, which specifies the year for calculating the output;
- Link/Ramp designations, which designates each link roadway type/area type combination to either ramp or non-ramp;
- MOVES default database;
- Month ID, which specifies the month for calculating the output;
- sourcetypeyear, SUT age, and sourcetypeage inputs from the MOVES runs (optional, only if sourcetypeage table output is to be created);
- Starts output from the OffNetActCalc utility (optional, only if starts table output is to be created); and
- Hotelling, extended idle, and APU hours output from the OffNetActCalc utility (optional, only if hotelling table output is to be created).

For each link in the link-based hourly VMT and speeds in which the county number matches the desired county ID, the link VMT is saved in a VMT summary array based on hour, link functional class, and link area type. The link VHT (link VMT/link speed) is saved in a VHT summary array based on hour, link functional class, link area type, and MOVES average speed bin ID (determined using the MOVES average speed bins and the link speed). The link VHT is also saved in a road type VHT array based on link functional class and link area type, and, if the link is specified as ramp by the link/ramp designations specified by the user, the VHT is additionally saved in the ramp segment of the road type VHT array.

A MOVES roadway type array by MOVES roadway type (roadTypeID codes 2 through 5) is also created using the data in the VMT summary array and VMT roadway type

designations. For the link road types designated a MOVES road type of 6 or 8, the VMT is added to MOVES road type 2 in the MOVES roadway type array. For the link road types designated a MOVES road type of 7 or 9, the VMT is added to MOVES road type 4 in the MOVES roadway type array. An hourly VMT array (by MOVES SUT, MOVES roadway type, and hour) is formed using the data in the VMT summary array, the VMT roadway type designations, and the VMT mix. If the time period VMT mix is used, each hour is assigned a time period by the user. Otherwise, the same 24-hour VMT mix is used for all hours. An average speed distribution array (by MOVES SUT, MOVES roadway type, hour, and MOVES speed bin) is created using the VHT summary array and the VMT mix. Using the appropriate MySQL code, the MOVES roadtypedistribution, hourvmtfraction, and avgspeeddistribution default values are extracted and saved for later use.

The VMT in the MOVES roadway type array is used to produce the roadway type distribution array by MOVES SUT and MOVES roadway type. This VMT is converted to a distribution by MOVES SUT (i.e., the total for a SUT over the five MOVES roadway types should equal 1), with the distribution value for MOVES roadway type 0 (Off-Network) equal to 0. The utility writes the tab-delimited roadtypedistribution table output (optional).

The VMT in the hourly VMT array is added to the hourly VMT fraction array (by SUT, MOVES roadway type, and hour) and for those roadway types where the VMT for all hours is greater than 0, this VMT is converted to an hourly distribution. For those roadway types where the VMT is equal to 0, a value of 1 is placed in the first hour, followed by 0 in the remaining hours. The utility writes the tab-delimited hourvmtfraction table output (optional). For those SUTs where the VMT mix is greater than 0, the hourly VMT fraction array is used. Otherwise, the MOVES hourvmtfraction default values are used.

The VHT in the average speed distribution array is converted to a distribution by SUT, MOVES roadway type, hour/day (combination of hour and the day ID specified by the user), and MOVES average speed bin. The utility writes the tab-delimited avgspeeddistribution table output (optional). For those SUTs where the VMT mix is greater than 0, the average speed distribution array is used. Otherwise, the MOVES avgspeeddistribution default values are used.

The VHT in the road type VHT array is converted to a proportion of ramp VHT by dividing the ramp segment of the road type VHT array by the total VHT for the road

type in the road type VHT. The utility writes the tab-delimited roadtype table output (optional).

The VMT in the hourly VMT array is aggregated to create the 24-hour HPMS vehicle type VMT array. Each SUT is assigned an HPMS vehicle type (SUT 11 is HPMS vehicle type 10; SUTs 21, 31 and 32 are HPMS vehicle type 25; SUTs 41, 42, and 43 are HPMS vehicle type 40; SUTs 51, 52, 53, and 54 are HPMS vehicle type 50; and SUTs 61 and 62 are HPMS vehicle type 60). The utility writes the tab-delimited hpmsvtypeday table output (optional).

The VMT in the hourly VMT array is also aggregated by SUT to create the 24-hour SUT VMT array. Using this VMT data, the utility writes the tab-delimited sourcetypedayvmt output table (optional) in a format consistent with the MOVES input.

Using the appropriate MySQL code, the fuel year ID is extracted from the MOVES default year database table for the user-supplied year ID. The tab-delimited year table output is written (optional) using the user-supplied year ID and the extracted fuel year ID. The "isbaseYear" data is written as well (automatically set to "Y").

The utility also produces two tab-delimited summary output files. A tab-delimited VMT summary is output by hour, link road type, and link area type for the user-specified county. A tab-delimited VHT summary is output by hour, link road type, link area type, and MOVES average speed bin for the user-specified county.

The utility creates five other tab-delimited outputs (state, zone, zoneroadtype, monthvmtfraction, and dayvmtfraction tables) using the user-supplied inputs. For the state table (optional), the utility extracts the data from the MOVES default state database table where the state ID is 48 and writes this data to the tab-delimited state table output. For the zone table (optional), the utility extracts the data from the MOVES default zone data for the county ID greater than 48000 and county ID less than 49000 and writes this data to the tab-delimited zone table output with the start allocation factors, idle allocation factors, and SHP allocation factors replaced with values of 1.

For the zoneroadtype table (optional), the utility extracts the MOVES default zoneroadtype data where the zone ID greater than 480000 and zone ID less than 490000 and writes this data to the tab-delimited zoneroadtype table output, with the SHO allocation factors replaced with values of 1. For the monthvmtfraction table (optional), the utility extracts the data from the MOVES default monthvmtfraction table

and writes the data to the tab-delimited monthvmtfraction table output with the month VMT fraction set to 1 for the user-supplied monthID and 0 for all other months. For the dayvmtfraction table (optional), the utility extracts the data from the MOVES default dayvmtfraction table and writes this data to the tab-delimited dayvmtfraction table output with the day VMT fraction is set to 1 for the user-supplied day ID and 0 for all other months.

For the sourcetypeage table output (optional, also needed if the hoteling hours table output is to be created), the utility calculates the adjusted relative mileage accumulation rates (MAR) by multiplying the input relative MAR (categorized by SUT and age from the sourcetypeage input) by the SUT-specific relative MAR adjustment factors (one factor per SUT applied across all age categories). These adjustment factors are calculated using inventory SUT VMT fractions within each HPMS vehicle type and the sum of the SUT-specific normalized travel fractions within each HPMS vehicle type. The inventory SUT VMT fractions within each HPMS vehicle type are calculated by dividing the 24-hour SUT VMT by the 24-hour HPMS vehicle type VMT for the respective SUT.

For the sum of the SUT-specific normalized travel fractions within each HPMS vehicle type, the utility uses the same calculation procedures used by MOVES to calculate the normalized travel fractions. The SUT vehicle population is distributed to each age category using the SUT age distribution input. Using the sum of the vehicle population by HPMS vehicle type, the SUT population fraction for each age category within each HPMS vehicle type is calculated by dividing the SUT vehicle population by age by the sum of the vehicle population by HPMS vehicle type. The utility then calculates the initial travel fractions (by SUT and age) by multiplying the SUT population fraction for each age category within each HPMS vehicle type by the relative MAR input.

These initial travel fractions are then normalized within each HPMS vehicle type to produce the SUT and age-specific normalized travel fractions within each HPMS vehicle type. The utility then calculates the SUT-specific relative MAR adjustment factors by dividing the inventory SUT VMT fractions within each HPMS vehicle type by the sum of the SUT and age- specific normalized travel fractions (i.e., aggregated across the age category for each SUT); resulting in one SUT-specific relative MAR adjustment factor for each SUT.

For the starts table output (optional), the utility aggregates the SUT/fuel type hourly starts input (output from the OffNetActCalc utility) by SUT and multiplies the SUT hourly starts by the SUT age distribution (by SUT) to distribute the hourly SUT starts to each age category. The SUT hourly starts by age are written to the starts table output file, along with the user-supplied monthID, yearID, dayID (used to form the output hourDayID), and zoneID (set using the user- supplied county FIPS code.

For the hoteling hours table output (optional), the utility uses travel fractions specific to SUT 62 to distribute the hourly hoteling hours input (output from the OffNetActCalc utility) to each age category. These travel fractions are calculated by multiplying the SUT 62 age distribution by the calculated relative mileage accumulation rates (MOVES defaults adjusted so to reflect the emissions inventory 24-hour VMT mix) for each age category and dividing by the sum of the product for all the age categories. These travel fractions are multiplied by the hourly hoteling hours input and written to the hoteling hours table output, along with the user-supplied dayID (used to form the output hourDayID), monthID, yearID, and zoneID (set using the user-supplied county FIPS code.

Post Processing Utilities

The post processing utilities process the intermediate results from the EI Main Utility to produce the post processed emission estimate results in a tab-delimited file (including all of the SUT/fuel type combinations listed in the VMT mix on a single line, separated by a tab character) for the specified county by pollutant, link roadway type, and SUT/fuel type combination for each of the specified episode time periods. A 24-hour (or total if all 24 hours are not specified) output is also included in the tab-delimited file. Only those pollutant/process combinations in the pollutants input file with tab-delimited output units other than "NONE" will appear in the tab- delimited output file. Prior to output, any unit conversions between mass units (i.e., pounds to grams or pound-mole to gram-mole) are performed by the utility. Unit conversions between unit types (i.e., gram-moles to grams or TEQ to grams) are not performed internally by the utility (these type of unit conversions must be done using the RatesAdj utility). This tab-delimited file also includes hourly and 24-hour summaries of the off-network activity and VMT, VHT, and speed by link road type. Link emissions may also be output by county, pollutant, process, and each SUT/fuel type combination. If specified, the tab-delimited activity and emissions by SCC output file is also created, which lists the activity and emissions for each SCC pollutant by SCC.